

# International Maritime Lecturers Association



## The 26<sup>th</sup> International Maritime Lecturers Association

### Conference (IMLA 26)

### “Modern Challenges in Maritime Education and Training”

## Proceedings

September 23-25, 2019

Legal Entity of Public Law - Teaching University

Batumi State Maritime Academy



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## Preface

The book contains the Proceedings of the The 26th International Maritime Lecturers Association Conference (IMLA 26), held at Legal Entity of Public Law - Teaching University - Batumi State Maritime Academy, Batumi, Georgia, September 23-25, 2019.

The IMLA Conference ensures a unique platform for the international discussion of Maritime Education and Training issues.

The conference proposes “**Modern Challenges in Maritime Education and Training**” and the event is aimed to promote collaboration between the IMLA members and the stakeholders.

Contributions to the IMLA 26 deal with the challenges related with development and implementation of distance learning in MET, LLL (lifelong learning) & CE (continuous education), simulator training based learning in MET, Problems of attractiveness of Maritime Education and Profession, collaboration between “Academia” and “Industry” for development of relevant skills, curricula internationalization and harmonization, IT technologies in MET, development of new technologies in Maritime Industry and its implementation in educational process, maritime training and certification challenges and other contemporary MET issues.

The editors of Proceedings of IMLA 26 at any time evaluated manuscripts for their intellectual content without regard to the nature of the authors or the host institution including race, gender, sexual orientation, religious belief, ethnic origin, or citizenship of the authors.

The collection of full papers includes contributions from the authors and the editors cannot accept responsibility for any inaccuracies, comments, contents and opinions contained in the text.

On behalf of the Key Hosts, Organizing Committee and Editorial Board, sincere thanks are directed to the Government of Autonomous Republic of Ajara, the Ministry of Economy and Sustainable Development of Georgia, Maritime Transport Agency of Georgia, the Ministry of Education, Culture and Sport of Autonomous Republic of Ajara.

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## **On the Way from Unified and Standardized MET to Personalized Maritime Education**

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### **Abstract**

Maritime education, and in particular the training of ship officers, is an area of education where attempts have been made to reconcile contradictory tendencies and approaches. There is a paradox in the training of seafarers: on the one hand, trying to achieve 100% readiness of seafarers for all kinds of situations that can happen at sea. On the other hand, it is assumed that the ship officer (above all the master) has enough creativity, courage and intelligence to find non-standard solutions for the non-standard situations and to implement them quickly and decisively.

The result is that the training of seafarers is based on maximum standardized and unified regulations, i.e. the STCW Code. It does not leave much room for the development and implementation of the personal qualities. However, the standard lessons may be insufficient in non-standard situations. The master can have necessary qualities and apply them in a critical situation, however, in some cases cannot have them and then the situation may come out of control.

Human qualities are particularly important in the upcoming era of smart shipping. It can be expected that with the standard situations, where nothing extraordinary happens (or happens in a predictable way) and all the activities can be algorithmic, artificial intelligence can do much better than people can. However, if a non-standard situation has appeared where algorithms do not work, then a human must step into the game and use the human-specified characteristics.

Is the maritime education and training today sufficiently focused on identifying and developing seafarers' personal qualities and orientation to collaboration with wise machines? The author of this article dares to argue that it is rather on the contrary – it pushes people into the narrow framework of standardized situations and solutions. The author offers his initial vision of



changing the maritime education more personalized and oriented on non-standard behaviour and solutions.

## **Introduction**

Seafaring has always been a high-risk area of human activity. Vessels have always been autonomous to a greater or lesser extent but the statement that nowadays quite fashionable and highly spoken so-called "fully-autonomous" or by artificial intelligence driven ships will have a maximum degree of autonomy is not quite true. There is no, because despite the lack of people on board there should be the opportunity to get information from ship at any moment, in order to get timely to know the problems that may arise (and inevitable will arise) with these vessels, and to do something to solve these problems.

Paradoxically, sailboats before inventing and putting into operation radio communications can be considered as vessels with the highest autonomy rate. For example, Columbus' ships were 100% autonomous, because when leaving the harbour, the seamen had very little chance of contacting anyone during the long voyage, not to mention the replenishment of food and water. Of course, they could not ask anyone for advice or help, so they could only rely on their own knowledge, skills and maritime experience, that is to say that the cost of poor "maritime education and training" was lost human lives and dead ships.

Today, the situation has changed, but seafaring is still a dangerous area and from time to time still require the giving of human lives. The design and technical equipment of modern ships has taken a huge step forward compared to Columbus ships. However, it is true that the abundance and dimensions of ships have increased many times as well, so that smaller and larger accidents, up to major disasters, happen from time to time. One of the most important factors contributing to this is the so-called "human factor", that is, the mistakes made due to human errors, deficiencies and imperfections, which cause dangerous situations and can ultimately lead to accidents at sea.

It is clear that ensuring maritime safety and, above all, preserving human lives at sea is a priority issue. No matter how good and constructive and technologically perfect ships are, the most important point is that they always get to port B from port A without endangering human life and property. Although probably seafaring as old as humankind itself, internationally, systematic and purposeful engagement in maritime safety started not quite long time ago – a little bit more than 100 years ago. One of the most important events that accelerated the development and implementation of the relevant regulations was undoubtedly the tragic

shipwreck of Titanic in 1912. This was the main driver for the development of first version of the SOLAS Convention (The International Convention for the Safety of Life at Sea) in 1929; the 1929, 1948, 1960 and finally the 1974 versions were further. This is considered as the main and most important transnational agreement on maritime safety [1].

The title of the SOLAS Convention reflects its main purpose - to ensure the survival of human lives at sea. To achieve this goal, the Convention includes detailed and stringent requirements for ship design and equipment, communication and rescue equipment, and many more, but until today, the most important safety link has been, and remains, the people themselves, first of all the crewmembers. Paradoxically, this link in different situations can be either the weakest or the strongest link. Maritime history knows many cases where fatal errors made by people have led to tragic consequences. At the same time, there are no fewer cases where, thanks to the very professional, adequate and self-defeating actions of the captain and the other crewmembers, people and property have been saved in the most difficult and at first sight hopeless situations.

It is clear from this that maritime safety can only be provided by ensuring the training of seafarers of the appropriate level and qualifications. If the requirements for ships and their technical equipment are presented at international level, it is logical that the level of training and qualifications of seafarers must be regulated at the same level, especially since the seafarers' labour market is completely international, which requires unification of the relevant requirements and criteria. Thus, the so-called STCW Convention (International Convention on Standards of Training, Certification and Watchkeeping for Seafarers) has been developed and enforced, the first version of which was adopted in 1978 and subsequently updated in 1995 and 2010 [2].

### **MET and "Smart Shipping" today and in future**

The STCW Convention and its integral part STCW Code contain minimum standards to the training, certification and watchkeeping for seafarers and do not determine the level of education required for the person who applies for a ship's officer certificate. True, the Convention provides for two levels of training and, consequently, qualifications: management level and operational level, but they differ in the content and scope of professional knowledge and skills and speak nothing about the level of education required for one or another professional level. It shows the so far prevailing point of view that the qualifications of seafarers are only determined by their professional knowledge, skills and practical experience. According to that point of view, the personal characteristics and qualities, which can be not only congenital but also developed to a greater or lesser extent through creative (higher) education, do not play any significant role in this respect: if it is, good, but if not, nothing terrible happens. This leads

*inter alia* to differences in the level of education of seafarers across countries because in some countries, it is sufficient to have vocational training diploma for both level, in others, for example, for having of management level certificate, i.e. as captain, chief mate, chief engineer and second engineer, a higher education diploma obtaining is needed.

Under all assumptions, the ship's captain and other crewmembers (at list on management level) must have the essential personal qualities and ability to apply them in a critical situation. At the same time it can happen that they does not have these qualities to the essential extent, and it only becomes evident in the critical situation itself when it is too late and the situation is out of control. It can be quite difficult to foresee and prevent such course of events because the professional training of the captain (ship officer) in question can be in full compliance with the STCW Convention, and is expected to have such a maritime experience, as the regulations require. However, one small remark: possible that their experience so far did not include emergencies and critical situations, so it is unpredictable what happens when such a situation occurs. Both distant and recent maritime history know the cases where the captain (ship officer) lost common sense in a dangerous situation, began to behave inadequately, made the wrong decisions, which ultimately led to serious consequences. Later it is commonly referred to as "human factor".

The leading international maritime organizations, especially the IMO, have been trying to find solutions to these problems through the adoption of new regulations as well as through upgrading and modernizing existing ones. Under the latter, the author thinks first the STCW Convention, which was last modified significantly in 2010 by the Manila amendments. Among changes was "New requirements for marine environment awareness training and training in leadership and teamwork", which states that, training on Bridge Resource Management, Teamwork, and Leadership has been made mandatory for both management and operation level.

It is clear that the efforts of international maritime communities over the last 40 and even more years have been effective. The training of seafarers has become more efficient, seafarers are more qualified, and seafaring is safer, especially if to keep in mind the coping with modern techniques and technologies. More and more advanced and modern simulators, guided practical training on-board, etc. undoubtedly help to achieve a high level of qualification and excellent coping capability for seafarers, primarily talking about daily routines and standard situations.

However, incidents and accidents at sea continue to occur. According to EMSA, the number of very serious casualties has even increased in the period 2011-2017, although the number of ships lost per year within the EU has decreased during this period and there were 15 ships lost in 2017, which is actually the smallest number throughout the EU history. [3] In total more than 1,500 incidents occurred with EU vessels in 2017. At the same time, we cannot in any way regard these numbers as satisfactory. According to EMSA, most of these cases are caused by a human factor, for example, in 2017, 58% of incidents have occurred through human error and this number arises to 70% if taking into account the mistakes made by people during the ship operations. [3]

Why do the main regulations for the training of seafarers, in particular the STCW Convention, do not able to reduce significantly the negative impact of the human factor on marine casualties? In the opinion of the author of this article, they cannot do it for the simple reason that they do not set it as a primary goal. Seafarers' training in the STCW Convention is as unified and standardized as possible, its guiding principle is that everything that can happen at sea needs to be learned in advance, and that solutions to all problems have to be played through in advance as well. Unfortunately, this principle only works in routine and standard situations and may be useless as soon as an unprecedented and non-standard situation occurs. In this case, there can be little use of the knowledge and skills learned and acquired and the scenarios played through; the personal qualities of the main actors come to the fore. So that, because situations at the sea rarely recur one to one and occasionally happens something that have not been experienced in the past, even the best "learners" can get into trouble and not cope with the situation and themselves.

It cannot be said that no attention has been paid to this contradiction. As has already been said, the most important recent changes to the STCW Convention in the form of the Manila amendments 2010 are to some extent shifting the focus from technical and organizational knowledge and skills to so-called soft values, such as management, teamwork, leadership but it is as before assumed that all this can be learned in the respective courses and trainings. These mostly a few days' courses that are built as usually - someone wise person (instructor) tells how to manage, work in team, be a leader, and so on. Who does more work on training (the most diligent student) will be a better manager, a team member, a leader, etc. However, is that enough? May be certain personal qualities that are congenital on the one hand and acquired (not learned) on the other hand, including during higher education studies, are decisive here. At the same time, it should be noted that when developing these characteristics, educational

institutions have to review radically not only the content and forms of their studies but main paradigms as well.

The first problem of the education system today is its inflexibility, ungainliness, bureaucracy and the inability to react quickly to the increasingly rapid changes in today's world. Creating new curricula or upgrading existing one takes 1-2 years. Starting with studies in the curriculum, the learner is obliged to go through it more or less in the same way as it was at the time of admission. This is 4-5 years more to the abovementioned 1-2 years, during which nothing can change significantly. During this 5-7 year period, there may be many changes in a field, especially in such dynamic field as shipping. Some of the job places, for working on which learner enrolled may have been disappeared by that time, for example by being taken over by smart machines. It should be mentioned here that the STCW Convention is also inflexible and over-regulated and, in fact, well compatible with this system.

The second problem is the fragmentation of curricula. The author has in mind that the subjects in the curriculum are often not related to each other, especially general and core subjects to specialty subjects. Teacher of one subject do not know and are often not interested in the content of other subjects; likewise do not know what another lecturer is doing in his(her) subject and how (s)he does it. The result is that students also have no understanding about definite and logical relationship between the subjects they learn. Nevertheless, the world is one whole, everything is all about everything, and division into fields and subjects is rather an artificial way. It is imperative to accept and adopt a holistic perspective, especially in higher education. [4]

To illustrate the lack of a holistic way of thinking, one can point out the environmental and nature protection issues. The vast majority of people, including stakeholders, heads of companies and their employees, know that things in this area are out of order, know about drastic changes in climate, even the fact that these changes will soon be irreversible, if not already, etc. They even agree that something has to be done and people must act in this direction. What do they do next? In their work, for example, in the management of a shipping company or even in their daily activities, they continue with the same wasteful and self-destructive way of life and work that eventually leads to disaster. Why? Then they do not know or do not want to know how to create links between what they do in their company or even in their own home yard, and what is happening in the world. Probably no one made it clear to them during their studies or, worse, lecturers-economists have convinced them that everything is very well, economic growth is an eternal blessing and earning profit is the noblest goal of human beings.

The author does not share the view that the digitalisation of shipping leads to the reducing the importance of the human being. Taking into account that the emergence of so-called "smart shipping" will inevitably lead not only to benefits and positive consequences, but also to numerous threats and possible complications, the author believes that the importance of the human being in ensuring a viable and reliable system, on the contrary, is increasing. [5] There is a growing need not for not-minded rules-makers, but self-assertive bold and confident creators.

The author would come up with four key concepts that, in his view, must characterize the changes that have to be made in the near future in the education of seafarers to meet the challenges of the new (digital) era. The first is to make the specialty subjects complex and diverse. For example, a 6.0 ECTS subject may be divided into three several parts: it can have 2.0 ECTS subject-specific professional knowledge and skills, 2.0 ECTS could be related to environmental issues relevant to nature of subject, and 2.0 ECTS would be dedicated to corresponding ICT. The proportion may also be different, e.g. 4.0 + 1.0 + 1.0 or other, depending on the nature of the subject. These parts should not be autonomous, or separated from each other, but must intertwine well and support each other while teaching the subject.

The second keyword is collaboration. Of course, such a complex subject may have one teacher, but it seems more logical that there are several lecturers, each one is the specialist in one of these fields and they work closely together in teaching the subject. The principle of complex subjects presents the special requirements to teachers. They must have a very good co-operation capability, with each other and with students. Usually the subject should have a common part, which to be taught in the form of discussions and disputations. The so-called project training may be very well suited here, where the lecturers of different parts prepare and launch projects that require complex solutions founding together with students. Needless to say, that in the digital age teaching staff have to be familiar with modern technologies and teaching methods and to use them in teaching work broadly. [4]

The third keyword is flexibility. This means that the professional block in curriculum has a basic part that remains unchangeable for the student during all studies, but the majority of this block consists of different modules that each student is free to choose (or not) during their studies. Moreover, the content of these modules is constantly changing according to the changes taking place in the professional field and in the wider world.

The fourth principle is the further stratification of education when "smart shipping" will play a significant role in marine transportation. Currently, the ship officers' training system, according to the STCW 78, is two-tiered - operational level and management level. The output of it are

certificated officers for conventional vessels with different level of higher or vocational education. In the author's opinion, however, their level of education should be at least the level of Bachelor's or Applied Higher Education.

In the future, there should come into being a layer of "smart shipping" seafarers that author describes as the 3M and MP concepts in his recent publications [4], [5]. Operators of remotely controlled vessels belong to this group as well. In addition to a very good traditional maritime education and rich seafaring experience, they must be very good ICT specialists; some of the personal qualities already mentioned above are also very important for them. Their level of education should probably be a Master's degree, and author calls them the "Sea Elite" in the best sense of the word. They will have the primary responsibility for ensuring that the ambitious plans for the triumph of artificial intelligence at sea would become a reality and bring more positive rather than negative results.

Finally, the author would like to refer to his proposal made in the publication [4]. This is proposal about the simulation of seafaring in real-life conditions. The principle is that a considerable number of maritime educational institutions and a significantly higher number of real ships, both manned and remote-controlled, will be connected to the on-line network. If there are enough big number of ships in this network, then according to the probability theory, something unusual or even extraordinary should happen time by time with one or other. Learners connected to network can directly follow what is happening on the "scene"; moreover, they can intervene with the permission of the operator of the remote-controlled vessel or the master of the manned vessel, e.g. by giving advice or expressing an opinion. The big advantage of such an on-site simulation is that everything happens in real life, and the consequences of the wrong decision can be not only the screeching sound and the blind simulator screen, but also the real damage.

## **Conclusion**

The forceful advent of intelligent vessels on the seas will inevitably change the requirements for seafarers, and thus the foundations and principles of maritime education and training (in some cases watchkeeping as well).

As is often the case, large and, so to say, epoch-making innovations are accompanied by the division of people in the field into several groups. Some believe fanatically that the almighty artificial intelligence takes over the management and operation of ships from stupid people and is able to organize it perfectly, including with a high degree of safety. They are convinced that

the less people have the opportunity to intervene in the process, the better situation is because the minimizing (ideally close to zero) the impact of the so-called human factor in shipping.

Other people argue that artificial intelligence can be even more stupid than a human being can, and under no circumstances should such a complicated human activity as seafaring be trusted wholly to the machines, although they may seem very clever. In their opinion, artificial intelligence is not an intellect in the literal sense of the word, because it works using the algorithms created by people who remain imperfect.

The author of this paper does not fully endorse any of these extreme views. He thinks that artificial intelligence and other high-tech achievements must be treated without euphoria, realizing both the strengths of these systems and the potential weaknesses and the different kinds of threats that can stray intelligent ships and smart shipping if over trust in artificial intelligence. In his publication [5], the author outlines these factors, both external and internal to the system, which, in his view, could pose a major threat to artificial intelligence led ships and shipping, if to give it too much scope for "independent" action.

At the same time, the author understands how many extraordinary opportunities and advantages can be offered by the digitalisation of ships and shipping, when applied wisely and thoughtfully. In the author's view, more consensus should be reached in the coming years and regulations and other normative documents should be developed that clearly define the activities and situations that can be entrusted to and managed by artificial intelligence and those that require people to intervene and control the situation. Broadly speaking, artificial intelligence may routinely navigate and operate ships without any human intervention until the situation is standard, i.e. envisaged by corresponding algorithms, and does not go beyond the limits of standard decision-making. However, if there is a risk that the situation may go out or have begun to leave routine procedures and need non-standard, sometimes intuitive solutions, then human intervention and control over the situation should be ensured.

As described above, it also requires a review of the basic principles of MET and needs the differentiation, diversification, and orientation to solution of non-standard, including unique, situations. Eventually, the relevant regulations, including the STCW Convention, must go along with the changes that are taking place, such as setting different requirements and the content of studies for people operating ships with different degrees of digitization.



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## **The Accreditation Process: Analyses of the Results and Creating Impact on the Eyes of the Stakeholders**

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### **Abstract**

The study aimed to analyze the results of the accreditations by Commission of Higher Education (CHED), The Philippine Association of Colleges and Universities Commission on Accreditation (PACUCOA), and International Organization for Standardization (ISO) 9001 vis-à-vis its impact to the institution as perceived by the stakeholders.

Sixty – eight (68) faculty members, forty – three (43) alumni members and one hundred sixty – four (164) students participated in the study as research respondents. The data analyzed is from AY 2010 – 2015 including the admission, enrolment, graduation, and board passing rate. The present study utilized quantitative and qualitative research design.

The results of the study showed that the Maritime Academy of Asia and the Pacific (MAAP) successfully passed the accreditation process by CHED, PACUCOA, and ISO with some areas or opportunities for improvement. It also shows that the quality of education is the most benefited aspect by the accreditation process as perceived by the stakeholders. Statement of the Problem and its Background

**Keywords:** *MAAP, CHED, PACUCOA, ISO*

### **Statement of the problem and its background**

#### **Introduction**

The accreditation process is one way to ensure the quality education in an academic institution as seen in their outputs such an increase in the passing rate of board passers, success in employment and the higher level of competence of the graduates (Abesamis, 2008).

According to Adelman as cited by Ching (2013), accreditation is a method of quality control and policy whereby, as an outcome of deliberation or examination, whether the institution or its programs are granted based on the qualification set by the accrediting agency as complying with the required mandatory standards. However, in the Philippines, it is noticeable that the quality of education in several higher education institutions (HEI's) have worsened over time as cited by Conchada and Tiongco (2015) as showed in low passing rate in the national board exams. Improving the quality of higher education institutions is thus one of the concerns and driving force on why some of the government agencies such as CHED are continuously discovering different ways to address the issue. In the Maritime Higher Education Institutions (MHEIs), there are some issues on the quality of education earned by the students. It is the vision of all MHEI's to be globally competitive by producing skilled and proficient human resources. However, the task is demanding as these institutions need to constantly verify and check their existing policies against the international standards. To address the demand of the competitive world market, the CHED issued policies in relation to compliance of all MHEI's in the country. Thus, there is a need to determine the impact of accreditation at the Maritime Academy of Asia and the Pacific so that other maritime higher education institutions in the Philippines who will undergo voluntary accreditation will have the foundations and basis in modifying their policies, procedures, and systems in education.

### **Statement of the problem**

The general problem of the study is: What are the results of accreditation to the Maritime Academy of Asia and the Pacific vis – a – vis its impact to the institution as perceived by the stakeholders during the academic year 2010 – 2015?

Specifically, this study sought answers to the following questions: (1) How may the profile of the Bachelor of Science in Marine Transportation and Bachelor of Science in Marine Engineering be described in terms of years of offering, years of accreditation and admission rate? (2) How may the results of accreditation by CHED requirements on the two programs? (3) How may the results of accreditation by PACUCOA requirements on the two programs? (4) How may the results of ISO for the Management System Certification be described in terms of Quality management system, management responsibility, resource management, product realization, measurement, analysis and improvement, performance evaluation and improvement? (5) Is there significant difference on the perceptions of faculty, MAAP alumni, and students on the effects of accreditations? (6) How may the respondents have perceived being the most beneficial aspect of accreditation? (7) How may the results of CHED assessments,

PACUCOA accreditation and ISO certification affect the institution in terms of admission rate, graduation rate and board passing rate?

## **Review of related literature**

### **Quality assurance framework in the Philippines**

As mandated CMO-No. 46-s2012, it explains the QA framework used in the Philippines: (1) the fitness for purpose in terms of quality was used by the international organization for assessment and accreditation. This standpoint expects the institution to convert into learning outcomes, programs, and systems their vision, mission and goal. (2) Exceptional for quality should be used for being distinctive, meaning above very high standards, or conformance to norms based on a system of comparability using conditions and standards.

### **Resistance to quality assurance and accreditation**

In the study of Wang (2014), he emphasized the significance of teacher's and student's participation in QA and accreditation to help define quality in higher education in China. Jarvis (2014) opposes that there is an increasing global popularity of using QA in managing higher educational institutions as regulatory tool. Lucas (2014), argue the existence of the academic resistance to Quality Assurance practices.

### **What is the importance of QA and accreditation and its relationship?**

Quality Assurance is a state of conditions that may spearhead to the attainment of comprehensibility and transparency among areas of concerns. The transparency should be visible, it only means that the quality assurance and accreditation should make institutions evident of performance, it also letting the required outcomes to be experienced and felt by the faculty, staff and students.

## **Conceptual framework**

The study presents a theoretical framework based on the independent and dependent variables. The independent variables considered are the components of CHED assessment, the criteria of PACUCOA and the International Organization for Standardization (ISO) 9001 by DNV – GL criteria.

The dependent variable used in the study is the impact on the effectiveness of accreditation in terms of admission, graduation, and board passing rate and the evaluation of MAAP faculty, alumni and students on the accreditation of CHED, PACUCOA, and ISO. The perceptions of the respondents were used to validate the results of the accreditation.

## **Methodology**

### **Methods and techniques of the study**

The study utilized the quantitative and qualitative type of research. Descriptive type of research was utilized to explain and interpret conditions or relationship that exists, the perceptions of the respondents, the present conditions of processes and the effects that are evident or trends that are developing (Best and Kahn, 1998).

### **Population of the study**

Sixty-eight (68) MAAP faculty members, forty-three (43) alumni and one hundred sixty four (164) students of the Maritime Academy of Asia and the Pacific (MAAP) were used as the respondents of the study in the survey.

### **Research instrument**

The research instruments used in conducting this study were self-made questionnaire intended for the faculty members, alumni and students of MAAP. Several procedures in validating the instruments were repeatedly done to obtain accurate results. Likewise, the study used secondary data for the documentary analysis of CHED assessment, PACUCOA accreditation and ISO assessment results from 2010 – 2015 for the two (2) programs offered by MAAP. The research questionnaire focused on the areas evaluated by CHED and PACUCOA. This is followed by unstructured interviews to supplement the original information from the survey.

### **Findings**

#### **Part 1. Profile of the Bachelor of Science in Marine Transportation and Bachelor of Science in Marine Engineering.**

From the time of establishment, MAAP is committed to continuously improve its system in producing qualified and competent graduates by submitting to different types of accreditations. From the statutory and regulatory requirements to various third party accreditations that will check the existing quality policy of MAAP. The ISO started its verification from 2000 up to present, while PACUCOA started in 2012.

#### **Part 2. Accreditation ratings of the two (2) programs by CHED**

In the area of faculty, based on the assessment made of CHED in the two (2) programs offered by MAAP, it showed that the area of faculty is not compliant with the requirements. They found out that one (1) faculty member is not a BSMT degree holder. The said faculty member was given a chance to take BSMT program in a maritime institution using the Expanded Tertiary Education Equivalency and Accreditation Program (ETEEAP).

#### **Part 3. Accreditation ratings of the two (2) programs by PACUCOA**

**Table 1. Results of PACUCOA Accreditations for the 2 Programs offered in MAAP**

Areas of Evaluation	Program	
	BSMT	BSMarE
Philosophy and Objectives	4.13	4.13
Faculty	4.22	4.22
Instructions	4.53	4.53
Laboratories	4.83	4.83
Research	3.32	3.32
Library	4.03	4.03
Students Services,	4.17	4.17
Social Orientation and Community Involvement	4.05	4.05
Physical Plant and Facilities	4.58	4.58
Organization and Administration	4.21	4.21

Based on the report made by PACUCOA on the area of laboratories, "Latest model and impressive state – of – the – art simulators and computer – based training equipment approximating those used in the industry were provided" was found out to be one of the strengths of MAAP.

On the other hand, Research Area though it has the lowest score, the PACUCOA accreditors found it to have a strong management commitment for research activities as gleaned from the provisions of the MAAP Research Manual.

#### **Part 4. Accreditation ratings of MAAP on ISO 9001**

Based on the results of certification, it showed that MAAP is compliant with the certification standards of ISO 9001:2015. It is also stated in the report that the facilities are well maintained all throughout the campus including renovation of cadet's dormitories, efforts to improve the system of grades submission to Registrar through the On-line Grading System (OGS), very strong and effective leadership by top management in driving the risk-based thinking.

#### **Part 5. The effects of accreditations as perceived by Internal Stakeholders**

It can be gleaned from table 2 that among areas of evaluation, MAAP faculty members rated the organization as the highest area with 4.98 mean score while the area of library got the lowest score with 4.66. MAAP alumni rated the facilities as the highest with 4.98 mean score

while the area of research scored the lowest with 4.16. MAAP students gave 4.92 mean score to the faculty while extension services has the lowest with 4.60.

**Table 2. Perceptions of the Stakeholders on Accreditations**

Areas of Evaluation	Faculty		Alumni		Students		Total	
	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
Philosophy	4.90	0.27	4.76	0.35	4.63	0.50	4.71	0.44
Faculty	4.77	0.37	4.49	0.77	4.83	0.32	4.92	0.25
Instructors	4.75	0.38	4.62	0.46	4.89	0.25	4.81	0.34
Laboratories	4.85	0.40	4.66	0.40	4.84	0.31	4.81	0.35
Research	4.72	0.54	4.16	0.50	4.71	0.47	4.68	0.54
Library	4.66	0.44	4.81	0.36	4.75	0.41	4.74	0.41
Extension Services	4.77	0.36	4.21	0.48	4.63	0.45	4.60	0.47
Facilities	4.84	0.30	4.98	0.11	4.87	0.25	4.88	0.25
Organization	4.98	0.10	4.76	0.40	4.94	0.23	4.71	0.43
OVERALL	4.78	0.19	4.60	0.22	4.78	0.17	4.75	0.19

On the findings, the process led the administration to be supportive in trainings and personal development of the faculty and students and in practicing fair and reasonable judgement to the concerns of faculty and students. On the part of alumni, accreditation led MAAP to an environment that is conducive to educational activity and relaxation. Lastly, students strongly agree that this has led in producing sufficient and competent faculty members.

#### **Part 6. Comparison of perceptions towards accreditation between faculty and students**

Among the areas of evaluations, the perceptions of the respondents when grouped according to faculty/ alumni and students is significant on Philosophy, Faculty, and Instructions, therefore the null hypothesis that there is no significant difference on their perceptions is rejected. In the areas of laboratories, research, library, extension services, facilities and

organization, the perceptions of the respondents are not significantly different, therefore the null hypothesis is accepted. In overall, the perceptions of the respondents when grouped according to faculty/ alumni and students are significantly different therefore the hypothesis is rejected.

### Part 7. The perceptions of the respondents on the benefits of accreditation process.

**Table 3. Ranking of benefits of the accreditation process as Perceived by Stakeholders**

Benefits	Faculty		Alumni		Students		Total		Rank
	Freq.	%	Freq	%	Freq	%	Freq	%	
Welfare of Faculty and Students	6	8.8	17	39.5	30	18.3	53	19.3	2
Personal Development	1	1.5	8	18.6	14	8.5	23	8.4	3
Quality of Education	59	86.8	18	41.9	102	62.2	179	65.1	1
Improvement of the classroom or work environment	0	0.0	0	0.0	6	3.7	6	2.2	5
Improvement of the Quality System	0	0.0	0	0.0	4	2.4	4	1.5	6
Improvement of Physical Facilities	2	2.9	0	0.0	8	4.9	10	3.6	4
Total	68	100.0	43	100	164	100	275	100	

In the interview made with the stakeholders on the perceived effects of accreditation, one (1) faculty member said, “*Accreditation helps the management to determine its strengths and weaknesses’ when it comes to quality of education. Accreditation process guides the management towards different approach in education. They also make suggestions on how to improve the existing policies and procedures that will cater the needs of the learners*”.

Another faculty member said, “*With the help of accreditation, I was able to push myself to finish my master’s degree*”. In addition, one faculty member also said, “*Because of the accreditation, I was able to push myself to study and take my BS degree even at my age. I believed that it is indeed a great help for me. It will help not only for myself but also to my*



*students. I can be able to transfer my experiences and ideas to them". "It is just that we have that kind of checking and accreditation".*

Furthermore, one (1) alumnus said, *"I experienced the transformation of MAAP from an ordinary Academy to a world class maritime institution. Let's continue in improving our system and commitment to produce world class seafarer. The quality of education here in MAAP is incomparable to other maritime institutions".*

On the other hand, students of MAAP viewed accreditation as, *"It is one way to improve the performance of the Academy for the benefit and welfare of the students". "Accreditation helps the management to determine what is best for the institution, faculty, staff and to the students".*

Faculty members on the benefits of the accreditation process, 86.8% said that the quality of education had been beneficial followed by the welfare of faculty and students with 8.8%, and improvement of physical facilities with 2.9%.

On the perceptions of alumni, quality of education ranked first with 41.9% followed by the welfare of faculty and students with 39.5% and personal development with 18.6%.

While the majority of the students with 62.2% believed that quality of education has been beneficial with the accreditation process followed by the welfare of faculty and students with 18.3% and personal development with 8.5%.

**Quality of education.** It shows that the faculty members, the alumni, and the students believed that quality of education is the most beneficial aspect of the accreditation process. Accreditation helped the management to determine its strengths and weaknesses' when it comes to quality of education

**Improvement of physical facilities.** The respondents are well appreciated with the efforts of MAAP to give the state-of-the-art facilities to be used by faculty and students.

**Improvement of quality system.** The respondents believed that MAAP quality system has improved because of the accreditation process.

## **Part 8. The effects of accreditation to the admission, enrollment, graduation and board passing rate of MAAP.**

Table 4 shows the applicants for admission in MAAP the enrollment sizes, and reflects the number of graduates, while table 5 demonstrates the board passing rate of MAAP from AY 2010 – 2015.

**Table 4. The number of applicants who took the entrance examination,**

## Enrollment sizes and number of graduates

Class	Number of Applicants for Admission	Percentage Increase of Applicants (compared to class 2010)	Total Enrollment	Percentage Increase in Enrollment (compared to class 2010)	Total Graduates	Percentage Increase in the Number of Graduates (compared to Class 2010)
2015	3218	-67.46	478	132.04	406	126.82
2014	8671	-12.31	496	140.78	495	176.54
2013	10044	1.58	478	132.04	369	106.15
2012	12441	25.82	249	20.87	202	12.85
2011	9533	-3.59	244	18.45	218	21.79
2010	9888	0	206	0	179	0

**Table 5. The board exam passing rate**

Class	Program	National Passing Rate	Program	National Passing Rate
	BSMT		BSMarE	
2014	87.76	54.42	85.00	59.11
2013	50.00	55.09	83.34	63.05
2012	79.34	54.37	93.94	61.05
2011	83.33	48.3	89.33	54.56
2010	43.33	48.73	92.27	52.97

It only shows that accreditations may have an impact on the performance of MAAP in terms of admission, enrollment, graduation and board passing rate. MAAP management was able to determine the appropriate actions on how to run the institution properly based on the demands set by the local and international standards. Accreditation process helps the institution to determine the weaknesses and areas that need improvement. Suggestions from the external reviewing bodies are important to make sure that the existing policies implemented in the institution are working and implemented properly.

## Conclusions

The Maritime Academy of Asia and the Pacific started in 1999 with two (2) programs offered – the BSMT and BSMarE. In the year 2000, MAAP instituted the accreditation process with ISO 9001 and with CHED inspections. In 2012, MAAP received its Level 1 accreditation under PACUCOA. MAAP voluntarily submits the institution for accreditation from local and

international agencies for continuous improvement and ensure that the institution is compliant with national and international standards. MAAP passed the CHED inspections, the ISO certification and PACUCOA accreditation with some areas for improvements. As perceived by the faculty members and students, the area of organization got the highest mean while the alumni members gave the highest mean to the facilities. As perceived by stakeholders, the quality of education is the most benefited from the accreditation process. Accreditations may have an impact on the performance of MAAP in terms of admission, enrollment, graduation and board passing rate. The perceptions of the stakeholders have significant differences in the areas of concerns. MAAP may consider to focus and give importance on the opportunities for improvement as suggested by the accrediting agencies for the benefit of the institution, faculty, staff and students. External stakeholders that include sponsoring companies, parents, non-teaching personnel and the community may be included in the study for they may have other perceptions on the impact of accreditations in MAAP. MAAP may continue submitting voluntarily to accrediting agencies that will check and monitor the performance of MAAP.

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## **Simulator-based Training Course for Ice Navigation in Polar Waters**

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### **Abstract**

Vessels operating in polar waters are exposed to a number of unique risks. Safe navigation in polar waters requires not only ice-strengthened constructor of vessel, but also crew ability to conduct safe operation of vessels operating in this challenging and unique environment. Therefore, significant attention should be paid to human factor which is one of the main factors in this regard, especially for the training and qualification of masters and deck officers on ships operating in polar waters. Since ice navigation course is not fully developed for the countries in the far-polar region, more and more vessels will navigate in polar waters as shipping industry developing, it is extremely essential to study and carry out the ice navigation training course now. Navigation training by means of ship-bridge simulator become an efficient method of training in the maritime education now and has been recognized by international rules, as well as for ice navigation. The paper outlines the international conventions, regulations and guidelines related to the training for navigating in ice waters, and comparatively analyzes the simulator-based courses for ice navigation in the industry including the current status and courses content. By summarizing and analyzing the existing simulator-based training courses for ice navigation, it is convenient for maritime training institutions to get a general knowledge of requirements from international conventions, regulations and guidelines, and to learn about related content. But it is very important to establish a unified standard of simulator-based training courses for ice navigation training.

**Keywords:** Simulator-based; Training course; Safe navigation; Polar waters;

### **Introduction**

The Arctic route is a shortcut of maritime transport in Europe, North America and East Asia. Convenient navigation and development of rich resources will make it become a major part of the international shipping lines. Compared with traditional routes, ships taking the Arctic route will bring huge economic benefits. According to statistics, the ships that have passed across the Northeast Channel(north of the Eurasian continent and the coast of Arctic Ocean) amounted to 27 in 2018 1. Ships operating in the polar waters are facing to many unique risks, for decades

the ship navigation safety of polar waters is mainly dependent on a few experienced officers from a small number of countries<sup>2</sup>. But the experienced officers are so limited that cannot meet the needs of ship navigation safety in the polar waters. The shortage of certificated competent performance crew is increasingly prominent as a large number of ships begin to take the Arctic routes. The domestic regulations instituted by the surround-arctic nations and the international conventions lay down strict requirements on manning and ice navigation training for ships operating in the polar waters. The ice navigation training for crew is an essential precondition for ensuring the safety of the ship and people in polar waters as well as polar environment.

The existing training courses mainly include the theoretical, simulator-based training and on board practice. <sup>2</sup> wherein simulator-based training plays an important role in the course for crew. Canada Newfoundland University and other relevant departments (2003) review the development and evaluation process of the ice navigation simulator and the international ice navigation training courses. <sup>3</sup> John Tucker, et al. (2006) describes the progress of ice navigation training and the technical performance requirements of ice navigation simulator in simulation and modelling. <sup>4</sup> Jieying Xie (2011) summarizes the international regulations related to ice covered waters. <sup>5</sup> This paper is going to summarize and analyze the international regulations of ice navigation simulator and simulator-based training courses so that relevant government departments, educational institutions and the shipping company can read as a reference.

### **The international rules for ice navigation simulator and simulator-based training course**

Crew safety and environment protection of polar waters are the main concern of the international organizations, especially the importance of the human factors. The international organizations have issued and implemented conventions, regulations or guidelines that apply to polar waters, IMO Assembly adopted resolution A.999(25) Guidelines on Voyage Planning for Passenger Ships Operating in Remote Areas <sup>7</sup>in November 2007, Guidelines for ships operating in polar waters <sup>6</sup>in December 2009. STCW-2010 Manila Conference adopted the resolution on Measures to ensure the competency of masters and officers of ships operating in polar waters" and its section B-v/g Guidance regarding training of masters and officers for ships operating in polar waters<sup>8</sup>, but the guidelines and guidance are recommendatory. In November 2014, IMO adopted the International Code for Ships Operating in Polar Waters" (Polar code for short) and related amendments to the International Convention for the Safety of Life at Sea (SOLAS) to make it mandatory, marking a historic milestone in the work of IMO that protects ships and people in the waters surrounding the two poles<sup>9</sup>. Polar code contains the mandatory provisions on manning and training for ship operating in polar waters, the date of entry into force was 1 January 2017.

The amendment of the STCW Convention and Code was carried out vided MSC Resolution 416 (97) in NOV 2016. The amendments of the STCW Convention and code introduced new training and certifications requirements for Masters, Chief Mates and Officers who in charge of navigational watch on ships operating in Polar waters. These persons must meet the mandatory minimum requirements as specified in Section A-V/4 of the STCW Convention and Table A-V/4-1, Table A-V/4-2 of the STCW Code. Examination and assessment of evidence obtained from approved

**TABLE1.** The special requirements for ice navigation simulators of DNGGL-ST-0033

Detailed Requirement	Item	Requirement	Class A	Class B	Class C	Class S
Physical Realism	1.2.1	Two speed and distance measuring devices. Each device should operate on a different principle, and at least one device should be capable of being operated in both the sea and the ground stabilized mode.	×	×		
	1.2.2	Searchlight controllable from conning position.	×	×		
	1.2.3	Manually operated flashing red light visible from astern to indicate when the ship is stopped.	×	×		
	1.2.4	VDR (Voyage Data Recorder) or capability for vessel history track and learner actions log form the instructor and the assessor position.	×	×		
	1.2.5	Equipment capable of receiving ice, icing warnings, and weather information charts.	×	×		
	1.2.6	Anchoring and towing	×	×		

		arrangements				
Behavioral Realism	2.2.1	The own ship model shall realistically simulate hydrodynamics in interaction with solid ice edge.	x	x		
	2.2.2	The own ship model shall realistically simulate hydrodynamics and ice pressure in interaction with solid ice .	x	x		
	2.2.3	The own ship model shall realistically simulate the effects of reduced stability as a consequence of ice accretion.	x	x		
	2.2.4	It shall be possible to simulate the effect of the following ice conditions with variations: --ice type --ice concentration --ice thickness	x	x		
	2.2.5	It shall be possible to realistically simulate the towing of own ship-own ship, and own ship target ship and target own ship. It shall be possible to introduce different towing gear like rope or steel wire with different strength and elasticity, forward, stern, and side towing.	x	x		
	2.2.6	It shall be possible to realistically simulate the interaction between the ships propeller wash and the ice.	x	x		
	2.2.7	It shall be possible to realistically simulate ice drift.	x	x		



	2.2.8	The simulator shall be equipped with iceberg targets of at least six different sizes including realistic underwater bodies which interacts with the sea bottom. The icebergs should be visible on the ship's radar	x	x		
	2.2.9	Motion through ice hummocks should be simulated realistically considering ship icebreaking capabilities and affect ship's speed, roll and pitch.	x	x		
Operatin g Environm ent	3.2.1	The visual system shall be capable of showing concentrations of solid and broken ice of different thickness.	x	x		
	3.2.2	The visual system shall be capable of showing the result of ice-breaking including opening, twin breaking and compacting channel.	x	x		
	3.2.3	The visual system shall be capable of showing the effects of searchlight.	x	x		
	3.2.4	The visual system shall be capable of showing the effects of the ice accretion to the own ship model.	x	x		

simulator training where is appropriate is one of Methods for demonstrating competence in basic training and advanced training for ships operating in polar waters [10].

The international conventions have some mandatory provisions on the simulator for ice navigation, for instance that in the table A-II/2(Specification of minimum standard of competence for masters and chief mates on ships of 500 gross tonnage or more) of STCW-2010 Manila amendments, the training requirements of voyage planning in ice covered waters and ice

navigation are mandatory 8. Master and chief mate should complete the approved and applicable simulator training to conform to the minimum performance standards, the basic requirements of simulator are outlined in the part 1 and 2 of Section A-I/12.

*Part 1-performance standards state that each party should ensure that any simulator used for mandatory simulator-based training shall be suitable for the selected objectives and training tasks, achieving a level of physical realism appropriate to training objectives, having sufficient behavioral realism and providing a controlled operating environment and so on. Each party should ensure that any simulator used for the assessment of competence required under the convention or for any demonstration of continued proficiency, so the simulator shall be capable of satisfying the specified assessment objectives.*

*Part 2-other provisions states that each party shall ensure that the aims and objectives of simulator-based training are defined within an overall training program and that specific training objectives and tasks are selected so as to relate as closely as possible to shipboard tasks and practices.*

Some maritime training center are developing or have developed ice navigation courses which utilize full-mission bridge simulator and related software, in accordance with their own conditions as well as the requirements of the international rules [2]. At present, some national research and education institutions, referring to IMO rules and using DNV GL Certification, design the ice navigation simulator and develop the relevant training courses.

DNV GL issues the detailed requirements for simulators that are intended for ice navigation training. According to the performance level of the simulator, simulators will be divided into three levels, namely Class A (full mission), Class B (multi-task) and Class C (limited task), in addition to Class S (special tasks) in which the simulator is on a case by case basis<sup>11</sup>. In the section 3.3 of DNG GL-ST-0033, the special requirements for ice navigation simulators on physical realism, behavioral realism and operating environment are listed, as shown in Table 1.

DNV GL also makes regulations on the main aspects of training courses, namely instructors, trainee and the performance of simulators, resulting in many countries developing ice navigation training courses simulator-based and training system. DNV GL divides the cognitive ability of personnel after using the simulator into four levels, namely "knowledge(K), understanding(U), application(A) and integration(I)<sup>11</sup>. For every level, it establishes in the condition that the preceding levels have been mastered. The implementation of the teaching program is divided into 8 distinct functional domains, 39 subject-based groups, and 280 capacity requirements. Each competence requirement is allocated a level of cognition that can be used to determine the type of assessment required to measure competence. The

rules for ice navigation simulator adopted by IMO, an international organization, are not that explicit, which provide basic standard on the ice navigation simulator design and training course content arrangement for each contracting state. DNV GL standard includes detailed requirements on simulators, especially ice navigation simulators, in accordance with IMO rules.

**Simulator-based training courses for ice navigation**

It is the key factor that the numerical modeling of ice navigation simulator should be sufficient fidelity. In this way the simulator can be able to reflect ship handling performance and ice feature as far as possible. It could let trainees who attend the ice navigation training course, get accurate and timely response to future conditions that would be possible to be encountered in polar waters. In addition, the simulator should offer interactive communication between trainees and machine under virtual environment, then make sure that the trainees can gain training experience 4.

**TABLE 2.** Canada ice navigation course contents related to simulation items

<b>Simulation Items</b>	
<b>1.0 Ice regimes</b>	
1.5 Signs of ice in the vicinity	1.6 Ice imagery
<b>3.0 Vessel characteristics</b>	
3.1 Vessel types	
<b>4.0 Maneuvering in ice</b>	
4.1 Approaching ,entering, and transiting ice	4.2 Maneuvering astern
4.3 Avoidance and freeing vessel beset	4.4Manoeuvring capabilities
4.5 Docking and undocking	4.6 Safety procedures during ice transit
<b>5.0 Navigation in the ice</b>	
5.1 Navigation in the Arctic	5.2 Passage planning
<b>6.0 Icebreaker operations</b>	
6.1 Icebreaker communication	6.2 Icebreaker operating methods
6.3 Safe speeds and distances	6.4 Convoy operations

Canada began the research of ice navigation training course early. Marine Fisheries simulation center and Marine Institute of Memorial University of Newfoundland (Marine Institute) have adopted and implemented the courses 4, which include ice navigation training course and simulation training.The ice navigation training course of Canada is composed of two parts, each

part lasts one week. The first part can be classified as basic content which provides service to ice navigators without polar waters navigation experience. The second part is the advanced course based on special environment demands and customized courses. The simulator plays a very important role in training courses. The course contents related to simulation items are as showed in Table 2.

Maritime Training Center of Admiral Makarov Academy offers ice navigation training using the advanced and complex simulator approved by the Maritime Administration of the Russian Federation and DNV GL13, including: Full-mission bridge simulator; Full-mission ECR simulator and Steering compartment simulator. Course mainly includes familiarization training, professional ice navigation training, advanced ice navigation training, practical ice navigation training, and crew resource management in ice navigation. Among the course contents, practical ice navigation training includes ice navigation on ship simulation. Crew resource management in ice navigation uses full-mission simulator to simulate the environment of navigation bridge and engine room, virtually display ice conditions, to improve the crew's ability to deal with the harsh polar environment.

Alaska maritime training center is the only American institution that provides ice navigation training course 13. Ten days of the course makes extensive use of simulations, which begin with bridge familiarization and basics of observing and reporting ice conditions. Trainees apply ECDIS and ARPA tools to supplement life-like Arctic visualizations in the DNV GL certified simulator bridges. Complex simulation scenarios challenge trainees with exercises in route finding, pilot transfer, anchoring, convoys, and emergencies in ice. Each exercise in the simulator involves at least 45 minutes of intensive mission evolution, followed by debriefing discussions among course trainees and instructors.

MV YONGSHENG was the first Chinese merchant ship to sail in the Arctic in 2013, 15 vessels have been dispatched to complete 22 voyages through Northeast passage after 2013. As a result, a great deal of training and sailing experience has been accumulated for navigating in the ice area. Qingdao Ocean Shipping Mariners College has taken the lead in carrying out training courses for navigating in the ice area in China [15]. The course will select different ship types according to whether there is icebreaker assistance and ice conditions, and also can provide targeted training according to the ship types that the trainees will be on board. The course takes full account of the changes in the ice area, including the speed and direction of ice drift, the characteristics of the ice area, the range of the ice area and the temperature of sea water. The amount of ice can be fixed or varied throughout the voyage. During the simulation voyage, the icebreaker voyage and the icebreaker can be arranged to assist the voyage according to the size

of the ice volume. In the process of learning, the trainees should take full account of the actual situation and design the selected sea area as a changing sea area with gradually increasing ice conditions. The instructor will issue ice forecast to remind the trainees to choose whether they need the assistance of icebreaker and operate the ship according to the key points of ship maneuvering in the ice area. With the deepening of training, during the course of voyage, some unexpected incidents, such as navigation equipment errors or even faults, communication equipment faults, will be dealt with and solved by the trainees. The ability of trainees to deal with emergencies or incidents in the ice area will be trained. At the end of each voyage training, the trainees should be organized to comment, summarize the training effect and put forward the requirements for the next training, then the instructor will comment and arrange the next voyage training content.

### **Discussion**

Many maritime training institutes are developing or have developed courses on ice navigation. The courses of each training institute have different emphases, but they basically use full-task driving simulator and related software products. For example, Canada, Russia, U.S have developed the ice navigation training courses early and the course system is relatively perfect. The ice navigation training courses of other countries, including Latvia, India, Netherlands, Greece, English and Dutch [16-20] are slightly different contents, but all include simulator-based training courses for ice navigation with different time duration.

IMO has created a model courses to assist training institutions in developing ice navigation courses, emphasizing that the developing courses must meet requirements of international rules. Although some educational institutions refer to the model course to set up the ice navigation courses, the specific content of the course is different. The quality of trainers and instructors also is different, which leads to the great difference in the teaching effect of trainees. Because polar navigation is different from other sea areas, there must be a unified standard for instructors and course contents, in order to train the next generation of qualified polar navigator, international coordination is still necessary.

### **Conclusion**

The paper has stated the present situation of the ice navigation training course demands, the relevant international conventions, regulations and guidelines, also summarized the existing simulator-based training course for ice navigation. With a change in climate, the Arctic route in summer is becoming convenient for shipping transportation. In order to meet the needs of the polar shipping transportation, countries and related education institutions have begun or are working to design simulator-based training courses ice navigation. The lack of standards for

designing simulator and developing ice navigation training course is a main problem all over world. The unified international standards and coordination for ice navigation training course are very necessary.

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## **Collaboration between Iran Southern Ports Operators and Academic Partnerships (Case study: The Iranian Ports Operators and Khorramshahr University of Marine Science and Technology)**

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### **Abstract**

This paper discusses the existing status of industry academia partnership between the Khuzestan province ports (Abadan, Khorramshahr, Imam Khomeini port) and Khorramshahr University of marine science and technology in Iran. It should be noted that as result of an agreement which has been carried out between the ports- academia partnership, definitely it is not enough to keep them on paper. Therefore, the cooperation agreement has been done to prepare a scientific tour for the university students in order to improve their talent, skill and practical knowledge about the marine and maritime subjects. In other words, the academia-industry partnership not only is used to improve the students' knowledge, but also feels good for scientific research activities; it means that the results of these researches will solve real problems of maritime industries or ports. As consequences of European experience of industry-academia partnership which stated that it can be base for developing countries, therefore, an assessment and ranking of the Iranian southern ports operators has been carried out in this article. The author selected an optimum research methodology as descriptive survey method in this research. Statistical society in this research is the active port operators in the southern ports of Iran that are totally 20 port operators. Regarding the aim which is operators' assessment and ranking, the society in whole was selected as sample. Balance Score Card questionnaire based on four dimensions (customer, internal process, growth - learning and financial) has been used for gathering information. The Kruskal-Wallis test was used for inferential analysis of data from the equivalent parametric test, analysis of variance (ANOVA). Results uncovered this fact that Sina and Beta Companies at Shahid Rajaei Port and Kaveh Company at Imam Khomeini Port respectively obtained top ranks in order to be considered as industry academia partnership and remaining ports operators are rated in lower ranks.

**Keywords:** Port Operators, Port-Academia, Industry-Academia Partnership



## **Introduction**

Due to the special circumstances of the ports of the Persian Gulf, the status of the ports of Iran has made it possible, in addition to the use of advanced equipment, to increase the capabilities that affect ports growth, such as the capabilities of human forces, in order to compete with the ports of the region and increase the share of cargo transportation by the fleet of merchant shipping. Facilitate regulations and processes, and other influential issues of special interest. In this research, we try to evaluate performance of the port operators in southern ports with a special look at Shahid Rajaee Port. For this purpose, we first try to present the issue and its significance, and then proceed with the research objectives and problem-solving methods, as well as the tools necessary for data collection and analysis, and the required information will also be expressed.

Having a wide range of water borders, Iran has long since been one of the world's harbor bases. Iran has 14 active and large ports, each of which is a special area for the economy. Most of Iran's ports are important commercial terminals, which make up a large part of the country's imports and exports through these ports. Factories such as Shahid Rajaie and Imam Khomeini carry the main burden of Iran's trade exchanges with other countries, so that Iran's economic relations with other countries of the world continue to flow through the Persian Gulf. Since Iran's most important trading partner in the region and in the world is the United Arab Emirates, and most of the goods imported from the port of Dubai to the ports of Iran, and most of Iran's export goods are transported to this port, an important level of Iran's trade relations with the port's route goes.

In order to achieve this goal, it is necessary to measure operational operators in ports that are referred to as port operators. In this research, we will try to identify the ports-academia partnership as result of the appropriate ports and assess their performance of port operators. In this regard, the analysis was made to judge the performance of a port, which is an aggregate of port operators of that port.

## **The Kruskal–Wallis test**

The Kruskal–Wallis test by ranks, Kruskal–Wallis H test (named after William Kruskal and W. Allen Wallis), or one-way ANOVA on ranks is a non-parametric method for testing whether samples originate from the same distribution. It is used for comparing two or more independent samples of equal or different sample sizes. It extends the Mann–Whitney U test, which is used for comparing only two groups. The parametric equivalent of the Kruskal–Wallis test is the one-way analysis of variance (ANOVA).

A significant Kruskal–Wallis test indicates that at least one sample stochastically dominates one other sample. The test does not identify where this stochastic dominance occurs or for how many pairs of groups stochastic dominance obtains. For analyzing the specific sample pairs for stochastic dominance, Dunn's test, pairwise Mann-Whitney tests without Bonferroni correction, or the more powerful but less well known Conover–Iman test are sometimes used.

Since it is a non-parametric method, the Kruskal–Wallis test does not assume a normal distribution of the residuals, unlike the analogous one-way analysis of variance. If the researcher can make the assumptions of an identically shaped and scaled distribution for all groups, except for any difference in medians, then the null hypothesis is that the medians of all groups are equal, and the alternative hypothesis is that at least one population median of one group is different from the population median of at least one other group.

### **The main research purpose**

- Identification and ranking the Iranian port operators at south ports

### **Research hypotheses**

- 1) The operation of port operators in the southern ports of Iran is related to the customer and market process.
- 2) The operation of port operators in southern Iran is related to the internal process.
- 3) The operation of port operators in southern Iranian ports is related to the perspective of growth and learning.
- 4) The operation of port operators in southern Iran is related to financial perspective.

### **Literature review**

Theoretical Foundations overview of each performance evaluation process involves a series of activities and initiatives with a particular sequence is logical and purposeful. In the process of evaluating the performance of the model is chosen, process and discipline and sequence the following activities are necessary:

1 - to develop indicators, dimensions and related topics and determine the measure of indicators trajectory organizations to achieve specifies goals. At first glance realize the vision to develop indicators 1, Mission 2, goals, strategies, long-term, short-term action plans and the main activity is concentrated. Statute of operational programs and market share in the private sector and consider any purpose that is the criterion used. Performance Indicators have developed an intelligent system and advanced injection molded features that include: - for, to be certain. The comprehensive index, transparent and simple and is loud and clear and

unequivocal as a single interpretation of the concepts of creating Nmayd.- - is measurable. They measure is simply impossible. In addition to yield, ability to define performance indicators in the form of variable quality have also slightly. - is achievable. - be realistic. In other words, activities, mission, policies and strategies of the actual organization and critical areas related to organizational performance. - the framework and timeframe, the index evaluation period to be determined. - database, the data and information required and the indexes exist (Rahimi, 1385).

2 - Determine the weight of the indicator, in terms of their importance and ceilings of the relevant privileges in the sense that the importance of each of the dimensions and indicators What is the axis? Do you have the same significance or different criteria? Which index of the most important and which the least? To determine the coefficients and weights, measures and methods, including Likert method, the method group unrealistic, Borda method, method of selection of experts, analytical hierarchy process method can be named.

3 - standard and determine the desired state of each index benchmarking the performance and value realization of indexes as quantitative or qualitative, and growth performance in recent years, as average or moving average for two or more years, taking into account the specific objectives set for that period and phenomena affecting the implementation of the index, extraction and determined. In determining the optimum state of performance indicators must be realistic and ambitious action and agreed to units that are responsible task and practice it drew index.

4 - notification and disclosure expectations and index "self-assessment" in the conventional methods of performance evaluation, usually without evaluating early indicators informed assessment and judgment Assessment scores are suddenly facing. If the purpose of the evaluation and development of evaluation capacities, it is thus necessary to start the evaluation period expectations in the index to staff be declared so that they can plan, organize, good communication and other processes expected performance to realize. At this point the strengths and weaknesses, opportunities and threats in order to achieve organizational goals are identified.

5 - evaluation and measurement by comparing the actual performance of the end of the evaluation period, the appropriate predetermined standard at this stage activities and achievements of staff in relation to each indicator is examined. At this point the strengths and weaknesses, opportunities and threats in order to achieve organizational goals are identified.

6 - extraction and analysis of the results of the analysis will be done and, if necessary, corrective measures to improve the performance of a given index. Note that the performance results, usually prevailing view on performance evaluation approach and special attention

placed. For example, if a performance evaluation process is concerned, favorable or unfavorable results of the measurement results to determine the status of the process performance. If the process is to increase the value added for optimal performance, and otherwise negative performance due process should be explored. Can be used for reason of their experimental design techniques to reduce error of Six Sigma at leading organizations is more practical, can be used. As well as to improve the process of continuous improvement and to improve the overall process is used and external factors also need to re-engineer the process.

### **The role of maritime transport operators on the development of world container ports**

Due to the heavy downturn in global container market growth of 0.3 percent throughput in this segment by the end of this year, Alsafy (1391) reported total operational in 30 major container port in the world in the first half of 2016 saw an increase of 0.2%, reaching a capacity of 184 million and 280 thousand TUE in 2015 to 570 thousand TEU capacity was 184 million. Accordingly, growth in the volume of container throughput spots with a growth of 0.3 per cent. According to the report, six of the world's top container port container handling decreased in the first half of 2016 suffered. The volume of container handling in the ports of Hong Kong, Dubai, Singapore, Tanjung Pelops and Rotterdam respectively, a drop of 10.5, 6.1, 5.1, 2.8 and 2.3 percent in the first half of this year, world container port behind Shanghai port a decrease of 0.8% in throughput and achieve a capacity of 17 million 890 thousand TEU to 18 million TEU in the last year has announced three thousand. World container port operators in different roles written:

#### **1. - the role of international investors**

Port operators to adjust various methods of cooperation agreements with ports and port operation within the time specified points obtained. In recent decades, governments have paid much attention to greater participation of private sector in infrastructure investment have shown. The reason for this limitation is public funds. This strategy of "participation of the private sector - public sector" is named. In this model, the state's port operator terminals, port or even the wasteland put to them by investment, economic activity specified in the contract to do so. Usually 20 to 40-year long-term contract is considered to be justified their investment. The most common types of contracts in this regard include:

- Build, operate, transfer
- Build, own, operate, transfer
- Construction, leasing, property
- Design, build, operate

- Reconstruction, operation, transfer,

For example, in the port of Sohar, Oman, State with capital spending 100 million Omani rials development plan considers that involves the construction of a new pier with a length of 650 meters and the breakwaters of coastal land reclamation is. The terminal is 15 meters deep and 6 meters' length and regulations that increase the length of the pier to 1,000 meters. India also due to its rapid economic growth (6.8% in 2011) aims to 2017, 7 new port that capital needs \$ 7 billion and 600 million port operator DP World, APM for investment and therefore future economic benefits, have been negotiating with the government of that country. Port operator APM as its goal to be the best port operator in the world and in this regard set 4 as the design, construction, management and port operation is provided for themselves in this regard, with 63 terminals in 36 countries and 150 regions in 46 countries Services "logistics Hinterland ports' case".

## **2. Developer**

Next role container port operators in the world, "developer" container terminals in ports. For example, the terminal port of Antwerp, Belgium, in the form of financial participation (Joint Venture) 50-50 (percent) between MSC shipping line and port operator PSA of Singapore is 4.5 million TEU capacity container in 2005 as one of the most exploited and the Europe Union is known container terminals. It should be noted that PSA plans to invest 500 million US dollars up to 2016 TEU capacity container terminal of the port to 10 million container increase

## **3. Port marketing provider**

The world's top container ports in the world today, your performance is limited solely to imported and exported containers, but try having the central role of container operations to other ports of the region through the world's premier shipping lines transshipment and absorption as well as attracting other countries in transit containers. Being able to port and shipping lines to attract comment until they transship your hub port of the base rate, or that container ships deployed to the port liner and... All global marketing activities requires that port operators are having a proper chart, experts and specialists a proper budget allocation actions in this field.

4 – logistics in the supply chain of goods natural images as provider

port is the world's premier container operators are eager to try on the supply chain of goods and services dependent on the presence and role of logistics will have to be a serious example of their activities in the dry ports can be named backup marine ports. For example, in August of the year 2011 HPH port operator Hong Kong as the logistics center operator at 18 km from the port of Bhutanese Australia. Port operator DP World also participate in 3 billion dollar project, which is one of the world's largest airport they are making with the name Almaktom with a

capacity of 12 million tons of goods at a distance of 10 km from the port of Jebel Ali is can be an example of the activities of the operators of the ports of port logistics named which makes the transfer of The air transport system of goods to the port of it merely be possible during a period of 4 hours which makes the wonders of those involved in the transportation industry.

### **Research methodology**

Research method is a set of rules, tools and ways of authentic and fact findings of the system, access to unknown factors and discover solutions to problems. Adopt a scientific research method is the only way to achieve an acceptable and scientific achievements (Khaki, 1383).

This research is based on the type and purpose of the research is among the practical view of the nature and manner of data collection among the descriptive research – work.

Applied research on the local community or organization that is the study Association, done. The researchers established interaction with the participants in the field, and as far as possible in the processes and experiences of the participants involved. In addition to being a research collection, a method for obtaining information about viewpoint, beliefs, opinions, behaviors, motivation or a group of members of a community profile, this method is a statistical way of doing research and scientific research will be possible. Also, the survey can be considered a scientific social research that includes regular and standard methods for collecting information about individuals, families or groups of different society.

An analysis of the research variables in order to compare the performance of the port operations of Iran's southern ports operators, since the purpose of comparing the average indicators of evaluation of the performance of such operators in the dimensions of the balanced scorecard (BSC), Quad, and on the other hand, independent of each other are the operators of the Nonparametric test of Kruskal-Wallis variance analysis parametric test that is equivalent (ANOVA) is used.

-First hypothesis: between the ports of southern Iran port operations operators' performance from the perspective of the customer and the market there is a significant difference.

The first hypothesis test:  $H_0$ : between the ports of southern Iran port operations operators' performance from the perspective of the customer and there is no significant difference in the market. ( $\mu_1 = \mu_2 = \dots = \mu_{20}$ ).

$H_1$ : between the ports of southern Iran port operations operators' performance from the perspective of the customer and the market there is a significant difference. (At least in the two groups  $i, j, j \neq i, \mu_i \neq \mu_j$ ). the results of the test the first hypothesis is presented in table 1:

1. Table of Kruskal-Wallis statistics to compare average indicate later, the client and the market for port operations, port operators southern Iran

**Table.1**

	<b>Average customer and market indicators</b>
<b>R<sup>2</sup></b>	37.365
<b>df</b>	19
<b>Sing</b>	0.007

A significant amount of the level obtained in the Kruskal-Wallis that its value is less than the average, the equality 05.0 indicators of customer and market operations, after the port of South Iran harbors for operators (default zero). So significant difference between Iran's southern ports of port operations operators' performance from the perspective of the customer and the market. In order to compare them with each other from the table, the average ranking of the Kruskal-Wallis we use:

Table.2 shows average rating for the next customer and market indicators Port operations for the operators of the ports of southern Iran in the Kruskal-Wallis

**Table.2**

<b>Dimension</b>	<b>Port Operator</b>	<b>Number</b>	<b>Average Ranking</b>
<b>Customer and market</b>	Sina – Shahid Rajaei	2	39.25
	Beta	2	37.50
	Kaveh- Imam Khomeini	2	35.75
	Aria Andishe Nuveen	2	33.00
	Sina – Imam Khomeini	2	31.50
	Bay of Puzm	2	29.00
	Parisian-Persian Gulf Bulk Terminal	2	28.00
	Gulf Agency	2	24.75
	Tide water	2	23.00
	Iranian Ports Aria	2	21.75
	Iran South Shipping Line-Imam Khomeini	2	18.25

	Marie Beach	2	17.25
	Golden Anchor	2	15.75
	Sina Bushehr (general Cargo)	2	12.75
	Warehouse and Iran Custom Services	2	11.50
	Sina Bushehr (Container)	2	9.00
	Iran South Shipping Line- Khorramshahr	2	9.00
	Kaveh- Khorramshahr	2	5.75
	Genaveh Port Creators	2	5.00
	Buoy Port	2	2.25

The average rating obtained in table 2 indicate that head the next customer and market indicators respectively in the Sina Corporation (Shahid Rajaei port), Beta (Shahid Rajaei port), Kaveh (Imam Khomeini port), Aria Andishe Nuveen (Imam Khomeini port) and Sina (Imam Khomeini port) have the highest value in the companies to arrange Buoy port, port of Genaveh Port Designers and Kaveh (Khorramshahr port) has the lowest value.

-The second hypothesis: between the ports of southern Iran port operations operators' performance from the perspective of internal processes, there is a significant difference.

The second hypothesis test:  $H_0$ : between the ports of southern Iran port operations operators' performance from the perspective of internal processes there is no significant difference. ( $\mu_1=\mu_2=\dots=\mu_{20}$ ).

$H_1$ : between the ports of southern Iran port operations operators' performance from the perspective of internal processes, there is a significant difference. (At least in the two groups  $i, j$   $j \neq i$   $\mu_i \neq \mu_j$ ). the results of the second hypothesis test is presented in table 3:

3. the statistics table for the Kruskal-Wallis to compare average indicator after the internal processes for port operations, operators' ports of southern Iran. **Table 3**

	Average Internal processes indicators
<b>R<sup>2</sup></b>	26.199
<b>df</b>	19
<b>Sing</b>	0.010



A significant amount of the level obtained in the Kruskal-Wallis that its value is less than the average, the equality 05.0 indicators of internal processes for port operations after the operators of the ports of southern Iran (default zero). So significant difference between Iran's southern ports of port operations operators' performance from the perspective of internal processes there. In order to compare them with each other from the table, the average ranking of the Kruskal-Wallis we use:

Table 4 shows average rating for the next indicators of internal processes Port operations for the operators of the ports of southern Iran in the Kruskal-Wallis

Table 4

Dimension	Port Operator	Number	Average Ranking
<b>Internal processes indicators</b>	Sina – Shahid Rajaei	2	39.25
	Beta	2	37.25
	Sina – Imam Khomeini	2	35.25
	Kaveh- Imam Khomeini	2	33.50
	Aria Andishe Nuveen	2	31.00
	Parisian-Persian Gulf Bulk Terminal	2	29.75
	Gulf Agency	2	27.25
	Iranian Ports Aria	2	24.00
	Bay of Puzm	2	25.50
	Tide water	2	21.50
	Marie Beach	2	19.00
	Iran South Shipping Line-Imam Khomeini	2	14.25
	Golden Anchor	2	12.50
	Sina Bushehr (general Cargo)	2	12.50

Warehouse and Iran Custom Services	2	10.25
Sina Bushehr (Container)	2	10.25
Kaveh- Khorramshahr	2	9.25
Iran South Shipping Line- Khorramshahr	2	8.75
Buoy Port	2	5.25
Genaveh Port Creators	2	3.75

The average rating obtained in table 4 show that the internal processes of the head next to the Sinai in the company (Shahid Rajaei port), Beta (Shahid Rajaei port), Kaveh (Imam Khomeini port), Aria Andishe Nuveen (Imam Khomeini port) and Sina (Imam Khomeini port) have the highest value in the companies to arrange Buoy port, Genaveh Port Designers and Kaveh (Khorramshahr port) has the lowest value.

-The third hypothesis: the southern ports of port operations between the operators of the performance of the learning and growth perspective, there is a significant difference.

The third hypothesis test:  $H_0$ : between the ports of southern Iran port operations operators' performance from the perspective of growth and learning there is a significant difference. ( $\mu_1=\mu_2=\dots=\mu_{20}$ ).

$H_1$ : between the ports of southern Iran port operations operators' performance from the perspective of growth and learning, there is a significant difference. (At least in the two groups  $i, j \neq i \mu \mu$ ). the results of the third hypothesis testing is presented in the following table:

5. the statistics table for the Kruskal-Wallis to compare average indicator Later growth and learning for port operations, operators' ports of southern Iran.

Table 5

	Average of Growth and Learning indicators
<b>R<sup>2</sup></b>	37.236
<b>df</b>	19
<b>Sing</b>	0.007

A significant amount of the level obtained in the Kruskal-Wallis that its value is less than the average, the equality 05.0 indicators of later growth and learning for port operations, port operators, South Iran (default zero). So significant difference between Iran's southern ports of port operations operators' performance from the perspective of growth and learning. In order to compare them with each other from the table, the average ranking of the Kruskal-Wallis we use: Table 6. shows average ranking for the next indicators of growth and learning Port operations for the operators of the ports of southern Iran in the Kruskal-Wallis.

Table 6

<b>Dimension</b>	<b>Port Operator</b>	<b>Number</b>	<b>Average Ranking</b>
<b>Growth and Learning</b>	Aria Andishe Nuveen	2	37.75
	Kaveh- Imam Khomeini	2	26.50
	Parisian-Persian Gulf Bulk Terminal	2	35.00
	Sina – Shahid Rajaei	2	33.75
	Gulf Agency	2	32.75
	Sina – Imam Khomeini	2	30.00
	Beta	2	27.75
	Iran South Shipping Line-Imam Khomeini	2	24.25
	Bay of Puzm	2	23.00
	Iranian Ports Aria	2	20.50
	Golden Anchor	2	20.25
	Sina Bushehr (general Cargo)	2	17.75
	Tide water	2	16.50
	Marie Beach	2	14.75
Sina Bushehr (Container)	2	11.75	

	Warehouse and Iran Custom Services	2	9.25
	Iran South Shipping Line- Khorramshahr	2	7.00
	Kaveh- Khorramshahr	2	6.25
	Genaveh Port Creators	2	3.50
	Buoy Port	2	1.75

The average rating obtained in table 6 indicate that head the next indicators of growth and learning in the company of Aria Andishe Nuveen, Kaveh (Imam Khomeini), Parisian-Persian Gulf Bulk Terminal-Persian, Sina (Shahid Rajaei port) and the Golf Agency are the largest amount, and companies to arrange port Buoy, Genaveh Port Designers and Kaveh (Khorramshahr) of the latter.

-Hypothesis fourth: between the ports of southern Iran port operations, the performance of the operators of the financial perspective, there is a significant difference.

The fourth hypothesis test:  $H_0$ : between the ports of southern Iran port operations, the performance of the operators of the financial perspective, there is no significant difference. ( $\mu_1=\mu_2=\dots=\mu_{20}$ ).

$H_1$ : between the ports of southern Iran port operations, the performance of the operators of the financial perspective, there is a significant difference. (At least in the two groups  $i, j \neq i \mu \mu$ ). the results of hypothesis testing is presented in table 7, 4th:

Table. 7 statistics Kruskal-Wallis to compare average indicator Port operations port operators for the next southern Iran

Table 7

	Average of Financial indicators
<b>R<sup>2</sup></b>	36.558
<b>df</b>	19
<b>Sing</b>	0.009

A significant amount of the level obtained in the Kruskal-Wallis that its value is less than the average, the equality 05.0 indicators of financial operations for the port after port operators southern Iran (default zero). So significant difference between Iran's southern ports of port

operations, the performance of the operators of the financial perspective. In order to compare them with each other from the table, the average ranking of the Kruskal-Wallis we use:

Table. 8 shows the average ranking for the next financial indicators Port operations for the operators of the ports of southern Iran in the Kruskal-Wallis.

Table 8

<b>Dimension</b>	<b>Port Operator</b>	<b>Number</b>	<b>Average Ranking</b>
<b>Financial</b>	Sina – Shahid Rajaei	2	38.75
	Beta	2	36.00
	Gulf Agency	2	35.00
	Aria Andishe Nuveen	2	33.25
	Kaveh- Imam Khomeini	2	29.75
	Bay of Puzm	2	28.75
	Sina – Imam Khomeini	2	27.00
	Iranian Ports Aria	2	26.00
	Parisian-Persian Gulf Bulk Terminal	2	25.00
	Iran South Shipping Line-Imam	2	25.00
	Marie Beach	2	19.75
	Tide water Khomeini	2	16.75
	Sina Bushehr (Container)	2	15.00
	Golden Anchor	2	12.00
	Services Sina Bushehr (general Cargo)	2	10.50
	Kaveh- Khorramshahr	2	10.00
	Warehouse and Iran Custom	2	9.25
	Iran South Shipping Line- Khorramshahr	2	6.00
	Buoy Port	2	3.75
Genaveh Port Creators	2	2.50	

The average rating obtained in table 8 show that the next head of financial indicators of the company respectively in Sinai (Shahid Rajaei port), Beta (Shahid Rajaei port), the Gulf Agency, Aria Andishe Nuveen and Kaveh (Imam Khomeini) have the highest value and respectively at

the Genaveh Port Designers, Buoy port and Iran South Shipping Line- Khorramshahr are the lowest value.

-The fifth hypothesis: between the performance of the port operations of Iran's southern ports operators a significant difference there.

Fifth:  $H_0$  hypothesis testing: between the performance of the port operations of ports operators southern Iran there is no significant difference. ( $\mu_1=\mu_2=\dots=\mu_{20}$ ).

$H_1$ : between the operators of the ports of southern Iran port operations yield a significant difference there. (At least in the two groups  $i, j \neq i \mu \mu$ ).

The results of hypothesis testing are presented in table 9:

9. the statistics table for the Kruskal-Wallis to compare average indicator all dimensions for the port operations of Iran's southern ports operators

Table 9

	Average of all indicators
<b>R<sup>2</sup></b>	38.083
<b>df</b>	19
<b>Sing</b>	0.006

A significant amount of the level obtained in the Kruskal-Wallis that its value is less than the average, the equality 05.0 indicators in all dimensions of port operations for the operators of the ports of southern Iran (default zero). So significant difference between Iran's southern ports of port operations operators' performance there. In order to compare them with each other from the table, the average ranking of the Kruskal-Wallis we use:

Table 10 shows average rating of all the dimensions of the indicators Port operations for the operators of the ports of southern Iran in the Kruskal-Wallis.

Table 10

Dimension	Port Operator	Number	Average Ranking
<b>All Indicators</b>	Sina – Shahid Rajaei	2	39.50
	Beta	2	36.00
	Kaveh- Imam Khomeini	2	35.75
	Aria Andishe Nuveen	2	34.75
	Sina – Imam Khomeini	2	31.25
	Parisian-Persian Gulf Bulk Terminal	2	29.75
	Gulf Agency	2	27.50

Bay of Puzm	2	25.50
Iranian Ports Aria	2	23.50
Iran South Shipping Line-Imam	2	21.00
Tide water Khomeini	2	19.50
Marie Beach	2	18.00
Sina Bushehr (Container)	2	13.75
Golden Anchor	2	13.50
Services Sina Bushehr (general Cargo)	2	11.50
Warehouse and Iran Custom	2	9.25
Kaveh- Khorramshahr	2	6.75
Iran South Shipping Line- Khorramshahr	2	6.25
Genaveh Port Creators	2	3.75
Buoy Port	2	3.25

The average rating obtained in table 10 indicate that the overall index to head the order at Sina (Shahid Rajaei port), Beta (Shahid Rajaei port), Kaveh (Imam Khomeini port), Aria Andishe Nuveen and Sina (Imam Khomeini port) have the highest amount of companies in order to Buoy port, Genaveh Port Creators Iran South Shipping Line- Khorramshahr are the lowest value.

Table.11. Ranking of the premier port operation scheme operators in different dimensions.

Table 11

	<b>Customer and Market</b>	<b>Process</b>	<b>Growth and learning</b>	<b>Financial</b>
Sina – Shahid Rajaei	39.25	39.25	33.75	38.75
Beta	37.50	37.25	27.75	36.00
Kaveh- Imam Khomeini	35.75	33.50	36.50	29.75
Aria Andishe Nuveen	33.00	31.00	37.75	33.25
Sina – Imam Khomeini	31.50	35.25	30.00	26.00
Parisian-Persian Gulf Bulk Terminal	28.00	29.75	35.00	27.00
Gulf Agency	24.75	27.25	32.75	35.00

The superior performance of seven chart.1 the operator of port operations for the radar in the form of The superior performance of seven chart.1 the operator

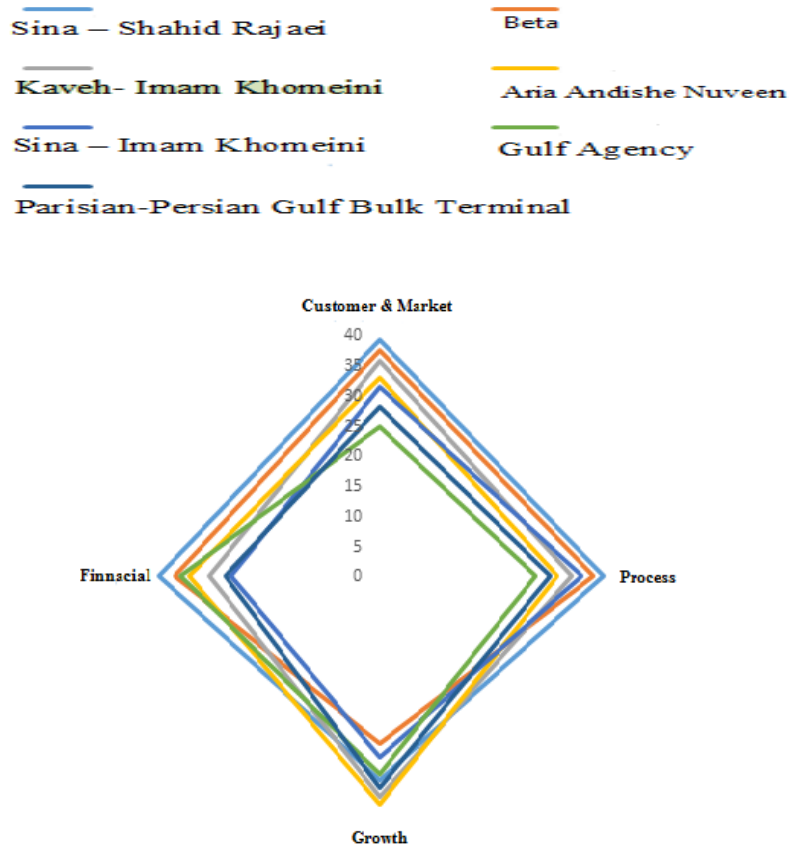


Diagram no.1 shows the operations of seven best operators in the following four balanced scorecard of schematic diagram.

**Research conclusions**

In this study, the questions raised in relation to the objectives of the research, which was first to check their results. The main question the research evaluating and ranking the performance of port operations, port operators, southern Iran. Blue float in a world of commodity transfer would have the blue routes and facilitate the main economic and commercial centers will have created. At the same time evolutionary technology transportation, the role of water floating on the spread of economic markets and more geographically integrated. international trade structure of the industry. In this research it was decided that for each port operator 2 is chosen as operations supervisor and a questionnaire to be distributed between them. The results represent a significant difference between the performance of the port operations of Iran's southern ports operators there. In two of the main port and port operations operators' performance critical of Iran's more favorable conditions than other operators in other ports. Customers and suppliers have a high share in the consumption of goods and services by companies. Technology advances, customers and suppliers are among the companies' external



environment, so maintaining and satisfying customers can be a factor in attracting customers. Therefore, knowledge of the external environment of companies can be a reason for the relationship, a meaningful environment with the interaction of industry and academia. The feeling of need is recognized as one of the factors associated with the interaction between the industry and the university, and at the same time it is very important. At times, the industry faces a kind of scientific theoretical vacuum for many projects.

The feeling of need is recognized as one of the factors associated with the interaction between the industry and the university and is, in the meantime, of great importance. It is possible that at times the industry faces a kind of scientific theoretical gap for many projects. Therefore, to fill this gap, there is a need to create a kind of Interacting with universities and academics, this explains the need to create a sense of need in the industry. Companies are always faced with changes in their internal and external environment, but the extent to which they want to make changes in different areas is related to the dynamics of the company. It is likely that how much companies can adapt to the university environment is a reason for the impact of this factor on the interaction between industry and the university.

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## **Study on Maritime Education in Turkey and other Countries in Regard to STCW and Innovative Approachings**

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### **Abstract**

Maritime Education is carried out in accordance with International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW-78) in Turkey and in the world. The Seafarers and Maritime Pilots Training and Test Instruction which is national legislation for Turkey as to maritime education was updated in 2018. The minimum level of education infrastructure, competence of lecturers and curriculums in Turkish maritime educational institutions are determined by this instruction. Universities which are placed in Turkey have to give education with minimum level of standards which are determined by instruction. In addition, Universities prepare their own curriculums in line with maritime sector's demand and carry on education and training activities in world class by updating their curriculums, regularly. In this study, curriculums in authorised educational institutions which give maritime education at a level of bachelor degree in Turkey and curriculums in education institutions which give maritime education at a same level with Turkey in other countries have been compared. Differences as to curriculums have been viewed. Also, suggestions which contain points to take into consideration to develop maritime education based on management, informatics and innovation have been submitted.

Keywords: Turkey, Maritime Universities, Deck Department, Curriculum

### **Introduction**

There are an estimated 1.65 million seafarers worldwide, 774,000 of whom are officers (ICS, 2018). However, fewer and fewer young people are opting for seafaring as a profession in Turkey and in the world (Dragomir, 2013), and the seafaring sector is experiencing problems in both the quality (Erdoğan and Demirel, 2017) and numbers (Schroder, 2004) of personnel. Just as coordination is needed between a large number of agencies and organizations for successful maritime transport (Baylon & Santos, 2011), states, universities, industries and technology providers need to be aligned to ensure successful maritime education. In addition to this, maritime education requires intensive theoretical and practical training in which many

components need to interact with one another, such as curriculum, faculty, laboratories, simulators, infrastructure, internships, and the like.

One of the main documents produced by the IMO is the STCW 78/95 convention, which sets out the basic guidelines for global curricula. The Directive for the Education, Training and Examination of Seafarers and Marine Pilots, as the national legislation in Turkey covering maritime education, was updated in 2018. The minimum standards for infrastructure, trainers and curricula in training centers in Turkey are established by this Directive, which is in turn based on the STCW. Universities create and update their own curricula in compliance with these minimum standards, and respond to the demands of the maritime industry in the provision of world-class education and training.

This study examines the curricula of four education institutions authorized in Turkey to offer bachelor's degrees in Maritime Transportation and Management Engineering, and compares them with other IAMU member institutions that offer similar degrees. The study also makes recommendations for the improvement of maritime education in Turkey in terms of management, information technologies and innovation.

### **Literature review**

In a study of maritime education in China, Dong (2014) found that the curriculum was mostly based on theory, and concluded that the curriculum and teaching programs needed to be changed to increase the share of practical training.

In another study of maritime education in China, as the largest supplier of seafarers in the world, Ma (2018) observed that international rules and new technologies for energy efficiency in transport had been taken into account in the content of the curriculum from 2012 onward.

Erdoğan and Demirel (2017) noted that developing better education systems to ensure continued maritime safety and security was a common goal, and claimed that new opportunities offered by technology could be used to improve the quality of maritime education.

Based on the social and educational effects of Industry 4.0, universities today have started to transition to University 4.0. According to Dewar (2017), University 4.0 represents a new university structure in which uninterrupted learning opportunities are offered through conventional, blended/multiple, or online channels. University 4.0 includes such features as short-term training and certificate programs for various professional competences, supporting the development of the career management skills of learners, and offering support programs and seamless connections between industry and researchers.

Lapteva and Efimov (2016), on the other hand, claim that University 4.0 is a complicated concept, and suggest that, in the age of Industry 4.0, universities should be engaged in more

scientific works aimed at turning information into reality, providing support for the establishment of high technology companies associated with universities, coordinating between different fields by establishing communication networks, and pioneering new applications.

The information and communication technologies ushered in by the third and fourth industrial revolutions were first used in scientific research, and there are ongoing works aimed at including computer-assisted applications in higher education, which started with the widespread adoption of computers thanks to the decline in the cost of mainframes in the 1980s. This process, through which information and communication technologies came to permeate all areas of life, can be referred to as the Digital Transformation (Computer History Museum, 2017).

According to Housewright and Schonfeld (2008), technological advances affect many aspects of higher education, including research habits, communication between faculty members and their campus roles, among others. Studies of the digital transformation in higher education have tended to focus on the digitization of libraries on university campuses (Housewright & Schonfeld, 2008; McCarthy, 2011; Dahlström & Doracic, 2009; Sennyey, Ross & Mills, 2009; Hufford, 2013), with many of these studies examining the views of academicians and learners on the digitization of printed materials and their means of access to these materials.

## **Research**

This study examines the curricula being applied in the schools in Turkey and elsewhere that offer bachelor’s degree programs in seafaring and that are members of the IAMU. In the first stage of the study, the curricula of four universities offering bachelor’s degree programs in line with STCW requirements and the “Directive for Education, Training and Examination of Seafarers and Marine Pilots” – the national legislation in Turkey on maritime education – were examined. The requisite courses that have to be offered as per “Annex 4, Minimum Requirements for Deck Operational Level Training” and “Annex 5- Minimum Requirements for Deck Management Level Training” were evaluated, as well as other courses offered throughout the degree programs. Within Turkey, the curricula applied in the Maritime Transportation and Management Engineering departments of Dokuz Eylül University, Piri Reis University, Istanbul Technical University and Karadeniz Technical University were examined.

In the second stage of the study, the curricula of nine higher education institutions located in other countries that offer bachelor’s degree programs in seafaring, and that are members of the IAMU, were examined. These universities with departments offering maritime education were the U.S Merchant Marine Academy; the Satakunta University of Applied Sciences; the Maine Maritime Academy; the Batumi State Maritime Academy; the Arab Academy for Science,

Technology and Maritime Transport; SUNY Maritime College, the Svendborg International Maritime Academy; and the National University Odessa Maritime Academy.

In the third stage of the study, the curricula of Turkish universities offering maritime education were compared and contrasted with the nine teaching establishments in other countries, and recommendations were developed regarding technology, innovation, Industry 4.0 and University 4.0 to better meet the future needs of the maritime sector.

## **Findings**

Examining the basic seafaring courses in the curricula of universities in Turkey and elsewhere, it was found that they were very similar in terms of content, even though they sometimes had differing names. Looking at the curricula of individual universities, they were found to have the following notable characteristics:

- Different from the other universities, the U.S Merchant Maritime Academy offered "Introduction to Naval Science," "LAB Self Defense Tactics" and "LEC Strategic Sealift" courses, in that it trains personnel for both military and merchant ships.
- The "Technology" course offered by the Svendborg International Maritime Academy is somewhat unique in offering "Ship Technology, Maritime Technology, Thermal Machinery and Systems, Electrical and Electronic Machinery and System, Process Analysis and Automation" components.
- The Mokpo National Maritime University offers many IT courses, aimed at teaching the participants to identify and resolve IT problems through the provision of technological know-how and skills. Furthermore, the separate teaching of Navigation and Information systems show that the aim is to train highly qualified ship officers and personnel to serve in all fields of the maritime transportation sector.
- The "Structured Problem Solving with Computer" course offered by the Maine Maritime Academy is another computer-assisted course.
- The "Shipment Technology" course offered by the Batumi State Maritime Academy is another technology-oriented course.
- The "Computer I" and "Computer II" courses offered by Arab Maritime Academy are other computer-assisted courses.

Moving on to the four universities offering maritime education in Turkey, at minimum, they are required to offer the courses specified in Annexes 4 and 5 (URL-3, URL-4, URL-5 and URL-6) of the national legislation, without which they would not be able to train seafarers qualified to serve as unlimited watchkeeping officers, and would fail in the audits carried out by public authorities. These courses, in line with the content specified in national legislation, include

Mathematics, Physics, Chemistry, Maritime Safety and Ship Safety, Navigation, Maritime English, Electronics, Electricity, Meteorology, Ship Structure, Watchkeeping Standards, Computer Programming and Usage, Cargo Operations and Ship Stability, International Maritime Conventions, Ship Maneuvers, Maritime Law, Communication at Sea, Maritime Management, Safety and Quality Management, Leadership and Teamwork Skills, Marine Engines, Maritime Commercial Management, Technical Management, Safety at Sea, Electronic Navigation and Use of Automatic Radar Plotting Appliances (ARPA), ECDIS, Meteorology and Oceanography, and Marine Insurance. These courses and their contents are offered by all four universities in Turkey examined in the present study, even though the courses sometimes may have different titles.

The “Computer Programming and Usage” course, in particular, is required to have the following content:

- Computer Programming and Usage
- Basic Principles of Computer Programming
- Computerized Systems Used in Shipping
- Programming Languages
- Use of Existing Computer Programs

In addition to the basic computer-assisted courses offered by these four universities in Turkey,

- DEU offers “Introduction to Computer Programming,”
- Piri Reis University offers “Introduction to Computer Technologies and Programming,”
- ITU offers “Introduction to Program Language (PYTHON)” and “Introduction to Scientific and Engineering Computing (MATLAB),” and
- KTU offers “Introduction to Algorithm and Programming” courses.

The “Simulation Techniques in Maritime Transportation” course at DEU and similar simulation-supported courses offered by the other universities are notable in terms of the application and increasing use of innovation in maritime education.

### **Conclusions and recommendations**

Industry 4.0, which refers to the fourth major revolution in Industry that has been ushered in by the technological advances in recent years, has significant implications for the way we live our lives. Societies have experienced rapid digital transformations as a result of these technological advances, and digitization has made itself felt in social life, and has given rise to some important social needs. We have come to place greater value on digital literacy to better understand the increasingly digital environment that surrounds us as a result of the digital transformation, and education has also started to be digitized in the form of Education 4.0 to

match the needs of Industry 4.0. One component of digital literacy is the ability to read and use advanced programming languages. In this context, curricula that teach and have learners practice programming languages play a critical role in spreading digital literacy.

With University 4.0, libraries will migrate to the Cloud, and learning will take place anytime and anywhere, using different devices. The idea of learning/teaching anytime and anywhere will become ubiquitous, with all courses and lessons becoming available through the Internet. Web interfaces and access systems will be developed to optimize learning, with the most important indicator of literacy being the ability to conduct data analyses and discover future trends on the basis of data. In short, digital literacy.

It is clear that knowledge of programming languages would change our outlook on the sector and on the world. Accordingly, universities should offer computer-assisted programming courses that go beyond the minimum legal requirements for curricula to monitor and implement maritime innovations, apply digitization to the maritime sector as part of Industry 4.0, to raise personnel who can utilize the latest technologies, and to gain the ability to monitor and manage unmanned fleets and undertake port operations.

A comparison of the Turkish universities offering maritime education with those in other countries shows that while they do offer computer-, technology- and innovation-oriented courses, these courses need to be improved to adapt to Industry 4.0, as well as to the changes it will introduce and the transformation it will bring about in the maritime sector.

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## **International Maritime Management: serving the seafarers of tomorrow and their educational needs**

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### **Abstract**

The paper presents the findings of a survey conducted on the didactic element of the distance-education, post-graduate Master's degree course: International Maritime Management. This degree course targets both nautical officers on board sea-going ships and logistics professionals working in junior management positions. A series of didactic elements (e.g. reflection questions, clearly defined learning objectives, etc.) have been defined to provide a visible learning process. The conducted survey shows that students appreciate all didactic elements to varying degrees, while some key areas are identified for further improvement of the didactic concept. The paper ranks the different elements surveyed and provides some answers to pertaining issues of continuous improvement.

**Keywords:** maritime education and training, distance learning, adult learning, visible learning

### **Introduction**

The international shipping business transports about 80 percent of the global trade by volume and over 70 percent of the global trade by value (UNCTAD 2017, p. 16). Therefore, the maritime industry is decisive for ensuring the seamless performance of the world economy. Manning ships safely necessitates the continuous education of seafarers, beyond their basic nautical qualifications, so that they assume leadership and organisational roles in global transport chains. In this article, an example of good practice is introduced regarding the provision of further maritime education and training (MET), the example of Jade University of Applied Sciences (Jade UAS) located in north-western Germany. At its Faculty of Maritime and Logistics Studies, approximately 700 of a total 7,600 students are enrolled, which makes it the biggest maritime university in Germany. In total, six degree courses are offered, four on an undergraduate level (Nautical Sciences and Maritime Transport, Maritime Economics and Port Management, International Logistics Management, Ship and Port Operations) and two on a postgraduate level (Maritime Management (on-campus) and International Maritime

Management (IMM; distance learning)). This article outlines the framework and didactic concept of the distance degree course offered as well as a retrospective view. Therefore, some data have been gathered and analysed using Hattie's category of self-reported grades by which students have a very accurate understanding "of their level of achievement" (Hattie 2009, p. 43). The structure of this text is as follows: first, the theoretical framework will be given in order to bring up the topic to the current state of research. Then the overall concept of International Maritime Management and its development is presented. Subsequently, the empirical part is introduced, and the discussion takes place. Our paper closes with a conclusion and some lessons learned.

## **Theoretical part**

### **Lifelong learning**

In 2001 the European Union defined lifelong learning as "all learning activity undertaken throughout life, with the aim of improving knowledge, skills and competences within a personal, civic, social and/or employment-related perspective." (European Commission 2001, p. 9). This definition is not only the basis for this article, but it was also used as a starting point for the development of the IMM degree course, and it encompasses the authors' understanding of lifelong learning today. Moreover, according to this definition, lifelong learning explicitly includes "the full range of formal, non-formal and informal learning activity." (ibid.):

- Formal learning activities are offered by public education institutions. Besides, they are clearly structured, learning outcomes and intended qualification targets are defined, learning takes place intentionally, and the programmes conclude with accepted degrees and certificates.
- Non-formal learning activities take place outside education institutions, and examples include self-learning studies at private institutions, which conclude with unacknowledged certificates but, in accordance with formal learning activities, they are undertaken intentionally and chosen as a deliberate act.
- Informal learning activities are not undertaken intentionally; instead, they are a side effect of every-day life. In contrast to the aforementioned settings, informal learning is unintended, and it takes place without guided instructions. Moreover, a definition of didactics for this area seems to be a contradiction in itself as it occurs in a passive form.

Lifelong learning is voluntary and self-motivated and usually not compulsory. It can be conducted in different ways, where the continuum reaches from formal training to far less structured courses, or it can even be self-taught learning. On the one hand, we find different learning situations in terms of different dimensions of place, degree of structure, intention, certification and learner-teacher relationship. On the other hand, all learning activities share commonalities: that they are undertaken in order to improve the personal and/or professional development thus they aim to gain new qualifications, add new skills, broaden knowledge, increase employability and income, etc.

In this context, Slowey & Schuetze (2012) have defined different types of lifelong learners. For the IMM programme and this paper, respectively, two (out of six) target groups are of importance. The first group are called ‘recurrent learners’. They return to the university in order to achieve a second (usually higher) academic degree and/or additional, diversified qualifications for their career. The second group are called ‘refreshers’. They wish to expand and/or refresh their knowledge and competencies by means of further tertiary education.

### **Adult learning**

In the early 1970s, andragogy and the concept of different learning approaches between children and adults were introduced in the United States by Malcolm Knowles. The concept was followed by controversial discussions on the differences between child and adult learning and on what andragogy is. However, for the purpose of this text, the following definition will be applied: “Adult education is a practice in which adults engage in systematic and sustained self-educating activities in order to gain new forms of knowledge, skills, attitudes, or values.” (Merriam & Brockett 2007, p. 7). According to Knowles et al. (2005, p. 3) “andragogy is a core set of adult learning principles. The six principles of andragogy are (1) the learner’s need to know, (2) self-concept of the learner, (3) prior experience of the learner, (4) readiness to learn, (5) orientation to learning, and (6) motivation to learn.” Besides, there are other factors that affect adult learning, “[t]hese include *individual learner* and, *situational differences*, and *goals and purposes of learning* [...]” (ibid.; emphasis in original).

Within this section, the principal ideas of a model on how to develop education programmes are introduced (Schlutz 2006). Firstly, it reflects our understanding of the whole development of the IMM degree course, and secondly, answers the following questions (ibid. p. 78; see also Nause et al. 2018): “What benefits does the programme offer? Which target group is addressed? What are the participants’ prerequisites to achieving the learning objectives and qualifications? Which

organisational forms and (main) methods are applied? Which media and learning locations are used? Which contents are delivered?" (ibid., p. 80).

### **Visible learning**

John Hattie (2009) developed a way of synthesizing various influences in different meta-analyses according to their effect size (Cohen's  $d$ ; Cohen 1988). In his study, 138 influences are ranked which are related to learning outcomes in the six areas that contribute to learning: student, home, school, curricula, teacher, teaching and learning approaches. While the effects vary between very positive to very negative effects, he found an average effect size of 0.40 across all studied interventions, which was introduced as the so-called 'hinge point'. This value serves as a benchmark in order to find an answer to the question "What works best in education?". Besides, he gives the backgrounds for the data. The major finding is that making a difference is to *make teaching and learning visible*. Later, the list of influencing factors was extended to 252 observed didactic elements (Hattie 2017). The following elements in the area "student" have "potential to considerably accelerate student achievement": Piagetian programs (1.28), prior ability (0.98) and self-efficacy (0.71). The former two belong to the sub-area of "Prior knowledge and background" while the latter belongs to the sub-area of "Beliefs, attitudes and dispositions" (ibid.).

Besides, the influencing factor of "distance education" ( $d = 0.09$ ) as one part of out-of-school learning will be reviewed (Hattie 2009, p. 232f.). This is obvious as the IMM degree course is mainly based on distance learning. Even if  $d$  is small, the meta-analyses show that "there are no differences in outcomes according to whether a student is a distance student or not—and certainly the message is not that 'distance education does not work'" (ibid.). Besides, the impacts of studio equipment, academic success, student satisfaction, audio and video teleconferencing, as well as synchronous versus asynchronous distance education, have been analysed without significant results. In other words, "the medium of instruction does not matter; it is how it is used to support instruction and facilitate learning that affects outcomes." (ibid.).

### **Reasons for, and educational concept of, International Maritime Management**

After the completion of their undergraduate studies in nautical sciences, the (young) alumni can start their primary career at sea, or they can proceed with postgraduate studies that were so far only offered (in Germany) as on-campus programmes, i.e. Maritime Management at the maritime faculty of Jade UAS. With the development of the distance degree course of IMM, a third alternative has been developed for the first time in Germany. Since 2017, nautical officers

have been afforded the possibility to combine their active sea time with post-graduate study, without interrupting their work. While developing the degree course, the following circumstances were considered:

- Nautical officers on board seagoing ships are absent for long and irregular phases; the same applies to their holidays. Absence times can include periods of up to six months.
- Ships and their crews are located in different (and constantly changing) time zones.
- E-mails can usually be sent and received, albeit without attachments. Other Internet services are typically not available.

To follow up on these unique requirements, a didactic concept was developed. This was achieved by blending distance-learning elements with carefully selected 'traditional' learning methods to a tailor-made setting. Inversely proportional to the distance to the university, the number of on-campus elements has been reduced to a minimum. Therefore, a first attendance phase has been scheduled at the very beginning, which serves mainly for familiarisation purposes and networking activities (voluntary participation). Later, attendance phases are scheduled for examination purposes. Overall, three examinations are conducted during attendance phases. Students may decide themselves the number of examinations they participate in per visit. The number of visits may vary accordingly. The course duration is flexible. The 90 credit points, according to the European Credit Transfer System (ECTS; each point amounts to 25-30 hours of student workload) equal three semesters (1.5 years) full-time study. As almost all students study alongside their work commitments, five semesters (2.5 years) part-time study is assumed to be the average value. The flexible approach allows students to deviate upwards and downwards in a way that suits their individual requirements i.e. slowing down or speeding up their studies.

At the very beginning of each learning module, all materials are available in the learning management system. This includes a course book/study text as well as assessment tasks. Initially, students acquire theoretical knowledge by working through the course book (theoretical part). On that basis, they are asked to link this new knowledge with their existing knowledge and include areas from their own professional context (active part). During this learning process, they can exchange ideas with fellow students and lecturers (communicative part). Right from the start of each module, they are confronted with the final assessment, which is, in most cases, a home assignment. They are able to work through the module during the whole semester. By combining theoretical knowledge with particular issues they are interested in, e.g. an authentic problem of their work environment, they can make use of previous knowledge and apply the

(newly) provided theoretical foundations and methods. Internet access is seldom required for downloading documents, conducting research and uploading assessments. Students can study at their own pace, decide for themselves when they do what, and when they need to have to access the Internet.

Within the concept of IMM, some didactic elements have been included in accordance with Hattie's major finding of *making teaching and learning visible*. Therefore, some innovations have been introduced concerning the design of the degree course and the learning modules (for further information see Nause et al. 2018). Therefore, even for (prospective) students, qualification targets/learning outcomes are stated on the Internet pages of the degree course and the module descriptions. Moreover, all learning modules have a uniform design, which enhances students' learning as the different elements reappear. To elucidate, course books have been designed in a visible way by formulating unit questionnaires, learning objectives and reflection questions. At the beginning of every learning module, students are familiarised with the aims of the learning module by a unit questionnaire. The questionnaire contains some 15 statements, which enable students to estimate their own level of knowledge before starting with the module contents itself. With this approach, students know right from the beginning 'where they stand' from a level of knowledge point of view. Following up on this, at the beginning of every chapter, the learning outcome to be achieved after finishing the respective chapter is outlined. At the end of every chapter, reflection questions are given to encourage the reader to consider what they have just been reading. These reflections also form the starting point for online discussions between the student group as well as between learners and lecturers. With these elements, students are repeatedly reminded of the learning outcome. Moreover, chapters' lengths are kept short so that students can work through them in relatively short phases besides family and/or professional obligations. All these elements have been introduced in order to enhance students' overview as they can rate their own level of knowledge by experience very well. Moreover, they always know what is expected of them at every stage. In other words, all these elements were invented to *make teaching and learning visible*.

## **Empirical part**

### **Data collection**

For the purpose of this paper, an online survey has been conducted in order to evaluate the overall didactic concept of International Maritime Management and, if suitable, to improve some aspects. The survey consisted of eleven statements (number 1 to 4; 10 to 16) to be assessed

on a four-point Likert scale (Likert, 1932; Thurstone 1929), possible answers were: 1 (strongly agree), 2 (agree), 3 (disagree), 4 (strongly disagree). Moreover, the survey consisted of six questions to be assessed and answered respectively, two of them (5 and 6) using yes/no/sometimes, likewise two of them (7 and 8) using yes/no only, and finally, two of them (9 and 17) using open answers. In addition, if question 6 has been answered with no, students were also asked for suggestions by means of an open answer. The order of the questions has been defined according to the structure of the degree course and the learning modules as described above by starting with questions about learning outcomes and ending with suggestions referring to the overall didactic concept.

Rating scales are one of the most commonly used and most important means for data collection in social research sciences. The basic idea is to formulate statements and questions (items) and ask participants to express their opinion by ticking the appropriate category with regard to agreement, intensity, frequency, satisfaction, etc. Possible answers have been included in descending order which resembles the German marking system, with the difference that participants tend to tick scales on the left side more readily than on the right side (the so-called 'general primacy effect'). Moreover, a centre scale has been left out with the exception of questions 5 and 6. Therewith, indifference ('neither nor') as well as ambivalence ('partly') is avoided. This also balances the following sources of error against each other (Menold & Bogner 2015): firstly, the centre scale is an invitation to tick for unmotivated participants. They tend to prefer a centre scale as ticking this avoids cognitive efforts, even if it does not resemble their actual opinion. Moreover, this leads to a reduction of the tendency towards the centre. Secondly, in contrast to this behaviour, there are people who are indeed neutral or value-free referring to a topic or item respectively. If they are not given a centre scale, they are forced to make a decision that could be randomly or systematically chosen, and thus erroneous or inaccurate. Thirdly, participants without an attitude towards an item may tick the centre scale because of social desirability, instead of reporting that they do not have an opinion, which could lead to an overestimation of a topic and/or its relevance.

The approach in the questionnaire follows an inductive reasoning approach (Wallace 1971/2017). This will assist the authors in drawing general conclusions from the sample based on the feedback given on specific aspects of the concept. Moreover, according to Hinkin (1998), "[s]tatements should be simple and as short as possible, and the language used should be familiar to target respondents" (ibid., p. 107f.). This advice has been considered, as questions have been kept short and hands-on. Throughout the whole questionnaire, easy formulations have been used like "helps me to reflect, has met my expectations, is very important, etc." The



invitation for the participation was sent to students as well as graduates (N = 141) by e-mail on Wednesday, 22 May 2019 asking them to fill out the survey not later than 10 June 2019. The sample analysed was (n=67), corresponding to a response rate of 47.5 percent. All questions were set as impossible to skip, resulting in 67 complete and evaluable answers.

## Data analysis

In every empirical study, a prerequisite is to ensure its reliability for validity (Kerlinger, 1986). One way of testing validity is to calculate the internal consistency, which is expressed as Cronbach's alpha coefficient (Cronbach, 1951). For the given survey among participants, a coefficient of 0.85 has been computed, which is very high. This indicates that the covariance is high enough, and thus, the sample can be considered an adequate data collection. The following table provides the above-mentioned eleven statements including the distribution of students' answers, their sum ( $\Sigma$ ) and furthermore their ranking in ascending order (from the lowest value to the highest; R). Moreover, the median of each answer appears in bold:

<b>Item</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b><math>\Sigma</math></b>	<b>R</b>
1) <i>The learning outcomes of the learning module (Unit Questionnaire) facilitate my learning process as they give me an overall overview of what I will achieve during the learning module.</i>	14	<b>40</b>	10	3	136	9
2) <i>The learning outcomes at the beginning of the chapters (learning objectives in the boxes) facilitate my learning process as they give me an overall overview of what I will achieve during the respective chapter.</i>	22	<b>35</b>	8	2	124	4
3) <i>The chapters' lengths are convenient for part-time students who work beside their studies, and/or have family commitments.</i>	<b>34</b>	27	3	3	109	2

4) <i>The reflection questions at the end of the chapters (in the grey boxes) facilitate my learning process as they give me a good starting point in order to rethink the chapters' contents and what I have achieved during the respective chapter.</i>	24	<b>24</b>	15	4	133	8
10) <i>The passive use of the module and/or reflection questions forum enhances my studies.</i>	11	<b>35</b>	20	1	145	10
11) <i>The learning outcomes of the learning module (Final Questionnaire) give me an overall impression of what I achieved during the learning module.</i>	22	<b>29</b>	13	3	131	6
12) <i>Overall, the learning modules' proportion of the theoretical and practical parts are reasonable.</i>	22	<b>33</b>	11	1	125	5
13) <i>Overall, the course achievements/examination questions enable me to integrate my professional topics/projects into the given theoretical context of the learning modules.</i>	20	<b>32</b>	12	3	132	7
14) <i>It is helpful for me to receive all module information (study text, examination instructions, ...) right at the beginning of the semester.</i>	<b>50</b>	14	2	1	88	1
15) <i>It would be helpful for me to have some defined milestones (time frame) throughout the semester.</i>	12	19	<b>24</b>	12	170	11

16) Overall, the concept enables me to self assess my prior knowledge in relation to what awaits me throughout the learning modules.	19	<b>40</b>	8	0	123	3
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Table 1: Likert survey answers.

The following table provides the Yes-No-Sometimes questions, including the distribution of participants' answers:

Item	Yes	No	ST
5) Do you answer the reflections questions for yourself (passive use)?	29	5	33
6) Do you share your thoughts in the reflection forum (active use)?	4	40	23

Table 2: Yes-No-Sometimes survey answers.

The following table provides the Yes-No questions, including the distribution of participants' answers:

Item	Yes	No
7) Do you feel that the reflection questions forum is unnecessary?	13	54
8) Would it be helpful for you to receive model answers to the reflection questions?	48	19

Table 3: Yes-No survey answers.

Moreover, three open questions/statements have been asked. All participants were asked to answer questions 9 and 17 while question 6b had been subject to the condition that question 6 was answered with "no".

6b) You answered that you don't share your thoughts in the online forum. Please explain why not.

9) In your opinion, what would trigger more activities in the forum?

17) In your opinion, what could be improved in terms of the didactic concept?

## Discussion

Following the succinct statistical analysis of the survey, the results are now summarised. This is done in order to identify and discuss the possible scope for improvement of the degree course and learning modules. On the basis of the Likert scale employed in the survey (statements 1 to 4 and 10 to 16), the median of all answers given with one exception (statement 15) can be found in the 'agreement category'. Therefore, no further discussion is required as students can be assumed to have fully understood and agree or strongly agree with the instructional method as displayed by the answers given in the survey, although individual answers have expressed disagreement or strong disagreement. Only the median of statements 15 lies within the 'disagreement category' which has been expected as it reflects the negative attitude towards an alternative way in terms of module organisation which would be more restrictive/inflexible from a students' point of view. On the other hand, it can be seen as a confirmation of the overall concept applied or as a control question, respectively.

When it comes to the ranking of the statements with the aim to analyse the impact of the different influencing factors analysed and their effects on what facilitates learning (König 2005) we find the following top three:

It is helpful for me to receive **all module information** (study text, examination instructions, ...) right at the beginning of the semester.

The **chapters' lengths** are convenient for part-time students who work beside their studies, and/or have family commitments.

Overall, the concept enables me to self assess my **prior knowledge** in relation to what awaits me throughout the learning modules.

These results are in line with both the findings of adult learning as well as visible learning methods (see above). Furthermore, they can be seen as a confirmation that the overall concept of International Maritime Management actually works for its target group. Additionally, the results clearly show that lifelong learners rely on a very high degree of freedom according to their individual study arrangements of pace, time and place. Besides, it shows that students can base their postgraduate studies on prior knowledge which not only builds upon their undergraduate studies but also, to a great extent, on their accumulated knowledge, skills, autonomy-responsibility and competencies acquired in their professional life. Solely the fact that the chapters' length is rated such high seems to be somewhat surprising, but again, it clearly

illustrates the demands of this (lifelong learning) student group compared to their 'traditional', on-campus students with different time constraints. Moreover, it seems to be especially the case for this unique student group of nautical officers who work long days for several months at a time, before returning to shore for some months.

When it comes to the reflection questions and especially the usage of the reflection questions forum, some ambiguities are found. On the one hand, the questions themselves seem to be appreciated as some 92 percent of all participants answer them for themselves always or at least sometimes (passive use). Regarding the sharing of answers in the online forum with their peers, only six percent of respondents do so on a regular basis and some further 34 percent on an irregular basis. In furtherance of this particular aspect, participants were asked for the reasons (see question 6b). Participants' answers (n=40) are presented in a categorised manner according to the limited available number of pages: no need (15), too time consuming (7), not very helpful (6), no Internet access (5), fear (4), and usage of other forums (3). To recap, reflection questions are welcomed for self-assessment purposes while contributing to the forum is not seen as contributing to the successful completion of learning modules. This points out again the limited amount of time available for studies, the goal-oriented approach and the behaviour of adult learners in general.

As the use of reflection questions is rather reluctant, this topic has been emphasised. Therefore, participants have been asked one provocative question, too (see question 7) with the following result: 'Only' 19 percent of the participants assess the reflection questions forum itself as unnecessary. Further, 72 percent of the participants wish to receive model answers for the reflection questions. This aspect will be discussed in the future in order to come to a conclusion by balancing the advantages of responding to students' wishes against the fact that *learning* can occur only when a person undertakes learning actions for themselves, e.g. reflecting on something or certain situations, applying new methods, models or techniques, constructing something new on the basis of prior knowledge, and so forth.

Besides, participants have been asked for their opinion on what would trigger more activities in the forum from their point of view (see question 9). The participants' answers (n=67) are presented in a categorised manner, too: more moderation (26), no idea (11), ease of use (9), mandatory visit (9), model answers (4), it is fine like it is (3), others (5; each stated only once). Nearly 40 percent complain that about a lack of moderation from the lecturer's side. This aspect will be taken up in the future, despite previous attempts, which were without sizeable impact. The suggestion of making the forum use mandatory will probably be analysed in more detail in

the future, e.g. as a means of examination. It seems that such a change should be given careful consideration as a higher degree of external determination/a defined timeline throughout the semester (see statement 11) has not only been ranked lowest by more than half of the respondents (see table 1), but it is the only statement within the 'disagreement category', too. Another explanatory approach could put different types of learners into the foreground, e.g. persons who need a higher degree of communication in order to retain their motivation versus independent learners ('lone wolves'). Furthermore, different occupations could lead to different levels of freedom, leading to higher self-determination of studies.

Finally, participants have been asked for suggestions on how to improve the overall didactic concept (see question 17). Participants answers (n=67) are presented in a categorised manner, too: nothing to add (29), interaction between lecturers/students and students (13), more practical parts (11), model answers to reflection questions (4), online tests (4), examination (3), others (3; each stated only once). Approximately 43 percent have 'nothing to add' which can be seen as proof that the overall didactic concept of IMM works fine for the target group. On the other hand, the increase in interaction resurfaces. Therefore, students seem to look for some interaction with students and/or lecturers for unknown reasons, e.g. remembering the studies when receiving notifications of new forum activity on a regular basis.

## **Conclusion and lessons learned**

First, the theoretical framework has been introduced. Subsequently, the trigger for and the concept of the postgraduate distance degree course of International Maritime Management have been described. Based on this, the empirical part has been presented. This core part consists of a survey which was conducted among 67 (former) students in order to evaluate the overall didactic concept.

In general, participants evaluated the use of didactic elements very positively. This finding is reflected on the different levels. With the evaluation, we have acquired confirmation of the concept of the degree course in general, but also improvement potential: the ranking shows that it is most important from a student's point of view to receive all module information (study text, examination instructions, ...) right from the start. This clearly shows the importance of *making teaching and learning visible*. Moreover, this reflects the attitude and characteristics of adult learners (with a limited time budget) who need to know what to learn and why, at all times, in order to organise their own lifelong learning processes in terms of pace, time and place in a self-determined manner. Only the use of reflection questions has been evaluated with mixed results. While the answering of these questions (passive use) is undisputed, the sharing of

information in the forum (active use) is regarded as inconvenient. This aspect has to be investigated further. All in all, the analysis shows that the cooperative programme of work and study, International Maritime Management, works and gives (young) professionals both onboard and ashore the possibility to achieve a postgraduate degree in part-time studies without interrupting their work. Therewith, IMM serves as an example of good practice. Additionally, the good practice example shown by this course could be transferred/adapted by other universities. This transferability could be applied to general MET courses, enabling learners to acquire higher cognitive skills (analysis, synthesis, evaluation,) which go beyond the scope of the STCW.

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## Industry 4.0 and the Reflections on Turkish Shipping Industry

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### Abstract

Over the last few years, the "Fourth Industrial Revolution" has spread in almost all industries. Digital innovation created by this development is driving shipping as part of the intelligent transport systems of the future. Although the concept of Industry 4.0 is a total global change, it is noteworthy that many countries have not reached the desired level yet. In this context, the purpose of this study is to determine the adaptation and application levels of the Turkish shipping companies on the components of Industry 4.0. To do this, first, the main components of Industry 4.0. was determined through literature review. Then the semi-structured interview based on the variables of Industry 4.0. was carried out with the experts of shipping companies operating a large part of the Turkish merchant fleet. It has been concluded that all shipping companies are storing some or all of their data in the cloud as part of the electronic documentation systems. In addition, the internet services on board are fully available although some are using limited quota application, while others are using low-speed services. It was found that the shipping companies have taken certain measures in the information security which cannot provide full protection against cyber-attacks. In other words, companies are familiar with the concept of industry 4.0. components, but in the practice it has not been reached the desired level. Because of this reason, it is necessary to increase the investments on the technology that will strengthen the productivity of the companies and to provide a structure that will meet the requirements of Industry 4.0.

**Keywords:** Industry 4.0, Shipping, Turkish Merchant Fleet, Turkey.

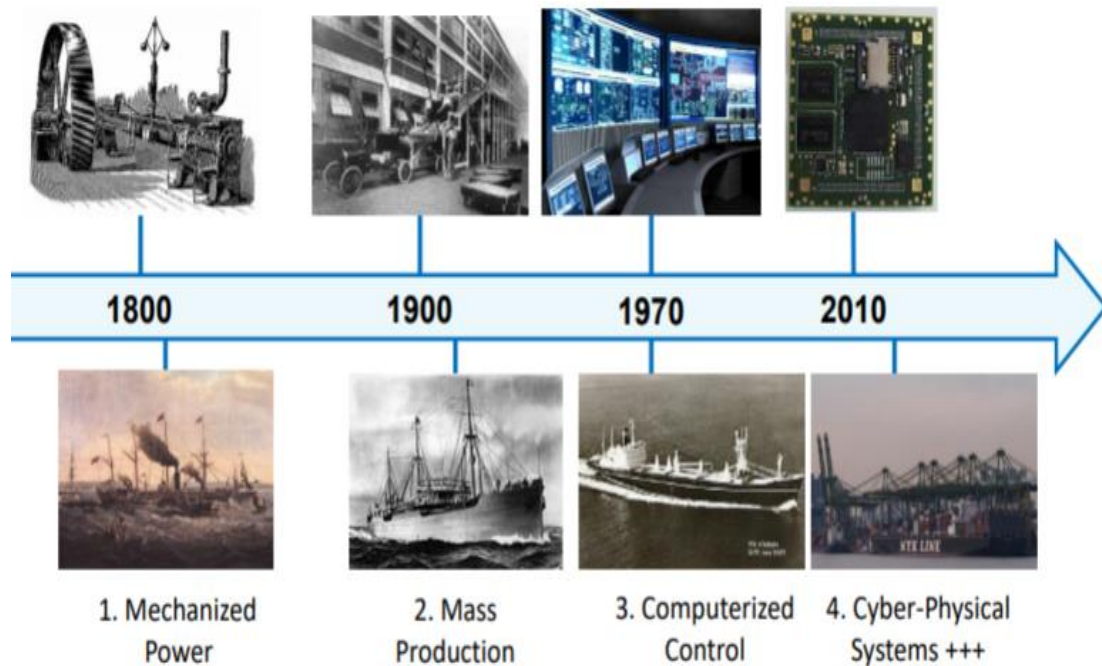
### Introduction and literature review

Fourth industrial revolution defines the evolution in automation and digitalization comprising technologies such as internet of things (IoT), artificial intelligence (AI), autonomous and

unmanned technology, and data analysis .Although the benefits of these technologies are considerable, they are still limited by the capabilities of the people who designed, created and operated them (Khalid, 2019).

The first industrial revolution was startup period of steam-powered mechanical manufacturing, the second industrial revolution was the application of electrically-powered mass production; the thirds industrial revolution was the initialization in the operation of information technologies (IT) (Lasi et al., 2014). The Industry 4.0 is based on the Cyber-Physical Systems; it represents the mass customization of the products turned to the wishes of the customer with the implementation of the intelligent, smart and optimal solutions embedded in the products visible on the Figure 1.

**Figure 1.** The fourth shipping revolution



**Source:** Stanic et al., 2018

The maritime market supports the economy through the cargo movement (Stuckery, 2013). Industry 4.0 with new technologies has brought the shipping industry to the new era of the IT platform. Some technologies have been deployed with success and some are still to be introduced to shipping (Baba, 2018).

**Figure 2:** The components of shipping 4.0.



The major components of Shipping 4.0. are closely related to technological developments. Basically all of them aim to increase the operational efficiency by minimizing human error with reducing workload. However, these technological developments also cause some security problems. In these days, the major shipping companies have been attacked by cyber terrorists and as a result, commercial losses happened due to the stealing of confidential data (Beaumont, 2018). In addition, cyber-security cooperation declared the 16 security flaws of defense system of the world’s 20 largest container shipping lines.

The biggest shipping cooperation such as Maersk Line or Hyundai Merchant Marine utilizes IoT technologies to track their reefer containers. They have also started to use a block-chain technology in their operation for safe data transfer and quicker operation. More and more technologies are predicted to shake up the maritime industry, such as automation, deep learning, artificial intelligence, augmented reality, drones, robotics, cyborg crew, and so on (Tran, 2018).

Among emerging technologies, an intense debate is on autonomous or unmanned vessels. Despite the fact that nowadays almost of the ships are automated in some way, the shipping industry is coming to a revolution in alignment with Industry 4.0 with the emergence of autonomous ships which are operated by machinery and systems making decision (Cross et al., 2017).

There are several reasons to build autonomous ships, namely increasing the safety of operations by taking out the human element because great amount of ship accidents by some form of human error (Rothblum, 2000; Kitada et al., 2018). The brand new unmanned ships will provide more spaces for transportation; reducing the operational cost by cutting labor cost,

saving fuel; contributing to ecological and social sustainability by reducing emissions (Rødseth and Burmeister, 2012; Rolls-Royce Plc 2016).

In the relevant literature there are many studies on Industry 4.0. Levander (2017) pointed out the advantages of remote controlled ships in high seas. Ahvenjärvi, (2016) focused on the connectivity challenges of autonomous ships in different environments, including ports, deep sea, and Arctic regions. Porathe et al. (2014) developed a project to show the importance of situational awareness of crew employed in the remote control station on the safety of shipping. Jensen (2015), in his study, pointed out the existence and tangible outputs of cyber-attacks and their effects on the computer systems. Mirovic et al. (2018) summarized the applications of Big Data in maritime industry, specifically in logistics optimization, safety and energy efficiency improvement, as well as the challenges that systems involving Big Data face. Vasiljević et al. (2011) presented a systematic overview of AR technology in shipping covering system components, applications, outlook on future research and development as well as main technology challenges and limitations.

In this context, the purpose of this study is to determine the awareness level of shipping companies operating in Turkey on shipping 4.0. issues. To do this, the relevant literature was reviewed, and the interview was carried out with the experts as the representatives of shipping companies.

## **Materials and method**

### **Aim of study**

The aim of this study is to determine the awareness level of Turkish shipping companies on issues of Industry 4.0. in shipping.

### **Method**

In this study, the qualitative research methods were selected in order to determine the state of awareness of ship operators in shipping 4.0. The qualitative research methods provide deeper understanding, build faster assessment, enable broad data collection, help developing a personal connection, and allow seeing body language (Meier, 2018). For this reason, interviews are the most important instrument in data collection for qualitative studies. In this study, initially, the relevant literature was reviewed and then the interviews were organized and conducted.

### Data collection and research sample

In this study, the semi-structured interview method was selected as a data collection instrument. This method is not as rigid as fully structured interviews nor as flexible as unstructured interviews. In semi-structured interviews, main questions are prearranged and asked all experts, while other details come out automatically in a free-flowing speech (Stuckey, 2013). The semi-structured interview is the most preferred method in data collection stage of qualitative researches (Bloom and Crabtree, 2006). The interview form was developed with the data provided by the reviewing of the relevant literature. Every variable was controlled by experts for internal consistency. At the end, the interview form was finalized with revised statements. In this study convenience sampling method which is a simple, cheaper and time effective instrument was selected. A total of 14 representatives of shipping companies participated to this study. The details of experts are shown in the Table 1.

**Table 1.** Interview details

<b>Date</b>	<b>Company</b>	<b>Duty</b>	<b>Experience(yrs)</b>
28.11.2018	Geden Lines	HR Manager	12
07.12.2018	Düz-Git Shipping	HR Manager	18
07.12.2018	Active Shipping	Technical Manager	21
07.12.2018	Bilka Tanker Shipping	HR Manager	11
07.12.2018	Armona Shipping	HR Manager	14
29.11.2018	Kaşif Shipping	General Manager	23
06.12.2018	Ditaş Shipping	HR Manager	11
26.11.2018	Omikron Crew Man.	CEO	13
26.11.2018	Maritime Trainer	Project Manager	7
28.11.2018	Angora Shipping	CEO	19
27.11.2018	Research Shipping	Captain	9
06.12.2018	YA-SA Shipping	Training Man.	13
06.12.2018	Ince Shipping	HR Manager	16
29.11.2018	Chem-Fleet Ship.	Captain	12
29.11.2018	Med-Log Shipping	HR Manager	11
29.11.2018	Borealis Shipping	HR Manager	14

The interviews were held face to face between 26/11/2018 and 07/12/2018 at the "Career Days Meeting" organized by Dokuz Eylul University Maritime Faculty. It is seen that the

participants are the employees who work at the top level in shipping companies operating a large part of the Turkish shipping fleet.

### **Findings and results**

In the study, a total of sixteen interviewees, 13 of them from ship operating company, 1 from the manning company, 1 from the training company, and 1 from the offshore company, answered the questions.

Majority of the responders declared that the 3D printing technology will be very useful in terms of design and production of spare parts needed especially in emergencies. However, sector representatives are cautious about the applicability of this technology in the sector. Because the concept is still brand new and time is needed to prove its effectiveness. Besides, another important detail is that they do not yet have any investments in this regard due to fiscal reasons due to fact that 3D printers are not currently cost effective.

All participants stated that they use cloud computing and big data technology mostly for the storing data in their companies. All the data generated by the companies are stored in cloud computing database. Every details of ship operations such as crew information, fuel consumption, passage planning, voyage period, loading and unloading cargo, ship requests, pms information, end of month documents are instantly stored in the system. However, some filters were also applied. that is, the access filter is applied according to the information classification. Almost all companies provide distance education modules via cloud computing system while some of them also use this system as personnel information database. According to the responders the most important advantage of this service is to have access to information at any time. Generally, "dropbox" storage service is the most preferred one as the service provider. Only operational data is stored in the database while commercial data is stored with traditional methods.

All participants declared that internet service is fully available on their ships. However, some ships have quota application, while some ships have unlimited internet service. Some companies also use filtering that only allows access to permitted sites. In addition, almost all companies have an integrated connection service combining PMS (Planned Maintenance System) and mail system. However, only two of the responders declared that, their ships have no compatibility for integrated system because their ships are old. Also, m2m (machine to machine) connection system is applicable and operative for all bridge and machinery space equipment. This infrastructure allows eliminating accidents caused by human error. However, the system still needs to be audited and the auditor should be competent to correct any errors

seen immediately. They all agree that, in near future, the system has to be fully available for remote control with the assistance of sensor technology and IoT. The inadequacy of users by means of training and knowledge is considered as the most important risk of this system. Therefore the effective training which following current changes in the system is needed for qualification of users.

Only half of the participants had training module on virtual reality (VR) concept including shipping operations. However, the rest of them have plans to integrate the VR technology to their training program sooner. However, all of them agree that this technology will reduce human risk in shipping accidents. Besides, they think that the mobility of the VR technology will allow the new system to replace the conventional immobile simulators quickly. Of course, the scenarios have to be created by the operational experts, because the simulation has to reflect reality in order to measure the capabilities of seafarers. Therefore, the approval mechanism is crucial. However, there is already a conviction that the space and time alone is not sufficient to measure a seafarer's actual decision effectiveness. Because the emotion is another important variable in decision making process. In addition, not only critical operation training but also SMCP module must be included and speaking English must be simulated.

In all companies, the information security issues are fully implemented at all levels of operations. In addition, when a new circular is published, a security meeting is organized immediately and new regulations are announced to the departments. The security preparedness of the departments is measured with announced and unannounced internal audits so that they are prepared for cyber-attacks. A large part of the participants (9) emphasized that the employees of their company were continuously practiced, educated and trained by the IT department on the subject of security gap avoidance and information security defense systems. The spam mail generated by the IT departments is sent to the clients at different times so that user's actions are observed frequently. Three participants stated that the information security service of company is provided by the third-party security companies. The information transfer through flash memories is completely or partially blocked due to security reasons. This application reduces the risk of illegal data transfer, data theft, computer viruses and malware.

The experts believe that it is not possible to see full automation vessels in the sea in near future, because the international legal framework and flag state jurisdiction is now built on human being. That is, the human figure will continue to exist in the seas as the most important decision maker for years. However, for semi-autonomous ships, the technology is rapidly constructing the infrastructure for robotic decision makers. So that the decisions will be made as

soon as possible and finally risks generated by human failure will be eliminated with the assistance of robotic structure. However, the system is still brand new and highly vulnerable to cyber-attacks. Nevertheless, the system will reduce the work load of seafarer and will assist them in decision making process.

### **Conclusion and recommendations**

In this study, it is concluded that major components of Industry 4.0. are growing phenomena in shipping industry in Turkey. It is observed that in recent years the investments for technology infrastructure is increasing dramatically in Turkish shipping sector. However, investments are yet to be made on a scale that meets the minimum requirements. Because, the sector representatives consider all strategies primarily cost-based. Therefore, the main driving force in investments is either cost or customer pressure. Executives of shipping companies operating in Turkey are acting quite cautious about adapting to changing technology requirements of the industry within the scope of 4.0. therefore, the adaptation process is slow. At the end, it will become one of the sanctions of this sector that institutions should adapt their priorities to the new world order.

The organization structure of the company in Turkey is another result obtained in this to have an effect on investment decisions. In particular, it is observed that corporate firms react faster and follow developments closely.

In the modern organizational charts, the IT department stands out as the strategically important unit of the organization. Therefore, the shipping companies are strongly recommended to re-structure their organization to meet the requirements of Industry 4.0. It has been seen that there is not enough qualified workforce in information security and information technology. Therefore, competent and qualified personnel should be trained and employed in this sector . The other conclusion is that, the shipping companies in Turkey could not be fully adapted new system meeting requirements of Industry 4.0. Although it is seen that the companies take some measures on their own dimensions, it is seen that there is a non-standard structure in the sector.

In addition, it is concluded that there is a lack of digital vision on cyber security issues of shipping companies in Turkey. Insufficient technology infrastructure of a country and lack of security culture of company may cause extension of adaptation process period.

In this study, the representatives of the companies operating a large part of the Turkish maritime trade fleet were interviewed. For further studies it is recommended that sample size can be increased, and also foreign companies can also be included.



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## **MAAP: Meeting Modern Maritime Education and Training Challenges through ISO 21001:2018**

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### **Abstract**

With the inevitable fourth industrial revolution and STWC '78 as amended new requirements, how can the Maritime Higher Education cope with the changes that new seafaring frontier and technology brings forth? Is the ISO 9001:2018 a suitable QMS system as intended by the STCW's QSS? Does the new ISO 21001:2018 standard fit as STCW's competence for seafarers requires? These are some of the challenges all maritime higher education institution faces to be responsive to modern challenges in MET which this paper shall be elucidating.

This paper shall discuss a comparative study on how adept amongst the existing ISO 9001:2018 and the new ISO 21001:2018 is with the STCW '78 as amended. What are the specific new requirements of ISO 21001:2018, Maritime Industry Authority (MARINA), and Philippines' Commission on Higher Education (CHED) and how can the Maritime Academy of Asia and the Pacific can meet these challenges to ensure graduates are ready and competent as they serve the modern world of shipping industry shall be the main focus of this paper.

The paper shall also serve as a resource and reference for those schools that are looking for standards that can attune their management systems gearing towards safer, cleaner, and excellent shipping by having a competent seafarer through an effective maritime education and training standard establishment and implementations.

**Keywords:** ISO 21001:2018 requirements, MAAP MET Challenges, Modern Challenges in MET

## **Introduction**

The Philippines' maritime authority hounded by EMSA monitoring visits for compliance to STCW requirements on maritime education and training have greatly affected how Maritime Education and Training Institutions (METI) operates from curriculum design and development up to its assessments systems. There have a number of Circulars from last five (5) or six (6) years from Commission on Higher Education in coordination with MARINA and being drafted and finalized as of this paper being written. There were questions at back of our head why schools and training centers have lapses wherein they have been certified to ISO 9001 standards and even followed IMO Model Courses. Debates on QSS and QMS have gone in Philippine Maritime forums. Was there a mismatch on adopting QMS as QSS for MARINA, CHED and METIs. With all these glooming Philippine MET challenges at the background advent of modern technologies advances, data privacy act and shipping trends are encroaching ahead while compliance to STCW seemed to anchors METIs behind at the same time. How can MAAP cope up and be sustainable and still lead the way into excellence in MET? These are the questions this paper would like to discuss and look forward to find way to meet and surpass insurmountable challenges and obstacles.

## **Methods**

A comparative study of the STCW '78 as amended, ISO 9001:2015, and the new ISO 21001:2018 and how they meet the modern challenges of MET were the sources of this paper. Qualitative Document analysis method was used as a systematic procedure for reviewing or evaluating public records, personal documents and physical evidence both printed and electronic (computer-based and Internet-transmitted) material. Using document analysis requires that data be examined and interpreted in order to elicit meaning, gain understanding, and develop empirical knowledge (Corbin & Strauss, 2008; Rapley, 2007).

With this method of obtaining and analyzing documents and records was often considered far more cost and time efficient than conducting your own research or experiments (Bowen, 2009). Furthermore, documents are stable, "non-reactive" data sources, meaning that they can be read and reviewed multiple times and remain unchanged by the researcher's influence or research process (Bowen, 2009).

Hence, using this method is related to quality management principle of evidenced based decision making through the analysis and evaluation of data and information more likely to produce desired results for this paper's conclusion.

### **Statement of the problem**

Overwhelmed with abrupt and unending changes in Philippines' maritime administration leadership, policies and guidelines in MET requirements coupled with the influx fourth industrial revolution in the shipping industry, MAAP needs to have a QSS to ensure that these challenges are addressed and mitigated. ISO 9001 is a generic standard for any type of organization while STCW '78 can be deemed as a competence standard with a section on QSS. MAAP and other MHTIs have adopted ISO 9001 as model for the QSS but have not focused on the STCW '78 as amended compliance.

Fortunately, MAAP has adopted another standard TUV SUD PSB 100:200 which is a combination of ISO 9001:2008 for the Programs of BSMT and BSMarE. However, with the current revision of STCW and ISO 9001 the program based standard have been obsolete and not updated. With a gleam of hope, ISO have come up with the a new standard ISO 21001:2018 – Educational organizations – Management systems for educational organizations – Requirements with guidance for use was released in May 2018. The first edition of the international standard for management systems for educational organizations (EOMS) can be used our academy to address QSS requirements of STCW and the modern challenges of MET. Therefore, the question we seek to and answer I this paper is: Can MAAP ISO 21001:2018 use as a QSS model to meet the modern challenges of the maritime education and training?

### **Review of related literature**

According to the survey of Taylor and Underhill (2019), the shipping industry, where METIs rely it future and subsistence, is facing a great change from environmental issues, security, fast-changing technology and expense in keeping up with the challenge. They have indentified greatest challenges for the next five year as follows:

- Flattening demand growth
- Operational challenges
- Cybercrime
- Industry consolidation forcing freight rates down
- Meeting fuel emissions regulations (IMO 2020)

- Availability of funding
- Cost of funding
- Digitization of supply chains
- Internal Regulations keeping pace with technological developments
- Increased trend towards domestic protectionism
- Changing working patterns and employee expectations

The complexities of both adapting and introducing regulations concern the shipping industry if whether regulation will keep up with technology. For instance, the world's first fully autonomous container ship which is expected to be in operation in 2020 and maritime autonomous surface ships (MASS) are expected to be operating by 2035. The IMO will need to decide whether the existing conventions and regulations need to be adapted, or whether entirely new conventions and regulations that deal with MASS and advanced technologies need to be introduced according (Taylor and Underhill, 2019)

Taylor and Underhill (2019) further stated that another new development is blockchain technology, which is used in platforms such as ShipChain and ShipCoin. There are still no established regulations even though blockchain technology creates efficiencies within the sector. Should nodes be located, and goods transported an internationally complex jurisdictional issues may arise.

Madden (2018) have observed that rapid change in the commercial shipping industry makes more exciting with new challenges and innovation for workers and in the industry to take as follows:

- Bigger and Better Ships
- Increase Specialization
- Going Green
- Data Analytics
- Prominence of Robotics and Automated Machinery
- Advance Communications and Connectivity
- Autonomous Vehicles
- Alternative Fuels and Energy Conservation

In an industry review paper of Crew Connect Global John Adams (2018) stated that

*"As a highly regulated industry, shipping has many demands placed upon it, which it must plan to implement as priorities. Therefore, an important part of answering this question requires us to be aware of upcoming legislations like the Global Sulphur Cap (2020), the EU's CO2 MRV Guidelines and IMO's Data Collection scheme, IMO's Ballast Water Convention and USCG requirements, Biofouling, Cyber Risk Management, and the list goes on. In 2018, the industry needs to strive to address a number of topical issues and challenges – some of which arise from these upcoming legislations."*

He added that in the near term challenges and opportunities from the business and crewing perspective, authentic leadership and management, safety as no. 1 priority as a developed culture and behaviors, and EU General Data Protection Regulation (GDPR).

Moving towards the Challenges of Maritime Education in the Philippines which have surmounted to more than thirty regulations is tall task for all MHEIs. According to Paralisan (2016) there two main challenges as a desired state of Maritime Education as follows:

A management system for MHEIs based on a Single Document that Embodies the Philippines Standard for Maritime Education

Harmonize standard that incorporates STCW Code, planning approach, key area of evaluation and the quality standard system (clause of ISO 9001)

He stated that with a single document where in all stakeholder will refer to as a standard for improving MET and monitoring compliance and performance by HEIs while harmonization will pave way for an audit ready institutions regardless whose the auditor (CHED, MARINA, EMSA, ISO Certifying Bodies).

US Coast Guard did a survey last 2016 for 167 maritime training providers and found fourteen (14) challenges that relates to STCW compliance with as follows as top 5:

Interpreting the revised STCW requirements

Recruiting qualified instructors to teach courses regarding the revised STCW requirements

Organization's QSS

Developing curriculum for courses your organization teaches regarding the revised STCW requirements

The willingness of current STCW-certified merchant mariners to remain employed as STCW-certified merchant mariners

After identifying some reference to MET challenges look into international standards in point.

According to Kelachava (2018) blog on the American National Standard Institute ISO

management system standards have advanced businesses and industries worldwide, aiding millions in establishing quality management systems with ISO 9001, cultivating their duty for environmental stewardship via environmental management systems with ISO 14001, and reducing the likelihood of worker injury or ill health through occupational health and safety management systems with ISO 45001. Now, the guidelines presented in the high-level structure are being poised to benefit users pursuing a noble and crucial cause: education.

ISO 21001:2018 – Educational organizations – Management systems for educational organizations – Requirements (EOMS) with guidance was published. With industries like automotive and IT having specific standards its high-time that educational institutions have its own version that can be utilized as the model of QSS that may help in address current and future challenges in MET.

## **Discussions**

### **MAAP modern MET challenges**

Being DNV GL ISO 9001 Certified since year 2000, PACUCOA Level III accredited for BSMT and BSMarE and IAMU members does not exempt MAAP to the reality of the challenges that were mention above. In reference to our MAAP Voyage Plan 2020 challenges were determined as part of identify sources of Risk and opportunities which are relevant at to date. However changes are so fast new ones arise and these are modern challenges that the institutions have to surpass eventually such as:

- Compliance to STCW QSS
- Abrupt Change in Maritime Administration and Regulations
- Curriculum and Syllabus Design and Development
- Fast Technology Change
- Control of Monitoring and Supervision
- Data Protection
- Communication
- Increase in Sponsorship

The burning question is can a new ISO standard help sustain a MHEI from the new obstacles brought about by this fourth industrial revolution and other relevant issues in the maritime shipping industry? So let's look on what the STCW says about quality standards. According to Regulation I/8 Quality Standards "Each party shall ensure that ... all training, assessment of



competence, certification ... carried out by a non-governmental agencies or entities under its authority are continuously monitored through a **quality standard system** to ensure achievement of defined objectives, including those concerning the qualification and experience of instructors and assessors..”

Furthermore, Section A-I/8 states that the field of application of the quality standard shall cover the administration of the ..., all training courses and programmers, examination and assessments carried out by or under the authority of a party... having regard to policies, systems, controls and internal quality assurance review ...”

Finally, in Section B-I/8 Guidance regarding quality standards states that the in applying quality standards under the provision of regulation I/8 and section A-I/8 each party take into account existing national or international models with incorporation of key elements. Whereas, establishing quality standards for education, training and assessment programmers the organization should utilized existing established national accreditation, or education quality standard for courses incorporating the knowledge and understanding requirements of the convention. Evaluation is to be done to provide an independent assessment of the effectiveness of the quality-standard arrangement at all levels. For education or training establishment, a recognized academic accreditation or quality standards body or government agency should be used.

As mentioned above there is a strong manifestation that for all education and training institution to ensure achievement of goals and objectives and that a national accreditation or education quality standard for course. ISO 9001 we can say is quality standard it is also a generic standard for all industry. Now just last year ISO have published a new standard ISO 21001 which have the foundation of the generic quality standard ISO 9001 but is tailor fit for educational organizations, a management system for educational organizations.

Wow this may sound great for some but for the skeptics they would say QSS is different from EOMS and fall into the paralysis by analysis rather move on apply what the international community have agreed upon. Let take into the comparison on the key elements of the QSS, QMS and EOMS on Figure 1.

Taken into consideration that EOMS is more adept to the education industry with more quality controls, education-based requirements, and STCW '78 as amended key elements for a quality system model, MHEIs adoption of it is a strategic advantage to all stakeholders.

How then it can address the modern MET challenges? As well know base of the EOMS is the Risk-based standard of ISO 9001 which was revised to make all organization sustainable in the next twenty five years.

QS Model	QMS	EOMS
<ul style="list-style-type: none"> <li>•Quality Policy</li> <li>•quality system/quality management function</li> <li>•quality system coverage (academic and administrative organizational structure, responsibilities, procedures, processes and the resources of staff and equipment)</li> <li>•quality control functions at all levels (teaching, training, examination and assessment activities)</li> <li>•Internal quality-assurance processes and reviews</li> <li>•periodic external quality evaluations</li> </ul>	<ul style="list-style-type: none"> <li>•6.2 quality objectives and planning to achieve them</li> <li>• 5. Leadership</li> <li>•4.4 QMS, 5.3 Organizational roles, responsibilities and authorities, 7.1.2 People, 7.1.3 Infrastructure</li> <li>•8.5.1 Control of production and service provision</li> <li>•9.2 Internal Audit, 9.3 Management Review</li> <li>•(criteria for periodic audit)</li> </ul>	<ul style="list-style-type: none"> <li>•6.2 Educational organization objectives and planning to achieve them</li> <li>• 5. Leadership</li> <li>•4.4 EOMS, 5.3 Organizational roles, responsibilities and authorities, 7.1.2 Human resource, 7.1.3.1-3 Facilities</li> <li>•8.5.1 Control of the delivery of the educational products and service, .1 General, .2 Admission of learners, .3 Delivery of educational products and services, .4 Summative assessment, .5 recognition of assessed learning</li> <li>•.6 additional requirements for special needs education</li> <li>•9.2 Internal Audit, 9.3 Management Review</li> <li>•(criteria for periodic audit)</li> </ul>

**Figure 1. STCW, ISO 9001:2015, ISO 21001:2018 Comparison**

What requirements then can address directly the challenges that MAAP are facing today? Lets discuss how figure 2 have identified the requirements that if a MHEI will conform will eventually address modern challenges.

Compliance to STCW QSS Model and even the key elements requirements have fully covered in figure and even more than that the ISO 21001 have seven annexes giving guidance and even covering regional standards.

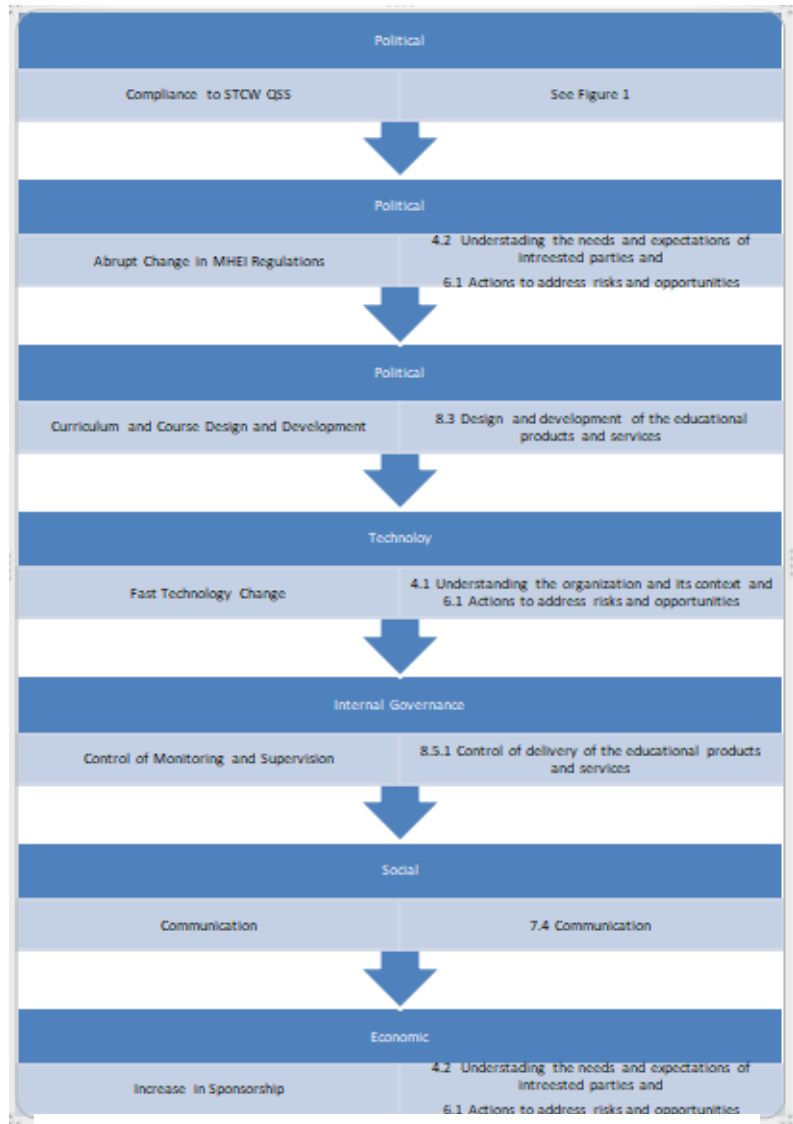
Faced with numerous changes in the regulatory and statutory requirements risk-based thinking shall cover this challenged couple with change management.

As educational products the curriculum and courses design and development have been fully covered by ISO 21001 that include general provision, design and development planning, inputs, controls (general, educational service design and development controls, curriculum design and development controls, summative assessment design and development controls), outputs, and changes.

Risk-based thinking should be enough to cover Fast Technology Change but more than that competence and infrastructure plays also major role in coping with challenge which is covered also by the standard.

Control of Monitoring and Supervision have been addressed by all the 8.5.1 as specified above that include general provision, admission of learners, conditions for admission, delivery of products and services, summative assessment, recognition of assessed learning and even additional requirements for special needs education.

All organization are haunted by miscommunication but the both ISO 9001 and 21001 have covered requirements general, communication purposes, and communication are both internal and external communications making a more structured and well defined communication system.



**Figure 2 MAAP Modern vis a vis ISO 21001**

Increase sponsorship is a good challenge for us making us more proud and credible. The standard has given requirements for this 4.2 and 6.1 to ensure interested parties requirement and needs are properly addressed.

Moreover, the Principles for an EOMS is way beyond ISO 9001 which is more comprehensive and value-adding to a MHEIs as follows:

- a) Focus on learners and other beneficiaries
- b) Visionary leadership
- c) Engagement of people
- d) Process approach
- e) Improvement
- f) Evidence-based decisions
- g) Relationship management
- h) Social responsibility
- i) Accessibility and equity
- j) Ethical conduct in education
- k) Data security and protection

From seven QMS principles adopting EOMS principles gives you six additional (a, b, h, i, j, k) or enhance guidance in the implementation of EOMS. This doubles up the benefits and possible actions that institutions can achieve in the adopting the standard meaning more arsenals to face whatever challenges the future may bring.

Finally, the EOMS strategy as related to mission and vision is articulated by elements of Figure 3. that illustrates that vision achievement relies on the periodic review of EOMS policy statements, the framework of establishing EOMS Quality objectives, to ensure organizational mission is effectively and efficiently accomplished. The framework of EOMS policy stems from the organization's culture and by the EOMS principles.

Reverting back to STCW QSS in ensuring defined objectives are attained and all the quality models and elements it requires, ISO 21001 indeed have high level of parallelism. Furthermore, STCW focuses on competence of seafarer which is the same focus of ISO 9001 for 8.3.4.3 Curriculum design and development controls a.2 states that learning outcomes are described in terms of competences learners should acquire by completing the curriculum.

From the education point of view the theoretical underpinning knowledge of Constructive Alignment (Biggs, 2003) is very evident in the ISO 21001 8.3.4.3 Curriculum design and development control a) learning outcomes; b learning activities, and 8.3.4.4 Summative assessment design and development controls a) a clear link can be demonstrated between the assessment design and the learning outcomes it is intended to assess, and where appropriate, the learning activities it is based on. The coherence between assessment, teaching strategies and intended learning outcomes in an educational programme (McMahon & Thakore 2006) have explicitly required by the standard promoting the world accepted Outcome-based education.

## **Conclusions**

Being ISO 9001 certified primary covered whatever modern challenges because of the dynamic risk-based thinking concept that fifth edition of the standards offers. However, ISO 9001 is a generic standard for all types of organization and industry. ISO 21001 now brings to the table tailor-fit detailed requirements with guidance for educational institutions.

With the question of Can ISO 21001:2018 help meet the modern challenges of MET? The answer is yes! ISO 21001:2018 was found enable MAAP to meet in the modern challenges of MET as discussed above for the following evidences:

- a) The standards meets the STCW QSS elements and model requirements
- b) The standards promotes Risk-based thinking enabling the academy of be sustainably successful even when changes occurs
- c) The standards is a learner competence inclined standard
- d) The standard requires constructive alignment
- e) The standard requires outcome-based education

## **Recommendations**

1. MAAP to undergo the process of certification for ISO 21001:2018 standard

MAAP initial certification roadmap have been taken in place to ensure that the academy is on the right track, with its long-time partner in Certification DNV-GL, toward to become the first to be certified in the Region.

2. IMLA members to consider in adopting the ISO 21001;2018 standard in their respective institutions

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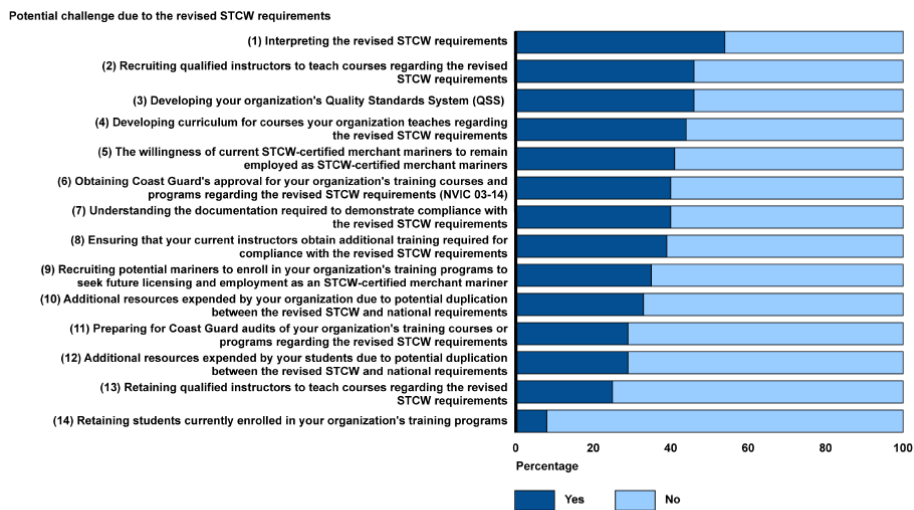
IMLA members can be the advocate of championing ISO 21001:2018 as catalyst of positive change that will fully support successful attainment of institutional mission and vision. For faculty to have a international standard in preparing their courses and curriculum and even classroom delivery.

3. Endorse to Philippine statutory and regulatory agencies for Philippines METIs to adopt the EOMS

MAAP to pave the way in the advent of a more educational-friendly standard that primarily benefits the learners and all beneficiaries of METIs and to have unified model QS for all that fully complies with STCW QSS requirements. This will will strengthen promotion of a OBE and Competence-based among Philippines METIs helping address their own challenges.

4. MAAP and IMLA to work together in promoting ISO 21001:2018 as accepted standard for International METIs

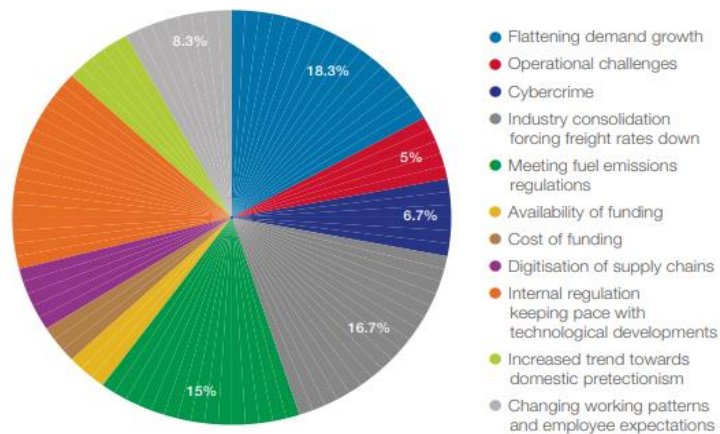
A collaboration between MAAP and IMLA to assist local and international schools in setting up an ISO 21001:2018 certified ready institutions and curriculum to empower a global collaboration and enhancement of Maritime Shipping Industry thru MET.



Source: GAO. | GAO-17-40

Note: A total of 126 survey respondents reported that they are STCW training providers, but not all of these training providers responded to each question.

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## **Innovative Simulation Method for Sustainable & Safe Operation of Ships in Coastal and Harbour Areas**

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### **Abstract**

New concepts to support sustainable and safe operation of ships in coastal and harbour areas have been developed at Maritime Simulation Centre Warnemünde MSCW/ISSIMS Institute in research projects based on Fast Time Simulation (FTS). These methods provide instant visualization of the ship's track for the intended rudder, thruster or engine manoeuvres. In contrast to conventional FTS concepts with autopilot control which are already known for simple manoeuvres, there is now a unique approach at ISSIMS which is called "Rapid Advanced Prediction & Interface Technology" (RAPIT): With this innovative simulation technology, based on complex dynamic models for ships manoeuvring motion, the ship can be steered by a smart interface to allow for the involvement of the professionalism of a human operator for complex manoeuvres.

This innovative RAPIT technology allows for a new method of manoeuvring support which is called "Simulation-Augmented Manoeuvring Design, Monitoring & Conning" – SAMMON. A unique software system was developed together with a small company to apply this method which consists of various modules for (a) Manoeuvring Design & Planning, (b) Monitoring & Conning based on Multiple Dynamic Prediction, (c) Trial & Training and (d) Predictive Replay & Assessment. The Planning module in particular is the missing link in voyage planning because it allows to develop a comprehensive concept of the manoeuvres in the non-stationary motion segment after passing the breakwaters up to the final berthing manoeuvre – and even to check out alternatives and search for limits of environmental factors. And in future it will be possible to also consider aspects of sustainability: A novel approach is the concept for the integration of advanced engine process models into the simulation (e.g. project MEmBran), described in this paper:

The focus is the transient engine behaviour to predict fuel consumption and emissions as e.g. NO<sub>x</sub>, soot particles and CO<sub>2</sub> during non-steady operation during ships manoeuvres.

This model will be interfaced into the SAMMON Software to enable the user (e.g. a navigator or



a harbour planning administration) to optimize ship manoeuvring actions e.g. with respect to effective control actions for safe distances, shortest time or most effective and least environmental effect.

By now the features in the SAMMON software have already been proven great potential for teaching and learning in the maritime education [2], improving simulator training for advanced ship handling training at several MET institutions as well as for port risk assessments and in harbour & waterway design studies. Samples of application of this innovative technology will be shown in the paper. The future potential will be discussed to consider environmental and economic aspects during manoeuvring, when the ship's motion and requested power are changing permanently.

**Keywords:** Fast manoeuvring prediction, Voyage planning, Simulator & On-board training, Emissions & fuel reduction.

### **Introduction – Current state**

Digital models of maritime systems (nowadays also called „digital twins“) have been widely used in ship design for a long time, but now they become also important for the operation of systems, e.g. for manoeuvring ships – And not only for the well-known training in bridge simulators, but in future also for the real ship operation on-board, e.g. as assistance systems for decision support. In earlier papers we introduced specifically the use of mathematical models for Fast Time Simulation (FTS) of ships manoeuvring motion to support in planning and executing ship manoeuvres. The need of such a method, the operational concept of the innovative software and potential benefits were shown e.g. in 0 - 7.

In contrast to conventional FTS concepts with autopilot control (1112 which are already known for simple manoeuvres only, there is now a unique approach at ISSIMS which is called "Rapid Advanced Prediction & Interface Technology" (RAPIT): With this innovative simulation technology, based on complex dynamic models for ships manoeuvring motion, the ship can be steered by a smart interface to allow for the involvement of the professionalism of a human operator for complex manoeuvres.

This allows to operate the software manually by both:

Students / young nautical officers for improving training skills and mental model of ship dynamic and

Experts / professional ship handlers to make better use of their professional knowledge and skills and improve their performance for complex manoeuvres.

This innovative RAPIT technology allows for a new method of manoeuvring support which is

called "Simulation-Augmented Manoeuvring Design, Monitoring & Conning" – SAMMON. A unique software system was developed together with a small company (ISSIMS GmbH 3) to apply this method which consists of various modules. Fig. 1 shows the elements of manoeuvring and ship handling operation - and the potential of SAMMON: on the left side the great potential is shown for the support both for Lecturing & Simulator Training, and on the right side the elements which could support the application on-board ships.

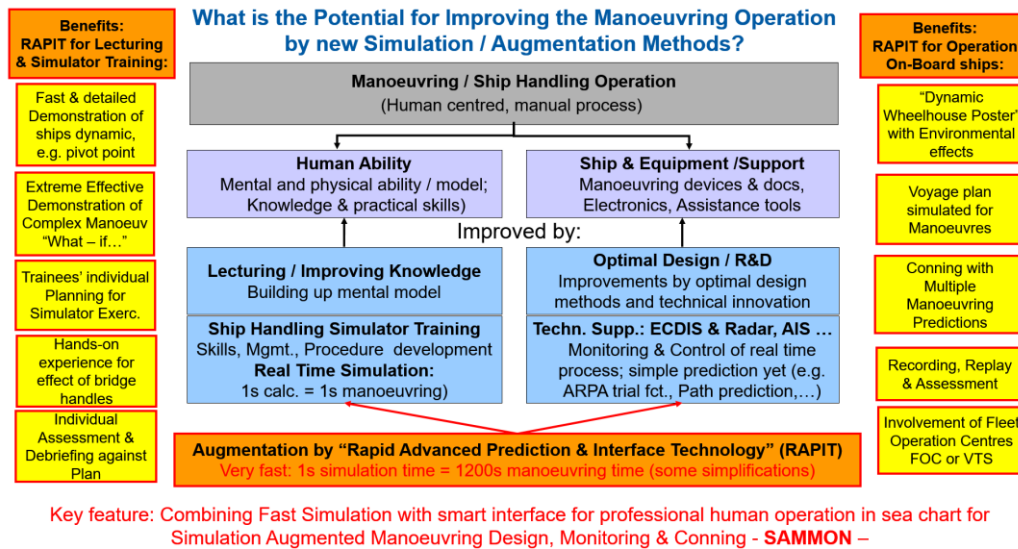


Fig. 1 Process elements of manoeuvring operation and advantages by using Fast Time Simulation FTS in Lecturing & Simulator training as well as support on-board ships.

In Fig. 2 a list is given of the different SAMMON modules (centre) and the elements of using the tools in simulator training ashore (left) and for operation on-board ships (right). It should be highlighted that this software is unique also for training on-board supporting continuous learning.

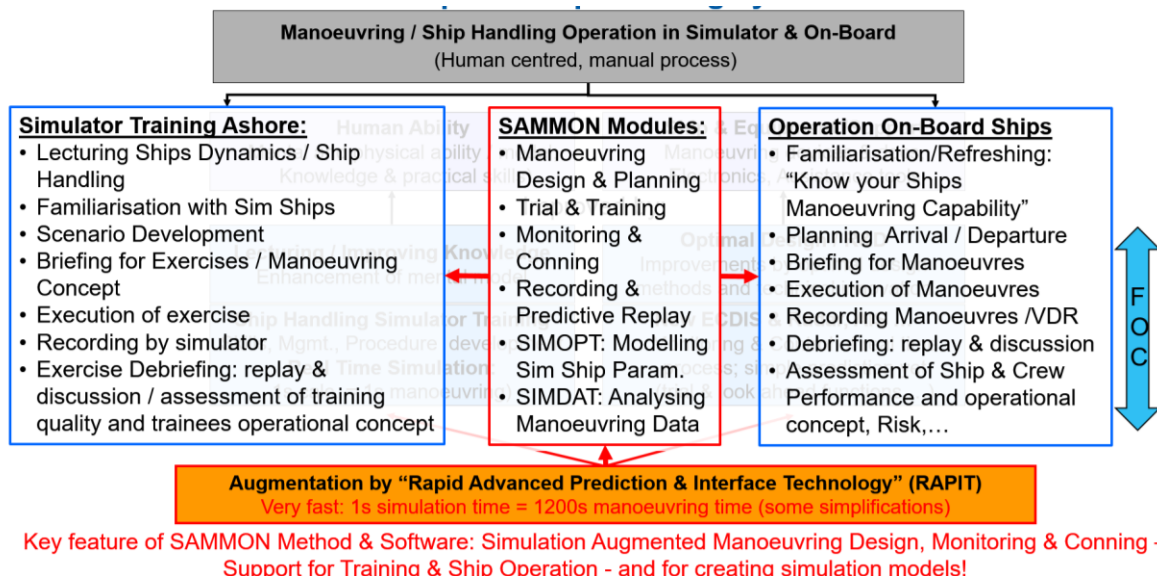


Fig. 2 Elements of Manoeuvring Training & ship operation and new Modules/Tools to improve

ship handling by innovative RAPIT

Now the modules of the system have matured and in this paper we will shortly describe some successful applications to show the benefits of the existing software but also to describe the future prospects. The main focus is on future improvements to extend the scope of application - from increasing safety and improving performance to also reduce fuel consumption and emissions during manoeuvres in future.

In Fig. 3 a sample is shown for successful application of the new software at Carnival Cruises Training Centre CSMART at Almere/NL: Two large Touch Screens are used for parallel Presentation & SAMMON application, complete manoeuvring plans can be made as concepts for full mission simulator exercises, not only by the instructor but also by the students which are using Laptops with mouse for operation of the Planning software.

Now the new software is transforming from successful training tool to future use on-board for pre planning as new element in voyage planning for the final part for manoeuvres in ports. In Fig. 4 a sample is shown for planning a manoeuvre for a cruise vessel arrival. The ship manoeuvre is steered by the virtual handle panel on the right side, the resulting ships manoeuvring motion is immediately shown on the central ENC for up to 24 min ahead. Then the new manoeuvring point has to be chosen on that track to add the next manoeuvring segment with new control settings. The full procedure of planning takes about 10 min, this manoeuvre planning was explained in detail e.g. at INSLC 2018 7.

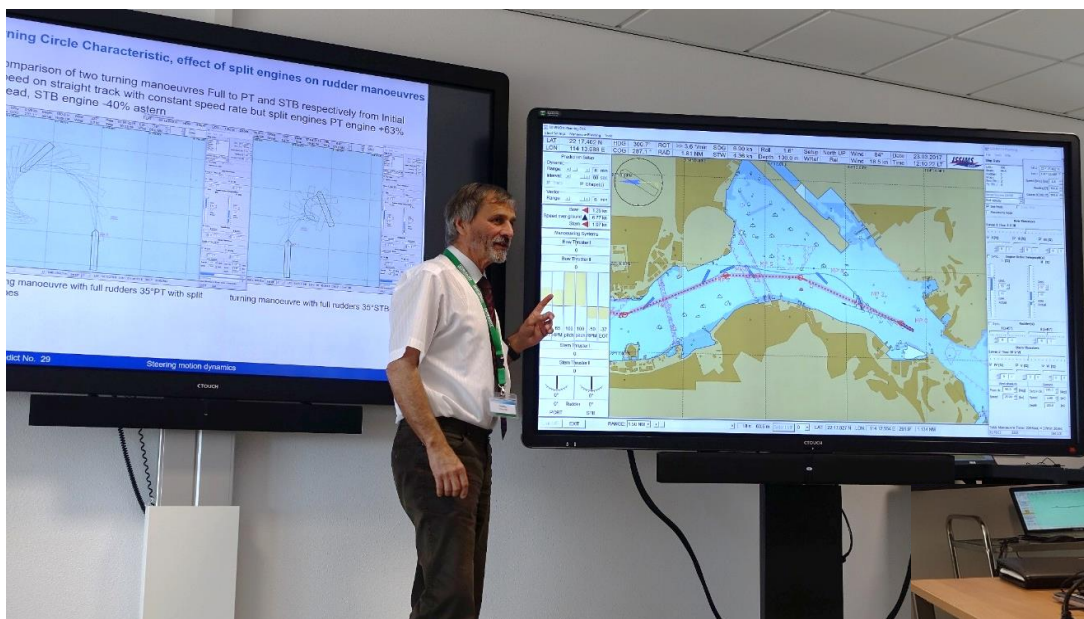


Fig. 3 Carnival Cruises Training Centre CSMART: Lecturing & Training at Touch screen - "Rapid Advanced Prediction & Interface Technology" (RAPIT) is used in the SAMMON

Planning for Lecturing effective turning of Cruise ships & wind impact in a Hong Kong arrival exercise

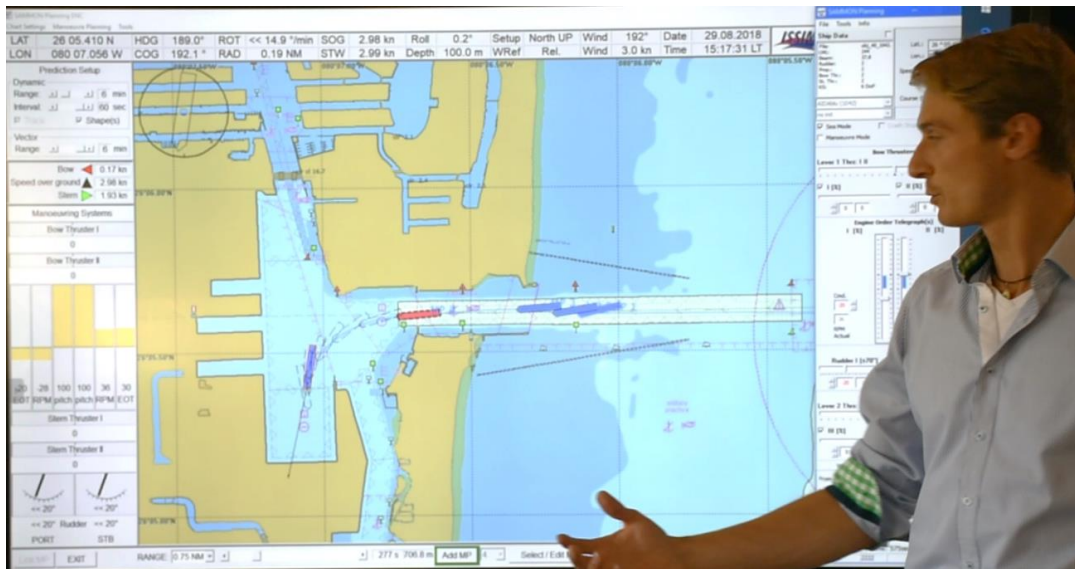


Fig. 4 Manoeuvring Design & Planning Tool Demonstration: Planning of manoeuvring sequence for a cruise vessel for arrival at Ft. Lauderdale by Nautical Officer of AIDA Cruises on touch screen.

Fig. 5 is a demonstration of the Monitoring and conning tool where the FTS is used to display the result of the steering or engine control changes during the ship motion and using the bridge handles. For practical application in training and research the new FTS-features were interfaced to the new Full-Mission and Desktop ship handling simulator Systems, configured by benntec (MarineSoft) Systemtechnik GmbH, based on Rheinmetall Electronics GmbH bridge simulator software ANS 6000 6.



Fig. 5 Manoeuvring Monitoring & Conning Module – Demo of using bridge handles in to train "Touch and Feel" for Controls with Multiple Dynamic Prediction showing the effect of any control change immediately as future ship shape on ENC (SAMMON Demo on Bridge

Simulator at benntec / Marinsoft Office at Rostock-Warnemünde Germany)

For the time being the SAMMON software is used to design manoeuvres with respect to safety (e.g. to ensure safe distances to limit lines and buoys) and feasibility of a concept (e.g. to make sure that the concept is also possible for high wind forces). In the following chapters will be shown how the software will be used to also allow for efficient manoeuvring procedures, i.e. to also compute the power consumption and analyse the use of controls. Moreover, sustainable aspects of manoeuvring come into view: the software will be extended by modules to predict the fuel consumption and emissions will be added to the core system.

## Identifying the potential for improvements and benefits of manoeuvring performance

### Results from test trials for manoeuvres with SAMMON in simulators

In order to expect the possible range of consumptions different Test Trials in a Full Mission simulator had been carried out. The main task for a group of experienced nautical officers was to reach a certain destination, e.g. an anchorage, crossing a TSS and avoiding other ship on anchor. Every test candidate had to carry out different scenarios in order to eliminate bias due to the learning effect,. The first attempt had to be carried out without prediction, a second one with prediction and the third one with prediction and manoeuvre planning. Every candidate had to make his own manoeuvre plan ahead, so that he can carry out his own individual concept. Fig. 6 shows a sample of the manoeuvring track generated by a candidate during the simulator trial. The blue line represents the track crossing the TSS to sail to the assigned anchorage position at the end of the track avoiding other ships at anchor.

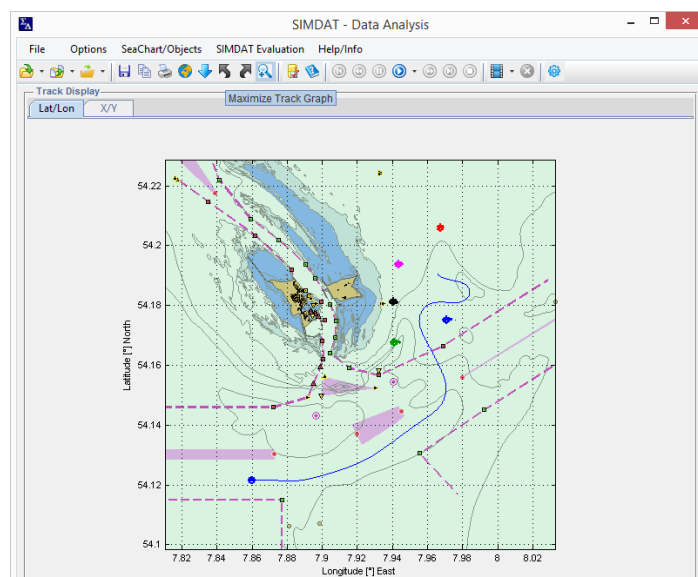


Fig. 6 Sample for manoeuvring track generated by candidate during the simulator test run

Fig. 5 shows the result of these test trials. The power consumption is dropping in average down to 80% with the sole use of prediction compared to a manoeuvres without any assistant

tool. The power consumption is reduced to around 65% if the candidate has carried out its manoeuvres with pre-planning and on-line prediction. Additionally, the usage of the thruster drops around to half of the previous numbers. In Fig. 8 the average usage of rudder commands in these scenarios can be seen. The small rudder changes drop down to 60% in average.

For emphasizing the impact of planning and prediction in Fig. 9 the differences of rudder commands can be seen. On the left side are the rudder angles in one scenario without any prediction and assistant tools. On the right are the rudder angles displayed with planning and prediction. As a conclusion the amount and amplitude of rudder changes decrease clearly.

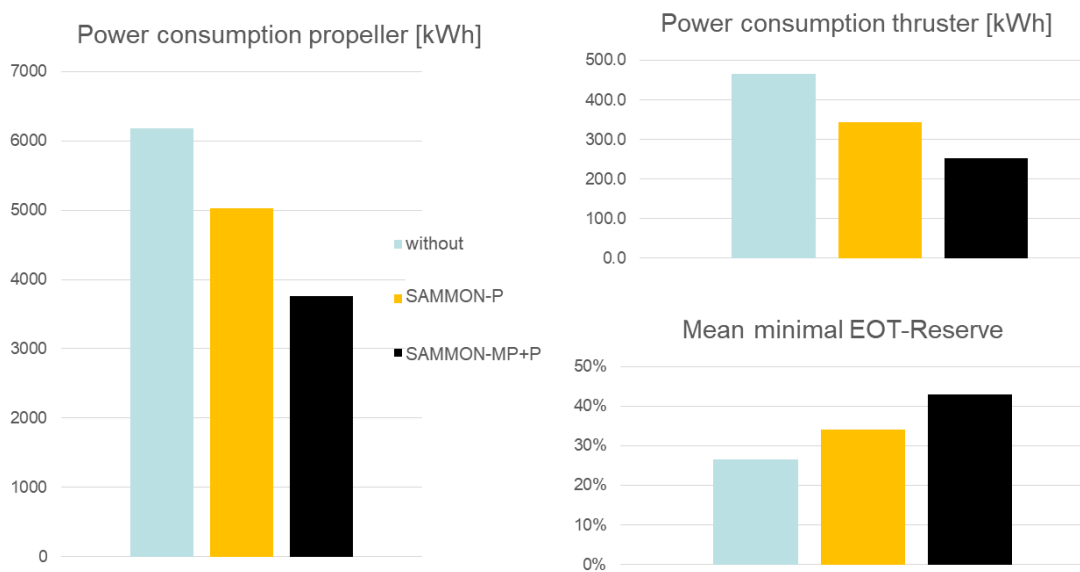


Fig. 7 SAMMON Advantage: Savings in Test runs with & without pre-planning and online-prediction

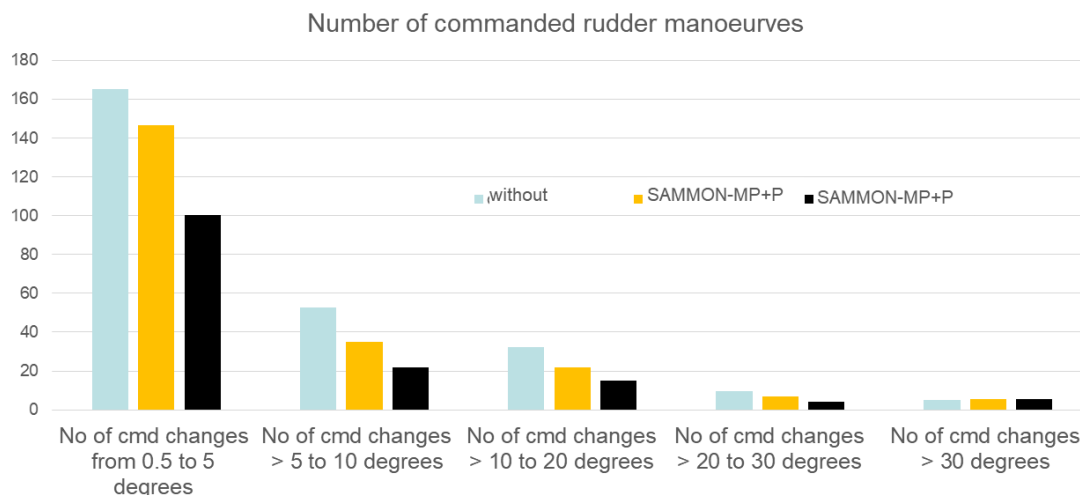


Fig. 8 SAMMON Advantage: Efficiency in Test runs with and & without pre-planning and online-prediction

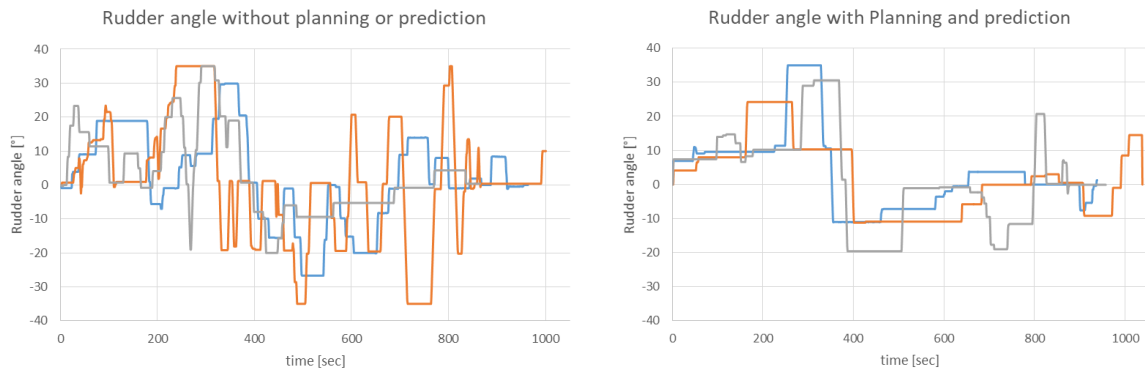


Fig. 9 Comparison of rudder angles during manoeuvring without (left) and with (right) pre-planning and online-prediction

### Discussing manoeuvres recorded for a Ro-Ro ferry arrival

In this chapter manoeuvres of a Ro-Ro ferry are shown which were recorded from arrival manoeuvres of the vessel at the Port of Rostock / Germany. An analysis will be made to find potentials for improvements of the manoeuvring performance. In Fig. Fig. 10 the tracks are displayed from 5 manoeuvres together with the last part of the route plan represented by the red dotted lines. It is obvious that normal route plans which are regularly only straight lines or circular segments are not suitable for the voyage planning regulation according to IMO which was already discussed and proposals were made to use the manoeuvring planning methods applying the RAPIT technology in the SAMMON planning tool to generate manoeuvring plans with Manoeuvring Points. In below Fig. 11 a) one manoeuvre is further analysed which was the closest to the route plan. The time history of the commands to control the vessel manually and the ship responses reveals that there were many actions necessary to steer the vessel, some of them are alternating back and forth, left and right which is known to not be very efficient. As an alternative Fig. 11 b) the same manoeuvre under similar conditions was planned by means of the Planning tool – it is obvious that the controls needed not to be used so frequently and with smaller magnitudes. The responses e.g. the rate of turn is smaller and smoother. Additionally, the planned manoeuvre is about two minutes shorter than the real ship trial. The expectation is, that those manoeuvres with smaller control intensity are also smaller in fuel consumption and emissions.

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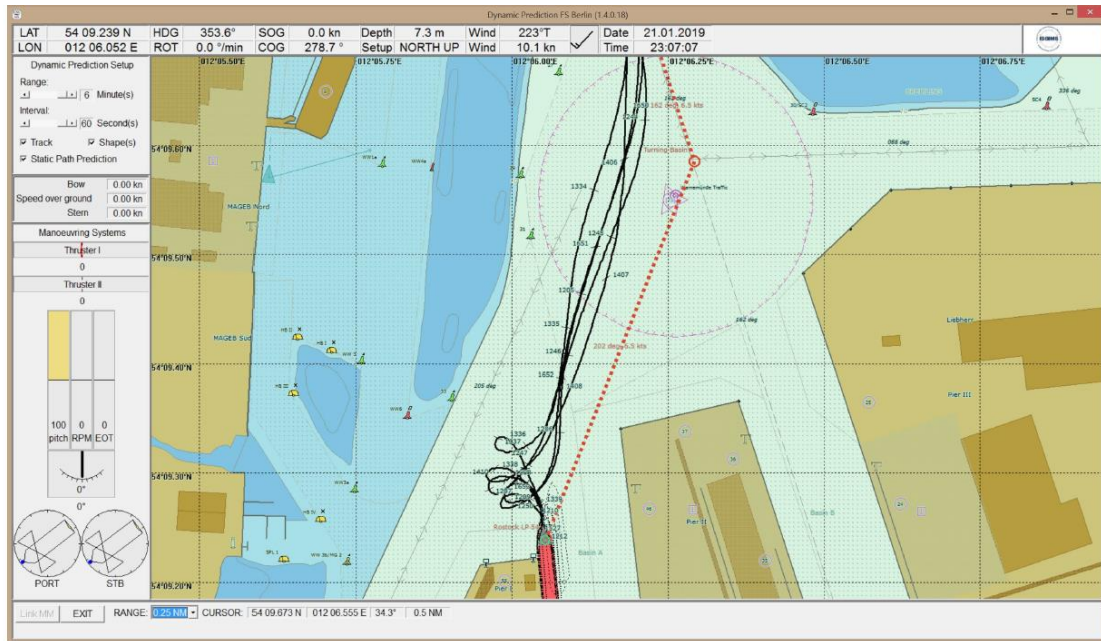


Fig. 10 Recordings of Five different manual controlled ships tracks (black) when berthing of a ferry in port of Rostock compared with the route plan (red dotted lines)

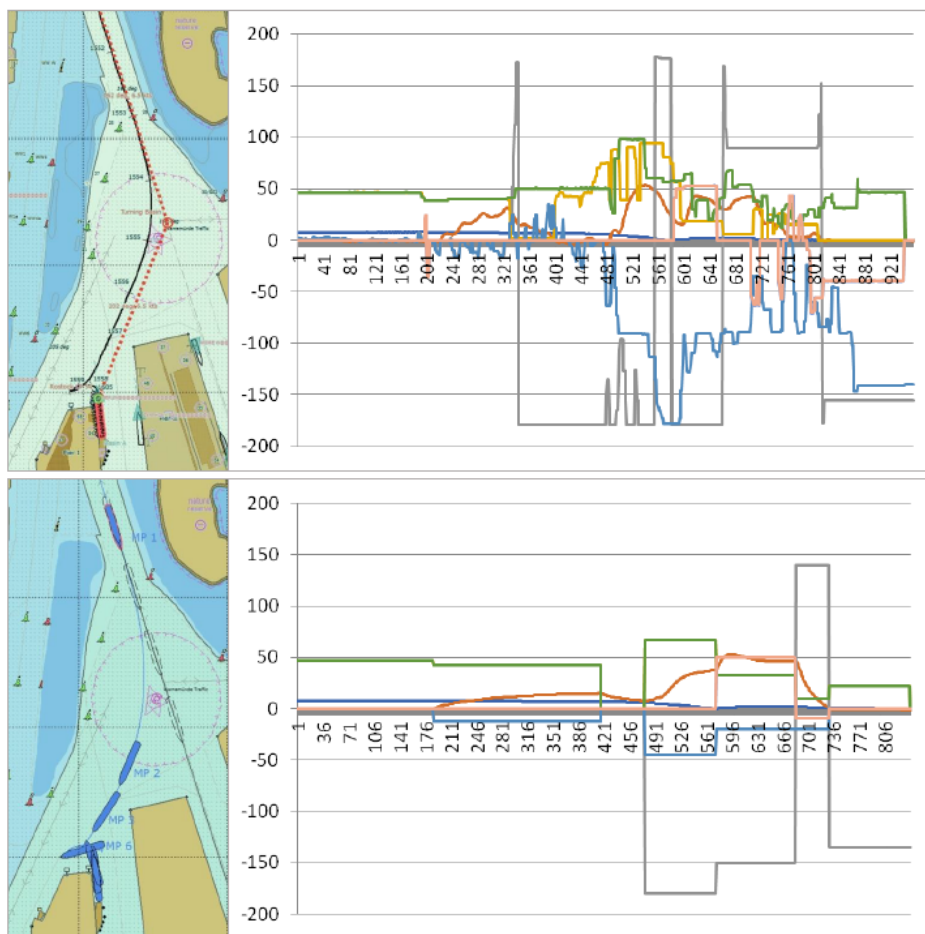


Fig. 11 Comparison of ships track (left) and time history of commands and ship responses (right) for a berthing manoeuvre of a ferry (POD power - yellow and green, POD angles - grey)



and blue, bow thrusters, power - salmon pink and light blue, speed over ground - dark blue, and the rate of turn - orange)

recorded data from real ship manoeuvre

Manoeuvring plan from SAMMON Planning tool with Manoeuvring Points to change commands at positions represented by the blue contours

To compare real ship manoeuvres it is necessary to gather data from the power output, caused by different manoeuvring approaches. Table 1 shows the differences in power consumption from the mole to the port carried out by different crew members under the same conditions i.e. low wind from the same direction, no current and no obstructive traffic. The measurements have been carried out over a time of 8 months and are leading in the way of differences in each measurement.

Table 1 – Comparison of power consumption during manoeuvring and berthing

<b>Power consumption of each measurement</b>		
<b><i>Measurement</i></b>	<b><i>Consumption (kWh)</i></b>	<b><i>Percentage</i></b>
0131	487.76	115%
0758	468.67	110%
1633	423.75	100%
2030	502.81	119%

## **Concept for future methods for calculating fuel consumptions and emission**

### **Introduction into the concept**

In order to extend the software by modules to predict the fuel consumption and emissions the following two different approaches are followed as shown in Fig. 12. The first one as shown in chapter 3.1 is based on thermodynamic equations in order to calculate the NO<sub>x</sub> and soot formation on a physical proven base. The second approach uses an artificial neural network (ANN) that could be trained by a variety of data bases e.g. a thermodynamic model like in chapter 3.1 or a set of measurements. Fig. 12 displays the concept of integration into the existing SAMMON model.

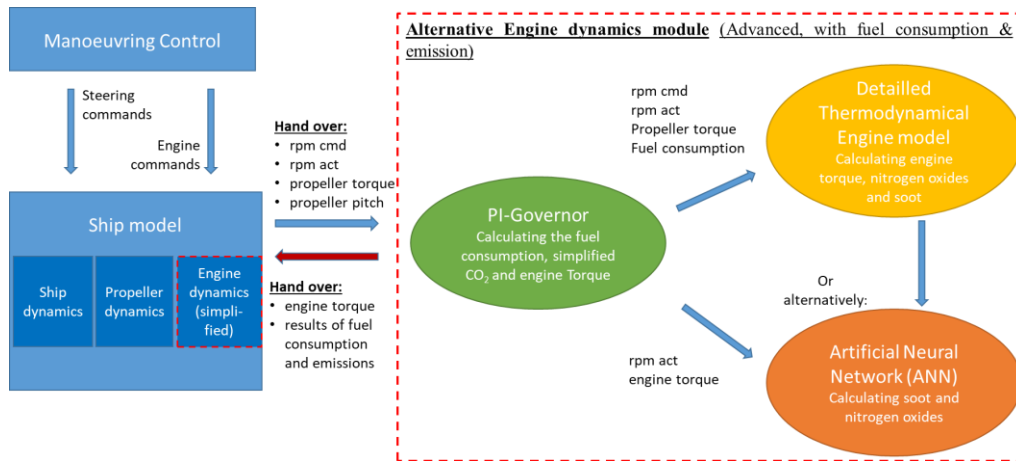


Fig. 12 Existing simulation model in the SAMMON system and intended expansion of advanced engine model

It consists of the calculation of the existing ship’s model including a simplified engine model in order to generate an engine torque for prediction. The engine model itself will be separated from an engine model and will consist of an PI –Governor for the calculation of the fuel consumption and of a detailed engine model or an ANN depending on the calculation speed, where the ANN can be trained using the data of the detailed engine model.

### Thermodynamic simulation model for calculation of soot and Nitrogen Oxides.

The formation of soot and nitrogen oxides is strongly depending on the combustion process inside the engine. The  $\text{NO}_x$  – formation is determined mainly by the temperature inside the combustion chamber. The soot formation is additionally depending on the air to fuel ratio. The calculations of emissions are more or less an output of the fuel delivered by the governor. In order to achieve more realistic engine simulation it is necessary to model the governor and the automation system more precisely. In contrast to the existing simplified engine model (which is based on look-up table controlled processes) the signal of the Engine Order Telegraph will regulate the fuel flow to the engine and to the cylinder simulating the combustion process. The air intake into the combustion chamber is depending of the geometrical shape of the inlet valve, the opening and closing times and the charge air pressure before the combustion chamber. Also the turbocharger that is driven by exhaust gas has a substantial impact, its mass inertia is the main source for soot during manoeuvring. The main base for a calculation of the average temperature inside the cylinder is the basic energy balance (1).

$$\frac{dU}{dt} = -p \frac{dV}{dt} + \dot{Q}_B + \dot{Q}_W + \dot{H}_{BB} + \dot{H}_{in} - \dot{H}_{out}$$

The inner energy  $u$  in formula (2) can be ascertained by a function of temperature and air-fuel ratio  $\lambda$  according to 15. The pressure volume work  $p dV$  expresses the work carried out by the

piston in the up and down movement during the compression or expansion phase.  $\dot{Q}_B$  is the heat released during fuel combustion. The time, duration and form of heat release can be described using approach in 16.  $\dot{Q}_W$  is heat flow through the liner wall. The heat transfer coefficient can be calculated using the approach in 17  $\dot{H}_{in}$  and  $\dot{H}_{out}$  stands for the enthalpy flow through inlet and outlet valve.

$$u(T, \lambda) = 0,1445 \left[ 1356, + \left( 489,6 + \frac{46,4}{\lambda^{0,93}} \right) * (T - T_{Bez})10^{-2} \right. \\ \left. + \left( 7,768 + \frac{3,36}{\lambda^{0,8}} \right) (T - T_{Bez})^2 10^{-4} - \left( 0,0975 + \frac{0,0485}{\lambda^{0,75}} \right) (T - T_{Bez})^3 10^{-6} \right]$$

With the thermodynamic average temperature it is possible to calculate the temperature of the flame front  $T_2$  and the temperature of the unburned zone  $T_1$  according to 18 and to estimate the formation of  $NO_x$  in (3), using the mechanism described in 19. The Arrhenius-factor  $k_{1,r}$  has the highest activation energy delivered by the temperature  $T_2$  (detailed description can be found in 14).

$$\frac{d[NO]}{dt} = k_{1,r}[O][N_2] + k_{2,r}[N][O_2] + k_{3,r}[N][OH] - k_{1,l}[NO][N] - k_{2,l}[NO][O] - k_{3,l}[NO][H]$$

Fig 13 is presenting the approach of the detailed engine model 14, that is used to replace the simplified one in the ship's model.

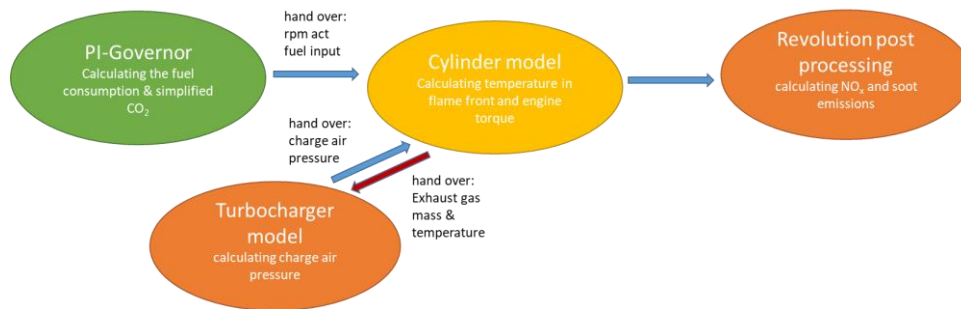


Fig. 13 Process overview of detailed engine model

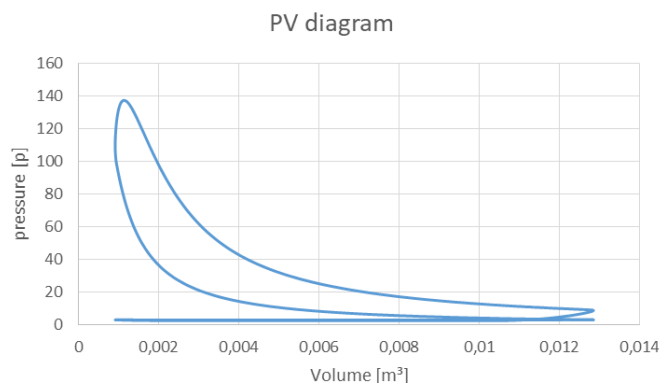


Fig. 14 pressure-volume diagram of the detailed calculation of the cylinder process as part of Fig 13

Fig. 14 is showing the result of the simulation of the pressure inside of the cylinder during two revolutions of the four-stroke engine MAN 6L23/30. On the upper part the high pressure part can be seen, where on the lower part the charge exchange through the exhaust and inlet valve can be seen. This result will be used as input to the future software modules representing formula (3).

### **Using an Artificial Neural Network (ANN) to be trained by experiments for calculation of soot and Nitrogen Oxides**

Purely data-based models do not need any information about the physical, chemical or other laws and relationships that determine the processes to be modelled. Attention is to be paid to numerous data of high quality covering as many input/output combinations as possible. Data can come from theoretical models or from test bed measurements. For the present studies the data is coming from the MAN 6L23/30 test bed engine. With respect to a restricted availability of input data from the ship model in the SAMMON software, only two input data will be defined: The engine revolutions and the fuel consumption. For clarity, the following examples will only focus on the data-based modelling of particulate matters (PM) which consist mainly of soot. The process of soot formation is not yet fully understood and described and even less the formation of PM during transient engine operation. For this reason, it is of special interest to find a reliable data-based method to create an instrument in order to simulate the formation of PM. Furthermore, the following examples refer to the test bed engine running in generator mode. Generator mode means that the commanded engine revolutions are constant. The PI-governor is responsible to hold the revolutions as far as possible by adapting the fuel rack position.

Fig. 15 presents the particulate matters depending on the engine torque. Close to the zero-PM line, a couple of clusters can be seen. These are the measurements during stationary engine operation. The measurements used for the training and the validation of the data-based model are shown in Fig. 16. These figures make it evident, that during stationary operation in generator mode almost no soot is emitted. But as soon as increasing the engine torque the formation of PM rises to the hundredfold of the stationary values. In propeller mode, when engine torque and speed increase in parallel, the amount of emitted PM during transient operation differs even more from the values of stationary engine operation.

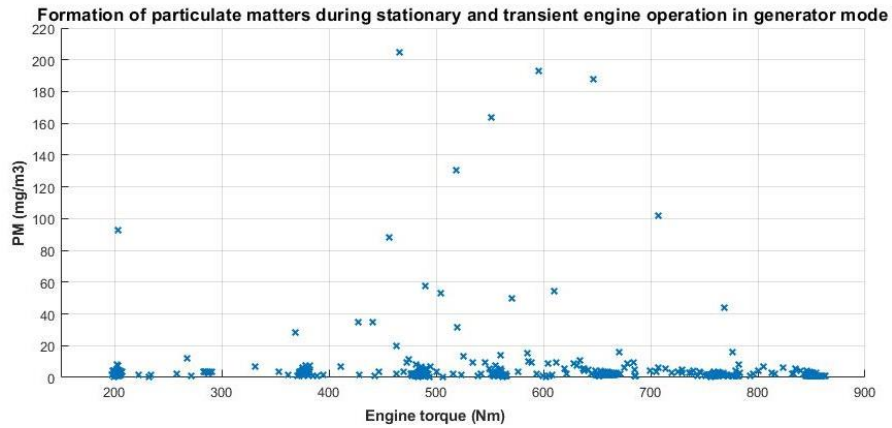


Fig. 15 PM emissions at different engine torques measured from the MAN 6L23/30 test bed engine

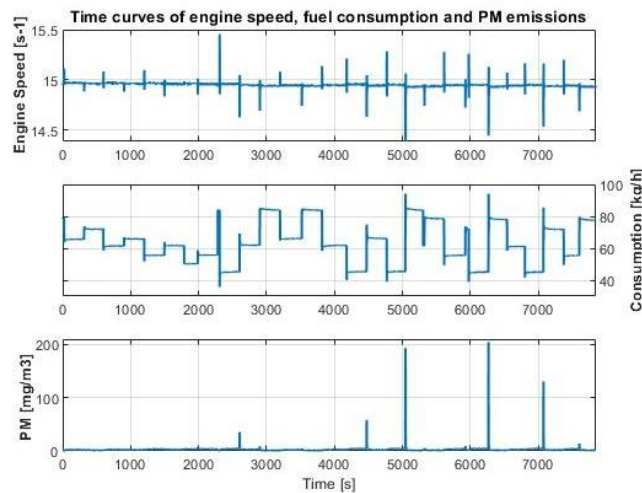


Fig. 16 Time curves of input and output data. Green dotted line shows the cut between training (75%) and validation (25%) data.

Among a big variety of data-based model architectures an Artificial Neural Network (ANN) architecture has been selected for a first attempt. Due to their flexibility regarding input dimensions and their relatively good interpolation characteristics they seemed to be adequate for the present study.

The observations presented above lead to the conclusion that PM formation during transient operation differs completely from stationary results at same load levels. Therefore, not only the inputs of the current time  $t_0$  have to be considered in a data-based dynamic model but also their preceding values. Such a time delay neural network (TDNN), a so-called lumped dynamics recurrent network, leads to a multi-dimensional input vector exceeding the two input variables by multiples.

The Multilayer Perceptron (MLP), being a widely known ANN architecture was selected for a first approach. It consists of an input vector ( $u$ ), one or more hidden layers with neuron vectors ( $h$ ) and one output vector ( $y$ ) as schematically shown in Fig. 17.

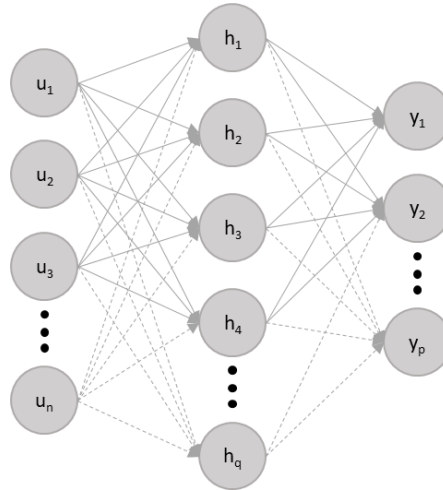


Fig. 17 MPL network architecture (inputs  $u$ , hidden neurons  $h$ , output  $y$ )

The neurons of the hidden layer are called perceptrons. All input data are multiplied by parameters (synaptical weights) in order to intensify or attenuate the input effect on the following neuron. All input signals are added up and the sum enters a nonlinear activation function that transforms the result which is then forwarded to the next layer. For the present study, a multiple-input single-output (MISO) network with one hidden layer is designed. In contrast to networks with internal dynamics the herein presented approach describes an external dynamic (lumped dynamics) network. For training purposes, the input vector contains measurement data of the input variables  $u$  and their time histories. The output value at  $t_0$  is needed to determine the difference between the desired and the current network output. The difference is propagated back through the network in order to adapt the parameters (synapse weights). Due to the fact that the model is nonlinear in its parameters no direct optimization strategy is applicable. The Levenberg-Marquardt algorithm, a more robust extension of the Gauss-Newton algorithm, has been chosen for training with backpropagation.

First practical experiments with data from the 6L23/30 test bed engine have been performed by taking a data set of 15 load increases in generator mode (Fig. 16). 75% of the data served for training whereas 25% were retained for validation. The number of hidden neurons was set to 20 and the delay to 70 seconds, taking only one sample in ten cycles.

Fig. 18 shows the curves of the training data in green colour. The data points are almost totally

covered by the blue curve displaying the simulation of the same data with the already trained network. This means that the network suits well with the dynamics of the training data except for the very high PM peaks.

For validation the last 25% of the measurement data set was taken. As already observed in the pre-validation making use of the training data (blue curve in Fig. 18) the network does not yet calculate the real height of the PM emission peaks. Zooming into the stationary simulation within Fig. 19 it can be stated that in the average the simulation suits quite well with the validation data, but there are a lot of small oscillations in the simulation.

This first attempt to simulate the dynamics of the PM emissions during transient engine operation by means of an ANN is a promising approach. Nevertheless, there is still work to be done in order to reproduce the emission peaks with more reliability and to get a smoother simulation. More training data will be provided soon, but in addition, a division of the ANN in part models as well as internal dynamics will be taken into account for further investigations.

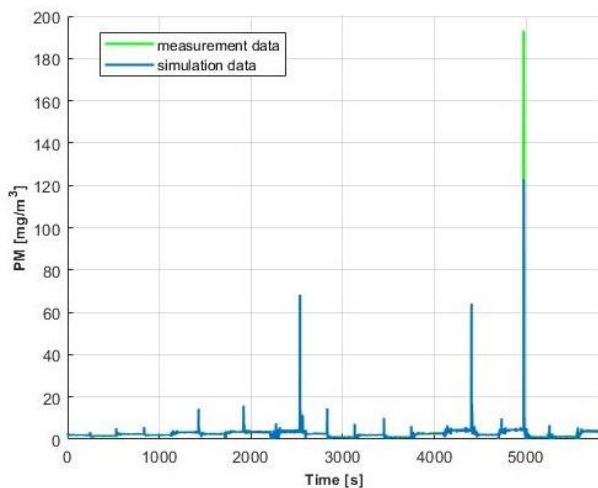


Fig. 18 Training data (green) and pre-validation by simulating with the same input data as used for training (blue).

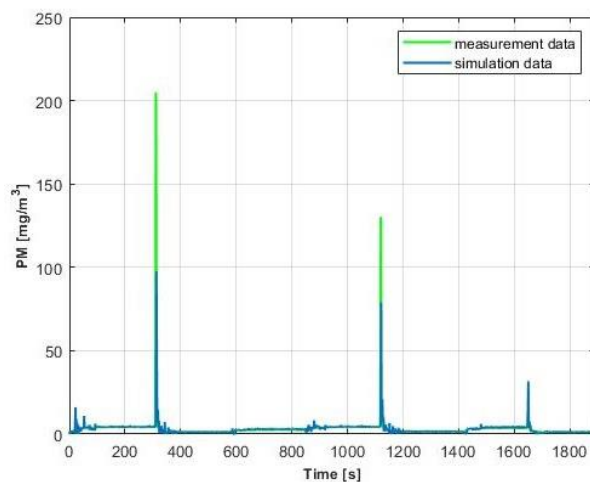


Fig. 19 Validation of network by using the validation data set.

Recently, this trained ANN has been transferred to an interface for data exchange with the FTS ship model in order to simulate the fuel consumption and soot emissions during manoeuvres (Fig. 20). A model was generated for a fictive ship which size was adjusted to the size of the testbed engine. During the first few seconds, the ANN needs to collect data from its two inputs fuel consumption and actual propeller revolutions in order to calculate the output which is soot from the start at the green line.

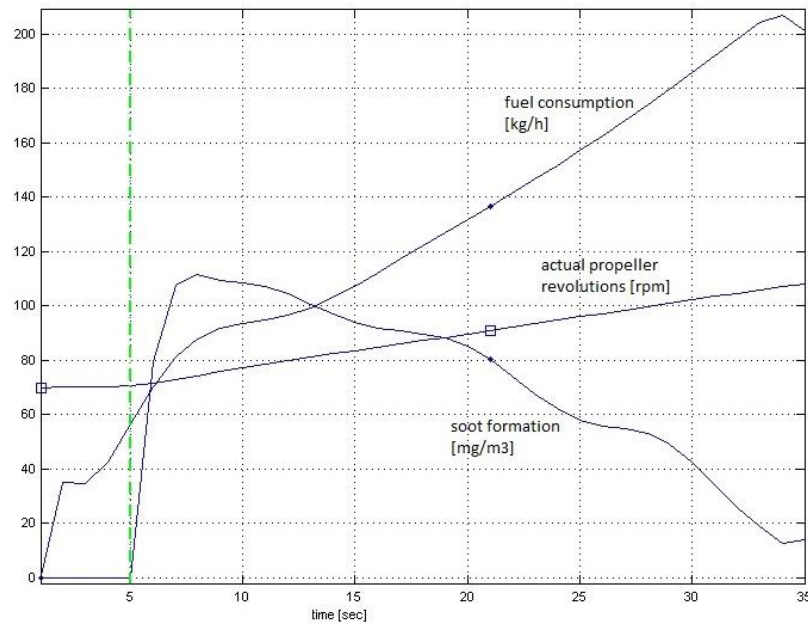


Fig. 20 Verification of network by using the trained ANN for a fictive ship model with FPP for acceleration from 20 to 90% EOT

Unfortunately, there is no possibility for validation, but for a qualitative verification of the method, which is working quite well. In future, measurements from a real vessel, e.g. the above mentioned Ro-Ro ferry, could be taken in order to train the ANN by data coming from a real ship.

### Conclusions / Outlook

Fast Time Manoeuvring simulation and specifically the new technology "Rapid Advanced Prediction & Interface Technology" (RAPIT) as core element of the unique SAMMON method for Simulation-Augmented Manoeuvring Design, Monitoring & Conning has proven its benefits for both lecturing and training for improving ship handling knowledge and skills. It can be used as an individual training tool but unfolds its potential interfaced to a full mission simulator which is successful implemented with the Rheinmetall Electronics ANS 6000 Ship Handling Simulator, manufactured and distributed by MarineSoft / benntec. It increases the effectiveness of simulation training which can be seen in the fact that the success rate of the trainees is increasing: An analysis has shown that navigators are able to successfully manage demanding ship handling exercises after preparation & briefing using the SAMMON planning tool and even more to perform the manoeuvres with less power consumption.

This shows there is a high potential for optimisation to reduce manoeuvring time and power consumption due to less and better adjusted control action during the manoeuvres. A first approach was shown how to introduce modules for estimating fuel consumptions & emissions during the manoeuvring process based on thermodynamic simulation models and Artificial



Neural Networks. For the time being the ANN model was trained only for a small diesel engine from our Ship Engine Lab, but in future also measurements with real ship engines will be used to achieve higher realism.

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## **“Who cares about oiled birds?” - How ocean literate are maritime students and is there a space for improvement?**

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### **Abstract**

The content of the Marine Environment Protection course at the Maritime Department of the University of Zadar goes beyond STCW requirements. It addresses a number of environmental topics aiming to improve ocean environmental knowledge base in order to reduce future seafarers' poor environmental decision making and/or actions. Because the course is taught in the 1st year of the programme, there is a challenge of fitting ocean literacy content into an already heavy curriculum. In order to tailor content according to previous knowledge of students, assessment of ocean literacy at the beginning of the course may be done. For that purpose a revised version of the SOLE—Survey of Ocean Literacy and Experience questionnaire may be used. To define revisions, we performed a survey of the 3rd year maritime students which included filling in a questionnaire and collecting their proposals of environmental content which should be included in teaching. The results of the survey are discussed and future research is proposed.

### **Introduction**

The health and sustainability of the ocean, the largest ecosystem on our planet, covering 71% of the surface and containing 97% of the water, are threatened by numerous activities of the human population (1). Human-induced stressors such as climate change (warming and acidification), loss of biodiversity, eutrophication, deoxygenation, and overfishing alter the biological, chemical and physical characteristics of the ocean and have the potential to significantly reduce many economic, social and environmental benefits that people obtain from it. Ocean has a central role in supporting life on earth and humankind's well-being. Therefore, in September 2015 all United Nations (UN) Member States adopted the 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals (SDGs) including SDG 14: *Conserve and sustainably use the oceans, seas and marine resources for sustainable*

*development* (2). There are seven targets addressing conservation and sustainable use of the ocean and its resources, including coastal zones, and capacity building and ocean governance and three means of implementation for the SDG14. To achieve ocean-related Agenda 2030 priorities the UN declared a Decade of Ocean Science for Sustainable Development from 2021 to 2030 (3). Scientists, governments, academics, policy makers, business, industry and civil society are invited to strengthen the management of oceans and coasts. The strategic objectives of the Decade are: 1. To increase knowledge of the ocean system, 2. To generate evidence for ecosystems-based management and the blue economy, 3. To save lives and reduce risks from ocean-related hazards, 4. To strengthen cooperation in observation, data and other infrastructure, 5. To increase scientific and technical capacity and Ocean literacy, 6. To enhance partnerships, cooperation, coordination and communication.

The contribution of maritime community to sustainable development is crucial for the conservation and sustainable use of the ocean (4). Beside obvious SDG14, safe, secure, clean and efficient maritime transport also enables achieving almost all other SDGs: 1) No Poverty, 2) Zero Hunger, 16) Peace, Justice, and Strong Institutions, 4) Quality Education, 5) Gender Equality, 8) Decent Work and Economic Growth, 6) Clean Water and Sanitation, 11) Sustainable Cities and Communities, 12) Responsible Consumption and Production, 7) Affordable and Clean Energy, 13) Climate Action, 9) Industry, Innovation, and Infrastructure, 10) Reducing Inequality, and 17) Partnerships for the Goals.

Sustainable shipping and protection of the marine ecosystem require the professionalism and competence of maritime personnel. Therefore, Marine Environment Protection, an obligate course taught in the 1st year of Nautical Studies and Maritime Transport Technology programme and Marine Engineering and Maritime Transport Technology programme offered at University of Zadar, contributes to achieving competencies necessary to carry out the ship operations efficiently. However, our students are not only future seafarers, they are also citizens and learning outcomes of the course include providing a proactive approach to the protection of the marine environment. To be able to participate in solving problems related to modification, destruction and pollution of the ocean they need to be ocean literate (5) because *an ocean literate person understands the essential principles about the ocean, can communicate about the ocean in a meaningful way and is able to make informed and responsible decisions regarding the ocean and its resources* (6).

Course`s 30 contact hours and 3 ECTS credits are not enough to cover complete ocean literacy content and we need to rely on students` previous knowledge. However, our students are coming from different parts of Croatia and have finished various secondary schools (grammar

schools, secondary maritime schools, other vocational schools), and their knowledge may vary substantially.

Therefore we decided to assess ocean content knowledge by revised Survey of Ocean Literacy and Experience (SOLE) questionnaire at the beginning of the course. For that purpose we aim to develop modified questionnaire. As a first step in developing revisions we performed a survey of 3rd year maritime students. Results of the survey and proposals for future research are presented below.

## **Methodology**

### **Participants and procedures**

The participants of the survey were 3rd year students attending Maritime Department of the University of Zadar. We chose students who completed On board training, under the assumption that experience on board ship influenced their environmental attitudes. Questionnaires were group administered during summer semester of the academic year 2018/19. Students filled in the anonymous questionnaire in the classrooms, after they were informed about the purpose of the study and the voluntary basis of the participation. In total, 27 (2 female and 25 male) marine engineering students (ME students) and 40 (4 female and 36 male) nautical science students (NS students) took part in the survey.

### **Instruments and data analysis**

An original version of the SOLE—Survey of Ocean Literacy and Experience scale, developed by Greely (7) to assess secondary students' ocean-related knowledge in the USA and containing 57 items was revised by Mogias et al. (8) to assess pre-service teachers' level of ocean literacy. The revised Greek version of the SOLE was translated in Croatian by a marine educator. The questionnaire contains 54 multiple-choice questions in alignment with the Seven Essential Ocean Literacy Statements (6): The essential principles of Ocean Literacy: 1) The Earth has one big ocean with many features (15 questions), 2) The ocean and life in the ocean shape the features of the Earth (6 questions), 3) The ocean is a major influence on weather and climate (9 questions), 4) The ocean makes the Earth habitable (1 question), 5) The ocean supports a great diversity of life and ecosystems (13 questions), 6) The ocean and humans are inextricably interconnected (6 questions) and 7) The ocean is largely unexplored (4 questions) (9). For the purpose of our study we added three open-ended questions: to propose additional topics and specific questions related to students' profession and to select items which should be omitted, because they address issues which students consider irrelevant.

## Results and discussion

The principal aim of our study was to collect comments and proposals of our students who have almost completed their studies in order to tailor content of the SOLE to the specific needs of maritime students. 18 NS students and 17 ME students returned questionnaire without replies to open-ended questions. Among 32 students who wrote something, 4 responded with jokes, proverbs, and frivolous suggestions to include questions like "what is the colour of the sea?" or "what does the ocean taste like?" indicating that they were not really interested, but decided to participate, perhaps because teachers were present. We were aware of the possibility that some students would participate from wrong reasons or give desirable answers, and that from this point of view an online survey could be a better instrument. However, since simultaneously we aimed to evaluate their knowledge, we wanted to avoid searching for answers online while taking the survey.

Serious responses regarding suggestion of topics that are not included in the SOLE questionnaire, and students' opinion on what they should be familiar with in order to pursue a course efficiently, were various, covering different topics in biology, ecology, geology, and oceanology. Several students mentioned that specific characteristics of the Adriatic Sea should be incorporated. Most frequently, the impact of marine pollution on humans, effects of fisheries and tourism on marine ecosystems, possibility of generating power from the sea and other ways of exploiting sea were mentioned, indicating that our students perceive humans and socio-economic services of the sea as very important and as a main reason for preserving oceans. Similarly, proposals for specific questions to be added most frequently included the share of maritime transport in the world trade.

Regarding questions that students did not consider important and should be excluded, 27 out of 54 questions were chosen by at least one student (17 questions by only one student), including some unexpected ones such as the questions about fraction of the total water on earth in the ocean, or sources of production of the earth's oxygen. Ten questions were selected by more than one student. However, only the essential nature of barrier islands was chosen by almost all students who responded to this open-ended question. It could be that they perceive it as not very relevant for the Adriatic Sea and/or easy to answer.

In summary, it seems that majority of the students conceives presented version of the SOLE to be satisfactory. An analysis of their suggestions did not indicate that there is a need to alter the SOLE significantly. Based on their proposals it seems that socio-economic services of the sea should be emphasised during lectures.

Although our main goal was not to assess ocean literacy of our students, particularly because the SOLE has been developed for secondary school students, we decided to analyse the results of the questionnaire. Table 1 shows participants' percentages of the correct answers to groups of SOLE questions in alignment with the Seven Essential Ocean Literacy Statements for marine engineering students and nautical science students. As can be seen from the Table 1 the values vary from 11.1 % to 100 %.

Marine engineering students had the most difficulty in correctly identifying the main source of the oil in the ocean. Only 11.1 % correctly chose evaporation from oil cargoes which returns to ocean by rain out. Out of the other 7 hardest items to correctly answer for marine engineering students (values below 30 %) 4 were related to weather and climate: the correct percentage of the carbon dioxide in the atmosphere absorbed by the ocean (item 23), was selected by 25.9 % students 29.6 % identified the evaporation as the process which takes heat from the ocean (item 27), 22.2 % chose Pacific as a location of the El Nino Southern oscillation (item 29) and 18.5 % correctly identified the percentage of primary production on earth which takes place in the sunlit areas of the ocean (item 30). The same percentage (25.9 %) of ME students recognised ocean as a location of the earth's flattest plains, highest mountains and deepest valleys (item 10) and plants (algae) in the ocean as the main source of the earth's oxygen (item 37), which we find worrying concerning the role of oxygen for life. Surprisingly, a small percentage of ME students (29.6 %) identified the role of condensation, precipitation and evaporation concerning ocean connection to earth's water reserves (item 8). On the other hand, items 24 (the essential nature of barrier islands), 41 (living spaces and habitats in the ocean), 54 (natural hazards which can impact coastal regions), 35 (relationship between sunlight and depth) and 1 (percentage of the earth covered by ocean) were generally easy for ME students to answer (Table 1).

Items 1, 24 and 35 were easy-to-answer for nautical science students too as can be seen in Table 1. More than 85 % of NS students answered correctly that temperature decreases with depth (item 34), that microbes are the most abundant life form in the ocean (item 40) and that surface temperatures would be more extreme than they are now, in case planet were without ocean (item 21). Among five questions that were the most difficult for NS students 3 (items 27, 22 and 29) were the same as for ME students (Table 1). Other two were item 13 (the fraction of the total water on earth in the ocean was correctly identified by 27.5 % NS students) and item 45 (deep ocean ecosystems, that are independent of energy from sunlight and photosynthetic organisms were selected by 25 % NS students).



Welch two sample t-test was used to determine if there was a difference between the mean percentage of correct answers between NS (n=40) and ME students (n=27). The results showed that NS students had minimal higher result ( $59.6 \pm 20.3$ ) compared to ME students ( $58.0 \pm 21.1$ ) and this difference was not significant (95% CI,  $p=0.7253$ ). Even though there was no significant difference in overall results, percentages of the correct answers for some of the items (5, 6, 10, 11, and 46) differ more than 20% for NS and ME students (Figure 1). Items 5, 6, 10 and 11 are related to weather and climate, and it can be expected that NS students possess better knowledge than ME students because they completed course Maritime Meteorology and Oceanography.

The average percentages of correct answers for ME and NS students indicate that they possess moderate knowledge of ocean science issues.

To the best of our knowledge, there are no studies investigating ocean literacy of Croatian students. However, studies performed in other countries show that students and other citizens possess low or moderate knowledge of ocean sciences issues and there is a need to determine influencing factors and to develop strategies to improve ocean literacy and enable citizenry involvement in marine environmental issues (10).

The research conducted in the context of the Sea Change project involved 257 stakeholders (including governmental departments of education, state bodies that sanctions the education curriculum, organisations offering informal education) from Belgium, Denmark, Greece, Sweden, Ireland, Portugal, Spain and UK (10). Collective Intelligence (CI), also known as Interactive Management, has been used to identify barriers to teaching 12–19 year olds about the ocean. Aforementioned study identified 657 interconnecting barriers and categorized them under 8 themes: awareness and perceived knowledge; policies and strategies; engagement, formal education; the ocean itself; collaboration; connections between humans and the ocean, and the blue economy. Awareness and perceived knowledge theme exerts the highest level of overall influence and included 10 barriers gathered under Ocean literacy (a lack of awareness of the concept of ocean literacy or its relevance for society) and 33 barriers under Ocean knowledge (lack of or partial knowledge about the ocean).

Other challenges faced by stakeholders include: a lack of money for resources and funds to experience the marine environment, a lack of support from local and national authorities to incorporate ocean issues in the school curriculum, a lack of interest of ocean topics by teachers and students, interferences coming from the social environment that distract students from the marine environment and affect their engagement toward it, the difficulty to reaching out to the targeted audience in their own language and through the right channel, a lack of hands-on

activity available to student, inadequate teaching methods used to teach about the ocean, the shortage of teacher training courses and the lack of motivation and knowledge about the marine environment among teachers, concerns and difficulties experienced by teachers and students during field trips, a lack of interdisciplinary work among teachers, a lack of adequate equipment in school, restricted curricula that do not include ocean topics, a lack of, or inadequate teaching material, the access to the ocean and influence of the physical location along with the socio-economic components on one's possibility to reach the ocean, the complexity of the ocean and how this inherent complexity challenges people's ability to get an overview of the ocean system, both abundance and lack of external programmes offering marine education, a lack of marine activities offered in informal education and marine teaching centres, a lack of connection between schools and scientific institution, personal experience with the ocean, citizens' inability to understand the cultural and societal importance of the ocean, a lack of awareness of the different potential career linked to the ocean such as marine educators, competing interests in the ocean environment. In our opinion all of these barriers exist in Croatia and therefore it is not unexpected that students show moderate knowledge, particularly in areas which are not covered by undergraduate programmes. Therefore, based on this study, it seems that there is a need to incorporate relevant topics into content of our courses to improve their ocean-related knowledge.

However, the possession of environmental knowledge and environmental awareness does not necessarily lead to pro-environmental behaviour (11). Many various factors determine whether a person will act pro-environmentally, and there is a large body of research exploring positive and negative, mutually dependent and interrelated variables. For example, Kollmuss & Agyeman (11) proposed a model which includes demographic factors, external factors and internal factors. Gender (women exhibit more environment-friendly behaviour than men) and years of education are two demographic factors, and institutional, economic, social and cultural factors are designated as external factors. Internal factors such as motivation, environmental knowledge, awareness, values, attitudes, emotional involvement, locus of control, defined as "an individual's perception of whether he or she has the ability to bring about change through his or her own behaviour" (12), responsibilities and priorities play an important role in triggering pro-environmental behaviours (11). Due to abundance and complexity of the influencing factors there is no one-size-fits-all model and research that identifies obstacles preventing each specific group to act pro-environmentally is necessary.

Encouraging personal connection and identity with the environment may stimulate the pro-environmental behaviours (13). For example, an activity named 'I am the Ocean', included field

trips, open discussions and sensory immersion(14). It was developed by an artist and a scientist because arts and sciences combined successfully may enable students to actively take responsible decisions regarding environmental protection. Therefore, an alternative knowledge transfer may be effective at bringing about behaviour change.

## Conclusions

The results of this study indicate that ocean literacy of maritime students at University of Zadar should be improved. We expect that ocean literacy can be enhanced by assessing it at beginning of the study programme using SOLE questionnaire to identify specific knowledge gaps and to incorporate topics necessary for filling them. Performing of survey at the end of the study can be used to evaluate our efforts.

As a next step in developing revised SOLE for above mentioned purpose we plan a survey of Croatian seafarers. Our goal is not only to collect their proposals of environmental content which should be included in maritime education, but also to assess their knowledge and attitudes. Additionally, because an emotional involvement has been recognised as a key factor leading to pro-environmental behaviour (14) we will ask them for suggestions how to emotionally connect students to marine environmental problems.

Table 1. The proportion of correct answers to groups of SOLE questions in alignment with the Seven Essential Ocean Literacy Statements.

Essential principle*	Item / % of correct answers for marine engineering students			Item / % of correct answers for nautical science students		
	1 Size of ocean	1 / 100	2 / 48.1	3 / 44.4	1 / 100	2 / 67.5
4 / 70.4		5 / 44.4	6 / 37.0	4 / 77.5	5 / 80.0	6 / 65.0
7 / 55.6		8 / 29.6	9 / 66.7	7 / 45.0	8 / 40.0	9 / 60.0
10 / 25.9		11 / 40.7	12 / 59.3	10 / 47.5	11 / 65.0	12 / 35.0
13 / 40.7		14 / 37.0	19 / 74.1	13 / 27.5	14 / 35.0	19 / 82.5
2 Ocean & its life shape	15 / 70.4	16 / 77.8	17 / 48.1	15 / 62.5	16 / 75.0	17 / 50.0

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Earth	20 / 70.4	21 / 77.8	24 / 85.2	20 / 67.5	21 / 87.5	24 / 87.5		
3 Weather & climate	18 / 55.6	23 / 25.9	26 / 55.6	18 / 67.5	23 / 30.0	26 / 60.0		
	27 / 29.6	28 / 77.8	29 / 22.2	27 / 15.0	28 / 72.5	29 / 22.5		
	30 / 18.5	31 / 59.3	32 / 77.8	30 / 35.0	31 / 70.0	32 / 65.0		
4 Habitability	37 / 25.9			37 / 40.0				
5 Biodiversity	33 / 66.7	34 / 81.5	35 / 88.9	36 / 77.8	33 / 65.0	34 / 85.0	35 / 95.0	36 / 67.5
	38 / 37.0	39 / 70.4	40 / 81.5	41 / 85.2	38 / 30.0	39 / 70.0	40 / 85.0	41 / 70.0
	42 / 63.0	43 / 40.7	44 / 59.3	45 / 44.4	42 / 60.0	43 / 47.5	44 / 55.0	45 / 25.0
	46 / 81.5				46 / 60.0			
6 Human connections	22 / 11.1	25 / 63.0	50 / 81.5	22 / 20.0	25 / 62.5	50 / 75.0		
	52 / 66.7	53 / 70.4	54 / 85.2	52 / 70.0	53 / 77.5	54 / 80.0		
7 Oceans largely unexplored	47 / 63.0		48 / 70.4	47 / 55.0		48 / 72.5		
	49 / 51.9		51 / 40.7	49 / 52.5		51 / 32.5		

\*Short titles according to (9)

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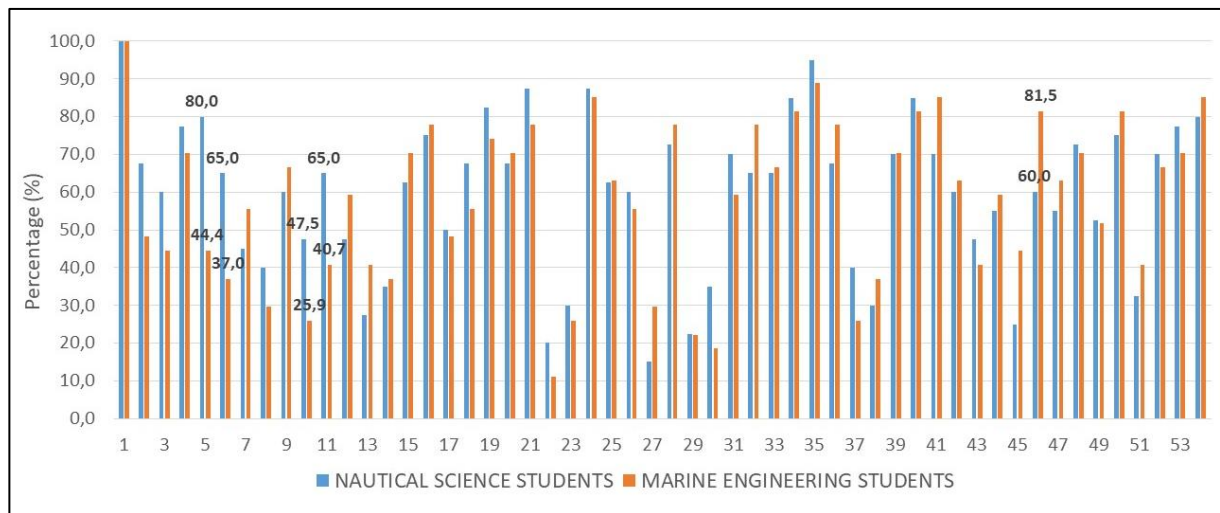


Figure 1. The proportion of correct answers for nautical science students and marine engineering students.

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## **Analytical review and perspectives of collaborations between MET and MSAs in China**

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### **Abstract**

The importance of understanding Lifelong Learning (LLL) and Continuous Education (CE) was highlighted. An introduction of MSEM program jointly run by WMU and DMU was made with respects to syllabus, schedule and structure. Analysis of graduates for the past 14 years was carried out in accordance with the statistics of the program. Finally, the mutual benefits and further collaboration was summarized in light of relationship between MSEM program and MSA training demands.

**Keywords:** Lifelong Learning; Continuous Education; Maritime Safety Administration; MET

### **Introduction**

As what we have witnessed that the development in all respects and fields all over the world is not only never ending but also rapidly growing at full speed, especially for the recent decades. Technology has been thoroughly invaded into our human being's life and dominating a major impact of changing the ways of our thinking, behaving and even living. Just taking a simple example, no one could deny the fact that people can never naturally spend a day as the time when a cell phone was not created, which was just less than two decades. The smart phone has been totally changed the way of living by all means rather than just simply making phone calls or sending/receiving text, but more man-phone interactions in terms of social contact, entertainments, information gathering, online transactions and knowledge learning, etc. Be that as it may, all above mentioned facts emphasize two major significances of being a human on this planet are lifelong learning (LLL) and continuous education (CE) in order to keep pace with the innovative technologies and developments. Nevertheless, this is also as true as what is happening in maritime domain.

Shipping is an international, dynamic and complex endeavor. As a result, those involved in maritime industries must constantly refresh and update their knowledge related to maritime affairs. From knowledge sharing points of view, participants of "academia" in MET (Maritime Education and Training) and "industry" in MSA (Maritime Safety Authority) should seek to

exchange ideas, experiences and opinions on a regular and frequent basis. Collaborations between the two abovementioned fields can be practiced in a variety of ways (e.g., seminars, thematic trainings, staff exchanges, and continuous education). As far as LLL and CE is concerned, higher postgraduate education provided by MET colleges / institutions will facilitate formal, stable educational services to administrative staff in the maritime industry. Hereafter, a joint venture MSc program organized by WMU (World Maritime University) and DMU (Dalian Maritime University) will be elaborated as a case study to illustrate how "Academia" and "Industry" both affect and benefit from each other. Data has been collected from program graduates regarding their perceptions of program goals and objectives, course design, syllabus construction, delivery of instruction, and career orientation. Statistical analysis of such feedback has been undertaken and is now shared. This MSc program, also known as MSEM (Maritime Safety and Environment Management), has been in operation since 2005 for a total of 14 years and cultivated more than 500 graduates who are actively working in various MSAs located in different main port cities along Chinese coastlines. Based on the results of this partnership, implications related to the impact and significance of for future collaboration between "Academia" and "Industry" are highlighted.

### **Perceptions of LLL and CE in maritime field**

The ultimate goal of CE is normally considered as re-educating those who have already been involved with the society towards a more advanced informative society by means of education or training to attain better knowledge update and society cohesion (Emine & Ismail, 2013). Currently, most of the CE programs are offered by colleges or universities which are the higher educational institutions of the communities for offering training demands with their academic faculties, knowhow and existing training programs. Noteworthy, it has been a common practice of setting up a center or department called as Continuous Education Center with purpose of providing lifelong learning for the society (Recep & Remzi, 2014). The connections and interactions between academia and industry can be possibly established and fostered via tailor made course design and specific candidates selection (Selin et al, 2017). Apparently, CE regarding professional development and LLL are synonyms that all refer to an educational or training process which is the main essential tool for an organization to succeed (Marjan, Ashkan, Arsalan, 2014). The term lifelong, as applied to education or learning, has been in circulation for more than a quarter of a century (Friesen, N. & Anderson, T., 2004). More and more people start to realize that the perceptions and fulfillment of continuously implementing LLL will cultivate and empower individuals to acquire all the expertise which will enable them



more confident and creative for the work throughout their lifetime (Bryce, J., Frigo, T., McKenzie, P. & Withers, G., 2000; Longworth, N. & Davies, W. K., 1996). Therefore, the importance of career education has new dimensions in the context of lifelong learning. Human integration into society is a socially active and lifelong process (Otilia, D, 2014).

Shipping is often regarded as an ancient but energetic industry, which has been ongoing for thousands years. No matter how the world will be developed, seaborne trade will continuously dominate the world's total trade volume. Ship itself as the main backbone in the entire shipping industry is also nonstop in conquering many influential challenges from one to another. For instances, containerization, from hundreds TEUs in the late 60s of last century up to 22,000 TEUs nowadays, is undoubtedly convincing people for how great changes have been done and will be continuously working on ships; Not forgetting another concurrent mainstream of reforming the ship, autonomous, i.e., MASS<sup>1</sup> (IMO, 2018), is defined as a ship which, to a varying degree, can operate independently of human interaction. The number of seafarers who are physically on board ship will be reduced until none, from degree 1 to degree 4, as what IMO defined regulatory scope of MASS. One thing leads another. Maritime affairs / administrations related to shipping are also undertaking the pressure of adapting constant changes which are created by the technology and innovations. Inevitably, the notion of LLL and CE will be of importance for all participants associated in the maritime and shipping circles, which should be kept and fulfilled at all times.

Traditionally, the majority of maritime and shipping personnel are those who have completed relevant specializations from any MET colleges / institutions. Initially, whatever they have learnt from the colleges was somehow still meeting the needs of practical operations after they graduated. As the time went along, more and more paperwork like international conventions, regulations, guidelines, inspections, audits, etc., and also implementations of technology integration like ECDIS, information technology, and eventually MASS, etc., all require knowledge update from time to time. Gradually, pre-work knowledge learnt from MET colleges will be somewhat lagging behind to the needs of industry with respect of the rapid development in maritime and shipping field. From these points of view, LLL and CE will be therefore closely attached to the work for all who are in this field with respect of optimal working performance. The key linkage between "academia" which is referring MET institutions and "industry" which is referring maritime administration hereafter in this paper would be definitely relied on how a CE program is tailor-made and implemented as required.

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<sup>1</sup> MASS: Maritime Autonomous Surface Ships

## **Joint venture MSc program between DMU and WMU**

### **Introduction of MSEM program**

The Master of Science program in Maritime Safety and Environmental Management (MSEM) is delivered by World Maritime University (WMU) in Dalian, China in collaboration with Dalian Maritime University (DMU). Established in 2005, the program is designed to extend the professional education that WMU has offered since 1983 to a new and thriving clientele from the region and beyond, and to meet the maritime industry's demand for high-level specialized professionals (WMU, 2019). The intensive, 14-month program begins in June and consists of four taught units plus a MSc dissertation. The first unit, foundation studies, is followed by specialization units that cover all aspects of maritime safety and environmental management. Faculties from DMU teach the first unit and supervise project work while WMU faculties teach the remaining units. The program is taught entirely in English and the entry requirements, grading system and quality assurance processes are those in force at WMU Headquarters. Successful students graduate with a WMU Master of Science degree in Maritime Safety and Environmental Management.

The ultimate goal of this program is to meet the need for high-level professionals capable of handling increasingly complex and important issues within maritime safety and marine environment protection. It prepares students for further career enhancement through constant up-dating and self-development. The specific objectives are also highlighted to broaden the knowledge base of the student by giving a holistic view of Maritime Safety and Environmental Management in today's increasingly globalized maritime market place; to provide the student with the advanced knowledge of modern management and organization theories with an emphasis on the application of the principles in Maritime Safety and Environmental Management; to present the methodology and analytical tools so that the student can apply them to improve the quality of management decisions; and to prepare the student for further career enhancement through constant updating and self-development.

### **Structure of MSEM program**

The MSc in MSEM consists of 17 subjects and 1 dissertation at master degree level. Each subject carries 4 credits, total 68 credits are therefore account for 17 subjects, and the final dissertation carries 20 credits (See Table. 1). To sum up, it is 88 credits in total for entire study of MSEM program. A standard 4-credit subject requires about 100 hours of work, of which 30 as class contact hours, about 30 hours on preparation, 40 hours on, group discussion, revision and

assessment. With the time needed for final dissertation, the whole 88-credit programme needs approximately 2,200 hours of study time (WMU, 2019). The first 4 subject consist of theoretical studies and include 16 credits to be taught consistently up to a total of 120 class hours. All students have to attend these lectures, as they are the prerequisites for the following units, unless an exemption examination is successfully passed. Students with a non-scientific education background will be offered some additional tutorial classes during the delivery of these subjects which will last for about 18 weeks. The rest subjects are specialization subjects with a total of 52 credits divided into 13 different areas related to maritime safety and environmental management. These courses are logically designed to address progressively various aspects of Maritime Safety and Environmental Management. The subjects within each unit are integrated issues even though they are taught separately and often by different lecturers. This stage will last for about 32 weeks (including some public holidays). Within each subject 2 weeks are scheduled for lecture, tutoring, self-study, examination/ assignment/case study preparation and examination.

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**Table.1 WMU / DMU - MSc in Maritime Safety and Environmental Management  
Class 2020**

(Each Subject: 4 ECs, Research Paper: 20 ECs, Total: 88 ECs)

Week	Activities
24/Sep/18	<b>Program is announced, Promotion campaign starts and Registration opens</b> <i>Holidays (Chinese New Year 5 Feb 2019)</i>
25/Feb/19 to 10/Jun/19	<b>ESSP – English and Study Skills Programme starts (14 weeks - IELTS test end May)</b>  (IELTS 6.0 or TOEFL 85 accepted directly, otherwise with IELTS 5.5 TOEFL 500 or above, an ESSP is required. For undergraduate students, such option not applicable which means only those with good English scores and a technical background are accepted)
17/Jun/19 24/Jun/19 1/Jul/19 8/Jul/19 15/Jul/19 22/Jul/19 29/Jul/19 5/Aug/19	<b>Inauguration - MSEM-MSS - Maritime safety standards</b> <i>Exam preparation and exams</i> <b>MSEM-ENG - Applied marine engineering</b> <i>Exam preparation and exams</i> <b>MSEM-NAV - Applied naval architecture</b> <i>Exam preparation and exams</i> <b>MSEM-QOM - Quality systems and organizational management</b> <i>Exam preparation and exams</i>
12/Aug/19 19/Aug/19 26/Aug/19 2/Sep/19 9/Sep/19 16/Sep/19 23/Sep/19 30/Sep/19 7/Oct/19 14/Oct/19	<b>MSEM-LAW - International maritime law, legal systems &amp; conventions</b> <i>Exam preparation and exams</i> <b>MSEM-ECO - Maritime economics and logistics</b> <i>Exam preparation and exams</i> <b>MSEM-GOV - Maritime governance and control</b> <i>Exam preparation and exams</i> <b>MSEM-MAP - Maritime policy design, implementation and evaluation</b> <i>(National day, Mid-Autumn 13 Sept. 2020)</i> <b>MSEM-ENS – Marine environment protection standards</b> <i>Exam preparation and exams</i>
21/Oct/19 28/Oct/19 4/Nov/19 11/Nov/19 18/Nov/19 25/Nov/19 2/Dec/19 9/Dec/19	<b>MSEM-HMF – Human factors in maritime safety and environment protection</b> <i>Exam preparation and exams</i> <b>MSEM-MLS - Maritime labour and safety</b> <i>Exam preparation and exams</i> <b>MSEM-MCI – Maritime casualty investigation</b> <i>Exam preparation and exams</i> <b>MSEM-CMC – Contingency planning, Search &amp; Rescue and Crisis management</b> <i>Exam preparation and exams</i>
16/Dec/19 23/Dec/19 30/Dec/19 6/Jan/20 13/Jan/20 20/Jan/20 27/Jan/20 3/Feb/20 10/Feb/20 17/Feb/20	<b>MSEM-TEC – Impact of Maritime Innovation and technology</b> <b>MSEM-OIL - Principles and Rules about Oil Pollution</b> <i>Exam preparation and exams</i> <b>MSEM-MPL – Prevention and combating of marine pollution</b> <i>Exam preparation and exams</i> <i>(holiday)</i> <i>(Chinese New Year 25 Jan. 2020)</i> <i>(holiday)</i> <b>MSEM-LEG - Legal issues and mandates in maritime administration</b> <i>Exam preparation and exams</i>
24/Feb/20 2/Mar/20   21/May/20   1/Jul/20 5/July-3/Aug. 23/Aug/20	<b>Research methodology workshop, research topics chosen (to finish in 4 months)</b> <b>MSEM-PRJ - Integrative Research Project Paper (20 EC)</b>  Interim report on research paper preparation  <b>Deadline for the submission of Integrative paper</b> Review of project paper <b>End of the programme - Graduation Ceremony at DMU (Sunday)</b>
31/Oct/20	<b>Graduation in Malmö (optional)</b>

**Source:** Description of MSEM program, WMU

### 3.3 Students composition of MSEM program

The MSEM program was initially established with the purposes of educating and cultivating young staff from various China Maritime Safety Administrations along Chinese coastline, in light of enhancing English abilities and enriching the fulfillment of international conventions. For the last 14 years, the majority of candidates of each year class are from different MSAs located all over Chinese coastline cities and some cities nearby inland rivers (See Table. 2). The candidates who are MSA staff are mostly from operational departments, like PSC/FSC, anti-pollution, VTS, and seafarers training/examination, etc., of which the core business is very

much related to the issues of maritime safety and environmental management.

**Table. 2 Statistics of MSEM program from class 2006 to 2018**

Year \ Number	MSA <sup>1</sup>	CCS <sup>2</sup>	BSc <sup>3</sup>	International <sup>4</sup>	SAR <sup>5</sup> Bureaus	Shipping companies	Total
2006	35	3	0	0	1	0	39
2007	31	0	3	4	4	0	42
2008	31	0	1	1	4	0	37
2009	39	0	1	0	2	0	42
2010	30	0	2	1	2	0	35
2011	28	0	2	1	2	0	33
2012	33	0	0	1	0	0	34
2013	35	0	5	0	1	0	41
2014	39	0	3	0	3	2	47
2015	44	0	2	1	2	0	49
2016	34	0	3	0	6	3	46
2017	30	0	4	0	1	0	35
2018	26	0	3	1	0	2	32
<b>Total</b>	<b>435</b>	<b>3</b>	<b>29</b>	<b>10</b>	<b>28</b>	<b>7</b>	<b>512</b>

**Source:** Compiled by author based on enrollment information over 14 years

**Remarks:**

1. **MSA** - Maritime Safety Administration
2. **CCS** - China Classification Society
3. **BSc** - Bachelor degree graduates
4. **International** - Foreign applicants
5. **SAR Bureaus** - Search and Rescue Bureaus

Furthermore, there were also some varieties of candidates from other organizations, like CCS, SAR bureaus, shipping companies, BSc graduates and some international students as well. However, besides the MSA candidates, the other sources of different organizations were actually taken very small portions (See fig. 1). Such phenomenon also illustrates that MSEM program to some extent is purposely designed for those who are really engaged in maritime administrative work, which is why a large number of candidates from MSAs were enrolled for the past years.

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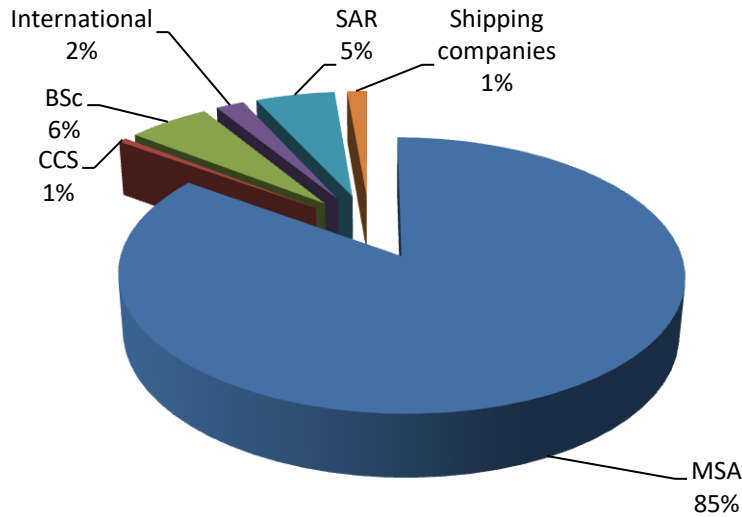


Fig. 1 Percentage of MSEM graduates from different organizations

**Source:** Compiled by author based on enrollment information over 14 years

4. Mutual benefits between “academia” and “industry”

4.1 Introduction of China MSA (Maritime Safety Administration)

China MSA, which situates in Ministry of Transport in Beijing, is normally regarded as central (national) MSA who supervises 15 sub-branch (provincial) MSAs located along all Chinese coastline and some major inland rivers (See Fig. 2). In accordance with the Maritime Traffic Safety Law of the People’s Republic of China, the Marine Environment Protection Law of the People’s Republic of China, and other related laws and regulations, Maritime Safety Administration of the People’s Republic of China (China MSA), under the Ministry of Transport, is the competent authority to exercise the administration of shipping safety and maintain the national sovereignty (MSA, 2019).

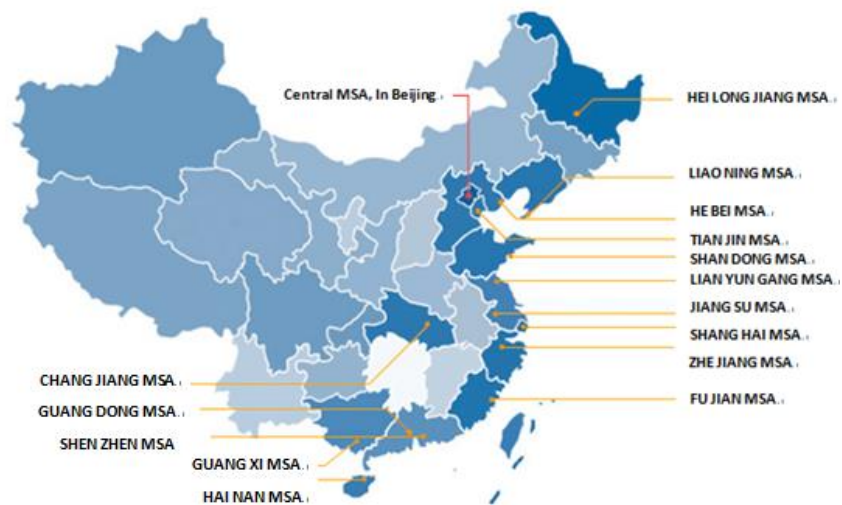


Fig. 2 Names and locations of central MSA and sub-branch MSAs

**Source:** MSA official website

#### 4.2 Analysis of LLL and CE provided by MSEM for MSA staff

As aforementioned, the MSEM program has continuously been designated as a maritime professional platform of providing LLL and CE for MSA staff for years. Central MSA has been sending their staffs from both headquarter and sub-branch offices since 2006 when the first class was commenced. Since then, the MSEM program and the work of educating MSA staffs towards more international maritime standards and up to master degree level have been successfully carried out for 14 years. Be that as it may, by analyzing the figure below (See fig.3), it can be inferred that from the year 2006 to 2008, there was a drop of supplying MSA candidates mainly because the organizational structure of MSA was reformed during that time and many young staffs were just enrolled or re-engaged with different work posts, so that many of them could not devote any time for further continuous education with MSEM program. However, as we all knew that, the shipping market was so bloomed from the year 2008 and thereafter until somewhere in 2013. Many ships were built and launched for sea services. Therefore, the workload such as ship’s inspections, audits, and even seafarers’ training and examination were all inevitably increased due primarily to the fast growth of ships. Simultaneously, a large number of young people were recruited by different MSAs in order to meet sudden burden of increasing ship calls, which also urged the ascending need of CE delivered by MSEM program for young and prospective staffs. Contrarily, the number of candidates was downsized as well in the recent years as the deduction of recruitment of MSA new comers because of depressed shipping market.

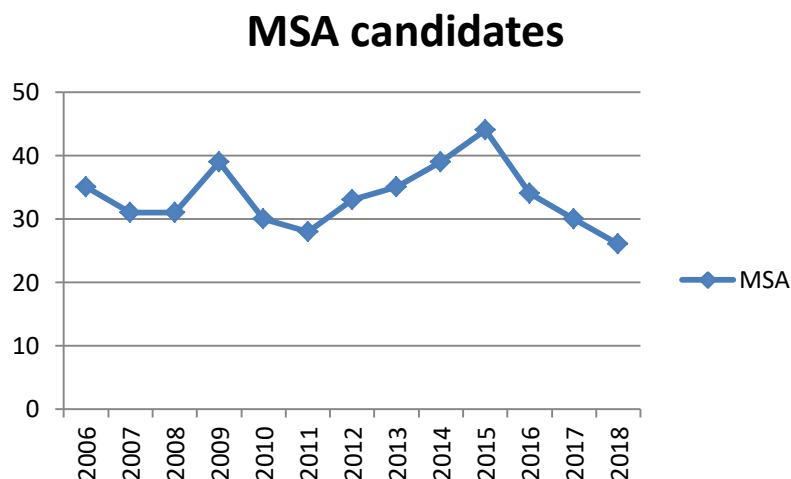


Fig. 3 The fluctuation of MSA candidates from 2006 to 2018

**Source:** Compiled by author based on enrollment information over 14 years

#### 4.3 Mutual benefit between MSEM and MSA

The regime of China MSA has been reformed several times since the China MOT (Ministry of Transport) was founded in the year 1949. Over decades, China MOT has been always devoting

in the commitment of seeking an optimal way of supervising all maritime safety and environmental related activities on Chinese waters. Particularly, the latest reform of MSA done in 1998 was aimed to integrate safety supervision and environmental protection in terms of its functions, structures, roles and human resources, etc., (CUI, 2018). Since then, more attention has been paid to cope with IMO international conventions and associated fulfillments. Whatsoever, a suitable platform of providing such training for MSAs was really a key link between MSA and academia. In 2005, the initial plan of establishing this joint venture MSc program was formulated and finally trialed it out in 2006 with 39 intakes (35 are from MSA, 3 are from CCS and 1 is from SAR bureau) of students as 1<sup>st</sup> MSEM class. All well known professors, experts and specialists were invited for lectures from both DMU and WMU teaching resources. Remarkably, a huge success was achieved as expected, and a good faith and strong intention of continuing this program was therefore firmly exchanged within three parties. The feedback and questionnaires taken by both course professors and graduates had proved that whatever theories taught by course professors and practical operations brought up by students were mutually shared, discussed, argued and finally combined with each other. Different experiences, opinions, personal working routines, organization working procedures and even some biases were also thoroughly debated as teaching schedule went along and finally merged together upon the entire program was completed. For students, they have been really led to the frontiers of related maritime affairs knowledge by course professor; similarly, course professors have more opportunities to scrutinized those contradictions happened in the practical work. After the first trial, the program has undoubtedly carried out annually until now, the 15<sup>th</sup> class has already been commenced this year, with the aim of prolonging the platform of LLL and CE for those who are keen in studying maritime affairs.

## **Conclusion**

For many years, it has been discussed over and over again about the gap between "industry" and "academia". It is somehow still true that "academia" tends to be more "rationalists", whereas "industry" tends to be more "practitioners". The overlap between the two domains seems shrinking and even none to some extent. However, the rationale of establishing a kind of platform which facilitates with the functions of LLL and CE will definitely provide a bridge between academia and industry. As far as the domain of maritime affairs is concerned, the MSEM program has been proved over years as a very unique professional hub of providing continuous education for those who have had working experience for some years. Statistically, there are 435 MSA staffs out of 512 total graduates from MSEM program between 2006 to



2018, which is taken up to 85% of the total. Most of them are now working in crucial positions in different MSAs along Chinese coastline for supervising maritime safety and environmental activities. In light of globalization and upcoming trends which will attract more young people to work in the maritime domain, the MSEM program will be continuously run as how it was run over last 14 years and might be further opened to allow more candidates without any working experience to gain more relevant in hand knowledge prior to working. By recognizing of the importance and significance of LLL and CE, the academia and industry could be mutually integrated and a win-win situation would be achieved if a professional platform is functioning properly.

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## **Interesting Career Opportunities for Women in Maritime Industry**

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**Keywords: women, maritime industry, education & training**

### **Abstract**

In maritime industry, there are only 2 per cent of women of all 1,2 million seafarers. The industry has been and still is strongly dominated by men. Promoting of progress of women in maritime sector has been done many decades by many international organizations and this work towards gender equality is continuing. It is said that investing in women is the effective way to lift businesses and get economic growth. In order to attract women in the maritime professions, it is necessary to increase the maritime career awareness by providing information about educational possibilities and career opportunities at sea and on shore-based positions.

The shipping environment is changing due to new technological innovations and development. Automation level will increase in ships. New skills are required, and nature of work will change in the future at sea and in other job positions in shipping.

This paper describes the current situation about the women's interest to seek their way to the maritime industry and what kind of career possibilities there may be in the future in maritime sector.

### **Introduction**

The maritime industry which is transferring 90 per cent of world's goods, is still operated by male work force. This unbalanced situation is unwanted, and many international organizations and agencies have promoted the progress of women in maritime sector for many decades. The first programme to foster the advancement of women in maritime industry was started by the International Maritime Organization (IMO) in 1988 and was called "Strategy in the Integration of Women in the Maritime Sector" (IWMS). The main goals of this programme were to encourage to IMO member states to allow women to study alongside with men in maritime institutes, gain

the competence that is needed in the maritime industry and increase the presence of female workforce.

Harmonization of regional support networks for women in maritime sector has also been one of IMO's priorities. As a result of this, there are currently seven regional associations for female in different continents. Sharing of experiences of succeeded women in maritime professions have been realized to be important and this kind of support networks are offering possibilities for discussions and opportunities for new professional connections within the industry.

### **Women in the maritime professions**

The equal possibilities to receive education and work alongside with men have not been self-evident all over. The barriers which are affecting for female seeking into maritime industry are various and are related for example to cultural and social matters and also to practical issues. The traditional arrangements of family life and working in male dominated profession at sea can be a challenging combination to solve which have an influence on women career choices. Female working in male dominated professions may be forced to struggle with masculine rules and values which can have an effect for career choices.

Due to different educational systems in the countries, possible career paths in the maritime industry are various and available career options can be challenging to become aware. European Community Shipowners' Association (ECSA) and European Transport Worker's Federation (ETF) published a study in 2005 which concerned career paths in the maritime industries in Europe. The research showed that there are several obstacles for career progresses and those blocks are related for example to a lack of information concerning work opportunities, financial arrangements of further studies and the argument that re-locations of place of residence may be required when seeking from sea positions to shore based jobs. The social-economic climate and social culture within different countries have an influence on the demand of manpower in maritime industry and that may cause to diverse conditions for access into shore-based professions. Due to the qualification level required in the shore-based positions, seafarer may have difficulties to reach these demands.

### **The changing shipping environment**

The nature of work has been changing over the decades in shipping due to a new technology and increasing level of automation in ships. These changes are rapidly driven by economic advantages, operational productivity, improvement of safety and minimizing of work force costs. The way of operating ships is starting to go through upheaval, and this will cause demand of new skills for employees and new working routines on ships and on shore operations.

According to The World Maritime University's report in 2018 "*Transport 2040 – Automation Technology Employment – The future work*", it is predicted that highly automated vessels would reduce the growth rate in the request of seafarers globally so that possible reduction of work force at sea would be 22 per cent by 2040. Nevertheless, the same report estimates that new types of workers, such as operator who will work from distant, various types of maintenance staff and mobility -as a service provider will be required in the future. This development will offer many new interesting career opportunities for men and women who are not willing or able to work at sea.

The nature of work in maritime industry will develop in many ways and people have to manage many kinds of tasks and compete with artificial intelligence in efficiency and productivity. Debra DiCianna from Choice Ballast Solutions, LLC states that: "*Women have the means to cover many topics and issues at one time. The ability allows the to focus on the important issues but also be dedicated to the long-term goals for a company or institution to envision the future*"

### **Maritime education**

Different countries have various maritime educational systems and possible career paths differs due to these matters. The International Convention on Standards on Training, Certification and Watchkeeping for Seafarers (STCW) Convention has globally directed the maritime education for many decades, mariners often need the higher degree when they want to broaden their knowledge and skills and continue their careers on shore- based positions. Studies have shown that majority of women who first make their career at sea, continue working ashore not only when starting own family, but when new interesting work opportunities comes available from shore organizations in the maritime industry. One factor which directs the change of working positions is the desire to have meaningful and challenging job where salary is in satisfying level.

Satakunta University of Applied Sciences (SAMK) in Finland has provided further education for seafarers, a Master of Maritime Management program, which is built on existing STCW based education. This education is custom-built to progress the gender equality and meet women's demand for higher degree studies which are often needed in land -based managerial positions. Experiences related to female students in SAMK Master of Maritime Management have shown that women are highly motivated to study, and their graduation level is at very good grade. The female students consider continuous self-development important and improving their possibilities in labour market vital. The factor that has made the master level further education more interesting is flexibility of distant studies so that participants are able to work either on

board/ ashore at the same time with their studies or combine the maternity leave and studies which improve their career development.

It is essential that the possible "career bridge" in maritime industry is visible and clear both at sea and ashore. In another words, if the career possibilities are not clear, it is very challenging to represent the lucrativeness of maritime profession for women in the first place.

## **Conclusions**

It is important to share the up to date information and knowledge about the career possibilities in maritime sector and to progress the gender quality to attract the women's interest towards the maritime professions. Many women who are at the moment working in maritime profession have got connection to maritime profession already from home when father or other relatives have been a role model. The promotion about maritime professions should be made in early stage in schools for those who do not have family connections or knowledge about the industry and when young people are starting to make plans for the future careers. The educational systems in early stages can have a remarkable role in promoting gender equality and progress of women seeking into traditionally men dominated maritime industries.

The benefits that women can bring into maritime organizations cannot be ignored and effort to progress of women participation should be paid attention. The characteristics of women leaders have been examined and advantages of this gender have been described to be the following: open communication, people orientated, focus on details and being well organized. The organizations also perform better financially with diverse workforces.

The female in leading positions in maritime industry could be more visible and serve as an example for other women instead of being invisible and blend into background in male dominated domain.

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## **Digital learning together – Teaching Marine Insurance and Charterparty issues for future leaders and experts of the shipping companies**

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**Keywords:** Digital learning, e-learning, methods of learning, marine insurance, charterparties, shipping company involvement, student exchange and co-operation

### **Abstract**

There is a growing need for Master Mariners with sea going background in shipping companies and management companies. Master Mariner education is usually based on a bachelor degree in most countries. Master of maritime management degree is a higher education aiming at higher university degree which gives the essential skills for Captain's who wish to take the next step into company management and specialise in expert or leading position in a Shipping or Management Company.

Marine insurance and charterparties are essential topics which are based on international development and which can be taught on a global basis. English law and Nordic law are in core and simultaneously developments in these jurisdictions often follow each other with many similarities. Teaching these issues has a huge potential for co-operation between Maritime Universities. The potential includes students exchange and cost efficiency which can be combined to digital learning. Digital learning means more than just e-learning and video conference lectures. It makes the world smaller and wider at the same time as the students in highly digitalised world can now interact with each other despite the time and place. For Master Mariners this means today a real possibility to study on board without interruptions.

For the last 13 years Satakunta University has developed a degree programme concentrating to digital teaching of Master Mariners and has 2017 taken the next step to broaden the education to English language open for all bachelor degree holders to able to apply. In this article we explain our methods how persons with STCW education and seagoing background can now efficiently gain the knowledge needed in a land based organisation. The use of electronic materials, group work, e-lectures and companies' involvement will be delivered in the article and presentation using also video material to make the presentation alive to envisage the use of the methods based on 13 years of experience in developing the programme.



The relevant question will be asked: Do we all need to do this or how can we efficiently share the experience and methodology. The possibilities for student exchange on the level are multiplied through digital learning. This will be visualised by the two topics relevant to all Master Mariners and especially those who wish to take the next step. Are we willing and able to take these steps together in the future and in what way – By doing it together or by learning from each other's?

## **Introduction**

The Satakunta University of Applied Sciences has developed a degree programme concentrating to digital teaching of Master Mariners. The project has taken thirteen years of development work. Since we are now fully confident that the solutions we have tested on national level, we are now taking the next step further to broaden the education to English language open for all bachelor degree holders to able to apply.

In this article we explain our methods how persons with STCW education and seagoing background can now efficiently gain the knowledge needed in a land based organisation and how studies can be efficiently be managed 85 percent through digital learning. The use of electronic materials, group work, e-lectures and companies involvement will be delivered in the article.

## **Digital learning**

Most Universities use some form of digital solutions. E-learning platforms are used for dividing materials and information and many professors already find it useful to collect also materials delivered by students to a virtual platform instead of hunting their papers. Giving feedback through e-learning platform for the student's papers is also no longer strange phenomenon.

Traditional exams on paper are still used by most, but digital exams are increasingly used especially by younger generation of teachers. [1] Use of multiple-choice questions which the e-learning platform automatically evaluates frees the professor from the weeks of hard work after the exam period. After hard lecturing periods before the vacation the students are also happy to receive their results immediately without having to wait 2 weeks for the results. This is the situation in general where we are at the moment in Finnish higher education.

Situation is however changing rapidly through demands from the government and ministry of education to hasten the graduation of students and to give the students more possibilities to finish their studies faster and beside working. Also economical pressure for using the spaces of the University more efficiently encourages the students to work more from distance and

spending less time in the classrooms. Satakunta University of Applied Sciences decided in Spring 2016 that all students have to be able to study also from distance and starting September 2016 all students have to equip themselves with own laptops also carried with them to lectures. Delivering papers for students is exceptional and all materials delivered has to be in electronic form. This is also a way to cut the expenses of the University as the number of computer classes can then be minimized in the future. This development is natural continuance of the school reforms in High School system in Finland. Most High Schools are already paperless and students are already there equipped with laptops. Some High Schools buy the laptops or pads for the students, but most still urge the students to buy their own. The digitalisation culture in education is therefore already necessitated by ministry of education before the students enter the University. Also the matriculation examination in Finnish School system has been in electronic form since 2018. Due to this process we will have in very near future students starting at the University who are no longer even used to write their exams on paper. Professors who ask them to write essays on paper will soon be considered as dinosaurs from the past. They need to renew themselves and their thinking or they will perish as they will be considered too old fashioned.

As I started to teach Master Mariners in Finland 2001 beside lecturing to future lawyers at the University of Oslo 2001 I realised the cultural differences in teaching methodology. Technologically orientated profession used the means of technology already then much more than traditional old fashioned University. a group of innovative teachers were far in developing the virtual platform as a place for studies. Even virtual persons' study environments like Second Life were being tested and developed already then.

After 2003 when I moved back to Finland and started the development of Master of Maritime Management degree programme I turned first to testing the virtual environments and their possible use for studying also from the sea as the task was to make the studies available from the sea worldwide. In the beginning I faced severe difficulties. The internet connections in ships were not yet on a level to make the studies possible from the seven seas. Since 2010 however the situation has changed dramatically. Through development of technology and especially when the demands of the bandwidth in video technology has decreased.

It is already reality that all the students gather in virtual classroom to listen to lectures online even though they are working at sea. During the last school year, I arranged the Maritime Law courses in a class at the University where the lectures could be recorded easily in a system called HILL (HILL- class) and where students working at sea could participate. They were also able to make their presentations from the sea with their own laptops. If they were not able to

follow the lectures online because of their duties at sea, they were able to watch others presentations afterwards as recordings.

This is a one solution for the maritime Universities in the future. When arranging mandatory practise at sea becomes ever more difficult, we are forced to become more flexible and allow our student to organise the practise also at times when we organise the lectures at the University. This is also an answer to the governmental demands to cut the study times and to hasten the students passing their studies.

Increasing Digital learning is therefore not just one solution but it will also become a necessity also in Bachelor studies leading to Master Mariner profession. Many solutions which have been developed and tested when creating the Master of Maritime Management programme can be used also in bachelor programmes in the future when we need to arrange the studies in a way that practice at sea is possible also during the months when we normally teach the students at school. In Master degree programmes the students are working almost without exception. Most at sea, but some already work in shipping companies, maritime administrations, classification societies etc. ashore. The digital learning is the only way to make the studies possible in the future. The essential element is the participation through video connection. Previously when participation from sea was not possible, the video recording in classroom or recording sound together with the PowerPoint presentation was used. These are still used but their disadvantage is the lack of communication from sea. Already now and increasingly in the future the recordings of contact lectures cover both persons in the classroom and at sea when technology has now made it possible. When the students are already highly skilled professionals, they divide valuable information and experiences to lectures and their fellow students. Those few who because of their duties at sea cannot participate in all lectures through video connection are able to watch the recordings. When seminars are held online, the students reserve electronically their groups and presentation times so that they can participate online. All seminars are recorded and used as study material and access to the material can immediately be added to as a link to the virtual platform. Material for individual exercises as well as group work are available online. Different solutions for group work are available. Video connection can be established also for participants of the group who are able to modify their work online practically the same way as they would be writing it in same physical space.

Teaching digitally can be as close to teaching in class as the teacher wants in the future. [2] The question is how can it be made even better than in the classroom? There we need digital teaching methodology. preparing for the lectures and the assignments can be made mandatory and this according to our experiments increases the study results immensely. it also saves a lot

of time when students are already familiar with basic materials – The studying the materials can be made a precondition for entering the lectures or assignments by for example preliminary multiple choice questions in which the platform chooses questions from a data bank and the test has to be renewed until a pre-set percent of right answers is achieved. Let us next take some examples of implementing this into practice.

### **Marine insurance and charter parties**

Marine insurance and charter parties are topics which the masters already graduating from bachelor level studies should be aware of – At least they should according to STCW know the main elements of these topics in order to take the issues into consideration when making the necessary decisions. [3] Constantly the Universities get complaints however that more of these topics should be taught to masters already at the bachelor level studies. In Master of Maritime Management studies, they are self-evidently therefore some of the key issues. Both of these topics are based on international development and they can be taught on a global basis.

The teaching method which is used is based on using digital technology. The students are first lectured the key elements. Thereafter they get familiar with the contracts which they study independently and thereafter they are tested by using multiple chose questions. When they pass the test they are given cases studies which are carefully studied and chosen, often taking into consideration the background and working experience of the student. The student prepares a case presentation and sends the Power Point presentation through e-learning environment together with his commentaries to the teacher to be evaluated and for feedback before he is allowed to present it in videoconference. If the teacher is not satisfied, he need to study it more carefully. The presentation time is reserved after the presentation has been approved. In videoconference all the participants in turn analyse the presentation and ask questions from the presenting student and the teacher. All this is recorded and made study material for the exam. The students also practise individually their skills on cases by answering multiple choice questions before the exam.

The study results are often amazing. The practical issues in the cases are opened up by those who know the practice at sea and they combine the practise with the theory they have learned. Testing years after they still remember the case studies and the alumni's explain sometimes in detail how they have been able to use in practise what they have learned from the cases and how the method has helped them to analyse fast the information from the conditions[4].

### **Ship owners to benefit from digitalisation**

There is a growing need for Master Mariners with sea going background in shipping companies and management companies. Master Mariner education is usually based on a bachelor degree

in most countries. Master of maritime management degree is a higher education aiming at higher university degree which gives the essential skills for Captain's who wish to take the next step into company management and specialise in expert or leading position in a Shipping or Management Company.

Ship owners need to further educate their best potential – Either to work on board or to ashore. Digital learning makes this also economically lucrative for them as the studies can be effectively combined with work. Thesis in Master programmes is also a development work which is usually combined to developing ship owner's business. They are often combined tightly to the activities which the ship owner should carry out and invest in anyway. During the studies the ship owner's employee receives support in development work from the University that helps to develop the business and solve the problems [4]. All this process is now possible by using digital solutions.

## Conclusions

English law and Nordic law are in core and simultaneously developments in these jurisdictions often follow each other with many similarities. Teaching Marine Insurance and charter party issues has a huge potential for co-operation between Maritime Universities. The potential includes teacher exchange, student exchange and cost efficiency which can be combined to digital learning. Digital learning means more than just e-learning and video conference lectures. Development of digital model courses in the future would also be possible when Universities work together. Digital co-operation makes the world smaller and wider at the same time as the students in highly digitalised world can now interact with each other despite the time and place [4]. For Master Mariners this means today a real possibility to study on board without interruptions.

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## **Arctic shipping management as an elective study for Master Degree students**

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### **Abstract**

The Satakunta University of Applied Sciences has been educating Master Mariners (bachelor level education) to land based organisations for 13 years. For the last three years the education has been in English language and it has included an elective 5 credits course on Arctic shipping management. The results have been promising and we are ready to take the next step and make it a product for student exchange for the students coming from countries with less experience in ice navigation.

Finland is surrounded by ice for 3-5 months during wintertime. The vessels still need to reach our ports either by own means or by assistance of icebreakers. There are several issues which the students need to be aware of before they can operate ships in ice – both when they are at sea with a vessel and when they operate and assist the vessels from a land based organisation. In this article we explain the education relating to arctic conditions on both bachelor level education as well as on the master level education. The Polar Code is of the essence in the studies as the vessels need to be able to cope with the regulations. The Management is responsible for creating the relevant documents for its compliance.

There are several other contractual issues also relating to ice navigation which need to be taken into consideration by the management of the company and they need to instruct the master on a vessel on their meaning and implication. The charterparties have special ice clauses and the marine insurers have their own clauses for ice risks.

The Master degree programme uses the student alumni's, who already have taken the Master of Maritime Management programme, as specialists in the education. They are captains of icebreakers who have conducted their studies already and who have written their thesis research on topics related to ice navigation and risks. The elective course brings to life their theoretical studies on the subject and combines it with their practical knowledge and experience for the benefit of those students with less experience on these topics. The methodology and

means is described in detail in this article. The possibilities to study this elective as distance learning is also described.

**Keywords:** Arctic Shipping, Shipping management, Polar Code, MET

## **Introduction**

The Satakunta University of Applied Sciences has been educating Master Mariners (bachelor level education) since 1880 with different institution names, but since 1990's with its present name and organisation. Since 2006 we have also educated Master Mariners further to a Master level education in Master of Maritime management which is a higher (Master) University degree. We have trained experts and leaders specifically to land based organisations for 13 years. For the last three years the education has been in English language and it has included an elective 5 credits course on Arctic shipping management as an elective course for students. The results have been promising and we are taking the next step year 2020 and making it a product for student exchange for the students coming from countries with less experience in ice navigation. As Finland is surrounded by ice for 3-5 months during wintertime, we have a lot of expertise in this field and many of our students and graduates also work on ice-breakers and multi-purpose vessels which are used both for ice-breaking and in offshore industry. During the ice winters the vessels need to reach our ports either by own means or by assistance of icebreakers for 3-5 months. There is several issues which the students need to aware of before they can operate ships in ice – both when they are at sea with a vessel and when they operate and assist the vessels from a land based organisation.

The Master degree programme uses graduated students - the student alumni's - who already have taken the Master of Maritime Management programme, as specialists in the education. They are captains of icebreakers who have conducted their studies already and who have written their thesis research on topics related to ice navigation and risks. The elective course brings to live their theoretical studies on the subject and combines it with their practical knowledge and experience for the benefit of those students with less experience on these topics.

## **Interest in Polar Regions creates demand for education**

The Polar Code is of the essence in the studies as all the vessels which in the future will enter the northern hemisphere determined by Code, need to be able to cope with the regulations. The Management is responsible for creating the relevant documents for its compliance.

There is several other contractual issues also relating to ice navigation which need to be taken into consideration by the management of the company and they need to instruct the master on a vessel on their meaning and implication. The charterparties have special ice clauses and the

marine insurers have their own clauses for ice risks. Arctic expertise is not found in all Maritime Universities. Therefore those Universities which have both theoretical and practical knowledge on arctic seafaring is in best situation to provide the courses for those with less experience in this topic. With modern teaching methods this can be done effectively. The course offered by SAMK is mostly offered from distance, but also contact lectures as part of the course on ice breaker are offered to students.

### **Polar code**

The IMO Polar Code entered into force 2017 creating new standard of seaworthiness for Arctic Shipping. The demands for vessels entering the arctic have now been determined for the industry from IMO. The new code sets the standards of seaworthiness in the Polar context. Implications for maritime contracting (risk management and risk sharing) in the polar environment needs to be addressed by the shipowner's and their masters. The International Maritime Organization IMO updated the SOLAS, MARPOL and STCW Conventions, to take account of the specific features of the Polar Regions. These updates will take effect at the beginning of 2017. Polar Code is not an own Convention, but it updates SOLAS, MARPOL and STCW conventions.

### **Polar code raises standards of seaworthiness in the polar context**

The effects of the Polar Code are described here by the term polarworthiness. When the vessels move in region where polar code is effected, new rules will require ships of different things. Fitness is a relative term, and implies fitness to the vessel's working environment: Equipment (propulsion, navigation, safety, cargo, etc.), supplies, number and training of crew, etc. IMO's Polar Code addresses both technical issues and training issues. Polar Code recognizes the unique nature and risks of the Arctic environment. [1]

Polar Codes part on operations and manning relates to navigation (ice conditions, weather). Ship entering polar waters need a specific Polar Ship Certificate and Polar Water Operational Manual.

Appropriate basic training for open-water operations and Advanced training for other waters, including ice needs to be created and arranged. The Code provides standards for both polar ready vessels and crews in order for the vessel to be considered Polarworthy.

Specific problems arise when meeting the demands of Polarworthiness. The harsh and fragile environmental conditions create challenges for operation in Polar waters. Lack of infrastructure is a special problem. Especially this consists of lack of navigational aids, lack of bunker facilities and lack of repair facilities. The vessels entering Polar waters need to be able to operate more



independently than usually. Technical assistance, salvage and ice breaking are services which are not available like elsewhere in more southern levels.

Achieving polar worthiness demands is crucial for shipowner's who need to assess their potential risks and liabilities. If the vessel is not seaworthy in arctic conditions the environmental liabilities cannot be limited. The insurance aspects are also related to seaworthiness: If the vessel is not seaworthy in arctic environment, the insurance cover will not be in force or if the safety regulations are breached, according to Nordic Marine Insurance Plan, the insurance will not cover the casualty. The Polar Code is automatically to be considered a safety regulation under the Nordic Marine Insurance Plan.

### **Educating seafarers for the Arctic**

The Polar Code is of the essence in the studies as the vessels need to be able to cope with the regulations. The Management is responsible for creating the relevant documents for its compliance. IMO gives guidance for implementation of the new Rules. [2] Model courses do not however meet all the demands the shipowner's and masters are facing in the area. Teaching these new issues has potential for co-operation between Maritime Universities and the Universities with the specific knowledge in this field have a task to share the information with those with less experience .

Polar Code implementation is an important issue not just northern shipping companies, but also all companies which consider the use of northern route from Asian markets to Europe in the future. The economic advantages are lucrative when using the northern route. This creates possibilities especially for Nordic Maritime Universities in exporting the education and attracts students to choose Nordic Universities as a destination for student exchange.[3] The Nordic Universities are like SAMK use this challenge and develop their activities to meet this challenge.

### **Modes of co-operation for achieving arctic excellence**

Maritime Universities in Nordic countries have a huge benefit when they develop education for arctic environment. Many Universities do research and co-operate with the companies already present in the Arctic environment. The co-operation between Satakunta University of Applied Sciences and companies is already used to develop in depth study courses, which can be delivered also to other Maritime Universities through student exchange and seminars. Company representatives have taken their Master of Maritime Management degree and produced parts of in-depth study course in Arctic Shipping Management based on their research together with Satakunta University of Applied Sciences.

Some examples of the research conducted in co-operation with the student working in the companies with arctic experience and the University are STS-operations in the arctic

environment, oil pollution response planning in the arctic and DP ice management. Satakunta University of Applied Sciences uses the Master of Maritime Management student's expertise as well as the own staff's expertise in creation of new knowledge and use of the experienced Masters are also used in teaching the specialised Arctic Shipping Management course.[3]

The ship design and shipbuilding industry in Helsinki in Finland is concentrating also to designing and building specialised vessels for arctic regions. Combining this knowledge to the course development and using the expertise of the companies in teaching the courses gives also great advantages for those attending the courses in Nordic Universities. Lecturers from the industry designing arctic vessels are used as guest lecturers.

### **Conclusions**

Polar Code is an important tool for the industry. Its implementation needs to be done with cautiousness by the companies that intend to operate in arctic regions. Therefore, the educations of those who will operate in the region also needs to be done properly. It is also important for the image of seafaring and shipping community in general. The environmental organisations are strongly opposing the use of arctic regions for transportation and especially for offshore activities. We all remember the consequences of the Exxon Valdez accident in Alaska 1989 and its impact in the oil transport industry as well as the legal implications that followed the incident. If the industry wants to operate in arctic regions, we cannot afford to allow any more fatal catastrophes even near the arctic. The education is of the essence and we need to use every opportunity to show that the education system together with the shipowners is ready to invest in education and preventing the spills to the sensitive areas. Therefore, we need to seek co-operation together with the Universities and the industry to make the arctic shipping as safe as possible.[3] Therefore SAMK offers this Master level elective Arctic shipping management course for the other maritime Universities for exchange studies purposes and invites students all over the world to participate through their Universities. The course will take place May-July 2020 for the first time open for exchange students.

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## **Knowledge of the English Language as a "Catalyst" for Lifelong Learning Process in Maritime Education and Training**

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### **Abstract**

Lifelong learning (LLL) is a very important phenomenon in the modern world for people occupied in different fields after being educated by different specialties. It is especially significant for graduates of Maritime institutions, future seafarers, due to specifics of this field as specialists of Maritime field need to constantly update their knowledge and qualifications. After receiving education and formal learning in MET institutions they have a good basis for further effective non-formal and informal learning in the field.

The aim of the article is to consider good knowledge of English as a means for lifelong learning process in MET as it is the language of information in the modern world and the language of vast majority of internet resources. In addition, English is an official international language of maritime field recognized by International Maritime Organization. Therefore, good knowledge of both General and Maritime English would facilitate process of acquisition of new information for seafarers and could motivate specialists of maritime field for lifelong learning.

Lifelong learning implies non-formal and informal learning; both of them are self-motivated and are often conditioned by life circumstances. Knowledge of English and self-motivation could give tremendous opportunities to those interested in their specialty in order to enhance information about the field, profound knowledge of specialization, borrow experience of other countries and integrate innovations of the field. Lifelong learning approach in Maritime Education and Training can be considered as mandatory and using such approach to Maritime English, that implies constant enriching of Maritime English vocabulary and improving language skills, is a guarantee of successful career for seafarers in contemporary maritime world.

Application of lifelong learning is significantly important in Maritime Education and Training due to the following factors: technological progress, constant updating of IMO

documents and Conventions, necessity to take training courses and revalidate certificates, familiarization with technological innovations, demands of labour market. The influence of these factors on lifelong learning process of specialists of maritime field will also be discussed in the article.

**Keywords:** Lifelong learning, Maritime Education and Training, Maritime English, General English, formal learning, informal learning, non-formal learning

## **Introduction**

In the present paper we consider such phenomenon as Lifelong Learning (LLL) in relation to the field of Maritime Education and Training (MET). Being quite different from the viewpoint of their essence these two fields are interrelated to some extent as lifelong learning is very important for Maritime Education and Training field and right approach to LLL by MET students and seafarers in the future ensures development of MET and success of the specialists involved in the field. Good knowledge of English and particularly of Maritime English is crucial to reach this goal as nowadays English is international language of maritime field and in addition to it all internet resources and information about the development of the field are usually offered in English.

The aim of the present article is to consider good knowledge of English as means of lifelong learning process for specialists of MET field for both graduate students and acting seafarers as it is the language of information in the modern world and the language of vast majority of internet resources. In addition, English is an official international language of maritime field recognized by International Maritime Organization. All IMO Conventions, documents, model courses, communication of information is implemented mainly in English in contemporary maritime world. Therefore, good knowledge of both General and Maritime English would facilitate process of acquisition of new information by seafarers and could motivate specialists of maritime field for lifelong learning (LLL). This is the subject of the present paper, in which we support our ideas by opinions of different LLL researchers.

## **Main text**

As one of the main subjects of this article is the phenomenon of Lifelong Learning (LLL) and its relation to Maritime Education and Training (MET), we think it to be expedient to consider this phenomenon first on basis of opinions of the specialists who have been researching lifelong learning for years. With the constant requirements to update seafarers'

knowledge due to technological progress and constant innovations in maritime field, lifelong learning can be considered as a means for achieving this purpose.

The first phenomenon to be considered in the lifelong aspect is lifelong education. This phenomenon differs considerably from the phenomenon of lifelong learning, therefore, for the purpose of comparing these two phenomena we think it to be expedient to refer to the words of Smith cited by Regmi in the article "Lifelong Learning in Nepal: Contexts and Prospects": "Learning is a cognitive process internal to the learner that can occur "both incidentally and in planned educational activities" while education is only the planned activities" [Regmi, 2011:2]. Cropley (1980) as stated by Elaldi in the article "Investigating lifelong learning dispositions of students studying English language and literature in terms of different variables" noted that "if lifelong education were to become a means for facilitating, lifelong learning should last the whole life of the individual; acknowledge the contribution of all available educational influences including formal, non-formal and informal" [Elaldi, 2015:2340]. V. Popescu in the article "Education and Lifelong Learning in Romania – Perspectives of the year 2020" intermixes these two phenomena saying: "Starting from the idea that lifelong learning represents the continuous building of skills and knowledge through the life of an individual, we believe that the process of continuous education is the key element that each and every society should be based on. For us, as professors and researchers, the idea of pursuing knowledge out of either personal or professional reasons, has always been a main trigger of our activity" [Popescu, 2012:305].

According to European Commission lifelong learning is "all learning activities undertaken throughout life with the aim of improving knowledge, skills and competencies within a personal, civic, social and or employment related perspective [Regmi, 2011:4]. Barros in her article "From lifelong education to lifelong learning" expresses similar idea saying that "Lifelong learning is "all purposeful learning activity, undertaken on an ongoing basis with the aim of improving knowledge, skills and competence" [Barros, 2012:124-125]. Therefore, Volles as cited by S. Bugge in the article titled "Flexible Studies as Strategy for Lifelong Learning" mentioned: "The EU seems to underline lifelong learning as a means to reform the national education systems" (Volles, 2016) [Bugge, 2016: 46].

According to A Policy Statement of Business Higher Education Round Table of 2001 titled "The Critical Importance of Lifelong Learning": "Lifelong learning is a concept of co-investment in which government, educational providers, employers, individuals and a range of other social partners work together for their mutual benefit and the achievement of lifelong learning goals" [B-HERT, 2001:6]. The above-mentioned document also states that: "education

and training is now the critical resource for any kind of growth and development for the economy, society, community and the individual" [B-HERT, 2001:8].

A.Ibatova in the article "Lifelong Learning in Russian Federation: Personal Aspect" describes the definition of lifelong learning in the following way: "Taking into account this definition, lifelong education is a process of growth of educational (general and vocational) potential of the person during his life, according to the needs of the individual and society [Ibatova, 2016:168]. A system of Lifelong Education is a set of tools, methods and forms of acquisition, general education development, professional competence, culture and training of civil and moral maturity [Ibatova, 2016:122]. Its goal is to create favorable conditions for the common cultural, social and professional development of the individual in different periods of life [Ibatova, 2016:9427].

Lifelong learning according to Longworth (2003) as cited by Abdallah in the article "Critical Thinking and Life Learning" refers to that "learning which occurs throughout the person's whole life including adult education and continuous professional development" [Abdallah, 2016:16]. As stated by Kokosalakis, cited by Regmi in the article "Lifelong Learning in Nepal: Contexts and Prospects": "The importance of lifelong learning lies in the fact that it refers directly both to socioeconomic and technologic change" (Kokosalakis, 2000) [Regmi, 2011:5]. According to the statement of International Labour Organization: "Globalization and economic integration are making learning and training policies even more important" (ILO). Regmi adds that "Learning is a lifelong process and it should be taken as an obligatory fact for the development of individuals, their society and their country" [Regmi, 2011:13].

The necessity to adopt lifelong learning as a tendency in education is stipulated by S. Elaldi in the article "Investigating Lifelong Learning Dispositions of Students Studying English Language and Literature in Terms of Different Variables" when she mentions: "Contemporary society has turned into a knowledge-based society to succeed in the changing educational, economic and political dynamics of the modern world; and therefore, in order to meet people's demand for upgrading their knowledge and skills to adapt to the rapidly changing environment, lifelong learning has emerged as a necessary guiding and a road map for the worldwide knowledge society of the future" [Elaldi, 2015:2340].

Due to the fact that in the present paper we consider the importance of knowledge of English for lifelong learning in relation to Maritime Education and Training, we think that good knowledge of English can become crucial factor – the "catalyst", ensuring seafarers with ability to be involved in lifelong learning process and thus correspond to the requirements of the field. Good knowledge of both General English and Maritime English in particular can become

foundation for lifelong learning in the future. This idea was fairly expressed in the above-mentioned policy statement issued by Business Higher Education Round Table of 2001: "the necessity of ensuring that the foundations for lifelong learning are set in place for all citizens during the compulsory years of schooling" [B-HERT, 2001:4].

The reason why we decided to consider the phenomenon of lifelong learning in relation to maritime education and training and view knowledge of Maritime English as a catalyst for lifelong learning is that LLL is very important in the field of MET as it is constantly developing field and requires regular updating of knowledge and revalidation of certificates by the specialists of the field. As it is known, according to IMO requirements acting seafarers quite often have to revalidate their certificates and pass different exams at maritime administrations. Therefore, they have to be guided by lifelong learning approach throughout their entire careers as "LLL is understood as any learning activity with an objective undertaken on a continuous basis and aimed at improving knowledge, skills and competences" (Comissao das Comunidades Europeas) [Barros R. 2012:125].

MET institutions and their graduates should have especially serious approach to lifelong learning because of not only globalization of knowledge but of the globalization of educational provision and certification of IMO courses.

In our opinion, the reasons why lifelong learning can be considered within the framework of Maritime Education and Training are:

- Technological progress
- Constant updating of IMO documents and Conventions
- Necessity to take training courses and revalidate certificates
- Familiarization with technological innovations
- Demands of labour market

In order to prove importance of lifelong learning for Maritime Education and Training and the role of technological progress we would like to refer to Blaszczyk's article "Contemporary Perspectives in Adult Education and Lifelong Learning – Andragogical Model of Learning", where it is mentioned that: "Necessity to keep up with technical and technological progress coerce the need of permanent adjustment of qualifications and skills of the employees to market needs and specific expectations coming from the employers" [Blaszczyk, 2013:306-307]. This statement is relevant for maritime field as technological progress is one of the reasons why

updating of certificates is required and why lifelong learning component became absolutely necessary from the viewpoint of studies in this industry.

Similar idea was mentioned by C. Yurdakul in the article "An Investigation of the Relationship between Autonomous Learning and Lifelong Learning" in which he stated that: "Lifelong learning takes, as one of its principal aims, equipping people with skills and competencies required to continue their own "self-education" beyond the end of formal schooling. So, it is critical for today's people because of the fast-changing nature of information age. In the information age, the knowledge and competencies are becoming major components of competition between countries, business companies, and individuals. People need to learn across the lifespan in order to adapt to the changing nature of the information age. Therefore, lifelong learning has to impact on the learners' lives, change their mindsets (Fischer, 1999) [Yurdakul, 2017:16].

In addition, it would be relevant to mention words of S. Soni from the article "Lifelong Learning – Education and Training" explaining the reasons for such popularity and widespread of lifelong learning in XXI century: "A number of important socio-economic forces are pushing for the lifelong learning approach. The increased pace of globalization and technological change, the changing nature of work and the labor market, and the ageing of populations are among the forces emphasizing the need for continuing upgrading of work and life skills throughout life [Soni, 2012:10]. Although the above-given statement is related to education system in general, it can be applied to maritime field too as the aged seafarers who want to have new contracts have to follow lifelong learning principles to update their knowledge according to technological progress and new achievements of the field. Irrespective of constant changes that take place in maritime industry, they have enough education, work experience and background knowledge for it.

Lifelong learning implies non-formal and informal learning; both of them are self-motivated and are often conditioned by life circumstances. Knowledge of English and self-motivation could give tremendous opportunities to those interested in their specialty in order to enhance information about the field, profound knowledge of specialization, borrow experience of other countries and integrate innovations of the field. Lifelong learning approach in Maritime Education and Training can be considered as mandatory and if learners are guided by such approach to Maritime English, that implies constant enriching of Maritime English vocabulary and improving language skills, they will have a kind of a guarantee of successful maritime career in contemporary maritime world.



As it is known there are three types of learning. They are: formal learning, non-formal learning and informal learning. The report "Lifelong Learning among Adults in Ireland" describes types of learning in the following way:

**Formal Education** covers the regular education and training system where courses are:

- of a predetermined purpose and format
- provided in the system of schools, colleges, universities and other educational institutions
- normally constitute a continuous ladder of education
- structured in terms of learning objectives, learning time and learning support
- normally intended to lead to a qualification recognized by national authorities qualifying for a specific education/programme).

**Non-formal Education** refers to all organized learning activities outside regular or formal education. The learner normally has to register for each learning activity. Non-formal education includes:

- participating in a course or a seminar to acquire/improve skills, knowledge and competence; courses can be aimed at improving job-related knowledge or enhancing skills for social and personal purposes
- both courses leading to certificates and courses not leading to certificates
- Grinds, piano lessons, night classes, art courses, letter writing, using the internet, courses in Tai Chi, driving lessons, etc.

**Informal Learning** includes learning that is not organized or structured in terms of purpose, time or instruction (e.g. language skills acquired during a stay abroad, IT skills acquired at work, skills acquired through sports, reading a professional magazine etc.)

**Lifelong learning** as defined by Eurostat includes 'all purposeful learning activity, whether formal, non-formal or informal, undertaken on an ongoing basis with the aim of improving knowledge, skills and competence'. However, statistics on informal learning are not always available and the CSO (QNHS) and international data on lifelong learning encompasses formal and non-formal learning only. [Lifelong Learning among Adults in Ireland, 2014:6]

Having referred to these theoretical explanations of types of lifelong learning we think it would be relevant to consider these types of learning and education in relation to maritime education and training. Formal learning – provided by education or training institute leading to certification e.g. MET institutes; non-formal learning (self-motivated) – continuing education, on-the-job training, not leading to certification (in case of MET often leading to revalidation of certificates as per Reg. I/11 of STCW); "informal learning (self-motivated) – results from daily

life activities related to work, family or leisure (constantly gained experience while on board a vessel)" [Regmi, 2011:2]. Thus, to be more concrete, we decided to consider types of learning in relation to MET and made several conclusions on the issue:

- Formal learning – graduates of Maritime higher educational institutions and vocational schools
- Non-formal learning – seafarers without education having work experience, generally occupied at the support level
- Informal learning - seafarers without any formal maritime education acquiring experience and working skills on board a ship

Only formal learning forms the professional of maritime field and enhances his cognition and ability to think within this field. Formal learning is a basis for further efficient non-formal and informal learning. The combination of all three types of learning ensures that Maritime field now has educated professionals of higher competence with further perspectives to be occupied in various onshore jobs at maritime authorities and international organizations.

Although non-formal and informal learning are self-motivated and are often conditioned by life circumstances, both are generally based on formal learning when individual is interested in his/her specialty, enhances and enriches his/her knowledge on workplace and acquires it from life situations.

Lifelong learners being specialized in any field of human activity acquire certain benefits from lifelong learning process as it:

- Broadens mind to acquire new knowledge
- Keeps individual's knowledge updated
- Makes a person more competitive
- Enhances skills and competences
- Improves quality of life

Lifelong learning requires the following skills from the learners: interest, curiosity, initiative, independence, communicability, maintenance of good relationships with teachers and colleagues to ensure constant transfer of knowledge and experience.

Seafarers enhancing their knowledge and competences to meet demands of labour markets and technological innovations follow the statements given below:

- Lifelong education is intentional. Learners are aware that they are learning.
- It has specific goals that are the reason why learning is learnt (in MET it is to keep knowledge and qualifications updated)

- The learners intend to retain and use what has been learnt for a considerable period of time [Eladi, 2015:2342].

In order to illustrate this with examples, we can mention the fact that knowledge acquired by seafarers during training for the purpose of revalidation of certificates (Reg.I/11) STCW is "valid" during period of 5 years. The courses required by IMO and offered by various Maritime Training Centres result in certification, making lifelong learning obligatory and it should become stimulating factor for seafarers for lifelong learning.

In her article "Lifelong Learning: Capabilities and Aspirations", Ilieva-Trichkova mentions that "In LLL, students are subjects of their own action, for their inclusion in education can only occur as a result of their personal decision" [Ilieva-Trichkova, 2016:208]. As we have already mentioned, in case of MET, lifelong learning, to a large extent, is conditioned by IMO requirements and necessity to update seafarers' knowledge and competences with consequent revalidation of certificates.

In her article "Contemporary Perspectives in Adult Education and Lifelong Learning – Andragogical Model of Learning" Blaszczyk says that: "In the field of economy and society development and in adult education the central category for both theory and practice is the process of adult learning. In modern culture of adult education and lifelong learning one may find various models of educational work as varied educational needs of adults require different strategies of their fulfillment" [Blaszczyk, 2013:309]. In maritime education and training, lifelong learning is generally oriented on updating seafarers' knowledge in accordance with the development of the field to meet requirements of IMO certification systems.

In order to update their competences through lifelong learning, seafarers can:

- Get familiarized with latest versions of International Maritime conventions as amended: SOLAS, ColReg, STCW, MARPOL, Load Lines
- Regularly read maritime periodicals to gain knowledge about innovations of the field
- Regularly read maritime news online
- Keep communicating with other seafarers of different specialties serving on different types of ships

Thus if we take Table a-2/II from STCW Convention as an example we can see that 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> columns of the Table implied different things in XX and XXI centuries because different navigational equipment for maintaining safe navigational watch is used at different time. In our opinion only lifelong learning approach can ensure the competency of the seafarer in different historical periods, when technological progress can entirely change the specifics of their work:

**Table A-II/1**

**Specification of minimum standard of competence for officers  
 in charge of a navigational watch on ships of 500 gross tonnage or more  
 Function: Navigation at the operational level (continued)**

<b>Column 1</b>	<b>Column 2</b>	<b>Column 3</b>	<b>Column 4</b>
Competence	Knowledge, understanding, proficiency	Methods for demonstrating competence	Criteria for evaluating competence
Maintain a safe navigational watch	<p>Watchkeeping</p> <p>Thorough knowledge of the content, application and intent of the International Regulations for Preventing Collisions at Sea, 1972, as amended.</p> <p>Thorough knowledge of the Principles to be observed in keeping a navigational watch</p> <p>The use of routeing in accordance with the General Provisions on Ships' Routeing</p> <p>The use of information from navigational equipment for maintaining a safe</p>	<p>Examination and assessment of evidence obtained from one or more of the following:</p> <ol style="list-style-type: none"> <li>1. approved in-service experience;</li> <li>2. approved training ship experience</li> <li>3. approved simulator training, where appropriate</li> <li>4. approved laboratory equipment training</li> </ol>	<p>The conduct, handover and relief of the watch conforms with accepted principles and procedures.</p> <p>A proper lookout is maintained at all times and in such a way as to conform to accepted principles and procedures.</p> <p>Lights, shapes and sound signals conform with the requirements contained in the International Regulations for Preventing Collisions at Sea, 1972, as amended, and are correctly recognized</p> <p>The frequency and extent of monitoring of traffic, the ship and the environment conform with accepted principles and procedures.</p>

	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.		A proper record is maintained of the movements and activities relating to the navigation of the ship. Responsibility for the safety of navigation is clearly defined at all times, including periods when the master is on the bridge and while under pilotage.
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[STCW Convention and STCW Code, 2011:101]

The following table shows the importance of knowledge of English for seafarers, concretely for marine engineers:

**Table A-III/1**

**Specification of minimum standard of competence for officers in charge of an engineering watch in a manned engine room or designated duty engineers in a periodically unmanned engine-room  
Function: Marine engineering at the operational level (continued)**

Column 1	Column 2	Column 3	Column 4
Competence	Knowledge, Understanding, Proficiency	Methods for demonstrating competence	Criteria for evaluating competence
Use English in written and oral form	Adequate knowledge of the English Language to enable the officer to use engineering publications and to perform engineering duties	Examination and assessment of evidence obtained from practical instruction	English language publications relevant to engineering duties are correctly interpreted  Communications are clear and understood

[STCW Convention and STCW Code, 2011:144]

How can Marine Engineer Update Competences to Meet Criteria for Evaluating? - The answer to this is the following example:

- Technical text requires 100% understanding and criteria is mentioned as "correct interpreting".
- Reading different engineering publications, technical manuals, learning of new terms is a guarantee to reach 100% understanding.

Learners interested in mastering English, increase their chances for successful Maritime career in the future. In this way they prepare themselves for lifelong learning as all materials and information about technological achievements and also communication of information by IMO are implemented in English. Therefore it is important that future seafarers are interested in English language as good knowledge of English will contribute to their interest in lifelong learning in the future. Besides, language learning also develops lifelong learning skills to some extent. In the above-mentioned article Elaldi states that "students studying English language and literature had high level of lifelong learning dispositions" [Elaldi, 2015:2347]. The same author also cites Dimova and Kubota who say that "the ultimate goal of foreign language education is to create a lifelong desire to learn and grow intellectually" (Dimova, 2012:.12); "learning a foreign language, in particular English, can be a lifelong hobby driven by intellectual curiosity or a pursuit of casual or serious leisure" (Kubota 2011:475) [Elaldi, 2015:2343].

It is very important that students build the foundation necessary for lifelong learning in the future including English language skills during their studies at MET institutions as usually awareness of lifelong learning and inclination to this type of learning come with age. We fully agree with Elaldi who after investigating lifelong learning dispositions of the students mentions that "it is possible to say that lifelong learning dispositions were strongly related to increasing age" [Elaldi, 2015:2347].

As stated by Popescu in the article "Education and Lifelong Learning in Romania – Perspectives of the Year 2020: "The key of any successful and well trained individual lies in his potential to have access to more and better knowledge and continuously reinvent it" [Popescu, 2012:305].

Ability of seafarer to learn and be involved in lifelong learning process is crucial for his career and largely depends on good knowledge of English. The importance of lifelong learning for the modern world is fairly illustrated by S. Soni in her article "Lifelong learning – Education and Training" when she mentions that: "The illiteracies of the 21st century will not be those who cannot read and write but those who cannot learn, unlearn and relearn" [Soni, 2012:1].

In the modern world the notion of "lifelong learning" has already become a synonym of knowledge and continuous education that are necessary for all fields of human activity in contemporary world, including maritime field.

## **Conclusion**

Lifelong learning being the "descendant" of lifelong education is relatively new tendency in contemporary world that became particularly widespread since the beginning of XXI century. The phenomenon of lifelong learning and its widespread is conditioned by various factors including technological progress, integration of different innovations, instability of labour market, ageing of population. All these factors require from seafarers constant updating of knowledge, renovation of skills and even development of new ones to meet requirements of constant changes in maritime field and thus be competitive on international and national labour markets. Lifelong learning acquired specific importance for maritime field as IMO Conventions require constant updating of knowledge and skills, and lifelong learning is mandatory for seafarers if they want to be competitive employees in maritime field. Lifelong learning process in maritime education and training is very closely connected to knowledge of the English Language, both General English and Maritime English. The reason for this is availability of all materials in contemporary world mainly in the English language, especially those of the maritime field.

In the present article, we tried to consider learning of English and consequently good knowledge of this language that has acquired the status of international language of maritime field in the last decades of XX century, as a guarantee for lifelong process in MET, that in its turn guarantees employability and competitiveness of seafarers on the international maritime labour market.

Therefore, curricula, syllabi of the subjects taught at maritime educational institutions should include topics mentioning and proving the importance of knowledge of English for lifelong learning process that in its turn is inseparable part of maritime education and training and life of a seafarer throughout his entire maritime career.

### **List of abbreviations:**

GE - General English

IMO – International Maritime Organization

LLL – Lifelong Learning

ME – Maritime English

MET – Maritime Education and Training

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## **Modular training advantages in LLL paradigm on the example of BSMA VET Programmes**

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### **Abstract**

According to the global tendencies in working life today's graduates, professionals, employees and academic workers have to update their competencies constantly. The necessity is conditioned by pursuit of keeping up with the present-day labor market requirements and succeeding in the dynamic environment which we live in today. It is obvious that the need to enter continuous education becomes vital.

The following research work aims at providing the analysis of the advantages and opportunities of modular training approach as a way to engage in LLL (Lifelong Learning). The study has been conducted using data from a sample of BSMA (Batumi State Maritime Academy) VET Centre Programs, that were developed within the framework of "Industry-led Skills and Workforce Development" project (ISWD) of Millennium Challenge Account- Georgia (MCA-Georgia). The main feature and requirement of the newly designed programmes was self-contained modular curriculum. In the course of the project (2016-2018) and up to date modular approach has been tested, observed, introduced and finally assessed basing on the collected information. The article studies syllabi, process of training, student body, challenges of the approach and displays its advantages in the concern of LLL paradigm.

Methodology for the research is mixed and combines quantitative and qualitative measurements.

Study results confirm the significance of continuous education. They discover modular training opportunities to become a lifelong learner with the skills and competencies required in a world of accelerating change.

**Keywords:** modular approach, lifelong learning, BSMA TVET programmes, vocational education

### **Introduction**

Nowadays, the world around is changing in such an accelerated pace that if people do not keep

up with this evolution they we will soon be left behind. So we all need to become flexible to adjust to the global changes. That means to be lifelong learners. Based on the Department of Education and Science's definition "Lifelong learning is the ongoing, voluntary, and self-motivated pursuit of knowledge for either personal or professional reasons". [1] Therefore," it not only enhances social inclusion, active citizenship, and personal development, but also self-sustainability, as well as competitiveness and employability."[2]

Lifelong learning implies use of a combination of methods throughout people's lives to fit their needs. LLL approach means no age restrictions, maximum flexibility, sticking to the everyday market needs, personality-oriented learning, basically no conventional study methodology. That makes modular training a perfect tool to engage in continuous education.

The word *modularisation* has emerged in education literature in the UK in the early 1990s. (Roger King, 1995:18) However, to date this topic has received not much of society's attention in Georgia. With the support of international organisations, aiming at supporting teaching / learning activities, increasing education level, improving efficiency of knowledge delivery, especially in vocational education, the possibility of adopting modularised course structures is going to become massive. In the nearest future that tendency is likely to cover higher education in this country too.

Modular education is a set of independent courses that make up a complete program of a particular direction. The meaning of modularity is that a person can independently design a program according to which he/she is going to study, depending on the needs and estimated material costs. Usually the modular education is compared with a children's designer, where each brick is a module. Modules can be developed separately for each skill or a set of skills. The purpose of developing the modules is to divide the content of each topic of the course into components, to professional pedagogical and didactic tasks respectively, the establishment of appropriate types and forms of training for all components, their coordination in time and integration into a single complex.

All the described futures of modular training ideally fit in LLL paradigm.

It is crucial to constantly improve/develop young people's and adults' qualification, whether it be on long-term or modular training courses, or via the validation and recognition of competences obtained throughout life. However, modular approach is more flexible and more convenient for today's life conditions.

"Flexible learning in itself is a complex of four components - technology, pedagogy, implementation strategies and organisational framework that leads to learner-centred experiences when they are well integrated" (Collis & Moonen, 2001).

## Literature review

According to Karaman (2012) the need for lifelong learning has appeared as a result of fast pace of change in the modern world, that led to a new LLL (lifelong learning) paradigm in educational systems since 1970s. Relying on IOJPE 2016 [3] LLL approach is an educational phenomena, that aim to develop individuals' knowledge, skills and competencies from birth to death (Lengrand 1989, Celep 2003, Güneş 1996, Cassin 2002, Freref 2004, Commission Européenne 2008 & European Commission, 2002). Ozdamli and Ozdal (2014) stated that changing world conditions and developing technologies makes lifelong learning approach essential for all individuals.

Modular learning concept allows educators design educational process for any target group with different learning abilities. Self-directed learning modules can be applied for staff trainings, to make the work process more effective, as well as for children, youth and elderly people. Working life tendency requires flexibility to combine study with job and family life. As well as increasing number of international students who looking for mobility between their home and foreign educational institutions.

Applying of modular packages takes into account individual differences and enables students to work at their own pace. [4] Loughran and Berry (2000) stated that individual learnt more at their own pace, because "Telling is not edifying and heedfully aurally perceiving is not learning."

Sadia Sadiq in "Effectiveness of Modular Approach in Teaching at University Level", Journal of Education and Practice 2014, has proved that modular teaching is more effective in teaching learning process as compared to ordinary teaching methods even at university level.

'Learning should be increasingly responsive to employment needs and include the development of general skills, widely valued in employment' (quoted in Bridges, 2000: 44). That is another issue of modular training. It provides a better mechanism for key skills delivery, a better connection and understanding of industry-required competency requirements.

Thomas Deissinger in his "Different Approaches to Lifelong Learning in Britain and Germany: A Comparative View with Regard to Qualifications and Certification Frameworks" names VET (Vocational Education and Training) a European Union's confession to lifelong learning. He also says that: "Further vocational training is seen as the flexible adjustment of individual skills and knowledge to the demands of a particular workplace without a basic qualification being necessarily required". [5]

Heiz and Holfold underline that "openness" and "flexibility" in VET education appear to be overtly geared to the notion of lifelong learning (Heinz 1999; Holford/Jarvis/Griffin 1999).

## Methodology

The purpose of this study was to identify modular training approach as a way to engage in LLL

concept and show its advantages. As a result to prove modular education to be one of the most flexible tools to take part in LLL. The study was conducted on the example of BSMA Vocational Training Centre from 2016 up to date.

Methodology for data collection combines BSMA statistical data, observations in numerical representations and statistical analysis. Qualitative and quantitative information has been gathered to achieve the goal. Due to narrative analysis (interviews with vocational students/candidates/graduates) some private information has been gathered.

Interviews were conducted at BSMA VTC using Questionnaire 1.

The answers were recorded by note-taking. All the interviewees are students/graduates of BSMA-VTC modular vocational programs in Logistics, namely:

Port Logistics Management- Level V 20 students (2017 Autumn cohort, 2018 Autumn cohort) ;

Cargo Handling Logistic Operation- Level IV 10 students (2017 Autumn cohort, 2018 Spring cohort) ;

Duration of each interview was not more than 10 minutes.

#### Project

Within the frames of “Industry-led Skills and Workforce Development Project” (ISWD) of Millennium Challenge Account- Georgia (MCA-Georgia) under the Program of Improvement Competitive Grants scheme, 4 new directions of Vocational Modular Education Programs were launched in Batumi State Maritime Academy (BSMA) in 2016. That implied renewal of material resources and training equipment, development of training staff and other specialists of different levels.

#### **Project beginning - September 2016**

New/improved TVET programs development period 2017:

Fishing Vessel Navigation (level 5)

Welding levels (levels 3 – 4)

Logistics and port management (levels 4 – 5)

Crane operator (levels 3 – 4)

Educational process starting period in 2017

Expectation to train around **160 students** per year.

Overall project Budget: **\$ 1,661,035**

Project code: MCA-Georgia-PICG-2015-09-14-01-016

After completion of the program students receive national BSMA diploma and international BTEC-recognised one. This fact increases BSMA VTC graduates employment opportunities.

#### Student Statistics

Starting from the first enrolled 27 vocational cohorts have been analysed in the frames of the

project. Based on Table 1 – "Current Number of students enrolled in PICG funded programs/courses - August 2018", Table 2 – "BSMA- VTC students age statistics" and conducted interviews, following results have been received:

Age category of vocational students in BSMA-VTC ranges from 19 to 63 years old (2017-2018 cohorts). Age differs depending on the chosen professional direction: The most "aged" programs appeared to be Fishing Vessel Navigation and Crane Operation level 4, the youngest – Logistics programs.

Educational background of the students turned out to be very diverse. Among interviewed students of Logistics programs (30) there were 1 PhD holder, 3 PhD candidates, 3 Master degree holders, 5 bachelor degree students indifferent education fields. The rest of the students represented secondary school graduates.

13% of interviewees appeared to be industry representatives. According to BSMA-VTC statistics about 27% of all learners (27 cohorts) are industry representatives.

#### Modular Curricula

Modular learning is personality-oriented learning approach.

Content of the educational material is constructed with separate blocks-modules (self-instructional packages) that are compressed to the required time intervals. The modules are delivered using specific and traditional methods and forms of training.

The knowledge and training is delivered in a way that fits students' needs and situation. This means that the learning process doesn't necessarily have to take place in one designated classroom. It can be adjusted to convenience and availability of the learners.

Modular teaching is based on a flexible method of tutoring. Each module/unit has specified outcomes of learning and assessment criteria. All of learning outcomes are clearly defined in curriculum-module. It also allows the learners to review own progress. Tuition for the learning outcomes lends itself to flexible delivery approaches. To pass a module/unit, students must meet all the outcomes of learning and assessment criteria.

#### Process of Training

Tutors can deliver the module/unit using a wide range of teaching and learning strategies including lectures, discussions, seminar presentations, case studies, video clips, internet research and library resources, where the learner can work individually and in a group researching and gathering information about the subject. There is no conventional assessment system based on grades/marks. During study process students receive feedback on their work. That approach lets learners to evaluate their progress themselves. By the completion of programme, students hand in an assignment brief that represents final work, quality of which proves the competencies / learning outcomes achieved in accordance with assessment criteria.

### Challenges and opportunities

Main challenges of modular vocational education at BSMA VTC for today is lack of qualified industry-experienced teaching personnel and qualitative apprenticeship opportunities for students. According to the results of workforce research in Georgia, conducted by PEM Consult and presented on 5th of August 2019, 61.5% of interviewed companies mentioned that they have not experienced substantial shortage of personnel for the last 3 years. 38.5% indicated lack of qualified staff. To face the challenges BSMA VTC decided to take an active part in the implementation of "The Private Sector Development and Technical Vocational Education and Training South Caucasus -PSD TVET SC)" project funded by GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH). The Project is implemented by PEM Consult and implies development vocational dual programs. "Dual System is determined by the involvement of the federal and state administration which makes occupational standards and conditions of skilled apprenticeship legally enforceable as well as marketable" (Raggatt 1988). Cost and benefits calculation of dual modular programs is illustrated in Figure 1-3.

Project duration: May 2019-March 2020.

Project objectives:

Develop quality assurance mechanisms for dual vocational education;

Provide training for teachers / instructors;

Promote human resources development in the field of transport and logistics;

To prepare 4 vocational dual programs in transport and logistics.

### Results

Basing on the student statistics and received interview results within the **MCA-Georgia-PICG-2015-09-14-01-016** project, people of various education background, regardless of age and gender, apply for the modular vocational programs in BSMA VTC. They find modular training convenient, effective, money-saving and job-oriented mode of study. It gives graduates flexibility to change professional orientation or get/update necessary skills fast enough to keep up with today's market needs.

Revealed advantages of using modular approach:

There are no marks or grade in the assessment system, that makes study process easier and more study-oriented;

Flexibility of learning/working environment, student mobility;

Learners can study without substantial disturbing of their usual routine;

Modules can be adjusted to individual use. More freedom in managing their own studies;

Approach enables the learners to have control over their achievements;

Greater respond to employers' needs due to skills-oriented modular packages;

Lower study fees due to effective resource optimization and governmental support.

**Conclusion**

Revealed modular training advantages ( effectiveness at different educational levels, flexibility in delivering trainings to various age groups, free self-learning style, etc.) make this education form a unique tool to engage in LLL paradigm.

The results of the research are in the favor of modular teaching approach, therefore, it is suggested that this approach should be widely used at various levels of education, in case of BSMA, at bachelor level.

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Name/Surname of the student _____		
Questions	Answers	Notes
1. How old are you?		
2. Your education_____		
3. Are you currently employed?		
4. If yes, name your position.		
5. Were you previously employed? If yes, where?		
6. Why have you decided to take this course?		
7. What are your expectations after the course completion?		
8. Did you know about modular approach ?		
9. Are aware of LLL paradigm?		



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**Table 1. Source: BSMA Quality Assurance Service**

Current Number of students enrolled in PICG funded programs/courses - August 2018													
Applicant	Existing programs/ certificate courses	Duration of the program (month)	Level	Initial N of students enrolled for the autumn 2017 smst		Initial N of students enrolled for the spring 2018 smst		Initial N of students enrolled for the autumn 2018 smst		Initial N of students enrolled for the spring 2019 smst		Current N of students from the spring 2019 smst	
				Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
LEPL Batumi State Maritime Academy- Vocational Training Centre	7 / 4												
	Welding	6	III	27		0	0	13		31		31	
	Welding	18	IV	27		5	0			9	4	9	4
	Fishing Vessel Navigation	14	V	23		14	0	30					
	Cargo Handling Logistic Operation	11	IV	3	2	3	2						
	Port Logistics Management	8	V	5	5	0	0	8	2				
	Crane Operation	7	III	12		8	0	16		8	1	8	1
	Crane Operation	14	IV	10		0	0			10		10	
Crane Operation - Operational Level	12 h				4	0							
Crane Operation - Supervision Level	16 h				22	0							
Fishing Vessel Navigation - Skeeper	180 h				7	0							
Fishing Vessel Navigation -Fisher -Salor	78 h				68	0							
Total				107	7	131	2	67	2	58	5	58	5
				114		133		69		63		63	

**Table 1. BSMA- VTC students age statistics . Source: BSMA Quality Assurance Service**

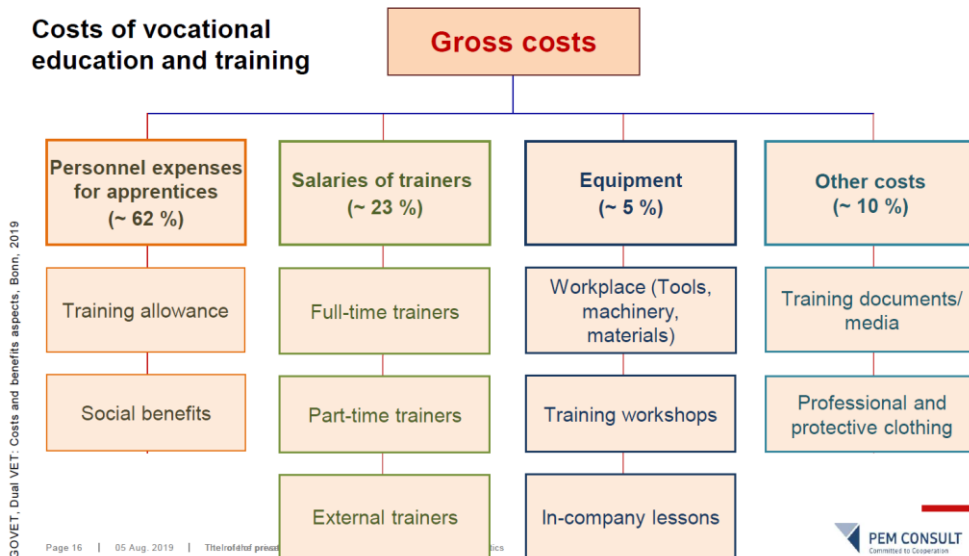
<b>Existing Programs</b>  <b>7/0</b>	<b>Level</b>	<b>Enrolled 2017 autumn semester</b>	<b>Enrolled 2018 spring / summer semester</b>	<b>Autumn 2018</b>	<b>Average age of enrolled students</b>	<b>The youngest and the oldest age</b>
<b>Welding</b>	III	27	0	15	26	19-33
<b>Welding</b>	IV	27	5	5	36	23-50
<b>Fishing Vessel Navigation</b>	V	23	14	30	43	19-61
<b>Cargo Handling Logistics Operation</b>	IV	5	5	5	27	23-29
<b>Port Logistics Management</b>	V	10	0	10	27	19-54
<b>Crane Operation</b>	III	12	8	12	39	19-55
<b>Crane Operation</b>	IV	10	0	0	40	19-63
<b>Total</b>		<b>114</b>	<b>32</b>	<b>67</b>		

Costs and benefits of vocational education and training -  
 Abstract calculation of employers



Figure 1-3. The role of private sector in skills development in sector of transport and logistics. Prof.-Ing. Gebhard Hafer. 05.08.2019

Costs of vocational education and training



Not measurable benefits aspects



## **Monthly Performance of JBL Cadets: Over-all Performance, Attitude or Willingness to Learn, English Communication, Safety Consciousness, and Teamwork**

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### **Abstract**

Maritime industry needs competent and competitive seafarers. In line with this, shipping companies have a set of criteria in selecting their applicants to join in the seafaring profession. The criteria set require the cadets to possess the right attitude accompanied with enough education and training. Thus, this study analyzed the evaluation which used the said criteria of a shipping company among John B. Lacson Foundation Maritime University cadets (deck and engine) from January 2017 to November 2017 only. The evaluation scheme was composed of five scales where the level of performance was rated in terms of the over-all performance, attitude or willingness to learn, English communication, safety consciousness, and teamwork. Fifty eight deck and 97 engine cadets for a total of 155 cadets were rated. The statistical tools used were mean and t-test of independent samples set at .05 level of significance using SPSS. Results revealed that cadets were described as having "successful performance". This means that cadets successfully deliver the expected results, perform consistently, meet the expectations of the position, and proactively seek to improve performance. Moreover, no significant differences were observed in the cadets' performance when classified according to department and throughout the observation period of 11 months when classified according to department. This study is an eye opener to the university to engage students in different activities that will provide them with soft skills and enhance their attitude and knowledge in maritime education and training.

### **Introduction**

Attitude is described as enduring due to the fact that it can be learned, thus, it can be taught (Oroujlou and Vahedi, 2011). A positive attitude towards learning if a person is interested

in and enjoyed what he or she is doing can be measured in terms of self-concept and self-efficacy (OECD, 2003).

Meanwhile, Makkos (2013) enumerated the six ways to improve one's English communication and these were: 1. Slow down the speaking speed, 2. Give time to think, 3. Lean sentences, not only words, 4. Learn to listen, 5. Practice interrogation, and 6. Produce correct English through practice.

Safety consciousness, on the other hand, is defined as the awareness towards hazards and being alert to danger. It is the most important factor to be looked into to prevent accidents (International Association of Drilling Contractors, 2015). Scarnati (2001) defined teamwork as "a cooperative process that allows ordinary people to achieve extraordinary results." Tarricone and Luca (2002) mentioned the six keys for effective teamwork: 1. Commitment to team success and shared goals, 2. Interdependence, 3. Interpersonal skills, 4. Open communication and positive feedback, 5. Appropriate team composition, and 6. Commitment to team processes, leadership, and accountability. These four components namely, attitude to learn, English communication, safety consciousness, and teamwork are important key elements that a cadet must possess to survive and to have an excellent performance onboard ship. JBLFMU as a maritime institution is obliged to mold the future seafarers because this is the number one agenda in the institution's Ten-Point Agenda which is Excellence in Education and Training. The institution therefore, should look into how its cadets perform vis-à-vis the criteria set by respective shipping companies. This study was conducted because of the evaluation conducted by a shipping company among the John B. Lacson (JBL) cadets. This will be the basis of the University to further enhance the performance of its cadets while they are still in school.

Thus, this study aimed to determine the performance of John B. Lacson (JBL) cadets for the month of January to November 2017 only.

Specifically, it aimed to answer the following questions:

1. What is the level of performance of JBL cadets when taken as an entire group and when classified according to department?
2. What is the level of performance of JBL cadets from January to November 2017 when taken as an entire group and when classified according to department?
3. Is there a significant difference in the performance of JBL cadets when classified according to department?
4. Are there significant differences in the performance of JBL cadets from January to November 2017 when classified according to department?

## **Method**

## Research Design

This study utilized a survey as a research design. A descriptive survey used the same set of questions for large number of individuals (Fraenkel and Wallen, 2010).

## Respondents

The respondents were cadets from John B. Lacson Foundation Maritime University. They were chosen through complete enumeration.

Table 1 shows the distribution of respondents.

**Table 1** *Distribution of Respondents*

Category	f	%
Entire Group	155	100
Department		
Deck	58	37
Engine	97	63

## Data Analysis

This study utilized the statistical tools such as mean, standard deviation, and t-test of independent samples set at .05 level of significance.

Table 2 shows the mean scale, description, and indicators in interpreting the level of performance of JBL cadets in terms of their over-all performance, attitude or willingness to learn, English communication, safety consciousness, and teamwork.

*Mean Scale, Description, and Indicators on the Level of Performance of JBL Cadets in Terms of Their Over-all Performance, Attitude or Willingness to Learn, English Communication, Safety Consciousness, and Teamwork*

**Table 2**

Mean Scale	Description	Indicators
4.51 – 5.0	Outstanding (O)	Cadets have continually delivered outstanding performance considerably above expectations on all aspects of the job, where the cadets have shown initiative and potential; a very positive team player; actively participate and contribute in various tasks onboard; and set a good example to others in the team.
3.51 – 4.50	Exceeds Expectations (EE)	Cadets have consistently delivered performance at a level above expectations on all aspects of the job and proactively seek to excel in their performance.
2.51 – 3.50	Successful Performance (SP)	Cadets have successfully delivered the expected results, perform consistently and meet the expectations of the position, and proactively seek to improve performance.
1.51 – 2.50	Meet Most but not all Expectations (MME)	Cadets have met most but not all expectations for the job and perform below the expectations of the position and require frequent direction. An action plan to improve performance should be considered.
1.0 – 1.50	Fail to Meet Expectations (FME)	Cadets have failed to meet expectations for the job, meet few of the objectives and deliver results considerably below expectations, and poor performance where there is little/no obvious sign of progress. An action plan should be established immediately in agreement between Master/DTO and cadet.

## Results and discussion

Table 3 shows the level of performance of JBL cadets when taken as an entire group and when classified according to department. When taken as an entire group, teamwork has the highest mean of 3.35 which is described as "successful performance". This means that cadets successfully deliver the expected results, perform consistently and meet the expectations of the position, and proactively seek to improve their performance. For deck and engine cadets, the

highest mean is 3.22 and 3.42, respectively that falls under teamwork which is described as “successful performance”.

This means that the cadets can easily mingle with their other fellow cadets and they are at their best performance when they are in group.

**Table 3** *Level of Performance of JBL Cadets When Taken as an Entire Group and When Classified According to Department*

Category	Over-all			Attitude/Willingness to Learn			English Communication			Safety Consciousness			Teamwork		
	Mean	Description	SD	Mean	Description	SD	Mean	Description	SD	Mean	Description	SD	Mean	Description	SD
Entire Group	3.15	SP	.50	3.24	SP	.64	3.15	SP	.43	3.13	SP	.47	3.35	SP	.57
Department															
Deck	3.12	SP	.50	3.19	SP	.66	3.07	SP	.37	3.12	SP	.50	3.22	SP	.50
Engine	3.18	SP	.50	3.27	SP	.62	3.21	SP	.46	3.13	SP	.45	3.42	SP	.59

*Note.* SP stands for successful performance. This means that cadets successfully delivered the expected results, performed consistently and met the expectations of the position, and proactively sought to improve performance.

Tables 4 to 14 show the level of performance of JBL cadets from January to November 2017 when taken as an entire group and when classified according to department. Most of their level of performance is described as “successful performance”. This means that cadets successfully deliver the expected results, perform consistently and meet the expectations of the position, and proactively seek to improve their performance.



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Table 4  
*Level of Performance of JBL Cadets as of January 2017 When Taken as an Entire Group and When Classified According to Department*

Category	Over-all		Attitude/Willingness to Learn		English Communication		Safety		Teamwork	
	Mean	Description	Mean	Description	Mean	Description	Mean	Description	Mean	Description
Entire Group	3.14	SP	3.14	SP	3.03	SP	3.17	SP	3.21	SP
Department										
Deck	3.0	SP	3.0	SP	3.0	SP	3.13	SP	3.0	SP
Engine	3.19	SP	3.19	SP	3.05	SP	3.19	SP	3.29	SP

*Note.* SP stands for successful performance. This means that cadets successfully delivered the expected results, performed consistently and met the expectations of the position, and proactively sought to improve performance.

Table 5  
*Level of Performance of JBL Cadets as of February 2017 When Taken as an Entire Group and When Classified According to Department*

Category	Over-all		Attitude/Willingness to Learn		English Communication		Safety		Teamwork	
	Mean	Description	Mean	Description	Mean	Description	Mean	Description	Mean	Description
Entire Group	3.24	SP	3.48	SP	3.29	SP	3.10	SP	3.67	EE
Department										
Deck	3.0	SP	3.29	SP	3.0	SP	3.0	SP	3.43	SP
Engine	3.36	SP	3.57	EE	3.43	SP	3.14	SP	3.79	EE

*Note.* SP stands for successful performance. This means that cadets successfully delivered the expected results, performed consistently and met the expectations of the position, and proactively sought to improve performance. EE stands for exceeds expectations. This means that cadets consistently delivered performance at a level above expectations on all aspects of the job and proactively sought to excel in their performance.

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Table 6

*Level of Performance of JBL Cadets as of March 2017 When Taken as an Entire Group and When Classified According to Department*

Category	Over-all		Attitude/Willingness to Learn		English Communication		Safety		Teamwork	
	Mean	Description	Mean	Description	Mean	Description	Mean	Description	Mean	Description
Entire Group	3.44	SP	3.38	SP	3.38	SP	3.13	SP	3.69	EE
Department										
Deck	3.40	SP	3.0	SP	3.20	SP	3.20	SP	3.20	SP
Engine	3.45	SP	3.55	EE	3.45	SP	3.09	SP	3.91	EE

*Note.* SP stands for successful performance. This means that cadets successfully delivered the expected results, performed consistently and met the expectations of the position, and proactively sought to improve performance. EE stands for exceeds expectations. This means that cadets consistently delivered performance at a level above expectations on all aspects of the job and proactively sought to excel in their performance.

Table 7

*Level of Performance of JBL Cadets as of April 2017 When Taken as an Entire Group and When Classified According to Department*

Category	Over-all		Attitude/Willingness to Learn		English Communication		Safety		Teamwork	
	Mean	Description	Mean	Description	Mean	Description	Mean	Description	Mean	Description
Entire Group	2.93	SP	3.14	SP	3.07	SP	2.93	SP	3.29	SP
Department										
Deck	2.75	SP	3.0	SP	2.75	SP	2.75	SP	3.0	SP
Engine	3.0	SP	3.20	SP	3.20	SP	3.0	SP	3.40	SP

*Note.* SP stands for successful performance. This means that cadets successfully delivered the expected results, performed consistently and met the expectations of the position, and proactively sought to improve performance.

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Table 8

*Level of Performance of JBL Cadets as of May 2017 When Taken as an Entire Group and When Classified According to Department*

Category	Over-all		Attitude/Willingness to Learn		English Communication		Safety		Teamwork	
	Mean	Description	Mean	Description	Mean	Description	Mean	Description	Mean	Description
Entire Group	2.77	SP	2.92	SP	3.08	SP	3.0	SP	3.08	SP
Department										
Deck	2.80	SP	3.20	SP	3.0	SP	3.0	SP	2.80	SP
Engine	2.75	SP	2.75	SP	3.13	SP	3.0	SP	3.25	SP

*Note.* SP stands for successful performance. This means that cadets successfully delivered the expected results, performed consistently and met the expectations of the position, and proactively sought to improve performance.

Table 9

*Level of Performance of JBL Cadets as of June 2017 When Taken as an Entire Group and When Classified According to Department*

Category	Over-all		Attitude/Willingness to Learn		English Communication		Safety		Teamwork	
	Mean	Description	Mean	Description	Mean	Description	Mean	Description	Mean	Description
Entire Group	3.20	SP	3.20	SP	3.0	SP	3.20	SP	3.20	SP
Department										
Deck	3.17	SP	3.17	SP	3.0	SP	3.17	SP	3.17	SP
Engine	3.25	SP	3.25	SP	3.0	SP	3.25	SP	3.25	SP

*Note.* SP stands for successful performance. This means that cadets successfully delivered the expected results, performed consistently and met the expectations of the position, and proactively sought to improve performance.

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Table 10

*Level of Performance of JBL Cadets as of July 2017 When Taken as an Entire Group and When Classified According to Department*

Category	Over-all		Attitude/Willingness to Learn		English Communication		Safety		Teamwork	
	Mean	Description	Mean	Description	Mean	Description	Mean	Description	Mean	Description
Entire Group	3.20	SP	3.50	SP	3.30	SP	3.30	SP	3.30	SP
Department										
Deck	3.0	SP	3.25	SP	3.25	SP	3.0	SP	3.25	SP
Engine	3.33	SP	3.67	EE	3.33	SP	3.50	SP	3.33	SP

*Note.* SP stands for successful performance. This means that cadets successfully delivered the expected results, performed consistently and met the expectations of the position, and proactively sought to improve performance. EE stands for exceeds expectations. This means that cadets consistently delivered performance at a level above expectations on all aspects of the job and proactively sought to excel in their performance.]

Table 11

*Level of Performance of JBL Cadets as of August 2017 When Taken as an Entire Group and When Classified According to Department*

Category	Over-all		Attitude/Willingness to Learn		English Communication		Safety		Teamwork	
	Mean	Description	Mean	Description	Mean	Description	Mean	Description	Mean	Description
Entire Group	3.10	SP	3.20	SP	3.0	SP	3.30	SP	3.20	SP
Department										
Deck	3.20	SP	3.20	SP	3.0	SP	3.60	EE	3.20	SP
Engine	3.0	SP	3.20	SP	3.0	SP	3.0	SP	3.20	SP

*Note.* SP stands for successful performance. This means that cadets successfully delivered the expected results, performed consistently and met the expectations of the position, and proactively sought to improve performance. EE stands for exceeds expectations. This means that cadets consistently delivered performance at a level above expectations on all aspects of the job and proactively sought to excel in their performance.

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Table 12

*Level of Performance of JBL Cadets as of September 2017 When Taken as an Entire Group and When Classified According to Department*

Category	Over-all		Attitude/Willingness to Learn		English Communication		Safety		Teamwork	
	Mean	Description	Mean	Description	Mean	Description	Mean	Description	Mean	Description
Entire Group	3.13	SP	3.25	SP	3.25	SP	3.0	SP	3.13	SP
Department										
Deck	3.25	SP	3.25	SP	3.25	SP	3.0	SP	3.25	SP
Engine	3.0	SP	3.25	SP	3.25	SP	3.0	SP	3.0	SP

*Note.* SP stands for successful performance. This means that cadets successfully delivered the expected results, performed consistently and met the expectations of the position, and proactively sought to improve performance.

Table 13

*Level of Performance of JBL Cadets as of October 2017 When Taken as an Entire Group and When Classified According to Department*

Category	Over-all		Attitude/Willingness to Learn		English Communication		Safety		Teamwork	
	Mean	Description	Mean	Description	Mean	Description	Mean	Description	Mean	Description
Entire Group	3.23	SP	3.15	SP	3.08	SP	3.08	SP	3.38	SP
Department										
Deck	3.20	SP	3.20	SP	3.0	SP	3.0	SP	3.40	SP
Engine	3.25	SP	3.13	SP	3.13	SP	3.13	SP	3.38	SP

*Note.* SP stands for successful performance. This means that cadets successfully delivered the expected results, performed consistently and met the expectations of the position, and proactively sought to improve performance.

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Table 14

*Level of Performance of JBL Cadets as of November 2017 When Taken as an Entire Group and When Classified According to Department*

Category	Over-all		Attitude/Willingness to Learn		English Communication		Safety		Teamwork	
	Mean	Description	Mean	Description	Mean	Description	Mean	Description	Mean	Description
Entire Group	3.27	SP	3.27	SP	3.27	SP	3.27	SP	3.45	SP
Department										
Deck	3.60	EE	3.60	EE	3.40	SP	3.40	SP	3.80	EE
Engine	3.0	SP	3.0	SP	3.17	SP	3.17	SP	3.17	SP

*Note.* SP stands for successful performance. This means that cadets successfully delivered the expected results, performed consistently and met the expectations of the position, and proactively sought to improve performance. EE stands for exceeds expectations. This means that cadets consistently delivered performance at a level above expectations on all aspects of the job and proactively sought to excel in their performance.

There is no significant difference in the performance of JBL cadets when classified according to department,  $t(153) = 1.45, p = .148$ . This means that their performance is the same regardless of their department, be it deck or engine. This might be attributed to the same knowledge and skills learned by the JBL deck and engine cadets from their school as well as their activities or exposure they have acquired.

Table 15 below shows the result.

Table 15 *t-test of Independent Samples Result for the Significant Difference in the Performance of JBL Cadets When Classified According to Department*

Department	N	Mean	SD	t	df	Sig.
Deck	58	3.15	0.41	1.45 <sup>ns</sup>	153	.148
Engine	97	3.24	0.39			
Total	155					

*Note.* ns means not significant at .05 level of probability.

Meanwhile, there are no significant differences in the performance of JBL cadets from January,  $t(27) = 1.13, p = .269$ ; February,  $t(19) = 1.79, p = .089$ ; March,  $t(14) = 1.30, p = .216$ ; April,  $t(12) = 1.51, p = .158$ ; May,  $t(11) = .08, p = .935$ ; June,  $t(8) = .30, p = .770$ ; July,  $t(8) = .90, p = .394$ ; August,  $t(8) = .49, p = .639$ ; September,  $t(6) = .447, p = .670$ ; October,  $t(11) = .178,$

$p = .862$ ; November,  $t(10) = 1.27$ ,  $p = .234$ , when classified according to department. This means that their performance is the same since January 2017 up to November 2017 when classified according to department. This might be attributed to the same knowledge and skills learned by the JBL deck and engine cadets from their school as well as their activities or exposure they have acquired.

Table 16 shows the results.

Table 16 *t-test of Independent Samples Results for the Significant Difference in the Performance of JBL Cadets from January to November 2017 When Classified According to Department*

Month	Department	N	Mean	SD	t	df	Sig
January	Deck	8	3.03	0.07	1.13 <sup>ns</sup>	27	.269
	Engine	21	3.18	0.38			
February	Deck	7	3.14	0.34	1.79 <sup>ns</sup>	19	.089
	Engine	14	3.46	0.40			
March	Deck	5	3.20	0.63	1.30 <sup>ns</sup>	14	.216
	Engine	11	3.49	0.29			
April	Deck	4	2.85	0.30	1.51 <sup>ns</sup>	12	.158
	Engine	10	3.16	0.36			
May	Deck	5	2.96	0.33	.08 <sup>ns</sup>	11	.935
	Engine	8	2.98	0.31			
June	Deck	6	3.13	0.33	.30 <sup>ns</sup>	8	.770
	Engine	4	3.20	0.37			
July	Deck	4	3.15	0.60	.90 <sup>ns</sup>	8	.394
	Engine	6	3.43	0.41			
August	Deck	5	3.24	0.59	.49 <sup>ns</sup>	8	.639
	Engine	5	3.08	0.44			
September	Deck	4	3.20	0.40	.447 <sup>ns</sup>	6	.670
	Engine	4	3.10	0.20			
October	Deck	5	3.16	0.38	.178 <sup>ns</sup>	11	.862
	Engine	8	3.20	0.40			
November	Deck	6	3.47	0.48	1.27 <sup>ns</sup>	10	.234
	Engine	6	3.10	0.52			

Note. ns means not significant at .05 level of probability.

## Conclusions

This simple survey concludes that the level of performance as measured by over-all performance, attitude or willingness to learn, English communication, safety consciousness, and teamwork of JBL cadets when taken as an entire group and when classified according to department is described as "successful performance" based on the rubrics given by a shipping company. This means that the cadets successfully deliver the expected results, perform consistently and meet the expectations of the position, and proactively seek to improve their performance. There was no significant difference in the performance of JBL cadets when classified according to department. Moreover, there were no significant differences in the performance of JBL cadets from January to November 2017 when classified according to department. It is consistently the same throughout the 11 months of observation. This might be attributed to the same knowledge and skills learned by the JBL deck and engine cadets from their school as well as their activities or exposure they have acquired.

### **Recommendations**

It is recommended that John B. Lacson Foundation Maritime University should exert more efforts to mold its students physically, mentally, and socially because these are the areas evaluated by a certain company for deployment. This can be done by exposing students to value-laden seminars and workshops, encouraging students to understand the value of English language for communication enhancement, inculcating safety practices in school and at home, and promoting group work to students such as cooperative learning, group dynamics, small group discussions, and many more. Students should be trained to be proactive and should be encouraged in joining school activities that will provide them with soft skills such as social skills, communication skills, character traits, attitudes, career attributes, social intelligence, emotional intelligence quotients, and many others.

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## **HOLAS [Happiness Life at Seas] and value creation for safety (Creation of a new seafarer society with young students and sailors)**

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### **Abstract**

Through my own experience of entering the Persian Gulf in the Gulf War in 1991, I would like to consider the necessity of fostering Global Citizens in maritime education. In addition, with the aim of converting to the human revolution in the seafarer society, I would like to clarify that seafarers, in particular, young seafarers, aim to create new values, which will lead to individual happiness at sea on their life.

I believe that the IMLA members, marine officers and engineers on board who are the leaders of seafarer development shall be able to create such values.

Introduction - Experience of entering the Persian Gulf in the Gulf War in 1991

"War has begun"

A colleague who noticed my appearance raised his face and said.

I was a second officer. I got up at Bridge around 10 o'clock.

At Bridge, several crew members surrounded the radio and watched it.

It was on the morning on January 17, 1991, the 50,000-dwt methanol tanker "Kohzan Maru" on which I boarded was heading off the coast of Sri Lanka toward port of Al Jubail in Saudi Arabia. Port of Al Jubail is located at the far end of the Persian Gulf, approximately 200 km from the Kuwait border.

I was boarding the tanker ship mainly. Therefore, even during the Iran-Iraq war, I have been in the Persian Gulf.

At that time, in order to avoid attacks from the Iranian navy, we tanker ships formed a

convoy and entered the Persian Gulf during the night. I put a boiler suit and life jacket so I should always be ready to evacuate the ship. I just fell on the sofa wearing safety shoes and waited to breathe over and overpass the dangerous Hormuz Strait.

The memories of that time had come back again.

Soon after, the company contacted the captain and instructed him to confirm the crew whether they could enter the Persian Gulf or not. On the afternoon of the same day, the captain gathered the crew members into the mess room and explained the situation. The captain gave a brief explanation of the situation. And he asked all crews to agree to enter Persian Gulf as if they were forced.

Unlike the bilateral war such as the Iran-Iraq War, the Gulf War this time was the great war that the UN forces would fight Iraq which invaded Kuwait, and several countries were being included like the United States and UK.

From the crew, "What happens if we actually refuse to enter Persian Gulf?" "What is financial compensation if we enter Gulf?" Or "What happens if we get bombarded or caught in a war?", There were imminent questions, and the meeting ended without conclusion on the day.

The radio informed the situation of the UN forces' bombardment from the next day onwards. Because of above, the company and the seamen's union showed that the bombing air raids was insulting as the bombings intensified. Kohzan maru was to be anchored on January 28 at Fujairah off the UAE's coast after drifting in Indian Ocean. On the ship, there was also an atmosphere which it would be very difficult to enter Persian Gulf. However, in the midst of this air strike, there was optimism thinking that no one would let our ship to enter to the Persian Gulf with carrying a huge explosive of 50,000 tons of methanol. However, at every night, everyone turned away from reality and gathered in the cabins holding the radio to check the war situation. On January 29, Iraqi forces attacked the port of Kahuji, Saudi Arabia, the city on the border near by Kuwait.

The following month, in February, the war situation seemed to end as it was due to the overwhelming power of the UN forces. On February 13th, the company contacted the ship again, and Captain was asked "Can you somehow go to Al Jubail".

On board, another meeting was held and eventually everyone agreed to enter the Persian Gulf. No crew refused to enter.

The next day, on the evening of 14th, the ship left the port of Fujairah. Captain decided to navigate during night only to avoid any dangers. The ship had passed the Hormoz Strait safely, proceeded off the coast of Iran, and then anchored near the UAE's territorial waters before the sunrise. The next day, the ship left the anchorage before sunset. Prior to next sunrise, the ship

anchored again near Saudi Arabian waters. After that, the ship entered the Al Jubail harbor early in the morning, taking almost three days. In the meanwhile, during passing Hormuz Strait and Persian Gulf, the ship was called from the UN forces so many times, and each time, we have to explain the details of the ship and continue the sailing.

It has been bombed daily in the vicinity of the Kuwait border, which is about 200 kilometers from the port of Al Jubail where we were now. Nevertheless, the harbor was so quiet as to suspect that a war was taking place. Shore workers who come to the ship also proceed with the preparation of the cargo operation, taking steps in an orderly manner without making sounds about the war. Eventually, 50,000 tons of methanol cargo loading was started.

It looked like very calm in the port.

Suddenly, the situation changed at midnight.

A violent siren on the shore wrapped over the terminal. Soon I got up from sofa and ran up to the bridge. Then I found the captain and agent on board were arguing.

"A squad missile fired from Iraq is heading to here," said by the agent.

The agent voiced up, "It is the usual case," but he quickly tried to pack up the belongings and get off the ship immediately. We, crew members, contacted the shore workers and stopped the cargo loading. However, we could observe the situation only. Crew members who felt something unusual, came to the bridge with one by one. Everyone has a life jacket. But no one knows how to escape missiles. I looked up at the dark sky through the window. I didn't know how long it was. After a moment, the siren was suddenly cut off.

Soon after the agent come back the ship, he said, "There is same siren once in three days." The captain strongly agued the agent, as there was no explanation in advance. After all, similar sirens never got twice in harbor.

The ship sailed from Al Jubail safely and proceed to the out of Persian Gulf day and night unlike entering. Captain determined that it is better to leave the Persian Gulf as soon as possible.

Then the ship passed Hormoz Strait on the morning of February 22.

At that time the ship met the US Marine Corps Task Force, centered on the huge aircraft carrier. A number of escort battleships and helicopters proceed, flew back and forth to guard the aircraft from front to back, centering on the aircraft carrier. The helicopter occasionally drops something. What I knew later was that it was a sonar for submarine detection. An aircraft lined up on a sparkling and iridescent aircraft carrier with gray huge hull, they were also a threat to me as tanker man who was used to be on VLCC.

Once they entered to ground battle, many people would inevitably get into the war. That

feeling was superimposed on the appearance of the aircraft carrier and the following battleships.

So, my Gulf War was ended.

Is it possible to maintain the safety on board by extending only knowledge?

I have already resigned as a captain and served as a pilot. But the experience of this war is still blinking from deep inside my heart. In my short experience, there was nothing big things happen in my war experiences. Just in the midst of a huge war, I was only embarked on a methanol tanker and had a glimpse of the area near the battlefield. But what I strongly think about through the experience is that the ship safety can be never guaranteed simply by accumulating knowledge and experiences gained over many years as seafarers.

From this point of view, I believe that the most important thing is not to rely on either knowledge or experience only, highly creative education and, especially, maritime education.

President Columbia University Teachers College Levin expressed,

"While education is perhaps the slowest means to social change, it is the only means"

Education is a privilege that only humans can achieve. It is a driving force that makes us a human, true human being, and a true mission as seafarers. In addition to this, the source of knowledge at the sea towards the safety of the ship must actually be educated.

Seafarers' society is now facing a number of complexes, intertwined crises.

Pirates and war on the sea.

As you well understand, Hormuz Strait is now really suffered to actual war.

Economic disparity.

### **Environmental destruction**

Discrimination due to differences in ethnicity, religion, language, etc.

How can we solve these difficult and real problems on board? What can we achieve for our students and young seafarers?

I would like to consider of the assumption that the one of the key to treat facing problem is the failure to lose sight of the seafarers who are human being and to forget the basic purpose of "happiness of seafarers".

Therefore, I would like to emphasize "Be consider as a human", it will be the starting point for us to turn back and make a new direction. It can be said that it is a reform of humans, and also seafarers ourselves.

It shall be called "To be a human revolution"

In IMLA Participants and We Hato-kai, there are many things in common. The IMLA participants have keep young students grow as seafarers, and also as human beings through maritime

education. We at the Hato-kai, through photo exhibitions that have been held in more than 2,000 venues in all over the world, tried to show the people, land scape, oceans, life at seas who / where the seafarers have actually seen on board. In addition to the photo activities, we have seminars / short meetings and conversations / dialogues with students in some maritime universities and academies. The creation of human education concerning the sea or seafarers is the common ideal shared by all IMLA participants and members of Hato-kai, isn't it?

In view of this common idea, I would like to say, "The seafarers become humans being by learning"

The value creation by seafarers and the happiness of each seafarer will be the purpose of maritime education. It will be "Creation of HOLAS on board"

"The purpose of education must be the lifelong happiness of learners," said My Mentor Prof. Dr. Ikeda, who is also an honorary professor at Dalian Maritime University. "The true happiness is to be found in the life of value creation." which was his conviction.

In short, value creation is the ability to find meaning, strengthen self-confidence, and contribute to others in any environment. In a sense, it is also my deep impression that I obtained through the experience in the Gulf War by forced participation.

Beyond the tied frames by peoples and nations, we look to new human society and Citizens solidarity. We will draw on the vision of a seafarers who can create value on a global scale, that can be called as "Global Citizens". Can such a "Global Citizens" be a modern ideal seafarer to next era?

What can be a "Global Citizens" ?

It is not determined by visiting countries in the world.

It is not determined whether you can speak any languages.

Seafarers who can wish for the safety of the ship which they are on board, and seafarers who are able to contribute to other crews by overcoming differences the countries, ethnic groups, religions and languages. That is the seafarers called as "Global Citizens".

In considering Global Citizens, I would like to clarify following 3 points.

"A seaman of wisdom" who understands and deeply recognizes the correlation with oneself, a colleague, the ship which such seafarers are on board, the oceans and environment which surrounds such seafarers.

No matter how tough the life on board, "Wisdom" which is keeping the ship and crew safe, protecting all crews, understanding seafarer's own missions and jobs, achieving each task on board.

"A seaman of courage" who respects, understands, and fosters growth rather than fears or rejects differences in race, ethnicity or culture.

Whatever emergency situations you may face, people have the courage to accept, share, and sympathize with each other's background, and to promote safe operation on board by cooperating with each other in a closed space on the vessel.

"A seaman of mercy" who are the compassion to maintain an imaginative empathy that reaches beyond one's immediate surroundings and extends to those suffering in distant places.

Keep your eyes on the reality you are facing now, sympathize with the society and the suffering beyond our common lives, the mercy that can achieve in hope of mutual fortune and prosperity.

What is necessary for becoming "A seaman of wisdom", "A seaman of courage", and "A seaman of mercy" is the interpersonal relationship within the ship based on interdependence.

While I myself, as the captain, commanded the ships many times, I felt that it was very difficult to say, "There is no unnecessary crew on the board. From the captain to all the crews on the last line of the crew list" They are an essential and important member as not only crews and also human being in the operation of the ship. And the interdependence goes beyond physical distance to the company staff who support us from shore, the inspectors who guarantee the safety of the ship, and the state agencies too. A seaman who knows the principle of such correlation is A seaman of wisdom. A seaman who protect and respect such correlations is A seaman of courage. And A seaman who can honestly act as a seafarer, as a human being, what least we can be done seriously for the one in front of us, is A seaman of mercy.

It is the HOLAS in the true meanings and the happiness of the seafarers that such "wisdom", "courage" and "mercy" are linked as the behavior of the seafarers, especially young seafarers.

Among these, I think that "mercy" should be particularly concerned.

Mercy is not about suppressing human-specific emotions, such as those who like or hate the other people. Even if it is sometime difficult for you to like them, you would be open your eyes to these possibilities which can be valuable to your life and deepen your humanity in your life on board. In addition, from the heart of "mercy" which is seriously consider what we can do for the one in front of us, "wisdom" shall come out endlessly.

Raising Global Citizens on Campus

The work of fostering Global Citizens is deeply related not only by all seafarers but also by marine instructors, officers and engineers. Then, I would like to say it is an important issue that everyone can be work for and responsible for.

In order to make that "Global Citizens" education meaningful, the work to foster Global Citizens is important. I believe that the key is to have the maritime academy root in a certain campus.

Without a doubt, the campus as the site of education, is the epitome of the world. Every maritime academy has students, who are often from the across the countries and sometimes across borders. These students are trying to learn and grow to be seafarers while carrying their respective back grands.

At this time, instructors and seafarers who have sea experiences like us can talk with the students. Directly reminding students how life, society, and campus life of students are related to the real life at sea. And then, we may let make them observe it.

Therefore, students know that each of their home and life is actually directly connected to the world they will see later on. Students will feel that the correlation between the city, harbor where they have lived today and the sea leading to all over the world is not themselves alone in the world but is directly connected to the world. Through such activities, I think that these sprouts shall grow the students as Global Citizens.

In fact, our daily lives are full of "Places of learning" where we and the people around us grow and improve together. Participation in other people's dialogues and exchanges is the one of best opportunity to create new value. We learn from human beings. In other words, our humanity as teachers and young sailor's seniors, will be the core of student's educational experiences.

Dialogue with students through photo exhibition.

We Hato-kai have been carrying out Ocean-themed photo exhibition activities at more than 2,000 venues. These include the standing photo exhibits at the IMO headquarters in London, England, which are still being held, and at other maritime universities / academies, including the World Maritime University and the others around the world. In addition to this, we now have lecture activities for students and subsequent dialogue meetings. In the future, we will continue these activities, and if there are any requests, but we will consider the venues, and then would like to conduct activities through similar photo exhibitions, lectures and dialogues with students at other maritime universities / academies.

Conclusion - Interaction among students, teachers and seafarers

Common Future / Common Prosperity

I have been long closed about the Gulf War experience. I was too helpless, in front of the reality of war. It had only made me to embark on the tanker ship and followed the instructions by the captain and head office, I had to go to the battlefield as the company said. Finally. I saw the US Marine Corps Task Force going to the ground battle passing Hormuz Strait without any choices. It is really negative and failure experience for me.

Why I could be relieved from soothing either memories or experiences is that I met a Filipino



Quarter Master on board. He was a young sailor and it was second vessel for him joining with me. He was partner of my duty. I was chief mate.

One day, a message was informed from the office. It said Q/M's brother was passed away. It was showing that his brother was killed in a raid case in the Philippine during the flight. After knowing the intelligence from captain, I took duty with him. I could not find what I was able to say to him. However, before finishing our duty, I told him of my war experience.

I talked about whole story. What happen. What I could do, actually, I could do nothing in the war. I forgot the time. It was not to comfort him. I suppose now I would like to share the hard seaman's life given to us together only.

Seafarers' lives have always long been tossed back and forth by the fate. Many seafarers spend their dead time on board and active time on the shore, killing time and spending time while they are on board.

Is that the correct way of life for the seafarers?

We seafarers has to be at sea almost half of our lives.

I believe no one ruin the half of sea life.

I doubt it at least. Rather, the time on board seems to be our most important and valuable time as a seafarer. That is a true sense of well-being of the seafarers, HOLAS, Happiness Life at Seas.

Allow me to return my experience.

After he heard my story, he left the bridge without any word, said thank you only. At that time, I was not sure whether my story was helpful for him. But the next day, he told me how important was his brother to him?

Apparently, his brother helped him a lot to attend a marine academy. Many Filipino works at sea for family. He is also sending money for his family including his brothers too.

He kept talking for un hours on duty. I was listening to his speaking until he stopped. And finally, he said he would return to the Philippines after this voyage. Then, he saw me.

"But Chief, I will return to the ship again. At that time, will you work with me again?"

Off course, I nodded to him.

After that, we continued to work in the same company. He then became an officer from Q / M and still works as a second officer of my previous company.

I suppose dialogs / conversations are very important for the people working beside the sea.

What is necessary for us is a gathering of students, lectures, and seafarers with diverse cultures, traditions and identities across communities. And then we can be in a dialogue to find limitless possibilities and values as a Global Citizen.

An instructor spoke after our photo exhibition and lecture given to students at the maritime university.

"Lectures are not the only education. Only humans can make human being. Education exists in a sincere dialogue."

We will continue to hold the photo exhibition and keep dialogues with students and maritime instructors in the future through the photos from all over seas and world.

IMLA as a no-border forum from all over the world has dedicated to be mediating in the process of Maritime Education and Training from 1977. The members in IMLA work to promote contact and cooperation between Maritime Lecturers of all disciplines and to develop a body of professional expertise for long.

IMLA has created new values for merchant marine education till today.

I myself as IMLA member, deeply respect the activities and contribution to the progress of Maritime Education and Training for long.

I myself and we Hato-kai would like to contribute the development of Maritime Education and Training with other IMLA members.

Let's talk among the lectures, sailors and students.

Let's talk our life on board and campus.

If you have not enough experience at sea, we shall talk, how your pupils studied and grew at campus / sea. We may be able to show them what is most important issue to survive life at sea.

What is your expectation on the life of your student's future?

These dialogues must create new value on your student's life at sea.

Eventually, it must be HOLAS for, not only students and also lectures / senior seafarers like us.

## **Reference**

1. A New Humanism - THE UNIVERSITY ADDRESSES OF DAISAKU IKEDA

## **A Study on the Students' Onboard Training in Specialized Training Ship in China**

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### **Abstract**

Onboard training is an important part in maritime education and training. Since the specialized training ship of Dalian Maritime University came into service, it has always mainly served for onboard training of interns in marine major. This paper analyzes the overview, organizational structure and implementation procedure of onboard training in motor vessel YU KUN, and proposes the six key points of teaching management about onboard training, which is worthy of reference for other maritime colleges and universities and they carry out onboard training better, **Keywords:** Specialized training ship; motor vessel YU KUN; onboard training; maritime education and training; teaching management

### **Introduction**

According to the requirement of STCW formulated by IMO<sup>[1]</sup>, candidates for certification shall provide satisfactory proof of having completed the seagoing service and any related compulsory training required by these regulations for the certificate applied for. Every candidate shall follow an approved program of onboard training. Relevant IMO model courses published by IMO pays attention to the cultivation of trainees' actual ability, sets lot of practical training<sup>[2-4]</sup>, and refers several times that exercises may be carried out onboard training as far as possible. Maritime education is a practical subject, and onboard training plays a vital role<sup>[5]</sup>. Dalian maritime university has a specialized training ship YU KUN and a combined training ship YU PENG. Motor vessel YU KUN is the only ocean-going specialized training ship in China. Since it came into service in 2008, it has always mainly served for onboard training of 1,000 interns in marine major every year. It has exercised students' practical ability and improved the quality of maritime education to a large extent. Based on the current situation of motor vessel YU KUN, this paper analyzes the teaching arrangement and management status of onboard training in motor vessel YU KUN, and proposes the key points of teaching and management about onboard training.



**Figure 1 Specialized training ship YU KUN**

### **Overview of onboard training**

Dalian maritime university has three marine majors, namely nautical science, marine engineering and marine electronic and electrical engineering, which educational system is 4 academic years and each academic year has 2 semesters. According to the requirements of the training plan, students' onboard training consists of cognition onboard training and graduation onboard training. The cognition onboard training is set in the 5th semester and lasts for 4 weeks, which is the student's first sea training and an important practical teaching link for students to know about ships, oceans and navigation. During the cognition onboard training, the teaching arrangement is conducted in accordance with the requirements of the cognition onboard training report, and students take turns to practice on the ship in batches, each batch is divided into four groups and they take turns on duty, as shown in table 1. The graduation onboard training is set in the 8th semester and lasts for at least 17 weeks, which is an important practical teaching link for students to further understand the ship business, supplement and consolidate the professional knowledge learned in class, and write the graduation thesis. As most of the graduates will have practice training in the shipping company after signing a contract with the company, motor vessel YU KUN only undertakes the graduation onboard training for some students who are recommended for admission to postgraduate candidates. During the graduation onboard training, the teaching arrangement is in accordance with the requirements of the graduation onboard training report. As the cognition onboard training, in the graduation onboard training the students are also divided into four groups and rotated on duty, but the duty is longer. The onboard training report is shown in figure 2.



**Figure 2 Onboard training report for marine majors**

In addition, motor vessel YU KUN has also undertaken the cognition onboard training for onshore majors such as maritime management, rescue and salvage engineering, marine science, maritime law and English, the cognition onboard training for marine major of other universities, such as National Taiwan Ocean University, National Kaohsiung Marine University, etc., and the graduation onboard training for marine engineering (onshore majors). The cognition onboard training of onshore majors is set after the cognition onboard training of marine majors, i.e., it is from the end of the 5th semester to the 6th semester, and lasts for 1 week or 2 weeks, which is a practical teaching link for students of onshore majors to understand navigation and help them learn professional knowledge better. During the cognition onboard training, the teaching arrangement is carried out according to the requirements of the cognition onboard training report, which is similar to that of marine majors, but the time on duty is relatively short. The graduation onboard training of marine engineering (onshore majors) is set in the 8th semester, and lasts for 2 weeks, which is an important comprehensive practical teaching link for students to get familiar with ship machinery equipment, collect graduation thesis materials and prepare for writing graduation thesis. During the graduation onboard training, the teaching arrangement is carried out according to the requirements of the graduation onboard training report, which is also similar to that of marine majors.

**Table 1 Watchkeeping arrangement of onboard training for marine majors**

Duty-hour Shift Major	0-4 o'clock	4-8 o'clock	8-12 o'clock	Designated time
	Nautical Science	Second Officer	Chief Officer	Third Officer
Marine Engineering	Third Engineer	Second Engineer	Fourth Engineer	Cook Helper
Marine Electronic and Electrical Engineering	Second Officer/ Third Engineer	Chief Officer/ Second Engineer	Third Officer/ Fourth Engineer	Cook Helper/ Electrical Engineer
Note: (1)For nautical science major, interns on chief officer shift consist of two sub-groups, namely cook helper				

shift and chief officer shift. In day shift, interns learn from sailors to operate and maintain deck equipment, seamanship skills, and so on. In officer shift, interns learn from duty officers and sailors on duty how to watchkeep in the bridge.

(2) For marine engineering major, interns on marine engineer shift consist of two sub-groups, namely day shift and marine engineer shift. In day shift, interns learn from oilers to operate and maintain engine equipment, metalworking technology, and so on. In marine engineer shift, interns learn from duty engineers and oilers on duty how to watchkeep in the engine room.

(3) For marine electronic and electrical engineering major, interns are divided into eight groups, namely Third officer shift, second officer shift, chief officer shift, fourth engineer shift, third engineer shift, second engineer shift, electrical engineer shift and cook helper shift, respectively.

(4) In cook helper shift, interns assist the cook to do cooking and help steward clean dining room, etc.

(5) Practice teachers and crew members should select the appropriate time to teach interns as per the ship's voyage plan and onboard training report.

### **Organizational structure and implementation procedure of onboard training**

In order to standardize ship arrangement and management of onboard training, organizational structure of motor vessel YU KUN sets four departments, namely deck department, engine department, catering department, teaching department, which is different from other ships. The instructors involved in onboard training include the captain, crews of deck and engine department, Practice teachers and political instructors of teaching department. The practice teacher is the head of teaching department, which does not undertake the duties of the crew, but mainly responsible for the ideological and political education, daily life and management of interns.

The total practical process should be managed and implemented, including plan, preparation, guidance and assessment<sup>[7]</sup>. The implementation procedure of the onboard training is shown in figure 3.

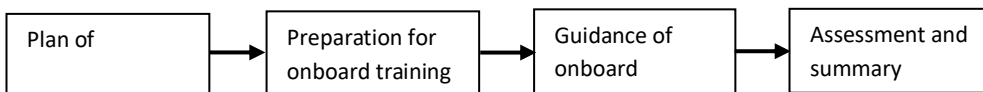
(1) Plan of onboard training: the experimental practice division of academic affairs office of the university is responsible for compiling the onboard training plan; Practice teachers are in specific charge of implementing this plan.

(2) Preparation for onboard training: Interns' college (department) is responsible for compiling the onboard training report, and appointing practice teachers, political instructors and crews. Hospital of the university is responsible for appointing the doctor. The ship management company of the university takes charge of ensuring shipping schedule and time of onboarding training, and appointing other rating crew members. Experimental practice division of academic affairs office is responsible for issuing certificates and supplies related to onboarding training, and sending students to motor vessel YU KUN and taking them back to the university. Division of international cooperation and exchanges is responsible for handling the documentation of students in marine major of other universities. Student affairs office is in charge of providing a

list of interns. Finance office is in charge of checking and issuing internship fees.

(3) Guidance of onboard training: Practice teachers onboard shall be responsible for the students' safety and environmental protection education, make detail teaching arrangements as per the onboard training report, organize and coordinate the total internship process, and guide the students to complete the onboard training report and evaluate the students' performance. Political instructors are in charge of the ideological and political education and daily life management of interns, and assisting practice teachers to ensure the normal operation of the training plan. The doctor is responsible for the health education, health care, and injury treatment of crews and students. Crew members ensure the normal operation of the ship and cooperate with the teaching department in the guidance and assessment of onboard training.

(4) Assessment and summary: At the end of the training, practice teachers and crews should assess the students' performance, in addition, practice teachers summarize the training through feedback from crews and students for improving the management of onboard training.



**Figure 3 Implementation procedure of the onboard training**

### **Key points of teaching management of onboard training**

Onboard training in motor vessel YU KUN not only improves the theoretical teaching in classroom, which cannot present the actual work on board better, and is of great significance to the quality of maritime education, but also has been well recognized and accepted by State Oceanic Administration, Maritime Safety Administration, shipping companies and associations, universities and the public, etc., and the honors are such as China Marine Research Vessel, China Maritime Training Vessels and Science Education Base of CIN. The achievements of onboard training in motor vessel YU KUN are related to the following key points of teaching management.

#### **(1) Formulating teaching management regulations**

Teaching management is a process in which the manager makes the teaching activities reach the established talent training objective through certain management means. Teaching management regulations can make teaching management standardized and scientific, and also maintain normal teaching order, improve teaching efficiency and ensure the improvement of teaching quality. For ten years, teaching management of onboard training in YU KUN has improved continuously. For example, in accordance with the requirements of Rules for Management of Crew Training, Rules for Quality Management of Crew Education and Training, Provisions on the Student Administration of Colleges and Universities, and so on, Dalian

Maritime University developed some management documents involving the qualification and responsibility of practice teachers, the requirements of onboard training and the like, throughout the whole process of onboard training, such as Administrative Measures of Students' Practice, Administrative Measures of Students' Onboard Training in Marine Major, Students' Discipline in Training Ship, etc., which connected various factors of the teaching system as a whole to ensure that the implementation of practical teaching activities was in order, standardized and efficient.

**(2) Compiling the onboard training plan**

According to the requirements of the training program, the experimental practice division of academic affairs office is responsible for compiling the onboard training plan. This plan should meet the mandatory requirements of international conventions and domestic legislation related to maritime education and training, and take full account of the characteristics of the major and the objectives of the training. According to the onboard training report and the ship's voyage plan, practice teachers formulate the specific arrangement of onboard training. If the voyage plan is changed temporarily, the corresponding teaching arrangements is revised. The teaching arrangement of cognition onboard training and graduation onboard training for nautical science major is shown in table 2 and table 3, respectively. Comparatively speaking, the shift of graduation onboard training is longer than that of cognition onboard training, but they both follow the shift of chief officer, second officer, third officer, day shift and chief officer in order, which may reduce the chaos of students' biological clocks caused by shift work.

**Table 3 Teaching arrangement of graduation onboard training for nautical science major**

Group Week	Group 1	Group 2	Group 3	Group 4
Week 1 to Week 2	Chief Officer	Second Officer	Third Officer	Day Shift
Week 3 to Week 4	Second Officer	Third Officer	Day Shift	Chief Officer
Week 5 to Week 6	Third Officer	Day Shift	Chief Officer	Second Officer
Week 7 to Week 8	Day Shift	Chief Officer	Second Officer	Third Officer
and the like	...	...	...	...
Note: According to the requirement of the syllabus in onboard training report and the ship's voyage plan, practice teachers and crew members give lessons during off-hours.				

**(3) Writing onboard training reports**

Onboard training reports, which are compulsory files, are not only the guide book for students to participate in onboard training, but also the basis for practice teachers to assess the students' performance. Cognition onboard training report involves syllabus, assignment, diary,



professional skills, summary, and so on. Graduation onboard training report involves syllabus, assignment, translation of English professional materials, diary, professional skills, summary, and so on. The syllabus is similar to the syllabus for the course which is taken in classroom, and include the purpose, requirements, basic teaching arrangements and assessment standards of onboard training, The assignment should be designed according to the situation of the training ship, the characteristics of the training, students' cognition of professional knowledge and requirements of the training, and is emphasized on the practice ability. Translation of English professional materials is used to exercise students' mastery of professional English and improve their professional knowledge. Practice content of graduation onboard training report is more comprehensive of higher demand for professional knowledge than that of cognition onboard training report.

#### (4) Writing onboard training textbooks

In order to help students master the knowledge of onboard training, facilitate students to complete the assignment and obtain more systematic professional knowledge, onboard training textbooks for Marine majors should be written according to the onboard training reports. The content of the textbook meets the requirements of the syllabus and the plan of onboard training, such as the textbook Ship Cognition Onboard Training is suitable for the interns in nautical science and other onshore majors; the textbook Marine Engineering Onboard Training is suitable for the interns in marine engineering, marine electronic and electrical engineering and other onshore majors. Those books should be written in accordance with the actual situation of training ship YU KUN, which make interns' learning more targeted, in addition, practice teachers and crew members arrange the training according to the content of the textbook to avoid teaching and learning with blindness and randomness<sup>[8]</sup>. In the library of training ship YU KUN, there are many teaching materials and reference books. Practice teachers and crew members should adhere to people-oriented and comprehensive development view, and pay attention to the knowledge how to transform into the ability and internalize to students' good quality in the process of education<sup>[9]</sup>.

#### (5) Appointing and developing instructors

In order to ensure the quality of onboard training, the instructors appointed in the practice should love education, and have sea service, professional knowledge, qualified ideological quality and strong sense of responsibility. For instance, the captain should be a "double-qualified" teacher with rich sea experience; Crews in deck department or engine department are also "double-qualified" teachers; Practice teachers are "double-qualified" teachers and hold the certificate of competency of second officer, second engineer or electro-technical officer or higher

level; Political instructors may be engaged in ideological and political work or "double-qualified" teachers. The developing of teachers is the key to improve the quality of education. Generally, formulating teaching management regulations, taking incentive measures and arranging educational teaching theory and professional knowledge learning can be used for developing instructors. For instance, the post responsibilities and teaching requirements shall be formulated; A systematic study of the situation of the training ship and post responsibilities is made for instructors before taking the job; Instructors discuss the situation of training on board together in time; The title assessment policy of teachers encourage instructors to participate in training on board, so as to improve the enthusiasm of teachers and stimulate their sense of responsibility.

#### (6) Establishing assessment and feedback mechanism

Practice assessment is an important method to check the effect of onboard training. There are many assessment methods, including assessing the assignment, diary, daily performance, professional skills, etc., but avoid the paper-based examination used in theory teaching. Practice assessment of professional skills may involve the operation of instruments and equipment, the use of charts, the familiarity of nautical publications, translation of English professional materials, the listening and speaking of professional English, and so on. Assessment forms may be spot operation, emergency treatment, live conversations, etc. Practice assessment should fully reflect the students' discipline, professional knowledge and professional skills. Feedback mechanism can be used to reflect the learning effect to the teachers in the practice, so that the teachers can improve the teaching management method in time. Feedback mechanism may run through the whole process. There are some feedback forms, such as setting up message box, face-to-face talk, group discussion, doing the questionnaire, gathering summaries in the onboard training report, etc.

#### **Conclusion**

Motor vessel YU KUN of Dalian Maritime University is a specialized training ship, which has accumulated rich experience about students' onboard training, established relatively completed teaching management method and played a key role in maritime education and training in China, which is worthy of reference for maritime colleges and universities. Specialized training ship is specially provides the onboard training for students and does not undertake the cargo transportation. Onboard training is an important part in maritime education and training, which may directly affect the quality of teaching. Therefore, in order to improve the practical ability of the future crews, it is necessary to strengthen the onboard training. Students' onboard training should follow certain rules, it is important that constantly exploring new ideas from teaching

management is used for carrying out the teaching reformation.

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## **The Problems Encountered by Navigation Cadets at Sea Training Phase as a Part of their Academic Programme**

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### **Abstract**

Vocational education for seafaring officers is a long process. During this period, the educational programs proceed within a periodical improvement framework. Sea Training is an integral part of Maritime Education and Education (MET) and it is a part of academic program in the MET institutions. All seafaring officers should complete at least one year duration sea training on board the ships to finalize their education. This training should be completed suitable commercial vessels and specially designed training ships. Initial evaluation of sea training are made by the ships which the cadet attended and the maritime schools made the final assessment to verify their achievement at sea training.

Practical training is an absolute must for every type of seafarer's education. The aim is to consolidate the academic knowledge taught and practical experience gained at sea. So, on the practical side of the curriculum, sea training comes into prominence during maritime education and that is what we discuss in this study.

The main purpose of this research is to pinpoint the main problems encountered by cadets during their sea training phase, and make some suggestions for possible solutions to ensure quality and efficiency of the training.

The study starts with a group study base on field study, to define the hypothesis is for questions of questionnaire for cadets participated sea training. The evaluation of the responds are used to finding and subsequently results and proposals.

In addition, we strongly suggest that the collected data and provided findings in this project are taken forward for further studies on this subject. .

**Keywords:** Sea Training, Practical Training, Maritime Education and Training, SEducation of ea Cadets

### **Introduction**

Practical training is an absolute must for every type of seafarer's education. The aim is to consolidate the academic knowledge taught and practical experience gained at sea. So, on the practical side of the curriculum, sea training comes into prominence during maritime education and that is what we discuss in this study.

Vocational education for seafaring officers is a long process. During this period, the educational programs proceed within a periodical improvement framework. Sea Training is an integral part of Maritime Education and Education (MET) and it is a part of academic program in the MET institutions. All seafaring officers should complete at least one year duration of sea training on board the ships to finalize their education. This training should be completed suitable commercial vessels and specially designed training ships. Initial evaluation of sea training are made by the ships which the cadet attended and the maritime schools made the final assessment to verify their achievement at sea training.

It should normally be conducted in two parts; while First Phase is for becoming an able seaman, Last Phase is for navigational engineers to practice their vocational knowledge and abilities. Academic education and sea training may overlap. As the very essential vocational knowledge is provided in the last period of academic education program at collage, the most difficult challenge is to match sea training phases and academic education program.

The main purpose of this research is to identify the main problems encountered by cadets during their sea training phase, and make some suggestions for possible solutions.

The common findings on the main problems encountered by cadets during sea training are identified in the previous researches are as follows; Overload and unbalanced working on board ,Not having enough options to arrange a more suitable ship for sea training, Not having enough maritime knowledge provided by schools before going to sea training ,Difficulties met in completing the training portfolio, Insufficient oral English skills, Need for a special training ship

When we stress on the importance of the sea training, we should also realize that there are many risks and difficulties in maritime sector. It means that today officers and ratings are expected to have required academic knowledge and practical ability simultaneously. This serious challenge can only be overcome by college type education. Whilst cadets have to familiarize themselves with ship and sea very well. The standard of judgment of a cadet could only improve by knowledge and experience, for example by deciding what to do correctly and fast due to weather conditions that can change any time. This is not possible learning through

schemas, drawings and even photos. In this respect, sea training clearly sets forth its importance.

## **Methodology**

The aim of this research is to pinpoint the main problems encountered by cadets during their sea training phase, and make some suggestions for possible solutions to ensure quality and efficiency of the training.

Initial evaluation of sea training is made by the ships which the cadet attended and the maritime schools made the final assessment to verify their achievement at sea training. The assessment of the schools is actually verification of success of sea training based on the records approved by ship officials and a verbal interview to prove all the facts in portfolio by maritime lecturers.

There is no possibility to reach the results of sea training in order to get more detailed information except the record on the portfolios made by ship master and ship training officers. In order to reach more reliable finding, it is intended to make a survey covering a reasonable number of cadets. The main purpose of this survey is to pinpoint the main problems encountered by cadets during their sea training phase directly from the trainees.

The study starts with a group study base on field study, an expert group study to define some visible facts and the hypothesis is for questions of questionnaire for cadets participated sea training. The findings of expert groups and evaluation of the responds are used to define finding and subsequently results and proposals to ensure quality and efficiency of the training

The collected data and provided findings in this study may be taken into account for further studies on Maritime education and training (MET).

## **Research**

### **Field study**

#### **The basis of Maritime Education and Training**

The International Maritime Organization (IMO)'s international convention on Standards of Training, Certification and Watch-keeping for seafarers (STCW-78/2010) ratified by all maritime nations, regulates the principals and standards of Maritime Education and Training (MET). The education and training programmes which meet the requirement in the STCW have been clearly defined by IMO Model Courses. IMO Model Courses 7.01, 7.02, 7.03 and 7.04 covers all details of operational and managerial level deck and marine engineering education. In line with these

model courses, ISF (International Shipping Federation), representing maritime industry, has published structured Sea Training programmes. The ISF recommended programmes have been accepted as a base line and approximately all maritime administrations submitted their sea training requirements with very small modifications.

The inherent needs of modern navigation require the MET to provide both education and training. Education means to give students or trainees the theoretical knowledge by means of lecturing and instructing, which could be done on a campus or on board ship. Training means to develop students or trainees' practical skills, which can be accompanied through the organisation of workshops, simulator training, and on board training (Wein, 1999).

New and on-going developments in the shipping industry, year-to-year place increased compliance requirements on MET institutions and in turn additional demands on the students who must carry out their applications in practical settings. (Demirel and Mehta, 2009).

Nowadays on the job training become rather important to improve the practical knowledge and the skills of the students in particular for the jobs directly related to use of the equipment to achieve their mission such as engineering. On the job training will also help the students to get familiarized to their future work places. Understanding this situation the education and training institutes should pay more attention to on-the-job training. That means they should prepare better on the job training guidance and produce procedures to conduct an effective on the job training (Demirel and Bayer, 2015).

### **Programme design philosophy for seafaring officers**

The Navigation Engineering) programmes in the faculties are generally planned in five phases;

- First Academic Phase is designed to introduce and address the main aspects of Seamanship, Navigation and Navigation Watch including mathematics and science units which provide a foundation for engineering education.
- First Sea Training Phase is generally conducted to equip them with able seaman skills and 3-4 months.
- Second Academic Phase covers the mathematics and science courses to enable them to continue with the "Ship Construction, Ship Stability, Cargo Handling and Advance Navigation" courses which knowledge and skills acquired in this phase. The "Second Phase" systematically progresses to fulfil the requirements necessary for taking-on higher level complex responsibilities in Navigation Engineering shipboard activities.

- Second Sea Training: It is intended to arm cadets with Officer of the Watch knowledge and skills and is expected to be conducted on board of capable and qualified ships for 7 to 8 months.
- Third Academic Phase: The advanced maritime studies such as Maritime Economics, Port Operations, Safety Management, Risk Management, and Logistics Management, for future professional progression on the maritime business and academic development are included in are delivered in this phase.

### **Sea training system in different countries**

Soon et al (2010) made a study on sea 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. SWOT 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.

Yoon and Ko, (2012), introduced a paper at Third Maritime Education Summit - Texas A&M on "Maritime training and education on-board training ships are compared among the maritime colleges in Asia including China, Japan and South Korea". By comparing the education and training these college offers, this paper shows differences of training and education on-board the training ships, accordingly. Their main proposal focused on the improvement of methods for sea training and essential issues for use of training ships.

### **The current projects on MET**

European Union Seventh Framework Programme (FP7) plays a crucial role in reaching the EU goals of growth, competitiveness and employment. FP7 encourages the cooperation between partners in particular on Transfer of Innovation and best practises in other countries. Although many MET related EU projects is initiated to reach this goal, but unfortunately there is not a project on the improvement of sea training.

### **Relation between MET institution and shipping company**

From an institute's point of view, the program should be capable of meeting the requirements of the position on board. The institute needs to understand more about shipping companies, ship-operation practice and seamanship, etc. while a shipping company can design training



programs according to a trainee's level (knowledge basis and skills mastered) and requirements of the job. In this case, refreshment should be brought into line to avoid unnecessary overlap. So these two organisations are two facets of one thing, in that they should connect and co-operate become competent, and the aim of safer ships and cleaner oceans will be realised (Shen, 1999).

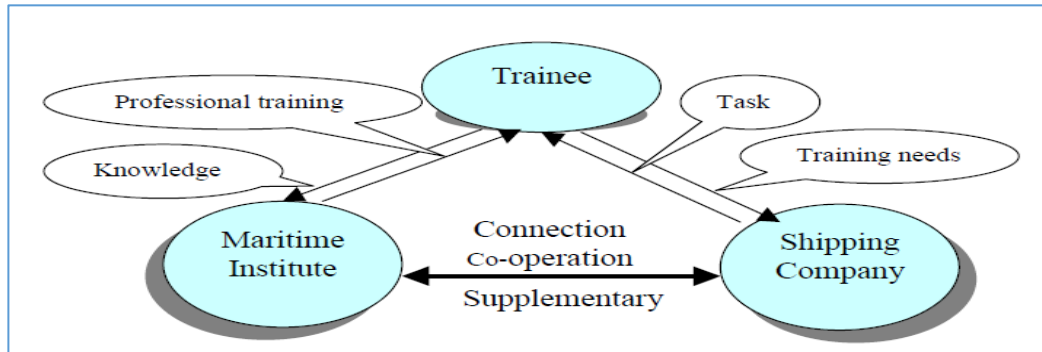


Figure 1: Linkage between a MET Institute and a Company (Source: Shen, 2019)

It is clear that there is not a good cooperation and coordination between MET institutes and shipping companies which both of them are important for the success of the sea training. So these two organisations are two facets of MET, in that they should connect and co-operate become competent to ensure the quality education and training.

### Group study

A group has established by 5 maritime lecturers who are all masters and served as maritime lecturer at least since 10 years. The group members are also doing the verification of the end of sea training and making overall academic assessment.

Firstly the group has studied on the completed sea training portfolios. The content of portfolios are in line with ISF (2012) recommended portfolio. Assessment of 86 portfolios are checked by the group members. As far as concerning the evaluation of the portfolio, the average of the Masters' Evaluation is 89.2/100 as the verifiers' assessment grade was 81.4/100. The master's evaluation is found highly optimistic.

The resume of field study is introduced to the group members at the beginning of the group study. The following issues are found as main problem areas during sea training as a result of the previous experience of the participants.

- Work overload: Some of the cadets are accepted by companies as not only trainees but also rating. These enforce cadets not to make training but also doing responsible crew member jobs.

- Difficulties in completing the training portfolio: There is not a sufficient support from ship crew to give help the cadets to fill their portfolios.
- Not having enough background before the training: There are some differences between information delivered in the schools and competencies on board specific ships. It is impossible to provide sufficient knowledge on specific types of the ships. The cadets may be delivered generic knowledge at the schools and cadets may learn specific information types of the ships such as LPG/LNG, chemicals, Ro-Ro etc.
- The cadets are not having enough options to arrange a more suitable ship for sea training: Some ships such as operating in inner waters or short sea liners are not suitable to meet all requirements of sea training. But due to lack of sufficient number of ships to cover huge number of cadets, some cadets go sea training on board of these under-qualified ships.
- Insufficient English oral skills: Most of the cadets expresses that all the documents are English but their language skills are not sufficient to follow it. In particular they have had problems in oral skills.

The group has defined 8 hypotheses to be tested and evaluated with a questionnaire. These hypotheses have been provided in the sub-paragraph 3.3 and not to be mentioned here to avoid repetition.

### **Survey results and analysis:**

The survey is based on the hypotheses defined by expert groups. It is aimed that the survey should cover at least half of total of a number of cohort minimum a cohort. The names of the cadets are asked optional to allow them to express their opinion freely.

### **Participants:**

The questionnaire covers 24 questions supporting 9 hypotheses. The 69 cadets at the final year were participated. This is approximately %76 percent of total final year students (103) and number of the participant of survey is sufficient and reliable for evaluation. The gender is not important for the hypothesis of survey and is not counted.

### **Type of the ship where the students have sea training:**

The distribution is shown as percentage:

Container: 17 %	Bulk Carrier: 29%	Tanker: 36%	LPG-LNG: 0%	Ro-Ro:7 %
Cruise Ship: % 0	Other types: 11%			

The students who are also sailed on Training ship: %11

Taking into account ship types of Turkish-owned fleet (Container: 16%, Bulk Carrier: 35% Tanker: 29% Ro-Ro: 7% LPG-LNG: 3% Other types: 10%). Distribution of students on board the ships it is in line with the composition of the fleet.

### ***Duration at sea training?***

Between 1-6 months: 50%      Between 6-8 months: 35%      Between 8-12 months: 15%  
50% percent of the cadets stayed at sea between 6 to 12 months and at least half of the cadet are fully eligible to make an assessment.

### ***Nationality of crew on-board?***

All Turkish: 69%      All non-Turkish:0%      Mostly Turkish: 15%      Mostly non-Turkish:16%  
That shows 69% has not experienced language and cultural problems. None of the cadets served (Mostly Turkish: 15%      Mostly non-Turkish:16%) reported language and cultural problems in the following parts of survey.

### **Hypothesis**

#### **H1: Finding a training ship is not easy**

#### ***How did you manage to find a ship to go sea training?***

By your own efforts: 51%      With assistance of school 18%      With help of a friend: 6%  
With help from your family: 22%      With help from a society: 3%      Other: 0%  
Half of the students find a training ship by own efforts that means they are able to find ship by their own efforts. 22% find ships with help from your family because mostly a quarter of the cadets are coming from maritime industry. The assistance of school is low (18%).

***H1 is proved.***

#### **H2: School does not provide sufficient background before how to complete the portfolio before sea training**

#### ***Did your school inform you adequately understand how to complete the portfolio before sea training?***

Yes: 31%      No: 22%      Not adequately: 47%  
69% of the cadets expressed that school does not provide sufficient information about preparation of portfolios. This subject should be considered.

***H2 is proved.***

**H3: The deployment of cadets in different post during sea training is reasonable.**

***How do you rate your tasking during sea training?***

a) Bridge Watch: 44 %      b) Maintenance: 38%      c) Study: 18%      d) Other: 0%

Tasking of cadets is reasonable taking into account ship routine.

***How drills been carried out on your ship?***

Yes, periodically: 56%    Yes, generally: 25%    Yes, partly: 13%    Not conducted: 6%

Drills are conducted generally or periodically except a few ships which are reluctant.

***Please specify your role when attending anchoring and mooring operations?***

	Always (%)	Sometimes (5)	Never (%)
As helmsman	16	64	20
On Forecastle deck	17	71	12
On Poop deck	14	75	11
As Junior OOW	17	60	23

Anchorage and mooring are distinctive operations on board. If the student attendance in critical positions during these operation is evaluated, it is understood that ships are deployed the students in a reasonable form.

**H3 is proved**

**H4: The major problems encountered are not to get trained properly and too much work on board.**

**Assessment of the biggest problems which anchoring and mooring operations a cadet faces when on sea training?**

Insufficient pocket money: 15%      Not enough opportunity to get trained properly: %37

Personal problems (not being able to get along well with the others): 3%

Not being able to complete sea training portfolio properly: 3    Accommodation Problems: 3%

Health problems: 1%    Too much work to do: 29%    Other (Specify): 6%

63% of the cadets believe they get proper training. 29% of cadets believe that they have much work to do. Actually there are some ships which are not suitable for sea training in particular ships sailing near distance such as Black Sea and Marmara Sea lines. Some of the cadets are accepting to work as a rating with a little payment or companies accept the cadet on boards if they accept to work as a rating. This is the real reason which creates access work load and reduce the effectiveness of training.

***H4 is proved.***

### **H5: Satisfaction of cadets from sea training is well**

#### ***How do you rate the benefits you've gained from your sea training?***

Very much: 23 %      Satisfied: 47%      Average: 25 %      Not much satisfied: 9%      Not satisfied: 0%

Most of the cadets are satisfied from sea training.

#### ***How do you feel that you are ready to go sea duty after this sea training?***

Fully ready: 14%      Ready: 24 %      Ready except some respects: 60%      Not fully ready: 2 %

Most of the cadets feel that you are ready to go sea duty after this sea training

***H5 is proved.***

### **H6: Support of ship officer and crew is not sufficient**

#### ***From whom did you get the most assistance on your training?***

Captain: 8%      Chief Officer: 63%      Chief Engineer: 0%      2nd/3rd Officer: 23%      Bosun: 2%

The C/O contribution is good. 2nd/3rd Officers also provide sufficient. Master's contribution is low and no participation of Chief Engineer in training. Bosun is important for seamanship training but it is also very low.

#### ***How do you rate the captain's behaviour towards you and your studies?***

Very satisfied: 12%      Satisfied: 23 %      Neither satisfied nor dissatisfied: 61%      Dissatisfied: 4 %

#### ***How do you describe the captain's behaviour towards you and your studies?***

- a) He was always helpful and supervised my studies: 30%
- b) He was trying to be helpful but did not have enough time: 45%
- c) He was impartial to me: 7 %
- d) He disliked and ignored me: 3 %
- e) He had nothing to do with me: 12 %
- f) He developed a hostile behaviour towards me: 3 %

Unfortunately Ship Masters support of sea training is generally very unsatisfied.

#### ***How do you rate the overall performance of the ship's officers towards your training?***

Very satisfied: 59%      Satisfied: 21 %      neither satisfied nor dissatisfied: 20 %      Dissatisfied: 0 %

General Assessment of the support of crew is good in particular C/O. But there is a significant issue that ship masters are very reluctant for cadet's sea training.

***H6 is partly proved***

### **H7: Cadets view on sea training is positive**

#### ***What would you wish? (You may choose more than one option)***

- a) I wish I had never gone sea training as a cadet: 8%
- b) I wish I had given more information about program before sea training: 26%
- c) I wish I had studied more and understand more about ships before sea training: 24 %
- d) I wish I was given more options to find a better ship for sea training: 21 %
- e) I wish I had studied and practiced more in English: 21%

50 percent of the students are agree that they should studied more and understand more about ships before sea training as well as they have been given more information about program before sea training:

#### ***How important you think the sea training is for your career as a merchant ship officer?***

Indispensable: 27 % Very important: 58 % Important: 15 % Not necessary: 0%

The cadets believe that sea training is very important for their career.

#### ***H7 is proved***

### **H8: School support of sea training is not sufficient**

#### ***On what matter might your school have provided more assistance for you? (choose more than one option)***

- a) Should have provided more information on Maritime English matters: %15:
- b) Should put more stress on practical shipboard operations: %15
- c) Should have provided more on fundamental courses (physics, mathematics): 4%
- d) Should have prepared us better before the sea training: 34%
- e) Has nothing more to do (satisfactory): 6%

#### ***How do you rate your schools' support for you during training ship?***

Very satisfied: 3 % Satisfied: 30 % Neither satisfied nor dissatisfied: 40 % Dissatisfied: 18 %

#### ***How do you rate your English skills when as a cadet on-board?***

Very satisfied: 28% Satisfied: 48% Neither satisfied nor dissatisfied: 49% Dissatisfied: 0 %

It is understood that there are some problems on the schools activities to prepare cadets for sea training as well as students express that they need school's support to find a suitable ship for training.

#### ***H8 is proved***

### **H9: There is a need for training ship**

### ***How do you rate the schools' need for its own training ship?***

A must: 24 %   A necessity: 24 %   Nice to have: 45 %   Not necessary: 5 %   A total waste: 2 %

The half of students believe there is a need for training ship as m believes half of the n students believes not.

***H9 is proved***

### ***Overall Assessment***

All these findings are collated and some of them are associated to be discussed in the discussion section. There is not any other specific comment by the cadets.

### **Discussion**

#### **a. Work overload:**

Some of the cadets are accepted by companies as not only trainees but also rating. These enforce cadets not to make training but also doing responsible crew member jobs. This was an approach to facilitate the finding a training ship for the cadets. But unfortunately it has been misused by some ships. Maritime Administrations should take measures to prevent from this type of misuses.

The students had difficulties in completing the training portfolio in particular the cadets were deployed as ratings. There is not a sufficient support from ship crew to give help the cadets to fill their portfolios.

#### **b. Not having enough background before the training:**

There are some differences between information delivered in the schools and competencies on board specific ships. It is impossible to provide sufficient knowledge on specific types of the ships. The cadets may be delivered generic knowledge at the schools and cadets may learn specific information types of the ships such as LPG/LNG, Ro-Ro etc.

#### **c. The cadets are not having enough options to arrange a more suitable ship for sea training:**

Some ships such as operating in inner waters or short sea liners are not suitable to meet all requirements of sea training. But due to lack of sufficient number of ships to cover huge number of cadets, some cadets go sea training on board of these under-qualified ships.

Half of the students find a training ship by own efforts that means they are able to find ship by their own efforts. 22% find ships with help from your family because mostly a quarter of the cadets are coming from maritime industry. The assistance of school is low (18%).

**d. Insufficient English oral skills:**

Most of the cadets expresses that all the documents are English but their language skills are not sufficient to follow it. In particular they have had problems in oral skills. The cadets rating their English skills as a cadet on-board: Very satisfied: 28%, Satisfied: 48%, Neither satisfied nor dissatisfied: 49%, Dissatisfied: 0 %. It is understood that there are some problems on English language skills gained at the schools to prepare cadets for sea.

**e. The deployment of cadets in different post/positions during sea training:.**

Anchorage and mooring are distinctive operations on board. If the student attendance in critical positions during these operation is evaluated, it is understood that ships are deployed the students in a reasonable form. Drills are conducted generally or periodically except a few ships which are reluctant.

**e. The major problems encountered by cadets.**

Insufficient pocket money: 15%, Personal problems (not being able to get along well with the others): 3%, Not being able to complete sea training portfolio properly: 3 Accommodation Problems: 3%, Health problems: 1%, Other (Specify): 6%. As a result of Pareto Analysis Not enough opportunity to get trained properly (%37) and "too much work to do (29%) are the major problem areas.

**f. The quality of training:**

63% of the cadets believe they get proper training. 29% of cadets believe that they have much work to do. Actually there are some ships which are not suitable for sea training. Some of the cadets are accepting to work as a rating with a little payment or companies accept the cadet on boards if they accept to work as a rating. This is the real reason which creates access work load and reduce the effectiveness of training.

Rating benefits gained from your sea training; Very much satisfied: 23 %, Satisfied: 47%, Average: 25%, Not much satisfied: 9%, Not satisfied: 0%. Most of the cadets are satisfied from sea training.



Student feelings that they are ready to go sea duty after sea training; Fully ready: 14%, Ready: 24%, Ready except some respects: 60%, Not fully ready: 2 %. Most of the cadets feel that you are ready to go sea duty after this sea training

**g. Support of ship officer and crew:**

The C/O contribution to cadets is good and 2nd/3rd Officers also sufficient. Master's contribution is low and no participation of Chief Engineer in training. Bosun is important for seamanship training but it is also very low.

The captain's behaviour towards cadets and their studies; 30% says he helpful and supervised my studies, 45% says he was trying to be helpful but did not have enough time, 12 % says he had nothing to do with me, 7 % says he was impartial to me. General Assessment of the support of crew is good in particular Chief Officers. But there is a significant issue that ship masters are very reluctant for cadet sea training.

**h. Cadets view on sea training is positive** 50 percent of the students are agree that they should studied more and understand more about ships before sea training as well as they have been given more information about program before sea training:

The students' assessment the importance of sea training is for your career as a merchant ship officer; Indispensable: 27 % Very important: 58 % important: 15 %

The cadets believe that sea training is very important for their career.

**i. School support of sea training is not sufficient**

On the school support to sea training half of the cadets needs more support from the school on sea training in particular practical shipboard procedures and maritime English.

Additionally establishment of an online Sea Training Support system by the university will be useful to assist the cadets to solve their problem at sea training. . On- line Sea Training System of Nautical Faculty of Barcelona. (FNB) could be a good example for this application

**j. Need for training ship**

The half of students believe there is a need for training ship as m believes half of the n students believes not.

**k. Assessment of Sea Training:**

As far as concerning the evaluation of the portfolio, the average of the Masters' Evaluation is 89.2/100 as the verifiers' assessment grade was 81.4/100. The difference is over 10 percent and master's evaluation is found highly optimistic. A better master evaluation system should be created to reach a more realistic evaluation.

### **I. Relation between MET institutes and Shipping Companies**

It is clear that there is not a good cooperation and coordination between MET institutes and shipping companies which both of them are important for the success of the sea training. So these two organisations are two facets of one thing, in that they should connect and co-operate become competent on the sea training.

### **Conclusions**

#### **a. Not having enough background before the training**

Although ISF Sea Training Portfolio is prepared in line with IMO Model Course 7.03 there are some differences between information delivered in the schools and competencies require practical application on board. Ship masters/officers has an opinion that school does not provide sufficient information for on-board application as well as the students. It would be suitable to make an additional study to define missing points and reflect this subjects in the MET programme as much as possible.

#### **b. Work overload**

In order to facilitate the acceptance of cadets for sea training some countries allow the companies to accept the cadets also as a rating. But this application is misused by the companies by using the cadets as seaman not cadet. This causes a condense workload for cadets which hampers their effort to achieve duties at the portfolio. Maritime Administrations should take measures to prevent from this type of misuses.

#### **c. Finding a ship more suitable ship for sea training**

Due to lack of sufficient number of ships to cover huge number of cadets, some cadets go sea training on board under-qualified ships. The efforts of schools is not sufficient to find suitable ships for cadets. To ensure the quality of sea training Maritime Administration review their regulation to facilitate finding better quality of ships for training.

#### **d. Insufficient English oral skills**

Unfortunately English language skills of cadets are not sufficient to accomplish requirement in the STCW in particular oral skills. The maritime schools should give more emphasis to English language.

**e. The deployment of cadets in different post/positions during sea training:**

Deployment of students at different posts is suitable except a few ships. But it is understood that some ships are not conducted the drills as required which create a negative impact for training

**e. The major problems encountered by cadets**

As a result of PARETO analysis two major problem areas reported by the cadets are "too much work to do (29%) and "not enough opportunity to get trained properly (%37)". The possible reason for too much work is deployment of cadets also as rating. Explained in the paragraph 5b (Work Overload). This situation also hampers the activities should be done during sea training. It also hampers deployment opportunity as Junior Officer of the Watch duties which requires to be completed during the second phase of sea training

**f. The quality of training:**

Approximately 2/3 of cadets believes that they get proper training. 1/3 of cadets believes that some additional measures should be taken to ensure the quality.

Most of the cadets satisfied from sea training and they are ready to go sea duty after this sea training.

**g. Support of ship officer and crew**

The support of crew is good in particular Chief Officers. But there is a significant issue that ship masters are very reluctant for cadet sea training. Bosun is important for seamanship training but it is also very low.

**h. Cadets view on sea training is positive**

50 percent of the cadets are agree that they should studied more and understand more about ships before sea training as well as they have been given more information at the school before sea training. 85 percent of the cadets believe that sea training is very important for their career.

**i. School support of sea training is not sufficient**

Students express that they need school's support for more information on Maritime English and practical shipboard operation matters. Additionally establishment of an online Sea Training

Support system by the school will be useful to assist the cadets to solve their problem at sea training.

#### **j. Need for training ship**

The half of students believe there is a need for training ship as m believes half of the n students believes not.

#### **k. Assessment of Sea Training**

As far as concerning the evaluation of the portfolio, the average of the Masters' Evaluation is 89.2/100 as the verifiers' assessment grade was 81.4/100. The difference is over 10 percent and master's evaluation is found highly optimistic. A better evaluation system should be created to get more realistic evaluation from the ship masters.

#### **l. The relation between MET institution and Shipping Companies**

It is clear that there is not a good cooperation and coordination between MET institutes and shipping companies which both of them are important for the success of the seat training. So these two organisations are two facets of one thing, in that they should connect and co-operate become competent, and the aim of high quality education and training.

#### **m. Final word**

Although there are some problem areas mentioned above the sea training is successful. It is strongly believed that further studies should be made on this issues to improve the quality of training such as better preparation for sea training,

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## **Bridge Resource Management Techniques as a Learning Tool for an Effective Teamwork**

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### **Abstract**

Teamwork, as a type of modern ship's organization, represents a logical and a natural connection of the ship's crew on both, management and operational level. The team status evaluation involves three parameters: identification of the roles, relationship between the team members and identification with the team organization. The three mentioned parameters of the team status could be observed through development stages such as forming, adjusting, norming and efficient performing. The knowledge about the team obtained from the evaluation parameters and stages of process could be optimized with appliance of particular methods of BRM communication techniques. Such methods are: situational awareness, challenge and response, short term strategy, cultural awareness, team state, authority and assertiveness and other. The effective learning about the teamwork could be achieved by combining teamwork development stages and some BRM techniques such as support for a better understanding of the teamwork principles on board modern ships.

### **Introduction**

The shipboard organizational and communicational hierarchy has originated from the maritime tradition of the inviolability of a higher authority with the master at the top of the hierarchical structure.

The practice of the formal master's authority and the obedient and non-resistant crew has generally endured due to the vertical ship organization and its traditional hierarchy. The drawbacks of such a management have resulted in passive, non-motivated, initiative unwilling crew and lack of management authority.

However, as a team, the crew members unite their personal skills and knowledge, which results in the optimal achievement of the common goal. This goal could not be achieved if it were based just on the coordination and not the cooperation. In addition, the cooperation would not have been achieved if the team was not qualified and trained in teamwork, communication

and the ship-crew resource management techniques. All of these techniques that can be implemented in the different stages of the team development, including the guidance technique in which the members of the team accept the authority and the leader's behaviour activates all the human resources, are the subject matter of this paper. They are also applicable during the student's education through the content of the courses dealing with the organization of the ship. Combining theory and practical exercises on the bridge simulators, students can be trained for efficient teamwork on board.

### **The stages of the team development**

The process of the team development can be identified through four stages that most teams follow to become high performing. These stages are divided into 3 common categories (Warsash, 1994: pp.12-92): The team, during its development can be assessed through four development phases that precede the final stage of the optimum team performance. We divide these phases into three common categories (Warsash, 1994: pp.12-92):

the role identification;

relationships within the team;

identifying with the team organisation.

#### **1. The role identification:**

Individuals:

Do the individuals feel as the members of the team?

Do they want to be the members of the team?

What can they do to join the team?

Authority, control and trust:

Who will have the most authority?

Will other persons have some authority?

Will other persons be heard?

Will other persons be able to contribute to the work of the team?

Will other persons be allowed to contribute?

Mutual co-operation:

Do the members of the team agree on co-operation?

Can they develop a team spirit?

## 2. The interpersonal relationships:

How will the team members of different rank react on each other?

Will the cooperation be a strictly professional one or more of a friendly one?

Will the members of the team be more open or closed in their mutual interaction?

Are the conflicts to be expected or the team members will be able to work together?

Will the team members show affection or aversion to each other?

## 3. Identifying with the team organisation:

Will the identification with a team and its goals contradict the identification with other teams on board and their goals?

Will loyalty to one team have an impact on the relationship with people who are members of other teams?

Does the co-operation with one team contradict the principles of the department to which a crew member is a part of?

The team categories mentioned above develop within four predictable development stages (Warsash, 1994: pp.12-92):

- forming stage;
- adjustment stage;
- norming stage;
- performing stage.

The forming or the research stage involves the forming of teams. The members of the newly founded team spontaneously check the limits of the acceptable behaviour. This is also a transitional stage from the role of an individual to the role of a team member as well as the



stage of checking the possibilities of formal and actual leadership. This stage includes multiple events, which makes the team performance in terms of achieving work-related goals low or non-existent. All of this is normal at the very beginning because of the excitement, doubts and anxiety regarding the mutual work expectations, the role of individuals in the team and the acceptance of the leadership.

The adjustment or "wishy-washy" stage is the most difficult one for every team. The tasks are defined. The team begins to realize that the tasks they should perform are different or much harder from their initial expectations. Conflicts on how to go forward, impatience and illusion of progress result in the withdrawal of some team members who start relying solely on their personal experience and knowledge. This, however, might lead to the lack of cooperation with others and even refusal to cooperate. At this stage, a little is done on performing tasks, and more on acquainting other members' habits and personalities.

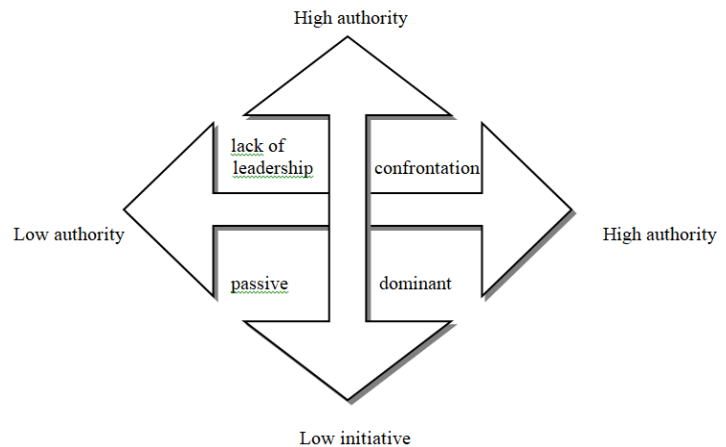
The norming or consensus stage constitutes new relationships because the team members come to accept their team. The foundations of the future cooperation are set and are based on the fact that each member of the team is an individual with his/her personal rights and habits. At this stage, any competitiveness and conflicts are resolved and competitiveness turns into collaboration. There are less emotional conflicts, which forms conditions for constructive acceptance of criticism. Mutual differences are accepted as well as belonging to the team. The decision to help other members becomes distinguishable. Norms as specific team rules and boundaries are established. More time and energy is now spent on achieving results and meeting goals. The progress becomes visible.

In the performing stage or efficiency and personal-development-stage, the mutual relationships and expectations are well established. That is the beginning of the efficient performance from the aspect of diagnosing and solving the problems, and the beginning of the contribution to the improvement. Members of the team now know and accept their mutual virtues and weaknesses, have established roles and cooperate closely with each other. Insight into individual behaviour as well as characteristics of the individual as the team member is detectable. The advantages and drawbacks of teamwork decision making can be recognized. The team members start communicating more freely and spontaneously thus making team the efficient organizational unity. They are satisfied with the team development and are aware of the personal and group progress. The possibility of preventive action as well as the rapid response in cases of emergency are made optimal.

## Implementation of the Bridge Resource Management methodology in the team development stages

### Organization or research

The organization or research stage is suitable for the implementation of the BRM –MCRM method of recognizing the relationship between authority and initiative. At this stage, it is crucial to recognize the danger of the dominant behaviour of individuals in time. In fact, because of their high initiative, they can question the Master's authority and his/her following of orders in the emergencies. In that case, we are dealing with low authority and lack of leadership. In such circumstances, the master sensing the loss of leadership with the aim of increasing the authority can start applying his/her formal authority, which can, at this stage, lead to disputes and misunderstandings.



Summarizing the possible relations between the master's authority and the crew initiative, the four basic relations can be established:

high authority – small initiative

low authority – high initiative

high authority – high initiative

low authority – low initiative

### Figure 1 Authority and initiative correlation

Source: SAS Bridge Resource Management 2000, Workshop Leader's Guide.

The crew initiative can be defined as a necessity or suggestion of individual crew members implied to each other or the authority in order to reach an optimal decision or performance.

The balancing of the master's authority and crew's initiative depends on the level of the initiative, the team maturity and the cultural background of the members of the crew. This means that during the first stage of the team's development and personal identification, the master must have the most influence on the team's work. In addition, the master must make sure that he/she will listen to the other members of the team thus allowing them to contribute creatively to the team's work.

Consequently, the balancing of the authority and team members' initiative is being carried out from the very beginning of the forming or research stage. Thus, it is possible to review the conditions for the actual and formal leadership. At this stage, it is very important that the master, in addition to the chosen leadership style, also shows the actual characteristics of the leader. This way, the master is accepted because of his/her knowledge, experience and the ability to develop the cooperation among the team members.

Therefore, it can be concluded that participation-based model has a positive impact on the

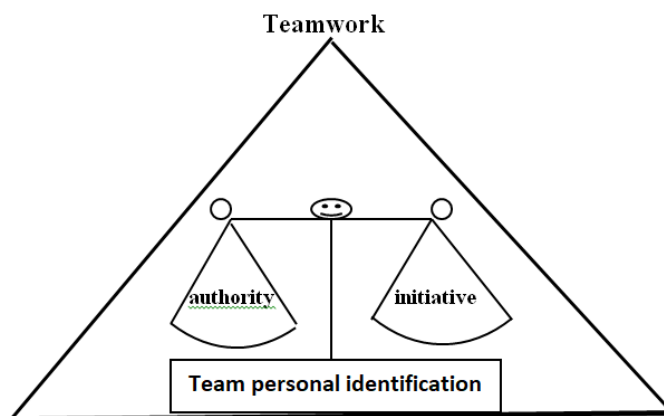


Figure 2 Authority and initiative balance

team; it encourages and motivates the team members on initiative. Respecting the master, considering his/her management style and his/her virtues, influences the level of the initiative that the certain team member will demonstrate in their work.

Source: According SAS – Oxford Maritime Crew Resource Management 2012.

## Adjusting

At this stage, it is necessary to develop the team communication so that there is no alienation and insufficient cooperation between the team members. The successful communication on board ship can be achieved by *the briefing method*. *The briefing* is applicable in all situations subject to changes and those where previous complying with the course of action is needed. The purpose of "briefing" is to achieve everything planned in the most efficient way, in cooperation with other team member and without any communication obstacles. Therefore, the guidelines or the successful briefing procedure should be followed as follows:

plan the time for a short briefing, keep the communication open and friendly, the one who has the most relevant information regarding the problem or the situation, not necessarily the master, can hold a meeting and give briefing,

to achieve briefing efficiency, the master can delegate the person who will arrange the team briefing instead of the master, two-way communication should encourage all team members to give suggestions and offer comments, at first, the problem should not be discussed in details, taking into consideration only the essential information for solving the problem or taking the course of action, upon reaching the agreement on future course of action, the discussion should end with possible additional questions.

In case that the course of action based on briefing is not successful and efficient, short analysis or debriefing of the observed irregularities should be done:

- as soon as possible,
- start from yourself and your actions,
- highlight positive and negative observations in order to avoid future mistakes,
- involve the whole team into debriefing,
- make mistake analysis more interesting,
- improve the plan for future similar activities based on the analysis made.

During this brief analysis of the observed irregularities, it is very important not to blame the individuals for their mistakes in order not to diminish the team morale and to achieve the basic goal – learning on experience and mistakes.

One of the elements that can improve communication is to predict future events taking into consideration the experience and team cooperation. However, the prediction can be dangerous if we handle the experience wrongly or get the wrong prediction. Essentially, communication is in its essence, a process influenced by our own experience. In other words, communication is mostly cognitive, not physical process although it is initially based on our senses. The information we have heard, but have not understood clearly can lead to a wrong prediction and action because we tend to correct the information according to our own personal experience.

## **Norming**

At this stage, the team is more mature and apt to cooperation. Therefore, the implementation of the BRM method "challenge and response" is fully applicable at this stage.

Challenge and response – represents a method of communication which can be applied in the third stage of teamwork development. The implementation is based on the assumption that the cooperation, coordination and open communication have already been set. The method consists of active participation of the team members during routine operations or emergencies.

In these situations, all the participants create their own scenario of the situation development by asking questions, expressing attitudes and doubts, and expecting answers to their remarks. The concept implies that one will create a personal cognitive image about the situation and assume its further development. Considering a particular situation makes one create a concept and decision that should be clear to all the participants. The idea of creating a concept is to establish boundary limits, which preliminary determine borderlines within which certain activities take place. If the course of action exceeds the boundaries, it is necessary to ask questions and to perform the check with respect to new circumstances, which have not been foreseen by the original idea. Any participant who notices a deviation from the concept can ask the question. The answer to the question or remark may confirm the new circumstances or it may lead to the change of the existing concept and creating a new one. Remarks or queries may be groundless, but retain their purpose of checking the circumstances and the existing concept. After summarizing this method, it can be said that the team communication consists of four basic elements:

- forming of concept,
- setting of boundaries,
- question and remarks check,
- question and remark answers.

In addition to the above-mentioned method, one more important feature of the team communication needs to be emphasized. The communication between two people is, figuratively speaking, like sending and receiving on three different channels and frequencies:

1. non-verbal channel (Body Language),
2. the formal verbal channel (how it's said),
3. clear and non-ambiguous verbal channel (what is said).

A lot of studies and research have been made in order to find out which of those channels is the most important. Everything points to the non-verbal channel with 60% in favour of its importance, 30% in favour of the formal verbal channel and 10% in favour of clear verbal channel (Fahlgren, 2000: p.116). Body language is so convincing that, if there is a conflict between what is said and what Body Language is transmitting, the receiver will misunderstand the message because he/she will "see" the message instead of listen to it.

## Performing stage

The organization of the ship crew based on teamwork requires a team management and leadership. The master manages the officers as a team and is responsible for its work. At the same, the team performance enables optimal control of the situation and all the conditions during navigation and ship exploitation. In this context, there is a mutual connection between the teamwork and the role of the master as the formal and actual team leader. The formal leadership is a clear role of the master, although his actual leaderships represents much more important component. The role of the actual leader is best accomplished through the democratic and participation-based style of management that are based on the following principles (Warsash, 1994: pp.12-92):

- establish standards and assist the team in its work by determining the direction of work and course of activities;
- listen and be open to ideas of others without insisting on your personal attitude;
- allow every member of the team to act as a leader when appropriate;
- avoid imposing decisions upon team unless it is necessary;
- know when to trust the team's ability and maturity;;
- be patient if the team is progressing slowly;
- represent the team towards the "outer" world;
- provide sufficient information to the team members so that they can perform his/her duties;
- include into the team professionals with certain necessary skills and (or) knowledge who know when and how to apply them;
- be well informed about the interaction among the team members;
- be aware of your own and your team limitations and abilities;
- accept and redirect criticism and discussion within the team; be pleasant in communication with the team members;
- have sense of humour to be able to reduce tensions;
- think about the differences, offer compromise solutions, find new possibilities.

The master's ability to implement these principles and maturity of the team in the fourth or the performing stage are the conditions for effective decision-making and carrying them out effectively. At this stage, there are many performance possibilities because there is more flexibility and spontaneity in the expressions of opinions and judgements. Thus, the possibility of

preventive actions in the first phase of the emergencies (in the narrow sense of the word) rises and the risk of *the near miss* decrease.

Apart from the aforementioned principles for effective decision-making and their implementation in teamwork, it is necessary to apply a certain style of management or guidance as well. Given the fact that communication is a demanding element and condition for the team's successful performance, the style of leadership is a crucial factor for the effective application of communication postulates. In this respect, the effective adoption and implementation of decisions and the realization of the communication principles can be observed through "The Path-Goal theory"<sup>2</sup> and the "Leadership and Decision-Making Model"<sup>3</sup>.

According to "The Path-Goal theory", the subordinates accept the leader's behaviour to the extent of their current or future satisfaction. The motivation impact of the leader is perceived through the satisfaction of the subordinates and their efficient performance. House defined four types of the leader behaviour styles (Robins, 1992, p. 46)

- directive,
- supportive,
- participative and
- achievement.

*Directive* behaviour is a style in which the leader informs his/her subordinates on what is expected of them by telling them what to do, how to perform a task, and scheduling and coordinating work.

*Supportive* behaviour involves a style in which the leader provides support, he/she is friendly and approachable and shows concern for the need of the employees.

*Participative* behaviour of the leader means that the leader consults his subordinates before making a decision.

*Achievement* behaviour of the leader is a style in which the leader sets challenging goals and expects from the subordinates to perform at their highest level.

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<sup>2</sup> The "path-goal theory" is a theory based on specifying a leader's style and it was first developed by Robert House (1971). The essence of the theory is that the leader helps his followers in accomplishing their goals by providing the necessary guidance and support so that their goals are compatible with the overall goals of the group or organization.

<sup>3</sup> "Leadership and Decision-Making Model" was developed by Victor Vroom and Phillip Yetton, and it refers to leadership behaviour and participation in decision-making regarding various routine activities or emergencies.

"The Path-Goal theory" starts from the assumption that one leader can apply any of these behaviours, depending on the situation. In addition, the environmental factors such as navigation conditions and crew coherence, define the type of behaviour of the leader-master. It is all necessary for achieving the best result while the personal (cultural) characteristics of the subordinates influence the interpretation of the leader's behaviour.

## Conclusion

The implementation of knowledge and skills within the teamwork can be observed through the individual stages of the team development. In the first and second stage the implementation of knowledge and skills is still on an individual level. Daily tasks and duties can be carried out properly, but this team is still not able to solve more complex and serious problems. Emergency response can be confusing and ineffective since the crew members react individually on the basis of their own experience and knowledge.

At the third stage, the team is ready to work together, but their knowledge and skills still have no common foundation. In other words, the problems are diagnosed quickly, but the approach to solving is unbalanced due to the lack of work routines within and between the teams and departments.

The fourth stage represents a mature phase from the aspect of knowledge and skills performance. Now the team does not act as an average sum of individual knowledge and skills but as an optimal whole of common knowledge and skills.

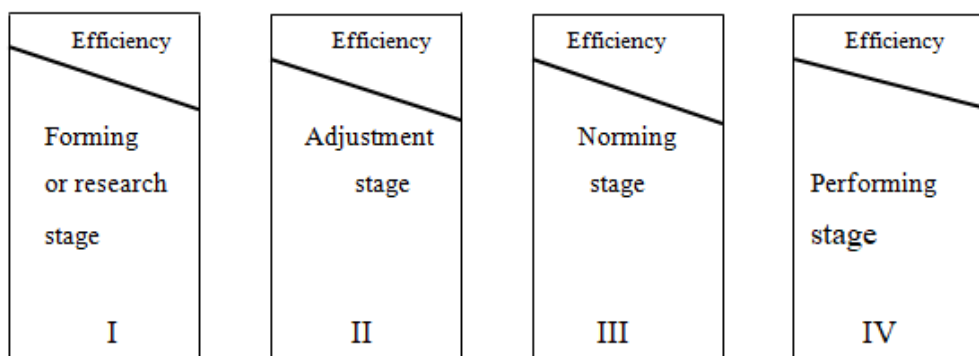


Figure 3: The graphic representation of the team development stages and application of knowledge and skills

Source: According Southampton Institute, Warsash Management Group 1994.



The application of these methods during the team's development stages enables the forming of effective attitudes in carrying out all duties on board as well as the optimal team performance under all conditions. The team formed in this way is motivated to develop the safety culture in terms of attitudes, beliefs, observations and values in relation to the maritime safety requirements. The affirmation of these methods optimizes the possibility of identifying and analysing the risk factors through the team situational awareness on the overall circumstances. The priorities are clearly defined since the total knowledge and skills of individual members of the team are unified, and the possibility for risky actions is reduced.

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## Development of Evaluation Procedures for Chemical Tanker Officers Using Liquefied Cargo Handling Simulator

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### Abstract

A comprehensive assessment of chemical tanker officers should be considered as a preventive measure in terms of safety of cargo operation. On the other hand, the complexity of cargo operation often leads to workload on officer and this poses a risk on safety of operation. Officers, who attend to work in chemical tankers, are assigned after passing exams of state authorities and various evaluation procedures of companies. However, the evaluation of officers in terms of their practical skills on cargo operations remains incomplete. The aim of this study is to develop a practical evaluation method for recruitment of officers. In this study, simulation was designed with safety critical and operational performance parameters to indicate important points on the situations the chemical tanker officers face in cargo operations. Two parameters were determined for difficulty adjustment; type and number of operations and operation period corresponding to a real cargo operation. During the simulated cargo operation with 4 difficulty levels and in total 90 minutes, these two parameters were progressively complicated. At the last phase of this study, performance evaluation method was prepared and scenario was evaluated for comprehensiveness by experts. According to the experts' evaluations, it was seen that the sample practical evaluation carried out in the Liquefied Cargo Handling Simulator covers the requirements of the STCW, the abilities expected from officers in the audits such as SIRE, CDI and the training and evaluation procedures of companies. Hereby, the developed performance evaluation method for cargo operation can be used to generate more reliable method to evaluate the officers' competence of technical skills.

**Keywords:** safety of cargo operation, chemical tanker, liquefied cargo handling simulator, scenario-based evaluation.

### Introduction

Rapidly increasing ratio of using oil and chemical products in our daily life obliged oil and chemical transportation to develop during the last century. The cheapest way of carrying oil and chemical products overseas is by tankers. During the transportation of these products, there

have been certain accidents which cause environmental disasters. Therefore, IMO set strict rules for the tanker industry. These strict rules affect both structure of the tankers and crew who work onboard a tanker.

The certificates and trainings for officers who work onboard a tanker are stated in STCW (International Convention on Standards of Training, Certification and Watchkeeping for Seafarers). Operational knowledges of the officers are inspected by SIRE (Ship Inspection Report) Programme and CDI (Chemical Distribution Institute) inspectors regularly intervals. Then the vessel is scored by the inspectors. The major oil and chemical companies evaluate these scores for hiring the vessels. Therefore, competence of the officers is vital for these evaluations. Because of that, companies give serious trainings and examinations to evaluate their officers.

Most of the companies are still using old version of paper-based trainings, examinations and evaluations. In this study, it is aimed to develop simulator-based evaluations of the officers who are responsible for cargo operations onboard. Simulation was designed with safety critical operation tasks and operational tasks to indicate important points on the situations the chemical tanker officers face in cargo operations. Two parameters were determined for difficulty adjustment; type and number of operations and operation period corresponding to a real cargo operation. During the simulated cargo operation with 4 difficulty levels and in total 90 minutes, these two parameters were progressively complicated. At the last phase of this study, performance evaluation method was prepared and scenario was evaluated for comprehensiveness by experts. According to the experts' evaluations, the following issues are addressed that the sample practical evaluation carried out in the Liquefied Cargo Handling Simulator covers those:

the requirements of the STCW,  
the abilities expected from officers in the audits such as SIRE, CDI,  
the training and evaluation procedures of companies.

#### **Procedures and requirements for cargo duties**

STCW organizes the trainings for seafarers. Chapter V of the STCW Code includes that special training requirements for personnel on certain types of ships and Regulation V/1 indicates the mandatory minimum requirements for the training and qualification if masters, officers and ratings on tankers (STCW, 2011):

Officers and ratings assigned specific duties and responsibilities related to cargo or cargo equipment on tankers shall have completed an approved shore-based firefighting course in addition to the training required by regulation VI/ii and shall have completed:

At least three months of approved seagoing service on tankers in order to acquire adequate knowledge of safe operational practices; or

An approved tanker familiarization course covering at least the syllabus given for that course in section A-V/ii of the STCW Code.

STCW mainly sets the minimum certificates and their areas covered, the masters, officers and ratings on tankers should have and should familiar the details of those. STCW set the model courses for officers as advanced training for chemical tanker stated in the regulation V/1-1 of STCW. This course is for officers and key ratings, cover precautions for basic safety and pollution prevention, layouts of different types of tankers, types of cargo, their hazards and their handling equipment, general operational sequence and oil tanker terminology, it meets the mandatory minimum training requirements prescribed by regulation V/1 of STCW (STCW, 2011).

One of the most significant safety initiatives introduced by OCIMF (Oil Companies International Marine Forum) is the Ship Inspection Report (SIRE) Programme. The SIRE Programme is a unique tanker risk assessment tool for ship operators, terminal operators, ship charterers and government agencies involved in ship safety. Essentially, SIRE has emphasized on the ship safety standards and the importance of meeting satisfactory tanker quality in tanker industry. SIRE includes a part which should be concerned by officers and has some technical questions based on such as the aware of the dangers of free surface effects, cargo systems, cargo plan, material safety data sheets, emergency procedures, cargo venting system, inert gas system (SIRE, 2009). On the other hand, SIRE inspection reports can enhance the reputation of a tanker operator and help ensuring quality business. Therefore, officers should essentially be familiar with the SIRE inspection process.

Other initiative organisation is Chemical Distribution Institute (CDI) as an inspection regime formed for chemical and gas tankers, and the completed report provides a score for the inspected vessel. A higher score means that a vessel compliant with industry standards. Similar to SIRE, CDI includes a part which duty officer on cargo have to be aware and this part contains the issues related to cargo operation such as drying, padding and inerting operations, reactive cargoes, heating requirements, high density cargoes, corrosive cargoes, toxic cargoes, solidifying and high viscosity cargoes, pollution categories, PV (Pressure and Vacuum) systems, cleaning and steam procedures (CDI, 2015).

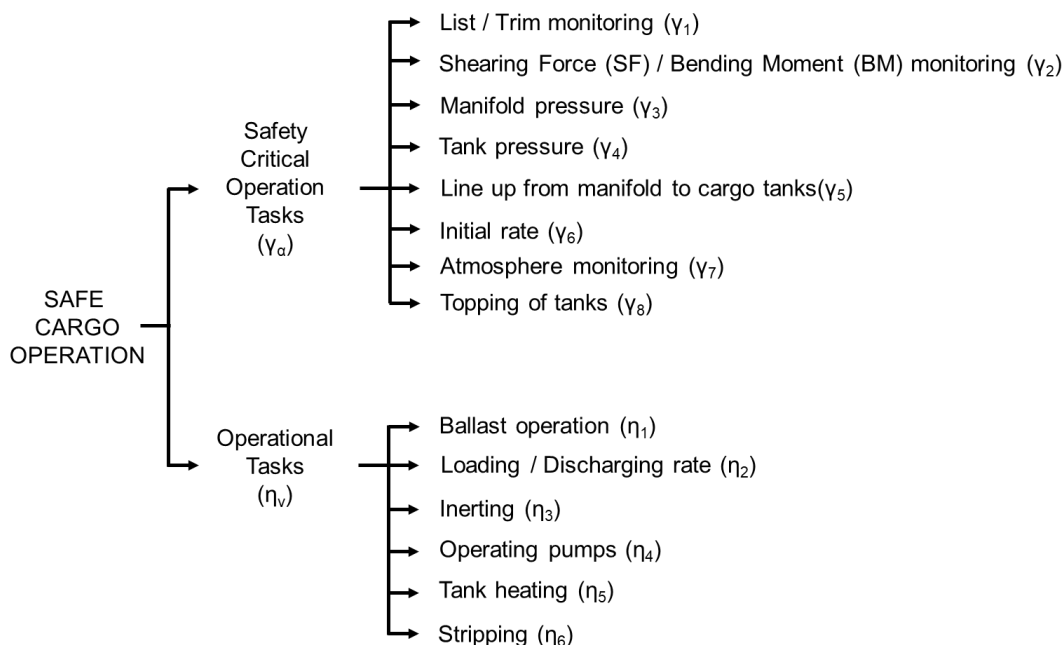
Tanker companies consider both STCW requirements and SIRE – CDI inspection reports. They prepare the ISM (International Maritime Safety Code) documents and checklists. Standard ISM checklist has the following issues for cargo operation: understanding of loading / discharging

plan, operational process on deck, stability and stress calculations, the procedures of topping off tanks, the control of hydraulic valves, monitoring of pressure in cargo tanks and lines, loading / discharging rates, ventilation procedures etc (ISM, 2014). They organize the training and evaluation process according to these standards and requirements. Generally, trainings mainly contains the following parts related to cargo operations: safety management, nitrogen on board chemical tankers, explosion on board a laden chemical tanker, fatal consequence of negligence and non-compliance, static electricity on board tankers, ship stability in chemical tankers.

**Method**

By reviewing the items stated in STCW, SIRE / CDI and company ISM and training procedures, cargo operation tasks can be divided into two categories; safety critical operation tasks and operational tasks which include monitoring and adjusting loading / discharging rate, operational process on deck and hydraulic valves, tank heating procedures. With the help of the liquefied cargo handling simulator, cargo operation scenario was created by considering the tasks stated in figure 1.

**Figure 1. Cargo operation tasks which will be monitored and evaluated in simulator environment.**



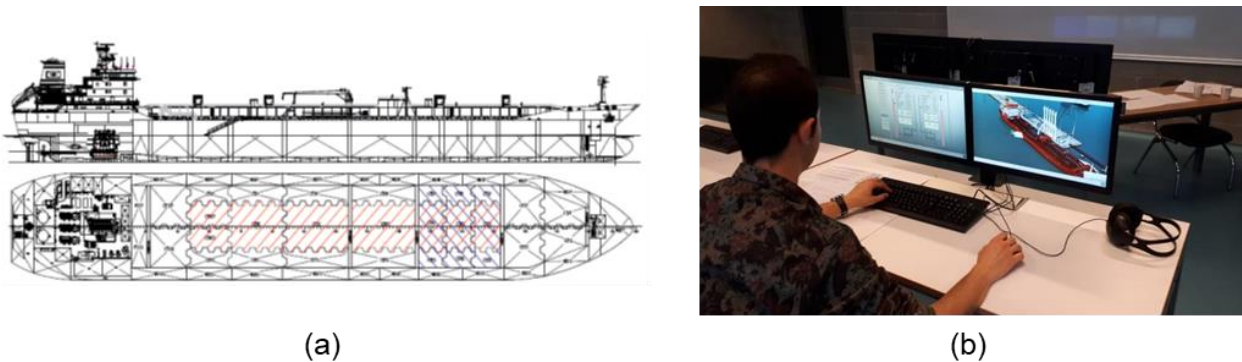
The cargo operation scenario was divided to 4 steps those have different difficulty levels. 2 parameters were determined for difficulty adjustment:

Type and number of operations

Operation period corresponding to a real cargo operation

Operation type includes loading, discharging, ballast operation and inerting. Operation period corresponding to a real cargo operation includes tank changing, tank topping, stripping and tank heating. When the number of operations increase or the specific periods of operation are added, the difficulty level of the scenario increases.

In liquefied cargo handling simulator, ship Type-1 chemical tanker with 28 cargo tanks (Figure 2a) (its displacement is 28921 tonnes and its length overall is 161.12 m.) was used for this scenario (TRANSAS, 2012). Figure 2b presents the sample execution of the scenario in the liquefied cargo handling simulator.



**Figure 2. The general plan of the chemical tanker used in the scenario (a) and the sample execution of the scenario in the liquefied cargo handling simulator (b).**

First step takes 15 minutes and subjects carry out only one parcel (methanol) loading to 3 tanks and required ballast operation. Change of loading from one tank to another tank occurs in 10 minutes. Subjects should consider the following tasks while tank changing and the whole step:

Monitoring list and trim ( $\gamma_1$ )

Monitoring the shearing force and bending moment in loading programme ( $\gamma_2$ )

Monitoring the manifold pressure ( $\gamma_3$ )

Monitoring the tank pressure ( $\gamma_4$ )

Carrying out proper line up from manifold to cargo tanks ( $\gamma_5$ )

Considering initial rate ( $\gamma_6$ )

Doing proper ballast operation ( $\eta_1$ )

Keeping loading rate constant ( $\eta_2$ )

Safely and efficiently operating the cargo and ballast pumps ( $\eta_4$ )

Step 2 takes 18 minutes and subjects carry out two parcels (methanol and p-xylene) loading to 5 tanks in total and required ballast operation. Before p-xylene loading, subjects carry out inerting operation in 3 tanks. In 12 minutes, two methanol tanks are topping off. Subjects should consider the following tasks addition to first step:

Monitoring the tanks atmosphere for inerting operation ( $\gamma_7$ )

Carrying out the topping off the tanks safely and in values desired ( $\gamma_8$ )

Doing proper and efficient inerting operation ( $\eta_3$ )

Step 3 takes 23 minutes and subjects carry out two parcels (methanol and p-xylene) loading to 5 tanks in total, one parcel (Benzene) discharging from 2 tanks and required ballast operation. 2 methanol tanks topping off occurs in the step and methanol loading is completed. Topping off for 3 p-xylene tanks in total and tank changing amongst p-xylene tanks occur in the step. Additionally, subjects carry out the preparation of the valves and lines of the tanks will be discharged. Subjects should consider the tasks stated in previous steps except atmosphere monitoring ( $\gamma_7$ ) and inerting ( $\eta_3$ ).

Step 4 takes 25 minutes and subjects carry out three parcels (p-xylene, caustic soda and soybean) loading to 7 tanks in total, one parcel (Benzene) discharging from 2 tanks and required ballast operation. 3 p-xylene tanks topping off occurs in the step and p-xylene loading is completed. Additionally, benzene discharging is completed and stripping operation is carried out. Subjects carry out the tank heating operation during caustic soda loading. Subjects should consider the following tasks addition to previous steps:

Carrying out proper tank heating ( $\eta_5$ )

Carrying out proper stripping of the tanks ( $\eta_6$ )

The importance of the cargo operation tasks in chemical tanker varies transiently belongs to characteristics of the operation. Therefore, subjects should be evaluated according to the specification of the operation. Three experts evaluated the importance weights of the tasks (criteria) for each step and for each designated times with triangular fuzzy numbers (TFN) (Buckley & Eslami, 2002) (Table 1).

<b>Table 1. Fuzzy numbers corresponding to the importance weights (Buckley &amp; Eslami, 2002)</b>	
Linguistic expression	TFN as lower, middle and upper limits
Very Low (VL)	(0.1, 0.1, 0.3)
Low (L)	(0.1, 0.3, 0.5)
Medium (M)	(0.3, 0.5, 0.7)

High (H)	(0.5, 0.7, 0.9)
Very High (VH)	(0.7, 0.9, 0.9)

The averages of each criteria' weights were calculated with following equation;

$$w_j = \frac{1}{E} [w_j^1 (+) w_j^2 (+) \dots (+) w_j^E ] \quad (1)$$

where  $w_j$  is the weight of  $j^{\text{th}}$  criteria and  $E$  is the number of experts. The averages of all membership functions (lower, middle and upper values) are calculated according to the equation 1. Next step is defuzzification;

$$A_j = \frac{l + 4m + u}{6} \quad (2)$$

where  $l$ ,  $m$  and  $u$  are respectively lower, middle and upper limits of the fuzzy numbers which are stated in Table 1. To normalize the weights of the related criteria, following equation is used;

$$w_{\alpha,v} = \frac{w_j}{\sum w_j} \quad (3)$$

where  $w_\alpha$  is the weights of safety critical operation tasks criteria and  $w_v$  is the weights of operation tasks criteria. Table 2 presents the evaluations of the experts for criteria weights of step1. P1, P2, P3 and P4 indicate the time periods corresponding to beginning of the step, the duration which ballast operation and loading operation are carried out together, tank changing process and the last part of the step respectively. The weights as results of the calculations on the evaluations of the experts for criteria weights are stated in figure 3 for step 1.

**Table 2. Evaluations of the experts for criteria weights of step 1**

	Step1																												
	P1				P2				P3				P4																
	$\gamma_1$	$\gamma_2$	$\gamma_3$	$\gamma_4$	$\gamma_5$	$\eta_2$	$\gamma_1$	$\gamma_2$	$\gamma_3$	$\gamma_4$	$\gamma_5$	$\eta_1$	$\eta_2$	$\eta_4$	$\gamma_1$	$\gamma_2$	$\gamma_3$	$\gamma_4$	$\gamma_5$	$\gamma_6$	$\eta_2$	$\gamma_1$	$\gamma_2$	$\gamma_3$	$\gamma_4$	$\gamma_5$	$\eta_1$	$\eta_2$	$\eta_4$
E1	L	VL	H	H	L	M	M	VL	H	H	L	H	M	H	L	VL	VH	M	VH	H	H	M	VL	H	H	L	H	M	H
E2	L	L	M	H	VH	M	M	M	H	VH	H	M	VH	H	H	L	VH	VH	VH	H	H	M	M	H	H	H	H	M	H
E3	M	M	H	H	VH	M	VH	M	H	VH	M	VH	M	VH	VH	H	VH	VH	VH	VH	H	H	M	H	H	M	H	M	H

For performance evaluation, score values and the operational data and responses of the subjects corresponding to score values should be determined. There is no similar study for cargo operation parameters in literature. However, There are similar studies for navigation parameters in literature. Gould et al. (2009) developed TARGETS method to evaluate the watchkeeping officers and the subjects were evaluated as "just acceptable or not" by experts. In another study, keeping the CPA (closest point approach) value more than 1 nm (nautical miles)



is good performance while less than 0.8 nm is near miss and less than 0.5 nm is collision. They scored the performances as 1, 0.5 and 0 respectively (Robert et al., 2003).

In similar way, score values were determined as 1 and 0 in terms of "just acceptable or not" for safety critical operation tasks and as 1, 0.5 and 0 for operation tasks. Experts also determined limits on such shearing force / bending moment, manifold pressure etc. and required responses such as monitoring tank pressure or carrying out proper line up in trials. The limits and better performance values correspond to score values as 0, 0.5 and 1. Then, the performance score of the subject can be calculated with the weighted sum of the score values; (4)

where  $\gamma_{\alpha}$  is the score value for safety critical operation tasks and  $\eta_{\nu}$  is the score value for operation tasks.

$$P_i = \sum_{\alpha=1}^p w_{\alpha} \cdot \gamma_{\alpha} + \sum_{\nu=1}^q w_{\nu} \cdot \eta_{\nu}$$

## Results

After completion of the scenarios, a HSEQ (Health, Safety, Environment and Quality) Superintendent of a chemical tanker company evaluated the scenario and answered the questions stated below:

What do you think about the scenarios which are developed in simulator?

Superintendent:

*"The scenario is well enough for initial evaluation but while an officer is promoting from senior officer to chief officer, it must be more complicated. The scenario should contain MARPOL (The International Convention for the Prevention of Pollution from Ships) Annex I and Annex II cargoes at the same time. Annex II cargoes must be heated and a few cargoes should not be compatible to each other. There should be more than one port. There should be discharging and loading port or ports. Therefore, the officer can consider the load line zones. The ports should be selected carefully to see how the officer uses ODME (Oil discharge monitoring and control system) equipment and whether he uses the equipment in Annex I special areas or not. Oil record books should be recorded and all of the entries must be made. The scenario does not contain entrance of enclosed spaces. It should be added to scenario to see reaction and knowledge of the officer."*

Is it possible that companies apply such a developed scenario by using simulators for evaluating officers in future?

Superintendent:

*"None of the chemical tanker operators have the similar simulation system such as located in the University. Existing crew promotion system is not subject to a real simulation system. Most of the operators are still using old version a paper-based promotion system. Consequently, the*

traditional system does not properly present actual officer acknowledgement. Our promotion system is still based on paper system but it is supported by load master programme. Every company needs such a simulation system for evaluating officers. Higher standards only can be achieved by such systems. Yes, it is possible that companies have such a system."

Have the limits and better performance values corresponded to score values been correctly determined for safety of operation?

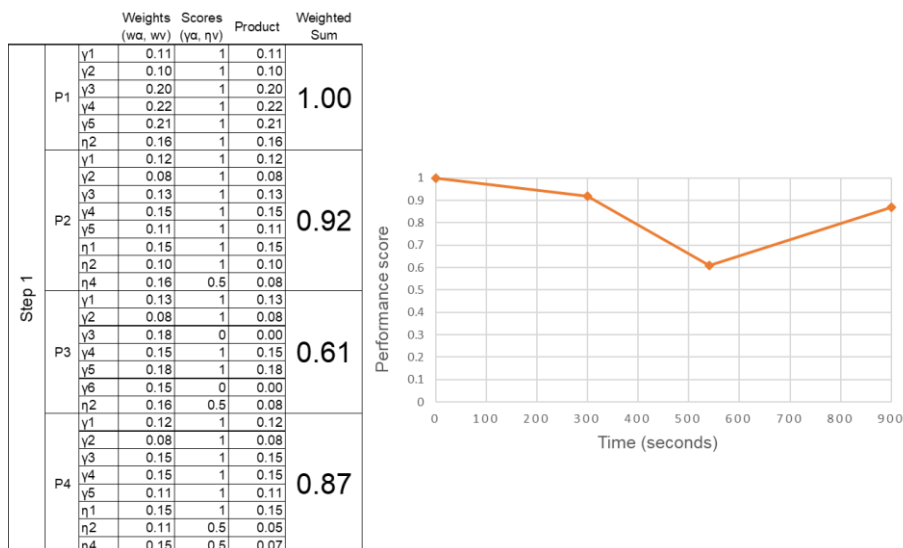
Superintendent:

"The limits are well enough for evaluation and safe operation. They are really close to SOLAS and MARPOL criteria. However, the limit of the list is really low. A vessel can be listed to 3 degrees during operations and it is not a big problem. It can be more."

After preparation of all steps of the cargo operation scenario, a trial was conducted by oceangoing watchkeeping officer who have worked in chemical tankers. The results of the performance evaluation of the subject for first step are presented in figure 3. Subject couldn't perform the tank changing procedure correctly. Thus, manifold pressure was increased suddenly. And he didn't care to initial rate for empty tank. Therefore, he took 0 points for two criteria and his total performance score decreased to 61 percent.

**Conclusion**

State authorities and shipping companies evaluate the officers according to mostly paper-based exams during the process of recruitment and promotion. However, the practical exams are needed to enhance with different methods and various evaluating criteria.



**Figure 3. A sample performance score calculation for step 1.**

In this study, it was seen that some tasks such as entrance of enclosed spaces, multiple port operations, using ODME or tank cleaning procedures in open sea and the required procedures for that cannot be evaluated in simulator environment. However, most of technical skills of cargo

operation can be evaluated and simulated in the scenario. The comments of the superintendent contribute to the study by the suggestions. Especially, the evaluation of cargo compatibility is an important task for chief officers. It should be noted that some limit values were set lower than the requirements because of that the duration of test is so short than actual cargo operation time. The change of list and trim is so less due to duration of the steps.

The method, which is developed during the study, is usable for all simulator evaluation procedures. The weighting method considers the output priorities of an evaluation session. This is highly related to safe cargo operation parameters which are varied from case to case. These parameters can be easily manipulated for different cargo operation scenarios for different type of tankers.

As a result, the developed performance evaluation method for cargo operation can be used to generate more reliable method to evaluate the officers' competence of technical skills.

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## Three reasons to flip your English lessons and how to do that

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### Abstract

The paper is aimed at revealing the matter of using flipped classroom techniques when teaching Maritime English. It's been proved that the 21<sup>st</sup> century sets new requirements to the competencies students need to acquire during their education thus demanding from teachers to search for and actively apply new and modern teaching strategies along with the traditional face-to-face learning. The introduction of computer-based technologies into the system of education can help to motivate students and increase their interest towards the material presented. It also allows for the round-the-clock access and availability of learning materials which are delivered via Internet and are stored at special data-bases at the same time giving equal opportunities to access them from all over the world.

We believe that such approach is also beneficial for English teachers as well because by placing the materials on-line and having students already familiar with the topic during the classroom-time provides teachers with the opportunity to save precious time for developing key language skills and competencies – speaking and/or writing – by organizing group discussions, debates, presentations and peer teaching instead of lecturing or making them read long technical texts. Though, of course, there are some limitations which are determined by the specific features of a language lesson and which should be taken into consideration when planning a flipped English lesson.

The paper suggests key ideas of how to 'flip' your English lessons depending on the year of education and the level of the group. We also suggest a practical example of how to organize a 'flipped English lesson' with the students and what lesson format may be suitable for such an occasion.

**Keywords:** communicative approach, innovative techniques in teaching foreign languages, blended learning, flipped classroom.

**Introduction:** Over the last few years the national strategy of Ukraine in terms of high education development has been aimed at satisfying the need of renewal and modernization in compliance with the requirements of the European Union (*Ugoda pro asotsiatsiyu, 2014*). Besides, the strong demand of international maritime community to increase the English language proficiency among future seafarers and thus to enhance safety of life at sea makes us

face the need to change the traditional classroom face-to-face teaching approach where a teacher is a "sage-on-the-stage" into more flexible, student-centered and accessible on-line-based methodology allowing for students to work at the material, study it independently and for teachers to become "guide-on-the-side" monitoring students' performance and facilitating their activities in the classroom.

Moreover, in today's rapidly changing and complex world, students need much more than a traditional academic approach which provides them with theoretical knowledge to be successful and competitive. They need a broader set of knowledge and skills that enables them to understand, navigate, adapt, and thrive in response to novel and complex problems and contexts. The set should for sure include:

- interpersonal skills (communication and collaboration skills, as only working collaboratively students cooperate to identify and suggest solutions to academic, social and professional problems);
- intrapersonal skills (positive mind sets and learning-to-learn skills, as the world is changing rapidly around them and students need to be able to respond to the changes and keep up with the modern tendencies and trends of both professional and social areas of their lives. It will help them to monitor and direct their own development in terms of Life Long Learning);
- cognitive skills (critical thinking and problem solving skills which allow for the application of tools and techniques gleaned from different sources to formulate and solve a problem. This will include data analysis, reasoning, conclusion making, etc.).

So, as educators we need to think about appropriate approaches and techniques which will help to create the opportunities for students to build the essential competencies, think about the ways and methods of applying them at the lessons and introducing them into our practice remembering the fact that students should not be plunged into extremely new teaching and learning environment harshly and heedlessly as the effect may appear to be quite opposite of what has been expected.

So, at Kherson State Maritime Academy we tried to analyze the possibility of flipping our Maritime English classes and work out a step by step procedure for doing this at the lessons.

Flipped English classroom – why to do that?

A flipped classroom is a pedagogical approach in which a conventional notion of a classroom-based approach is inverted, so that students get an opportunity to master the material needed at home at a convenient time and at a pace which is suitable for them. In such way, the lower level of learning (according to Bloom's taxonomy) such as remembering and understanding is happening at home, meaning that the lower level of cognitive work is done before the class.

Thus, a teacher's class-time activity shifts from lecturing, presenting or demonstrating to working with small groups of students or one-on-one with those who most need the teacher's help (Rosen D.J., Stewart C., 2014).

In the majority of resources we have studied on the issue of flipped classes the main argument for flipping the classroom which was presented by researchers is that it changes the traditional classroom approach where a teacher is "typically the central focus of a lesson and the primary disseminator of information during the class period" (Ryback D., Sanders J., 1980). But we, at Kherson State Maritime Academy, have actually managed this problem with the introduction of a communicative approach to language teaching suggested by the Model Course 3.17 in Maritime English. Within the framework of this approach our teachers follow its basic principles, one of which says that teaching should be student-centered (IMO Model Course 3.17, 2009). Another thing is that as language teachers we do not have so much of a material to lecture the students about, to supply them with long and complicated explanations of principles or phenomena as, for example, the teachers of chemistry, physics and the like.

So, for us it was a disputable matter if we really need a flipped classroom approach and if the number of its benefits is bigger than the number of challenges it brings forth. All the teachers of English language department for deck officers were asked to speculate on the matter for a while and then share their ideas at one of the Faculty Development Sessions we regularly conduct at KSMA. And as the result it appeared that there are still some important benefits we may have from implementing this approach though there are still some limitations we need to consider to make the process useful, productive and effective.

Among all the reasons we discovered there were top three named by all the teachers and we want to share them here.

The first and the most important reason is that at KSMA we are not just English teachers but Maritime English teachers and it means that what we actually do is CLIL (Content and Language Integrated Learning) and thus there are some topics and materials which should be learned and understood by students at home before they come to the class. The students must master English together with their professional topics such as cargo handling aspects, collision avoidance, safe working practices, mooring and anchoring and the like. So, they will develop their English speaking and/or writing skills when discussing their professional issues, formulating and suggesting the ways to solve professionally-related problems and for that purpose they will need to get some idea and familiarize with the content of what they are going to talk/write about first. And as the revised Bloom's taxonomy suggests, they do need to cope with "understanding" and "remembering" first and only then start "applying" and "analyzing"

stage of their cognitive work. And it is quite obvious, in our opinion, which part it is better to leave for home and self-studying and which one should be done in the class.

Yet another reason for implementing the flipped classroom approach when teaching Maritime English is the language level of the students who enter KSMA (or any other educational institution). Unfortunately, though English is taught in all Ukrainian schools starting from the 2<sup>nd</sup> grade, we still face the reality of low-level English language proficiency. To cope with the situation in the best way, we at KSMA group the students according to their language level by suggesting them a division test at the beginning of the 1<sup>st</sup> academic year. Students with the best results go to groups 111 or 112 and students with lower results are shifted to groups 113, 114 or 115 correspondingly. Teaching materials for different groups are chosen according to the level of English skills so that the information is not too easy or too difficult for students. Actually, the idea is to use info which is a bit challenging and demands some effort from students. Thus, flipping the class and delivering information online allows for the multiple and repeated reviewing and/or rereading until the idea is quite clear for everybody. Students are provided with the possibility to go through the material in detail at their own pace as many times as they need without feeling ashamed or uncomfortable as, for example, when seeing that other students can do it faster or that they understand it better at the lesson. So, all the students in such a way get a chance to learn and understand the key concepts of the topic and then perform at the lesson at their best during collaborative activities of discussion, debating, project-making, etc.

And the last but not the least important reason for flipping our English lesson was, of course, motivation. As we all know motivation is an important factor that can greatly influence the achievements of learners without which even individuals with the most remarkable abilities do not accomplish long-term goals. There are many things that can motivate students (good marks, praise from the teacher, opportunity for promotion or getting a specific position, etc.) but one of the most effective ways, in our opinion, to motivate students is to make them interested in what is going on around them. It is not a secret that a young person of the 21<sup>st</sup> century cannot imagine his/her life without digital online technologies and the time he/she spends online and using gadgets is immense. So why not to use this affection for educational purposes? With the introduction of flipped classes students can watch the presentations as many times as they wish from a computer at home, work, a public library, or in the program or school computer lab. Increasingly, students who do flipped learning are also watching the instructional videos from portable digital devices such as smart phones or electronic tablets. Studying process in such a way becomes more engaging and entertaining allowing for the growth of interest and additional motivation leading to the quality and effectiveness promotion of the educational process.

Nevertheless, all above mentioned benefits of flipping your English classes may actually end in failure if done without appropriate preparation and required consideration. Our teaching experience at KSMA shows that you can't just flip a class whenever you want to. Actually, we insist that the 1<sup>st</sup> year cadets, who just enter the Academy are already overwhelmed by the great change they experience concerning the organizational issues (number and duration of lessons, the obligation to keep duty, the discipline they are faced with, etc.) and they do need the time to get used to them and to realize what is wanted from them. So, we suppose that the 1<sup>st</sup> semester is a kind of adaptation period for our cadets. Besides, their level of professional knowledge is quite low at this stage of their education and we need only to start developing their self-studying skills and let them gradually learn how to learn by introducing only some elements of flipped classes instead of flipping the whole course at once. Later on, with the course of time, with the practical experience they will gain during their shipboard practices, they will become more and more mature and able to discover, learn and understand the information by themselves having the classroom time left for collaborative work, group discussions, project makings and the like.

Another thing we need to mind is the initial language level our cadets have when entering the Academy. With low-level groups (114, 115) the approach may work, of course, as it provides a possibility to re-watch and re-read the information as many times as needed, but at the same time can be problematic to apply as there is always a risk to post material which is too difficult or challenging for cadets so they may start doubting their ability to cope with it and feeling ashamed to admit it at the lesson and thus losing the possibility to catch up with going-on.

So, the main idea a teacher needs to keep in mind when starting flipping a class is that the introduction of this approach must be considered, deliberate and staged beginning with some elements of flipped classes first, then gradually moving on to a flipped lesson and then, probably, to the whole flipped course. Such gradual implementation will allow for both teachers and students to grasp the idea of what is going on better, to notice the most challenging points in the process and to think about the ways for improvement.

Here we suggest some ideas of how to flip your English lesson. As the lesson was conducted with the 1<sup>st</sup> year cadets of KSMA (the period which was previously recommended only for introducing some elements of flipped classroom) the lesson cannot be considered fully flipped and shows the way how to teach students to learn themselves but mindful monitoring and guiding of the process is strongly required at this stage.


The flipped learning approach has two main elements to consider: the direct instruction part at home and the interactive face-to-face element in the classroom (Sharples M., Adams A., 2014).



So, we strongly believe that the first thing you need to do is to figure out when and why to flip your class, i.e. a teacher should understand that the flipping process should be done at the stage when students may feel free to discover some additional profound details about the topic they are learning at the moment. It means that the key concepts, main vocabulary should be introduced during traditional lessons to allow students to concentrate on the content but not struggling independently through unfamiliar and sometimes too complicated language. For our flipped class we chose the topic “Hazard signs” in the module Personal Safety Aboard (Welcome Aboard, 2019). During the traditional lessons we with students learnt the information about different groups of warning sign used on board ships, they practiced how to describe the appearance of the signs and recognize them from the description. Plus, we discussed the functions and the message each sign delivers to seafarers and people aboard. Having assumed that the main concepts and vocabulary have been mastered by the cadets we suggested them to work individually and to explore the detailed information about hazard signs.

And here comes another important thing to remember about flipping your lesson: you must provide your students with precise and clear instruction of what to do at home. It means that such instructions as “watch a video about...”, ‘read about...’ or ‘learn about’ will not work, especially with the students who only try this approach for the first time. They need to have a clear understanding what to pay attention to, how to distinguish important facts and what final outcome they need to achieve as the result of studying at home. This will help students to learn how to learn and to understand when the aim is achieved and they may feel confident about their knowledge or if they still need to work upon the topic and search for more information or explore the issue better.

For our purposes (as we aimed at providing our students with the information about the type of risk a hazard sign warns a person about) we supplied them with a print out of a hazard sign (the pictures were distributed among the cadets at random). As there are 12 cadets in the group, we chose 4 types of hazard signs to be explored: explosive, corrosive, toxic/poisonous and biohazard. After that we assigned the task “Surf for the information about your type of hazard sign and complete the table”:

<b>Sign</b>	<b>Type of danger</b>	<b>Examples of substances</b>	<b>Shipboard places</b>	<b>Risks</b>
				

With that the first element (the direct instruction part at home) is done and we proceed to the next important element – the interactive face-to-face element in the class. At this stage students

meet and engage with peers in different purposeful activities. As at KSMA we widely use communicative approach to the English language teaching we mostly use different types of pair and group work, activities based on collaboration and the like. So, in this specific situation we found it preferable to combine flipped classroom approach with the peer instruction method. 12 cadets were exploring the information about 4 types of hazard signs so it was possible to arrange them in groups of three first and give them time to share and compare the information they had found, to learn from each other the additional information they had missed or couldn't understand at home. By the end of such group discussion the cadets were able to come to final agreements on the main items presented in their tables and had quite clear idea about the risk type identified by the sign they had. During this stage of the lesson the teacher was monitoring the discussions and, being a facilitator, guided them where necessary. The next step of the lesson procedure included whole class peer instruction. The representative of each group had to present the key concept ideas about the type of danger according to the sign they had while other groups were to complete the tables with the relevant information. The cadets were encouraged to ask questions, to inquire about some details to make everything clear about the piece of information presented. At the final stage of the lesson – Production (if to follow PPP lesson format suggested by the Model Course 3.17) – the cadets were engaged into problem-solving activity. During this stage they had to actually apply the conceptual knowledge of what they had learnt before. For that purpose the teacher rearranged the groups to provide for the opportunity to work with other people. Each group was given the instruction to develop the list of safety guidelines for "crewmembers who were about to work in a space labeled with one of the hazard signs". The instruction list was to include not only the recommendations but also the reasons to follow them to help people to be aware of all potential risks. At the end each group presented their guidelines and other groups were encouraged to ask questions or comment on their group-mates' performance. So, proceeding from the above, we may conclude that the flipped classroom approach may give both teachers and students the possibility for interactive, engaging and motivating educational environment which will make the language learning process more interesting and efficient, will provide for the development of critical thinking and give students the chance to learn how to learn. It also saves precious classroom time for the development of key language skills and competencies – speaking and/or writing – by organizing group discussions, debates, presentations and peer teaching instead of lecturing or making them read long technical texts. Further exploration of the flipped English lessons will allow for the elaboration of lesson plan formats and methodological recommendations and guidelines of

how to implement the approach at different levels within the framework of life-long learning and continuous education.

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## Disambiguation in Collocation

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### Abstract

The paper discusses the importance of studying collocations in Maritime English and the way these phrases help students improve their proficiency and correct understanding of the foreign language in a professional environment. Examples are given of polysemous terms whose meaning is defined in collocation. Exercises are proposed for training students how to resolve the ambiguous meaning of such terms depending on the collocational framework and the content they are used in. Attention is paid to the role of prepositions and articles. Conclusions are drawn and recommendations given for the training of future deck officers with the purpose of enhancing the safety of navigation based on correct and successful communication.

### Introduction

Most words in any language are polysemous, i.e they have more than one distinct meaning. Polysemous words often induce ambiguity when they are used alone or in short phrases. Native speakers identify the right sense intuitively but foreign language learners need to find the best way to understand the word or phrase and remember it. In Maritime English correct decoding and production is especially important as it is often directly related to the safety of people and ships because miscommunication can sometimes lead even to disaster. There are a number of frequently used multi-sense terms with a lot of meanings, e.g. *head* (n., v.), *sound* (n., v.), *ground* (n., v.), *a point*, *a bank*, *a cable*, *a shipment*, *to run*, etc., so that seafarers have to be able to decode their correct meaning instantly and use them appropriately in various circumstances.

Ambiguity can be resolved in various ways. Context of course plays the determining role in sense disambiguation but in an ESP environment collocations are another powerful tool for correct understanding and acquisition of lexical units. As Yarowsky (1993) states, 'for several definitions of sense and collocation, an ambiguous word has only one sense in a given collocation with a probability of 90-99%'. This fact justifies the view that maritime learners have to be familiar with the problem of ambiguity and be trained to resolve it in the quickest and most effective way, which very often is in collocation.

## Collocations in ESP

People tend to learn and use language in chunks, i.e. in phrases. When a phrase is arbitrary, fixed and recurrent, linguists call it a collocation. This term is fuzzy and there are a lot of different definitions but they are not the focus of the present study. What is important is to show that collocations are typical for technical language and that different words collocating with a polysemous term trigger the choice of a certain sense. Yet, it is appropriate to accept a definition connected with terminology which will guide the research. Vicheva (2015:55) describes the terminological collocation as "a terminological phrase composed of a base term and other words that co-occur for lexical rather than semantic reasons'. Therefore the focus of the present study is on the nature of the lexical items accompanying the base term.

Collocations are common in technical language (Smadja, 1993). Specific sub-languages contain a large amount of terms which may be unintelligible for the general public but there are also a lot of common words used as specific terms. This requires ESP users to have comprehensive knowledge in the domain-dependent collocations of such everyday words. Since the use of collocations is genre-specific, the training of Maritime English students should focus on the problem of polysemy and the behaviour of ambiguous words in collocation. In everyday communication and especially in emergencies the lack of collocational knowledge may have a negative effect on the performance of Maritime English users in terms of both reception and production.

The present study is focused mostly on nouns because technical terms are typically nouns defined by adjectives which form lexical collocations. The collocations of the focus terms have been extracted from two volumes of the Admiralty Sailing Directions: NP 28 and NP 37.

### Collocation patterns

This section describes the basic patterns or frameworks of the **lexical** collocations in which the highly polysemous keywords **head**, **ground** and **bank** enter in Maritime English texts. The latter word is widely discussed in linguistic literature as a typical example of ambiguity. For most technical terms the patterns are similar, e.g. **Noun + term** and **Adjective + term**, the disambiguating function resting entirely on the collocate.

#### Head

1. **Name + Head** In this pattern the meaning of the base term is point, cape, promontory. It should be pointed out that the term is capitalized but in oral communication this feature is irrelevant for sense disambiguation.

e.g. South Sand **Head**, Beachy **Head**

## 2. **N + Head**

This general pattern is very common but without clarification it cannot be of any help in sense decoding because the meaning of the base depends entirely on the meaning of the N to the left. Sometimes the two words may be written together, especially if the collocation is part of a name or is used attributively to define another term. The phrase can be transformed into the framework **Head + of + N**. For the purpose of sense disambiguation the pattern may be divided into the following sub-patterns:

2.1. **N** (denoting a structure alongside which vessels can lie) + **Head**. The meaning of **Head** is the seaward end of the structure.

e.g. the breakwater **head**, West Breakwater **head**, East Pier**head**, the **head** of East Pier, the **head** of the E training wall, the **head** of South Quay

2.2. **N** (denoting an indentation in the coastline) + **Head**. The meaning of the term is the inner part of a gulf, bay, basin, harbour, haven, dock. Most often this pattern is used as a prepositional phrase: the **head** + of + **N**.

e.g. the **head** of Bassin de l'Atlantique; The **head** of the bay is backed by clay cliffs.

2.3. **N** (denoting a column/mast-like structure) + **head**. The meaning of **head** is the top of the structure.

e.g. pile **head**, mast**head** height, mast**head** light

2.4. **N** (denoting a river, channel/canal, well) + **head**. The meaning of the headword is mouth or entrance.

e.g. **head** of the River Orwell, **head** of navigation, well **head**

2.5. **N** (ship) + **head** – the ship's bow

e.g. It is not dangerous to boats afloat in the centre of the river, **head** on to the wave

This collocation is very rare in Pilot Books but is used in various other ME texts.

## 2. 6. **N** (lock) + **head**

The collocation denotes the area between the lock gates and the lock chamber where the water filling and emptying systems are located.

## 3. **Adj + head**

The pattern must also be divided into sub-patterns because it is the meaning of the adjective which determines the meaning of the ambiguous noun.

### 3.1. **Adj + head**

An adjective describing the composition, form or another specific property of the term **head** implies that this is an underwater formation which can be a reef or another kind of shoal area.

e.g. rocky / shallow / shoal **head**

### 3.2. **Adj (bold/steep) + Head(land)**

The adjective decodes the meaning point.

### 4. **Head + V**

Several verbs collocating with the term **head** in the active or the passive define it as a reef or promontory.

e.g. Long Sand **Head** (5½miles S), which dries in parts

Collier, a group of shoal **heads**, lie 1 mile NW of Runch

Saint David's **Head**, 30 m high at its W extremity may be identified by Carn Llidi

## **Bank**

This word is the most often quoted example of ambiguity in linguistic literature. In search systems queries about financial banks retrieve documents about rivers, if the term is searched alone without any word narrowing the intended meaning. This fact alone is enough proof of the importance of co-text and especially of collocation.

### **Basic patterns:**

#### 1. **Name + Bank**

As in the first pattern of the **head**-collocations, the collocate (the name) defines the term **bank** as an underwater formation or a shallow area.

e.g. Tizard **Bank**, Maplin **Bank** Light-buoy

#### 2. **N + Bank**

This general pattern can also be transformed into the phrase **bank + of + N**. The nature of the noun determines the meaning of the base term.

2.1. A noun describing the nature of the sea bottom denotes that the base term stands for a shoal area

e.g. mud / stone / boulder / shingle / sand **bank**; a **bank** of stones and shells

2.2. A noun denoting a water passage implies that the term **bank** means coastline.

e.g. river/channel **bank**

2.3 In the collocation Fog **Bank** the noun determines the meaning of **bank** as a patch

#### 3. **Adj + Bank**

As with the collocational frameworks of the other node terms under consideration, the properties of the adjective determine the meaning of the base. However, some of the collocates with similar connotation describe different aspects or features, therefore special attention should be paid to this distinction (e.g. 3.1. and 3.2. in which the form of the object is described by different adjectives).

3.1 Adjectives describing composition, form, position or another similar feature define the term **bank** as an underwater shallow area.

e.g. rocky / shallow / coastal / offlying / narrow / steep-to / scattered **bank(s)**

3.2 Adjectives describing the form or shape of a coastal feature imply that the meaning of the term **bank** is coast.

e.g. low-lying / steep **bank**

3.3. The determiners *both* and *either* and the adjective *opposite* before **bank** also define its meaning as coast.

e.g. The commercial quays lie on both **banks**; ... can be seen on either **bank**

#### 4. Cardinal point + Bank

The collocation clearly defines the meaning of **bank** as coast.

e.g. The town of Littlehampton, ..., lies on the E **bank** of the River Arun

#### 5. Coordination

The joining of two terms with similar meaning negates the ambiguity of the polysemous term.

e.g. shoals and **banks**; artificial **banks** and training walls

#### 6. Bank + V

If the verb is intransitive (lie / dry/ extend / change / front / consist of), it is used in the active. In this case the -ing form of the verb can be used as a modifier (see Pattern 3).

If the verb is transitive (cover / locate / situate), it is in the passive. However, in the case of underwater objects, the verb 'cover' is often used intransitively in the active\*.

e.g. The banks lie to seaward of ... (a shoal area)

The **bank** is covered by the red sector ... (a shoal area)

The **bank** is covered by woodland (coastline)

Shifting / drying / changing **banks** (a shoal area)

\*The **banks** cover at HW (a shoal area)

**Ground** - In Maritime English this lexical item collocates in two grammatical forms: as a noun and as a verb, both representing typical navigational terms. However, the noun occurs



frequently in its basic meaning, i.e. part of the earth's surface, therefore sometimes it is difficult to disambiguate it outright.

The meanings in which the term **ground** is used in Maritime English can be summarised as follows: (N) 1. Part of the earth surface (on land); 2. The sea bottom in general; 3. Specialised area of the sea bottom; 4. Reason, argument; (V) 5. To strand. It is important to note that the verb does not cause ambiguity problems.

### **Basic patterns:**

#### **1. Adj + ground**

As with the two above-discussed terms the collocate, i.e. the adjective to the left determines to a large extent the meaning of the polysemous term. The adjectives collocating with **ground** generally denote the type, composition, properties and use of the area. (Vicheva, 2015:81,82)

1.1. The adjectives low / high / rising / level / reclaimed / marshy define the type or form of land surface. In this sense the phrase is usually used without an article.

e.g. a detached ridge of broken **ground**; in the lee of high **ground**

1.2. The adjectives shoal / foul / holding refer to the properties of the sea bottom in terms of depth and holding potential.

e.g. good holding **ground**

1.3. The adjectives fishing / spoil / dumping / oyster describe the purpose of a specialised area of the sea bottom.

e.g. trawling ground

1.4. The adjectives rocky / gravel describe the composition of the sea bottom.

e.g. rocky **ground**

1.5. The adjective **environmental** triggers the fourth meaning, i.e. reason or argument. In this sense the noun is very often used in the plural.

e.g. a compromise on environmental **grounds**

#### **2. Name + Ground**

The collocation denotes a specialised water area

e.g. the Platters and Pitching **Ground** Buoys

3. **Ground + V** - Similar to the collocational framework of the term **bank** (Pattern 6) this base can be used with both transitive and intransitive verbs, e.g. back, front, orientate, surround, mark, comprise, extend, lie) in the active or the passive.

e.g. Foul **ground** orientated on the same alignment; higher **ground** which lies about 1 mile inland; sandhills backed by higher **ground**; low **ground**, which backs a narrow sandy foreshore; an offshore scallop fishing **ground** extends from ...; The W side of the island is fronted by foul **ground**

#### 4. **Ground + N**

If the term is used as a modifier, it describes the noun as situated near the sea bottom

e.g. heavy **ground** swell, **ground** tackle

#### **Prepositions and articles**

Very often the meaning of a lexical item depends on the preposition with which it collocates. Taking into account that most terms are nouns, the **Prep + N** framework, classified as G4 group of grammatical collocations by the authors of BBI (Benson, 1986) is considered the most frequent disambiguating pattern.

As mentioned in Section III, sometimes the noun or the adjective to the left may not be enough to narrow the meaning of the term because of their different connotations. In this case the preposition to the left of the phrase helps to further negate the ambiguity.

The word **spring** is a very good illustration of the power of prepositions to determine meaning. In pilot books the term is used in its meaning 'phase of the moon'. If used alone, the noun is always in the plural, which is enough to decode the correct sense. If, however, it is in an attributive position, the 's' is omitted and the meaning is not so transparent. Sometimes the word **spring** is used in its common sense, i.e. season, which automatically results in ambiguity. Then the preposition is the most obvious guide to correct interpretation. The article may also help but sometimes it can be omitted and cannot be entirely relied upon (see sentences 14, 15 and 16).

Special attention must be paid to the expression steep-to in sentence 17. The addition of the preposition to after the adjective 'steep' specifies that it is used with reference to an underwater object.

The examples below illustrate the role of the **Prep + N** pattern in specifying meaning.

1. The sea breaks heavily over the shallower **heads** in bad weather. (shoal)
2. Noord Volkerak curves to the N and divides around a **bank**. (shoal)
3. at the **head** of navigation, at the **head** of the River Orwell (entrance, mouth)
4. Etaples is a small fishing port at the **head** of Baie d'Etaples (the inner part) on the N **bank** of Riviere Canche (coast)
5. Trevoise **Head**, on which stands a conspicuous lighthouse (promontory)

6. Inside Saint Ann's **Head** (*on the lee side of the promontory*)
7. Remotely controlled radars of the surveillance system are situated at Saint Ann's **Head**, Great Castle **Head** and Patrick's Hill (promontory)
8. ... the front leading light on great Castle **Head** (promontory)
9. ... the foot of the cliff below the **head**. (promontory)
8. West Breakwater, at the **head** of which stands a lighthouse (end)
10. The red brick houses of Bexhill ... stand on rising **ground** (land surface, zero article)
11. Mean **spring** range (no preposition, sg.; phase of the moon)
12. Manningtree can be reached at **springs** (phase of the moon)
13. tide-rips occur over these shoals and very heavy seas develop in bad weather, particularly near **springs** (phase of the moon)
14. Pair trawling for Dover Sole occurs in the area in **spring**. (season)
15. Breskens is liable to silting and dredging takes place in the **spring** and autumn (season)
16. E to NE winds may persist for several days but can occasionally, most frequently during the **spring**, last for .... (season)
17. The E side of the **bank** is steep-to and the sea breaks over the bank in bad weather. (shoal)

The conclusion which can be drawn is that different meanings of a polysemous term require different prepositions: over and around refer to underwater objects; on is used before the terms meaning promontory, coast or land surface; at defines position in the inner part of a bay, at the end of a pier or in the mouth or entrance; below is used with reference to a promontory. However, at is sometimes used with **head** in the sense 'promontory' which may cause problems with understanding. In this case other collocational clues and the context will help. When the term **spring** denotes 'phase of the moon', it collocates with the prepositions at or near. If the meaning is 'season', the prepositions are in or during. Note that in the latter case the article can be omitted. The term **sea** is another example of polysemy. Most of the considerations above apply to its collocations, too but special attention should be drawn to the presence or lack of an article. 'In *the sea*' refers to position in the water. The following three collocations: 'At **sea**', 'in *the open sea*' and 'on the high **seas**' are synonymous and denote a place far into the sea. 'A high **sea**' describes high waves caused by wind. The disambiguating elements are not only the prepositions but also the use of the definite and the indefinite article or its absence.

## Exercises

There are a lot of publications which contain various types of exercise on collocations. Most of them aim at making students remember collocations in order to use them in the appropriate

context. Our purpose is to train seafarers to treat collocations as a means of resolving ambiguity and pay attention to the collocates in order to retrieve the correct meaning of a polysemous term. Some of the activities we propose are modified exercises from the book "English collocations in use" (McCarthy et al:2006). The samples of the suggested exercises are given in the **Appendix**. They contain several other terms besides those discussed in the paper.

### **Conclusion and recommendations**

In Maritime English the collocational competence of L2 users is important not only for their language production and reception but also for the safety of people and property at sea. Miscommunication may lead to disaster, therefore seafarers must be able to decode linguistically ambiguous information promptly and correctly and be able to speak as clear as possible. The ME teacher's role in this respect is not only to teach their students the various meanings of multi-sense words but also to train them in paying attention to the collocations in which such words occur because these set phrases are a highly reliable indicator of sense.

In practicing collocations teachers have to take into account the specifics of any of the collocation patterns a term can enter and draw the learners' attention to the meaning of collocates and even to the capitalisation of the term in written texts. Successful results can be achieved with a lot of practice in the form of various exercises aimed at focusing attention on the words with which a term or a polysemous word collocates.

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## Appendix

### Sample Exercises on Maritime English Collocations

#### Exercise 1

Match the two parts to form meaningful collocations. Then match them to the definitions below.

dangerous	head
entrance	ground
ship	bank
rising	point

1. a particular place, 2. bow, 3. land, 4. shoal

#### Exercise 2

Read the paragraphs and choose the correct meaning of the term in bold. Underline the words which helped you decode the meaning.

1. Les Ecamias are two groups of scattered **banks** formed by Grands Ecamias, least depth 12 m, and Petits Ecamias, least depth 11 m. The banks lie to seaward of the general line of the 20 m depth contour and consist of sand, gravel and shell, which are dangerous in heavy seas.  
a) financial institution; b) coast; c) shoal area
2. Sandwich Town Quay on the S **bank** just below the swing bridge has berths for craft up to 18 m in length. Depth alongside is about 0.9 m.  
a) financial institution; b) coast; c) shoal area
3. The sea breaks heavily on Ridens de la Rade in strong winds from the N and E and the **bank** is liable to change in bad weather.  
a) financial institution; b) coast; c) shoal area
4. The port of Terneuzen stands on the S **bank** of Westerschelde, 14 miles up river from the entrance.  
a) financial institution; b) coast; c) shoal area
5. Fairlight Down is the highest point and to its E the **ground** falls gradually in undulating fields and wooded hillocks.  
a) area on land; b) specialized sea area; c) sea bottom

6. Zero on the gauges equates to Mean Lower Low Water **Springs**.

a) phase of the moon; b) season; c) neither a) nor b)

7. Winds may persist for several days most frequently during the **spring**.

a) phase of the moon; b) season; c) neither a) nor b)

8. The terms and **conditions** of employing seafarers are specified in the contract.

a) clauses; b) state of the cargoes; c) health of seamen

### Exercise 3

**Read the sentences and answer the questions after them.**

1. Vessels take the ground at LW.

*What do vessels do when the water depth is small?*

2. The shoal is steep-to, with strong tide rips in its vicinity, and, in bad weather, a heavy sea breaks over it.

*What can seafarers see in bad weather and why?*

3. With strong sustained W winds there is a heavy ground swell over Kueerens.

*Can seafarers see the swell?*

4. The best holding ground is in depths of 12 to 18 m, clay and sand.

*What type of area does this sentence describe?*

5. The cargo damage occurred during shipment?

*When was the cargo damaged?*

### Exercise 4

**Choose the correct collocation.**

1. **Vergoyer** is a ... sand bank, which runs 15 miles NE.

a) steep; b) steep-to; c) ground; d) western

2. The area where the pilot embarks the ship is called pilot ... .

a) embarkation place; b) embarkation ground; c) boarding ground; d) boarding point

3. The coast is low and lined with sand dunes to the S entrance ... of the Baie de Somme.

a) position; b) point; c) place; d) area

4. There are also overfalls and breaking seas on the bar at ... .

a) spring; b) springs; c) the spring; d) the springs

## **The Critical Role of Governments and Key Industry Players for Sustainable Development of Maritime Education and Training Institutions: The Case of Institutional Development in Kenya**

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### **Abstract**

Maritime Education and Training in Kenya is a relatively young marine industry component. Nevertheless, the maritime administration marshalled efforts that saw Kenya being white listed. However, the challenges were and is still the relevance and importance of the role of key industry players and the government to guarantee sustainable training needs collaboration between the industry and the institutions. This paper seeks to highlights the challenges and possible recommendations to remedy the shortfalls.

**Keywords:** MET, Maritime, Institutional Development, Stakeholder, STCW, SOLAS, Technical and Vocational Training, TVET.

### **Introduction**

Through a concerted effort to its best of intentions, the Kenya maritime authority presented to the IMO the draft Kenyan syllabus on Maritime Education and Training, which was accepted and led to country's inclusion in the white list. As a result, a number of institutions launched maritime training programmes especially in the field of maritime engineering, with the most prominent being the Jomo Kenyatta University of Agriculture and Technology (a Public University), the Bandari College (owned by the Kenya Ports Authority) and the Technical University of Mombasa (a Public Technical University)<sup>1</sup>. Maritime education and training in Kenya has been largely incorporated in the existing departments and faculties. This can largely be attributed to insufficient teaching staff and resources for establishing new departments and faculties. Mostly it has been placed rather conspicuously under the Faculties/ Schools of Engineering. Currently the Jomo Kenyatta University of Agriculture and Technology is offering Bachelor of Science degree in marine engineering. The degree is offered under the school of mechanical engineering without STCW training. This has largely been through the lack of qualified staff to incorporate STCW training within the structures of the degree course The

Bandari College<sup>4</sup> was established in 1980 as a training and staff development institution for the Kenya Ports Authority; however, with time it transitioned in to a MET institute catering for the training needs of the Maritime industry. As at present, it is the only accredited institution offering STWC mandatory courses and issues certificates of proficiency and competences.

The Technical university of Mombasa offers diplomas in both nautical studies and marine engineering. However, the two are fragmented as the nautical study is offered under Faculty of Pure and Applied Science while marine engineering is offered under Faculty of Engineering under the department of Mechanical and Automotive Engineering. This has posed a challenge in STCW training and teaching modules that needs cross teaching for example the safety modules which are not being taught in the marine engineering diploma. The institutions have varied intakes which has been mainly attributed to the history of the institution and the logical position of the institution i.e. its presence and proximity to the port city of Mombasa. In this manner, concerning the degree training, the challenge brought by the BSc Marine Engineering syllabus is lack of continuity from the technologist to the scientist level. The intakes have been varied with different institutions and at different stages. This has been a major concern for institutions as most of the students are admitted through the central placement service known as the Kenya Universities and Colleges Central Placement Service (KUCCPS). The retention is dwindling ostensibly due to perceived failure of MET institutions to train to international standards, which requires a lot of technological infrastructure. This although the university has an Engine Room Simulator, capacity training has stagnated due to lack of funding to realize the ERS into an alternative source of funding to cover the running cost of the MET programmes.

### **Curriculum development and accreditation**

In Kenya, curriculum development is largely undertaken under the umbrella of the Kenya institute for curriculum development jointly with the stakeholders.

### **BSc marine engineering**

The bachelor degree taught in Kenya as “Bachelors of Science Degree in Marine Engineering” has so far focused on mechanical training. The STCW training component is incorporated within the structures of the degree substantively only but its final stages. It is however deviant from the common structures of the degree worldwide in that it is not progressive in nature from the technologist training to the engineering scientists training. It has quite affected the proper institution of MET institutes thereby it is a concern that might greatly affect the status of Kenya

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<sup>4</sup> The college has been upgraded to a Maritime Academy pursuant to the Executive Order under LEGAL Notice No. 233 dated 28th November, 2018 in the Kenya Gazette Supplement No. 149. The board has already been established and consultations are underway in restructuring the institution to an autonomous institutions running independent of the Kenya Ports Authority



in MET training. The progressive nature of the training is paramount. This has been specifically made impossible with the absence of an Academic Reference Standard. At the present little or passive consultations with key industry players has been the trend. The role of primary stakeholders has been largely ignored hence little involvement in outlining technological advances and industry specific needs for the training.

### **Nautical degree**

So far, no degrees have been launched in Kenya where at the moment only the diploma programme developed by the Kenya maritime authority in conjunction with the Kenya institute of curriculum development (KICD) and to be examined by the Kenya National Examination Council (KNEC). The process of curriculum development however is marred by bureaucratic procedures, which needs many resources hence translated to financial resources for proper institution of the Nautical Curriculum. Therefore, in such an event it is an obligation towards the government to facilitate the development of the curriculum, an aspect that is lacking in its foundation.

### **National government spending**

As much as the maritime sector development cannot be ignored, in the context of a national strategy, so far it is not clear whether the government has already put in place the necessary structures for the development of MET institutes in Kenya. MET institutes are broadly but not definitively categorized under Technical and Vocational Training (TVET). Therefore, it should be realized that the cost associated is not only the direct costs but rather it also incorporates the indirect resources associated with the training<sup>2</sup>. Grants and student loans from the government do not quite meet the desired amount for MET training per year.

Table 2: Amounts per Beneficiary disbursed by the Higher Education Loans Board

Year	Undergraduate Loan				Scholarships			
	Beneficiary	Total KES (M)	Amount per Beneficiary	USD	Beneficiaries	Total KES (M)	Amount per Beneficiary	USD
2010/11	77,141	3,434.0	44,515.89	445.2	50.0	15.0	300,000.0	3,000.0
2011/13	363,241.00	15,746	43,348.63	433.5	260.0	78.0	300,000.0	3,000.0

Source: The Higher Education Loans Board (Kenya) - Education Sector Report FY 2013/2014

The amounts disbursed per beneficiary on loans prove the inadequacy of alternative funding through tuition fees hence reliance on the government and stakeholders for sustainability. This leaves the burden on government to fund the deficit through infrastructural and capacity building

in providing the necessary technological tools and equipment. Otherwise, alternative funding in form of increased fees becomes a necessity. This is clearer with comparison to global median training cost per student. Taking that all marine students are the recipient of the scholarships we still find inadequate financial recourse in terms of competitive training.

Table 3: *Cost inadequacy in Training Cost deficit per student*<sup>5</sup>

Field of study	Average Annual Fees				Average Cost of Training on Cadet + (3-4 yr) Study			
	2014		2015		2014		2015	
	Global	Deficit	Global	Deficit	Global	Deficit	Global	Deficit
Nautical studies	12,000.0	9,000.0	13,500.00	10,500.0	36,000.00	27,000.00	40,500.00	31,500.00
Marine engineering	12,000.0	9,000.0	13,500.00	10,500.0	36,000.00	27,000.00	40,500.00	31,500.00

## Challenges

Maritime Education and Training is an expensive undertaking and it has much been proven in researches for the EU. Current tuition fees paid by MET students clearly show the deficit in terms of funding for the programmes. This deficit translates into lack of financial resources to equip the university with desired resources and equipment to produce very competitive graduates in the industry. Therefore, the university is forced to align its priorities within the minimum required standards of certification and as such, qualifications and training beyond the minimum standards becomes a mirage. This limits the competitiveness of both the university and the graduates in the ever-dynamic maritime and offshore industry.

Table 4: *Current tuition fees paid by students in both Nautical Science and Marine Engineering*

Field Study	Of	Average Fees Paid Per Trimester				Average Fees Per Annum (Study Period - 2 Semesters)				Diploma (3 Yrs) USD
		2014		2015		2014		2015		
		KES	USD (FX 95)	KES	USD (FX 98)	KES	USD	KES	USD (100)	
Nautical Studies		32,000	336.84	38,000	387.76	64,000	673.68	76,000	760	2,280.00
Marine Engineering		32,000	336.84	38,000	387.76	64,000	673.68	76,000	760	2,280.00

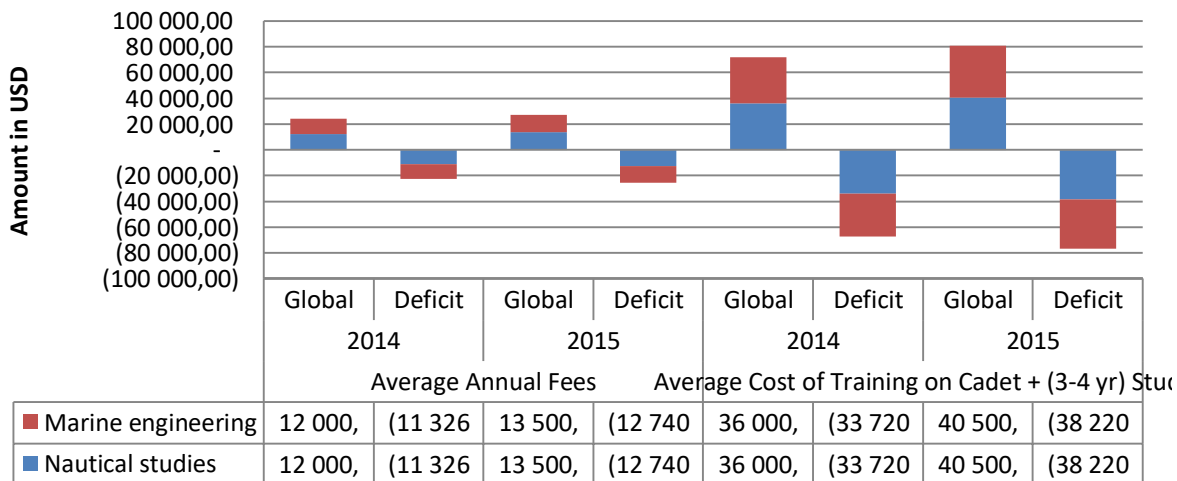
This is a huge deficit in the MET budget at international standards where it stands at 94.3%, which is untenable for sustainable growth in the MET sector.

<sup>5</sup> The global cost estimation has been done through assumption of a median cost of training using fees structure for international students in maritime institutions including the Arab Academy for Science, technology and Maritime Transport, the UK and EU countries

**Table 5: Deficit cost of training per student in comparison with median global fees per year**

Field of study	Average Annual Fees				Average Cost of Training on Cadet + (3-4 yr) Study			
	2014		2015		2014		2015	
	Global	Deficit	Global	Deficit	Global	Deficit	Global	Deficit
Nautical studies	12,000.00	11,326.32	13,500.00	12,740.00	36,000.00	33,720.00	40,500.00	38,220.00
Marine engineering	12,000.00	11,326.32	13,500.00	12,740.00	36,000.00	33,720.00	40,500.00	38,220.00

The analysis of the trends in funding from tuition fees from the students gives a rather alarming signal for the sustainability of the MET to meet international standards and enhance competitiveness for graduates.



**Figure 3: Financing Deficit in comparison to global financing trends of MET**

With continual admissions of MET students, the burden of funding and financing increases with a downward trend on the deficit. This as such calls for urgent measures to curb the downward trend.

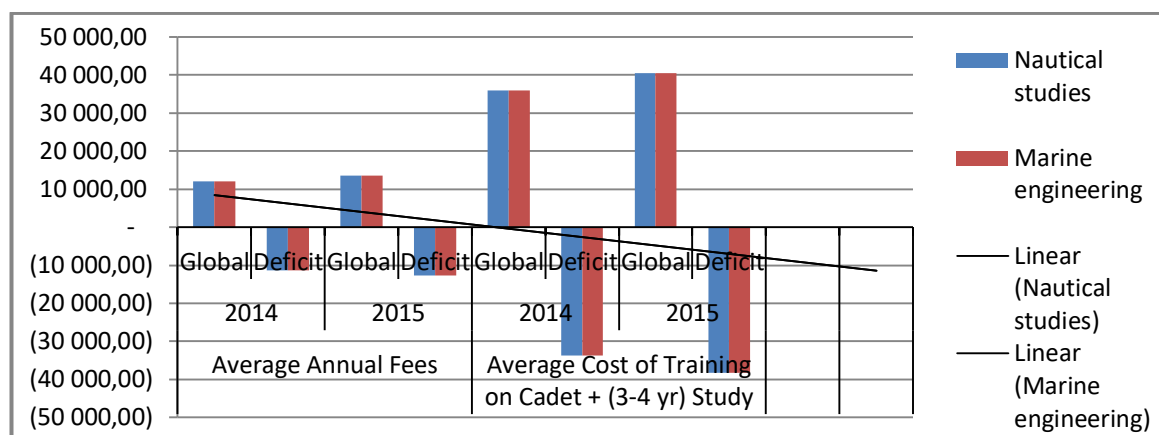


Figure 4: Comparison of Admission Trends vis-a-vis Financing Deficit

### Proposed MET funding structure

The government should adequately finance MET being primarily vocational. Relevant policies have to be implemented and reviewed over time with demand and necessity. The current model for MET-TVET funding in Kenya has been largely an all-funding structure for all TVET. The conspicuous flow is lack of identification for thematic areas for enhance training and funding through relevant technology tools of education and training. To beat the odds Kenya needs to look into key areas beyond traditional TVET Training as apprentice-based programmes have become more complex due to difference in learning environments. This is primarily complicated by the interest of employers, which at most times is maximizing their revenue through reduction of costs. Industrial placement (internship) has globally been acknowledged and acclaimed as an extremely valuable component of education and training. In MET particularly as they training is highly technical and professional, the government has the obligation to approach principal stakeholders in the Maritime Industry to fund cadetship of seafarers indirectly through berths for cadetship in ships in lieu of incentives. This follows a matrix of supplementing government funding in the long through funding diversification (seeking alternative sources), which can be represented by Fund Augmentation, Cost Sharing and infrastructural support for Income Generation<sup>3</sup>.

Level of training	Role of government	stakeholders	Level of funding
Basic MET and Cadetships	Increased quota for institutional and capacity building for the institution. Increased size of the funding pool available for distribution to	Enterprise training with: Training grants. Apprentice Wages. On-demand training funding for employees.	Increased Higher Education Loans Board (HELB) grants to MET Students Where possible creation of MET pool training kitty Structured MET apprenticeship/Cadetship with

	training institutions.		incentives.
Mid-Level MET	Incentives on enterprise training for stakeholders.		Through individual and other sponsorship channels
Maritime Industry Research and Graduate Research Programmes	Facilitation of Instructors and Trainers in MET	Funding of Research Programmes undertaken by Institutions.	Project Grants Research Grants Grants of bonded and disposable equipment and training assets

Figure 5: Proposed funding structure for MET

The financing and stakeholder functions in the funding can be articulated by the following graphic representation.

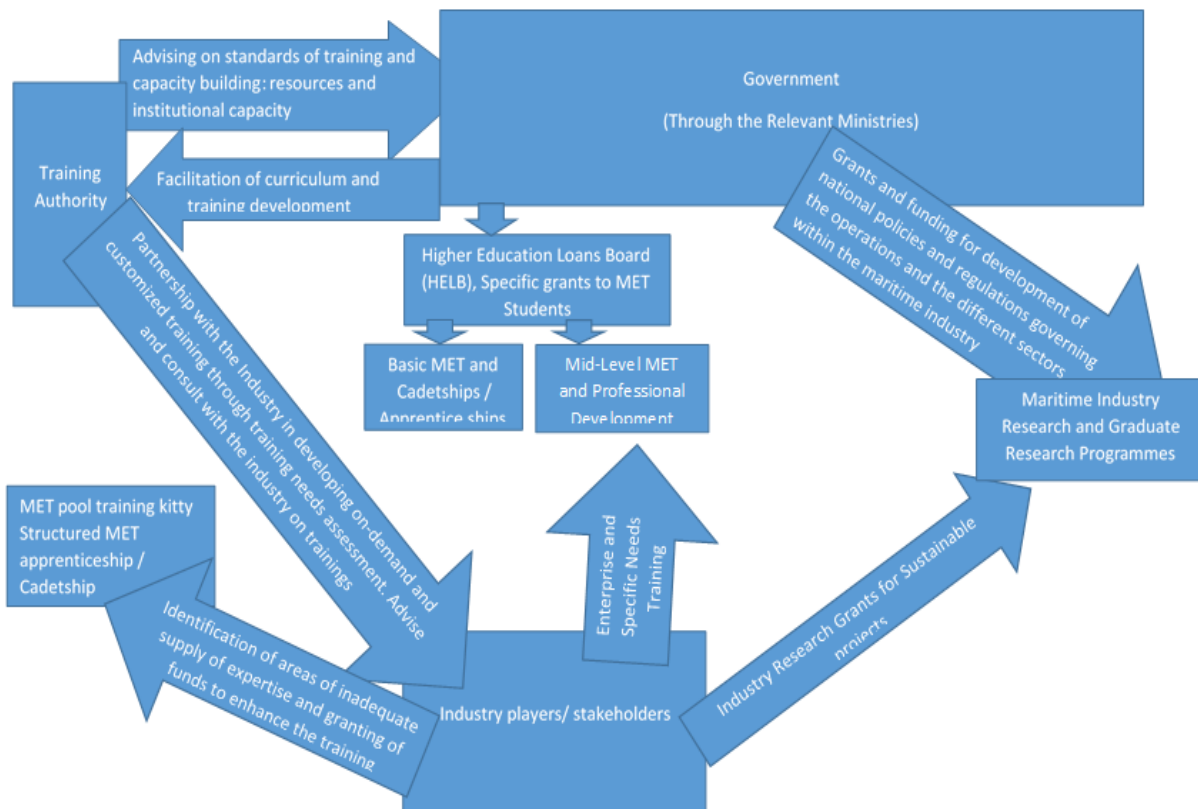


Figure 5: Model-funding structure for resource and institutional capacity building in Kenya for MET

### Stakeholder functioning and stimulus

This has been quite a challenge due to no-specific guidelines for maritime training, industrial placements and attachments guidelines. The burden of such has been left in individual guidance from tutors and lecturers who are overwhelmed. It is understandably clear that most maritime industry players are profit making ventures that are quite intent on profit taking,

thereby with the lack of training infrastructure in most met institutions, a lot is left to be desired. Stakeholders ought to be aware that the relevance of Education and training to sustainable development cannot be underscored thereby it is only prudent that in the initial stages of Maritime Education and Training (MET) it such needs are made available both widely and methodically. The integration of maritime education and training in matters relating to the maritime and shipping industry would be encouraged and enhance with a view to reflect the proper attitudes hence the right people being trained for the absorption in the industry. This, with special regards to the fact that it is the basis of development of professional values and practices<sup>4</sup>. It should be therefore of concern on the degree of professionalism and proper training of the maritime labour force to the industry stakeholder.

### **Sustainability in MET**

Sustainability is a key issue in running and operations of a maritime training institute. The maritime industry has seen tremendous global growth being global industry and as such encompasses and absorbs the emergent boundary-spanning roles within its academic, educational, entrepreneurial and industrial spheres<sup>5</sup>. It is therefore prudent that sustainability is a core factor in MET. As maritime education and training is clustered under Technical and Vocational Education and Training (TVET), it is therefore prudent that MET - TVET institutions are adequately facilitated to develop sustainable partnerships in the maritime domain through multi-prong approach that enhances sustainability. To meet such obligations, first it is important that the government and stakeholders realize that global nature of the industry which has a labour market that is increasingly defined as non-national neither nation specific<sup>6</sup> This has actually created a shift in recruitment process and methodology worldwide, where the pattern has shifted to predominant employment of cheap labour from low-cost labour supply countries e.g., the Philippines, Singapore, India and Malaysia. This is mainly as a result general deregulation in the maritime and shipping industry as expedited by the establishment of international open registers for ships which has seen shipping companies maintaining competitiveness due to low operating costs<sup>7, 8, 9</sup>. This has greatly affected traditional maritime nations and as such opening frontiers and opportunities for other nations although they do not have shipping fleets.

With the new regulations and standards in training, it requires that certain standards are met hence installation of specialised equipment and simulators. Students are mainly admitted through the central placement of universities with admission to technical institutes and universities through direct admission through localised applications. MET institutions therefore are obliged in the use of new technology, which it mutually benefits from. This however is

realized through rational planning and sustainable staged growth<sup>10</sup>. This technology revolves around the use of computer-assisted learning (CAL) and computer based training (CBT), which has placed pressure on the MET institutions because of the student's expectation that such technology is provided within their learning and training environment. This has become the challenge in the Kenyan context as technology expensive, and as a result development of the necessary and competent work force is a critical factor in the support for development and maintenance has now become more of a critical factor. This has left the institutions exposed to imminent collapse, as other sources of funding are not yet accessible to facilitate grants and donor aids. These grants for research and donor aids have a basic criterion of realistic approach to the output of such grants and most MET institutions in Kenya lack the necessary work force, resources and personnel in the fields of proficiency and expertise. It is therefore incumbent that the government in its essence to create funding structures either by inclusion on the existing budgets, drawing and implementing new policies for development within the maritime cluster. The interlinkages within the cluster has also proven to be weak, notwithstanding the 'disconnect' between research, education and training in the maritime sector and the maritime industry components especially core stakeholders and the supporting and ancillary industries to maritime operations.

#### **Funding of technology: theoretical, practical and simulator training to enhance competitiveness**

The nature of maritime training is expensive and therefore requiring many resources in monetary allocation. This has been so far realised by a number of concerned maritime entities that have established maritime related funds. It is proven that for to build the knowledge and skills base in maritime training, the states need to provide adequate resources to the institutions to provide quality vocational training for seafarers<sup>10</sup>. Singapore has established the Maritime Innovation & Technology (MINT) Fund<sup>12</sup> and the Maritime Cluster Fund (MCF)<sup>13</sup>. This has realised injection of S\$150 million to support development programmes for the maritime technology cluster<sup>12</sup>. However, this does not stop at that level but rather the disbursements and sponsor to develop maritime expertise through funding of maritime-based training for employees of Singaporean nationality or others with permanent residency status<sup>14</sup>.

It is therefore incumbent upon the government of Kenya to follow suit and institute the measures needed to revive seafarer training and in general MET in Kenya. The Technical University of Mombasa in its inception as Mombasa Institute of Muslim Education (MIOME) was the only seafarer-training institute in East and Central Africa. With time due to lack of interest and funding for the MET sector, the programmes collapsed. maritime service companies, whether

small enterprises or big corporate will always stay aloof of basic training mainly in terms of maximising revenue hence profits, therefore they covertly rely on governments to provide the much needed vocational training especially for seafarers both officers and rating<sup>11</sup>.

The maritime industry has moved towards more specific personnel especially on-board with relevant and additional qualifications due to the technological demand for safer ships to both the ocean environment and manning requirements. Without proper investiture for technological funding, the risk is training unemployable workforce. This requirement for technical and specialised qualification in technology comes special courses therefore more requirements at most time beyond the capacity for most developing nations, Kenya included. It is therefore beyond doubt that for competitiveness Kenya must invest in technology through proper funding of technology in MET

### **Conclusions and recommendations**

As it is, Kenya is far lagging behind in terms of MET, and therefore drastic and strategic measures have to be taken in order to arrest the situation and thereby give the domain a lifeline. Establishment of a proper authority for standardisation of training in MET which is properly funded, advising the government and consulting with stakeholders in areas of TVET-MET an example the Merchant Navy Training Board of the UK (MNTB) which developed a set of occupation standards for seafarers. Establishment of a clear structure on the requirements of the fields of Marine Engineering and Nautical Studies/Technology. This includes establishment of Academic Reference Standards for degree programs and especially Marine Engineering, which has a frontal war that is fought between 'what the EBK wants and what is relevant to the industry'. Establish and publish a national guideline on the acceptance and admission of cadets and seafarers according to IMO standards and regulations through establishment of a Merchant Training Board that shall coordinate the maritime training needs. Establish practicable and executable Government-to-Government MOUs and Quasi Consular agreements in terms of MET and maritime industry facilitation. In addition to that, establishment of clear guidelines to Kenya's diplomatic representation in different countries on maritime related issues. Tripartite agreements between maritime administration and industry players/stakeholders with the inclusion of training institutions; which would essentially enhance and develop quality standards and as such the finality being proficient and competent seafarers.

Rationalising government subsidies and grants, and creating special grants and funds for maritime education and training campaign.

Establishment of proper maritime clusters and as such simplify identification of critical industrial labour development tools and resources.



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## **Simulator Training Based learning in MET (Modern Challenges in Maritime Education and Training)**

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### **Abstract**

This paper seeks to review and evaluate the use of maritime simulators for training currently at the Regional Maritime University (RMU) Ghana and explore it's utilization for maximum benefits for both seafarers and the University.

The Standards of Training, Certification and Watchkeeping (STCW) convention requires the approval of simulators before they are used in any training and assessment of seafarers especially in mandatory courses. Thus certificates for mandatory simulator training would be recognized only if the manufacturers have a standard certification for maritime simulator systems. Maritime training demands acquisition of knowledge, skills and competency such that, beyond initial qualification, trainees are expected to continue to maintain, upgrade and update their skills throughout their working life. The use of simulators in maritime training and education (MET) in RMU requires that the trainee goes through the background theory behind the simulator first. The simulators are a highly accurate representation of "that specific part of the ship /sea vessel", meaning, the trainee will be getting hands-on experience, taking them to a level of proficiency comparable to what is done on-board a ship/sea vessel to meet sea time. The benefit here is for seafarers to be licensed as competent Merchant Mariners in pursuant to the STCW convention whilst at the same time allowing trainees to make mistakes, which may have otherwise destroyed real life/real time equipment. My experience with both hardware and software engineering makes me appreciate the integration of these tools that accurately represent shipboard equipment and the ship as a whole. Reviewing, evaluating and exploring the utilization of the current simulators at RMU will help identify some challenges and how it impacts maritime education and training as a whole.

### **Introduction**

The Regional Maritime University (RMU), Accra, Ghana is an [RMU-GhanaWeb] internationally accredited tertiary institution with full diplomatic status with its founding members, the Republic of Cameroon, the Gambia, Ghana, Liberia, and Sierra Leone. RMU exists to enhance the

development of the maritime transport sector and the fishing industry in member states through the maritime education of students, training of marine personnel, research and consultancy and promotion of maritime co-operation. The hallmarks of its operations are meeting international standards, teamwork, discipline, and professional integrity. [Vision & Mission - RMU] With a vision to within the next decade, be known and recognized as the tertiary institution of the first choice in advanced maritime education and training, research and consultancy in Africa and beyond". The Regional Maritime University is committed to the efficient and effective utilization of its resources to continually improve its Quality Management System in the provision of maritime education [About Us | Jordan Academy for Maritime Studies] and training that meets prevailing international standards.[Quality Policy Statement- RMU] Thus RMU's Mission, Vision and Quality statements endorses Captain Ashwawy's assertion that quality education empowers states to boost their progress status from developing to developed circles.[El Ashwawy]

The Standards of Training, Certification, and Watchkeeping (STCW) convention [India : IMTC (2015)] requires the approval of simulators before they are used in any training and assessment of seafarers especially in mandatory courses as well as performance-based competency tests [Section A-I/6; Section A-I/12]. The latest update of the STCW code, the Manila amendments 2010, has a greater focus on technical proficiency and the non-technical skills of team management and resource management on the bridge than previous convention . Thus certificates for mandatory simulator training would be recognized only if the manufacturers have a standard certification for maritime simulator systems. Maritime training demands acquisition of knowledge, skills, and competency such that, beyond initial qualification, trainees are expected to continue to maintain, upgrade, and update their skills throughout their working life. The use of simulators in maritime training and education (MET) in RMU requires that the trainee goes through the background theory behind the simulator first. The simulators are a highly accurate representation of "that specific part of the ship /sea vessel," meaning, the trainee will be getting hands-on experience, taking them to a level of proficiency comparable to what is done on-board a ship/sea vessel to meet sea time. The benefit here is for seafarers to be licensed as competent Merchant Mariners in according to the STCW convention while at the same time [MARINA NEWS DIGEST – Page 3.] allowing trainees to make mistakes, which may have otherwise destroyed real life/real time equipment. My experience with both hardware and software engineering makes me appreciate the integration of these tools that accurately represent shipboard equipment and the ship as a whole. Reviewing, evaluating and exploring the utilization of the current simulators at RMU will help identify some challenges and how it impacts maritime education and training as a whole

## Simulators in RMU

### Global Maritime Distress and Safety System (GMDSS)

In 1994 the Poseidon PC-based GMDSS Simulator, networked to meet all necessary training requirements for both radio- and satellite training for General Operators Certificate (GOC) and Restricted Operators Certificate (ROC) was installed. This acquisition was through the Technical Cooperation Committee of the International Maritime Organization (IMO). The simulator included an audio multiplexer unit. It was a "digital telephone switch," which allowed the instructor to create atmospheric noise, etc. and other challenges for the students for very realistic training. It allowed advanced training of various radio frequencies at will for the competent instructor depending on the ships' global location, time of year, and time of day. In 2010 it was upgraded to Pharos VOIP-based GMDSS Simulator which was updated in 2011 to Pharos version 7.3 which is still running although RMU is yet to upgrade to Pharos version 7.9 which is an integration of Navigation simulator + GMDSS

Fig. 1 An ongoing GMDSS Class

Since the simulator allows for advanced control, supervision, and debriefing according to [Poseidon] I joined a current class for review and evaluation of the following as Poseidon stipulated:

- Multiple sessions/parallel exercises
- Malfunction control
- Assignment of numerous VHF's
- Student intercom system
- Coast Radio simulation
- Ship station simulation (Traffic Ship)
- Advanced exercise logging
- Rescue Coordination Centre (RCC) simulation
- Voice debriefing module
- Ship database
- Coast Radio database



They were first introduced to the equipment (The minimum GMDSS carriage requirements) as is on-board a vessel such as;

VHF with DSC - Very high frequency with Digital Selective Calls

SART - an electronic device that automatically reacts to the emission of a radar. This enhances the visibility on a radar screen. SART transponders are used to ease the search of a ship in distress or a life raft. [EPIRB PLB and SART ] All GMDSS vessels up to 500 ton must carry at least one SART. [Search and Rescue Radar Transponder (SART)]

NAVTEX is an international automated medium frequency direct-printing service for delivery of navigational and meteorological warnings and forecasts, as well as vital maritime safety information (MSI) to ships.

EGC RECEIVER Enhanced Group Call (EGC) service is a part of the GMDSS system for the transmission of maritime safety information (MSI) in areas where the NAVTEX service.

EPIRB An emergency position-indicating radio beacon (EPIRB) is a distress radio beacon, a tracking transmitter that is triggered during an accident.

VHF PORTABLE

2182 kHz watch receiver

2182 kHz 2-tone alarm signal generator

MF R/T + DSC

PLUS

INMARSAT –A, -B OR –C International Marine/Maritime Satellite

HF R/T with DSC and Telex

Secondly, the concept, GMDSS communication links

Thirdly, Propagation

Followed by Transmitters and Receivers, GMDSS Distress and Safety Communications, DSC, Non-DSC Terrestrial Distress Communications, Terrestrial Urgency And Safety Communications, Radiotelephony Procedures, Inmarsat Satellites, Maritime Safety Information (MSI), EPIRBs – SARTs, General Regulations, Power Supplies, Antennas, Traffic Charging and GMDSS Frequencies.

They were then taken through the practical exercises after which they write exams to qualify for a certificate.

**Poseidon Borealis ARPA Simulator**  
to  
**Regional Maritime University**



Fig.2 Navigation Simulator

In 2004 the above simulator was installed in RMU, and the training system for navigators consisted of various simulator modules, depending on the specific training objective, the trainees' level of competence and the number of trainees that shall attend the training course. [Borealis Navigation Simulator - Poseidon Simulation AS.]

It consists of Poseidon Radar Simulator (PRS), Poseidon Exercise Maker (PEM) and Poseidon Virtual Console (PVC) for the ship's instrumentation and repeaters.

RMU had Poseidon Borealis ECDIS simulator which is a part of the Borealis Navigation Simulator system, installed as a single PC-Setup alone in the RMU Chart Room instead of integrating it to the ARPA Simulator as shown in Fig 3.



Fig. 3

Fig 3 contains an approved ECDIS system type, visual simulation, and IMO

compliant Automatic Radar Plotting Aid radar. The Borealis ECDIS Simulator setup is suitable for various navigational training.



Instructor chart view

FIG. 4

### ECDIS Interface

The instructor's interface for all preparations and monitoring is an ECDIS-based chart view. Using modern Windows dialogue boxes in combination with international recognized chart symbols, the instructor gets an intuitive overview of complex training scenarios.

### Exercise Manager

Poseidon Exercise Manager (PEM) is the network server as well as the instructor's interface for preparing and running exercises. The highly user-friendly system runs under Windows OS.

### Exercise Control

The instructor stops, starts, or pauses an exercise at any time during the practice. He can also stop the exercise and store the situation as a new exercise. This way, it is possible to start from the actual position in the next lesson if the exercise is not finished at the end of the session.

### Environmental Conditions

When the instructor sets current speed and direction, sea conditions/waves and levels of precipitation in the form of rain, snow, fog, the environmental conditions show visually and have an effect on radar image and the ships behavior. The instructor can change weather condition during the exercise, as shown in Fig 5.





Visual effect of rain and snow

Fig 5. Visual Simulation

The visual simulation contains fixed targets as marks, boys, etc. and floating objects as logs, life raft, the person in the water, etc. The instructor selects between predefined geographical areas. The ECDIS Simulator came with two different sailing areas from stock. The Singapore area was chosen, and the sailing area is as shown in Fig.6

RMU however acquired licenses for ARCS Maps so actual fields are simulated.



Fig 6

Sailing area Singapore

ARPA Radar

The ARPA radar (Fig.7) contains relevant, and ARPA features so can be configured to operate either as X- or S-band radar. The radar is entirely operated on-screen, using a 3-button roller ball or mouse. The radar video signal is transferred to the ECDIS system, creating the Radar Overlay functionality (Fig.8)

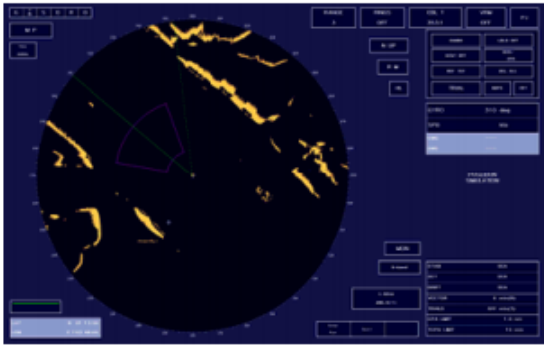


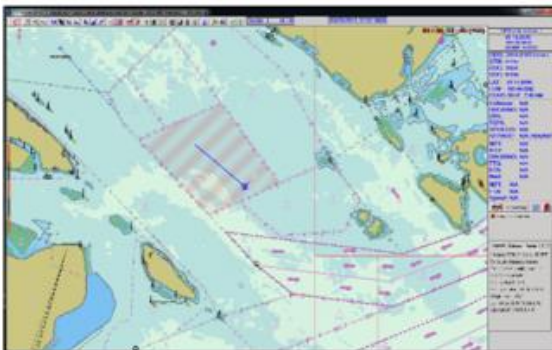
Fig. 7

### Radar overlay

The radar signal from the ARPA radar module is integrated into the

ECDIS chart. The student can through dialogs choose whether and how the radar signal should be displayed in the table.

MARIS was among the first companies to get IMO classification for a PC based ECDIS system, and they are responsible for the geographical management of the maps.



Maris ECDIS900

Fig. 8

### Chart information display

Chart database: IHO S57 Vr.3.0, C-MAP

CM93, ARCS, NOAA

C-MAP ENC for actual areas.

Display mode: True motion display, North

up display

Zoom up/down: 1/100~1/200,000,000

Navigation planning

Entry, deletion, and modification of

planning

App. 200 way-points per route

Grounding alarm and dangerous/prohibited

area alarm functions for route editing.

Navigation data calculation

Route storage capacity is more than App.

200 routes

Route monitoring

Monitoring for the prohibited area and safety contour crossing

Control for prohibited area entering

Monitoring for deviation from the route

Monitoring for arrival at way-point and departure from a fixed point

Other ships monitoring with ARPA targets information

Indication of own ship track

Bridge Simulator

RMU acquired a Bridge Simulator (pictures are shown below) as well in 2009, and maps of Port area of Member States integrated for the training of pilots in their respective ports



FIG.9

INSTALLED BRIDGE SIMULATOR (RMU)



FIG.10

An Instructor taking a Vessel to Port

Engine Room Simulator

In 2005, RMU acquired an engine room simulator ( UNITEST SINGLE CONSOLE ENGINE ROOM SIMULATOR).



FIG. 11

The UNITEST single console is a medium speed engine room simulator with a single desktop hardware console. The desktop hardware console combines features and benefits of a hardware simulator (real levers, gauges, lamps, and pushbuttons).

Medium Speed Engine Room (MER2) is a PC-based engine room simulator with all vital systems in a ship's engine room modeled and implemented.

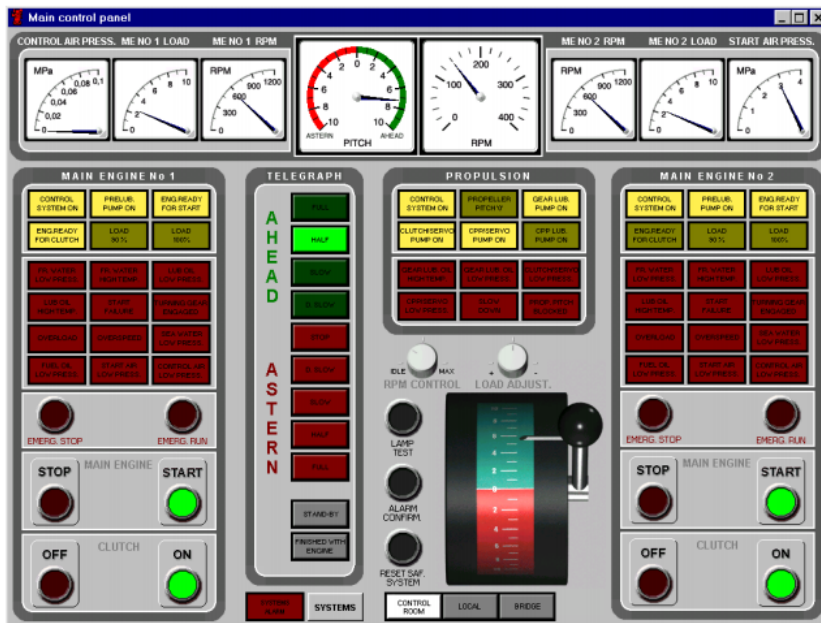


Fig.12

MER2 simulator model includes the following systems:

- Two (2) main engines (4 stroke, medium speed, 16 cylinders, reduction gear, controllable pitch propeller).

The fuel system (DO, including storage system and separator).

The lubricating system (LO circulation and separator, LO storage).

The cooling system (freshwater).

The compressed air system.

The power plant (2 diesel- and 1 emergency generator).

The bilge system with oily water separator.

The ballast system.

The steering gear.

The main educational tasks which can be accomplished [ERC6 – Unitest Marine Simulators ] using MER2 are listed below:

The learning of engine room typical operating routines.

Engine room operation training.

The user can accomplish any operational task starting from different setups, both pre-prepared and saved by the user.

Corrective action is, learning at the same time when faults occur.

Different faults are simulated and mixed in the run-time or loaded from disk.

In the same lab as the Console were other networked PCs (COMPUTER BASED TRAINING (CBT)) for – interactive programs application possibilities such as:

- lectures
- exercises and seminars
- laboratory
- examination centers
- vocational training centers
- individual self -training
- application on-the-job training

The programs also enable the simulation of faulty operation that may not always be realized under real conditions. Generally, optimum results in the use of computer-based simulation of an interactive character, are achieved with each student working on one PC station.

In my evaluation, the use of computer-based simulation increases the effects of the educational process considerably and reduces the cost of training and then increases the effectiveness of the marine engineering educational scheme.

In addition to this, RMU has in the last two years acquired and installed a Full Mission Engine Room Simulator to keep abreast with time.



FIG.13

Hardware Console with touch screens



FIG.14

Screens for 3D visualization of Engine Room Components



FIG.15

Students' Station

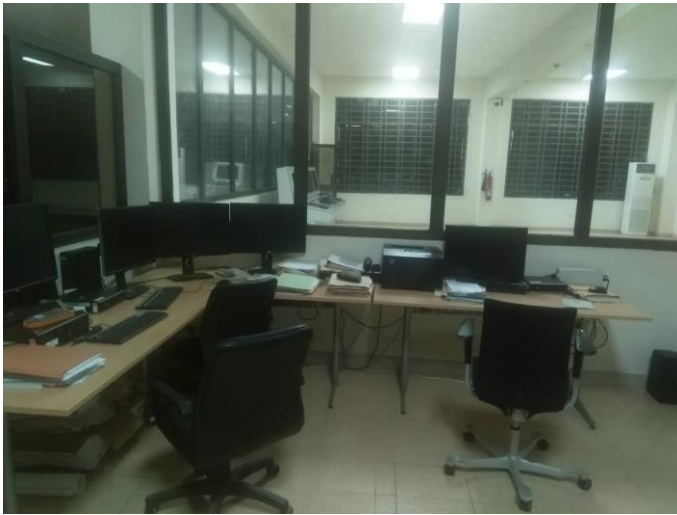


FIG.16

Instructor's station



FIG.17

Electrical Switchboard for the different Engine Room sub Systems



FIG.18

Navigating through the Engine Simulator Sub Systems

**Review and evaluation of RMU simulators**



In my review and evaluation, I realized that, because simulators allow trainees to make mistakes without compromising the equipment, when they are appropriately used with the support of expertly trained and experienced instructors, simulator training provides trainees with the necessary experience which makes them confident to discharge their duties on board diligently. This eventually improves their capability and efficiency, thus reducing accidents at sea. Also in the same simulator-based training, once the instructor meets all planned training objectives in the exercises given, then impartation of all performance standards to the trainee is achieved, and the practice can be referred to as reliable. If the same, excellent, useful, and reliable exercise is run on several trainees at different times, and the same learning outcome is achieved, then the uniformity of the exercise is also guaranteed. STCW, as amended, stipulates that "... any simulator used for mandatory simulator-based training shall be capable of simulating the operating capabilities of shipboard equipment to a level of physical realism appropriate to training objectives..." [A Methodological Framework for Evaluating Maritime].

### **Exploring RMU simulators**

In exploring the utilization of simulators in RMU, the effective way to facilitate learning and allow for competency to be demonstrated and assessed is to combine traditional lectures and simulators.

### **Conclusion**

In conclusion, since the recent growth of all forms of marine simulators, are driven substantially by technology, the maintenance culture of RMU must change to effect upgrades of the old simulators instead of getting rid of them immediately the hardware fails and thus having to abandon the costly simulator software. Therefore all current simulators must have Maintenance Agreement with Vendors to keep updating to the current edition of all the latest simulators.

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## **Research on Integrated Virtual Simulation Teaching Scheme for Ship handling Collision Avoidance and Bridge Resource Management (BRM)**

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### **Abstract**

With the development of virtual reality technology, virtual simulation has been widely used in maritime training and teaching. The high sharing of virtual simulation labs has enabled more maritime college students have more chance to use advanced navigation simulators, Can cultivate more and better marine technical talents. In the mixed teaching mode of "online and offline, virtual and real", this paper explores the practical training and teaching scheme of Ship handling Collision Avoidance and Bridge Resource Management (BRM) based on the platform of virtual simulation. It is satisfied the requirements of the International Maritime Organization (IMO) for maritime training and teaching and modern teaching information requirements, also, It has changed the learning style, study time and study space of the BRM practical course. Through the integrated virtual simulation teaching scheme for simulator training, students can enhance the understanding of knowledge and improve the ability to apply theoretical knowledge to practice and to validate theory through practice.

**Keywords:** Bridge Resource Management (BRM), Virtual Simulation, Practical Operation, Teaching Scheme

### **Introduction**

In order to cooperate with the implementation of the Manila Amendment to the STCW Convention, China's maritime authorities have formulated the "Measures for the Issuance of the Certification for Seafarers' Training in China" and "Rules for the Examination and Issuance of Seafarers' Crews in China", which came into effect on March 1, 2012. For cooperation the implementation of these regulations, the maritime authorities have formulated corresponding outlines and specifications. The document lists the BRM as a competent assessment subject. After the International Maritime Organization moved the principle of BRM to Part A, it became a mandatory requirement, and then BRM training has been widely carried out for students in colleges and universities. BRM training aims to build crew teamwork skills, fully and effectively

utilize the various navigation equipment of the ship, strictly and orderly execution of related work procedures, reduce the potential mistakes and ensure the safe navigation <sup>[1]</sup>. At present, a lot of research has been done on the teaching mode of BRM training. The universities and institutions are based on the "theory + simulator practice" for training <sup>[2]</sup>. With the development of information technology and the application of virtual simulation technology on the simulator, a virtual simulation platform has been created, which has changed the traditional training method. Students can use the terminal to conduct learning and practical training anytime and anywhere. Whatever it is a navigation simulator lab or a virtual simulation platform, the design of the training program and card design affects the training effect directly. This paper research and discuss the integrated virtual simulation practice teaching scheme for BRM based on the assessment outline requirements and the job requirements under the convention. It will provide some reference for the training schemes and modes of maritime colleges and crew training institutions.

### **Assessment outline and functional requirements under the convention**

"Qualified examination Outline for Sea-boat Crew of the People's Republic of China (2012)" provides detailed provisions on the subject evaluation of the ship handling, collision avoidance and bridge resource management. The part of ship's handling and collision avoidance requires correct identification and application of cross encounter, confrontation and chase. Grasp the relevant regulations of the need to turn to avoid, slow down or stop and the multi-ship encounters in poor visibility waters. Master the navigation methods and related regulations in special waters (narrow water or divided traffic). In the course of bridge resource management (BRM), students are required to correctly plan by specifying waters. Master the prioritization of the bridge resources and organize and coordinate, correct teamwork (Including team collaboration and communication, error chain identification and disconnection, internal and external communication), Make correct judgments and decisions on incidents during the voyage, Take correct measures to rescue the man over board, Take correct maneuvers for emergencies in an emergency situation where mutual views are difficult to avoid and avoid collisions <sup>[3]</sup>.

The requirements for the operational level navigation function are as follows: 1. Plan and navigation and positioning, including positioning, use of marine charts, navigational instruments, steering, etc. 2. Maintain a safe navigational watch, comprehensive knowledge of international maritime collision avoidance rules, Basic principle, correct use of the alignment system, use the information from the navigation device to maintain safe navigation watch, knowledge pilot technology, VTS Reporting, knowledge the principles of BRM, resource distribution, dispatch

and prioritize, effective communication, decisive and leadership, acquisition and maintenance of situational awareness. 3. Use radar and ARPA to maintain safe navigation, 4. Use ECDIS to maintain safe navigation, 5. Response to emergency, 6. Response to maritime distress signals, 7. Use English in written and spoken based the IMO standard sailing communication terms, 8. Ship handling <sup>[4]</sup>.

### Discussion on teaching scheme

At present, BRM practical training generally adopts the "theory + practice". The Training hours only meet the requirements of the rules. Due to the large number of students and not enough equipment, so the practical training hours for students is greatly reduced. Even if you have the relevant knowledge in the theoretical class, but no practical operation, the training effect will be great discount. In order to improve the training effect, we must consider how to carry out reforms from teaching content, methods and teaching models. It can not only reflect the content of the crew's test assessment outline and functional requirements in the training course, but also increase the fun of the course and fully mobilize the active learning enthusiasm of the students. This paper analyzes from the content selection of the course, the design of the practical card and the training process control, and put forward the practical teaching scheme of the BRM practice.

### Content select of the practical course

The main content of this paper is the BRM course for undergraduate and vocational colleges. Therefore, the content of the course is mainly based on the minimum post function and crew assessment requirements of the three officer involved in BRM. Here we focus on the navigation part, based on practical skills training. The select of course content as shown in the table below.

	Practical training content	rule requirements
1	Voyage plan, route design	Plan, guide navigation and alignment requirements, etc.
2	Sailing in narrow water, avoidance operation in poor visibility	Maintain safe navigation, use collision avoidance rules, navigational duty, etc.
3	Engine order, rudder order, external contact, etc.	Use IMO standard nautical communication
4	Ship positioning (instrument equipment, chart)	Positioning, instrumentation and use of charts and books

5	Report, bridge resource utilization, communication, situational awareness	Ship reporting, VTS reporting procedures, BRM principles, etc.
6	Correct use of radar and ARPA in poor visibility	Use radar and ARPA to maintain safe navigation
7	Use ECDIS and keep sailing safety	Keep safe sailing with ECDIS
8	Overcoming the influence of wind/flow, maintaining the position of the ship, emergency operation of personnel falling into the water	ship maneuvering
9	Engine failure, rudder failure, instrument failure, ship stranded, oil spill, collision, etc.	Incident/emergency response

Table1: course content

The above table is to organize and analyze the training content according to the rules. The content can be divided into: Cognition of bridge resources; make plan for the adoption of designated waters; operation by specifying waters; collision avoidance operations in interviews, poor visibility and special water; predictions and strains of incidents and emergencies<sup>[4][5]</sup>. In training, only incorporate this content into the training card and according to the training of the card, the training effect can be guaranteed.

### **Practical card and control process design**

According to the contents of the practical course in 3.1, reorganize each training project in order of simplicity and navigation time. According to the characteristics of the waters in the training, the training content of each card is designed and arranged. This article takes "outbound of Shanghai Port North Channel" as an example, proposed the reference flow of the card design and practice. The card creation process is shown in Figure 1.

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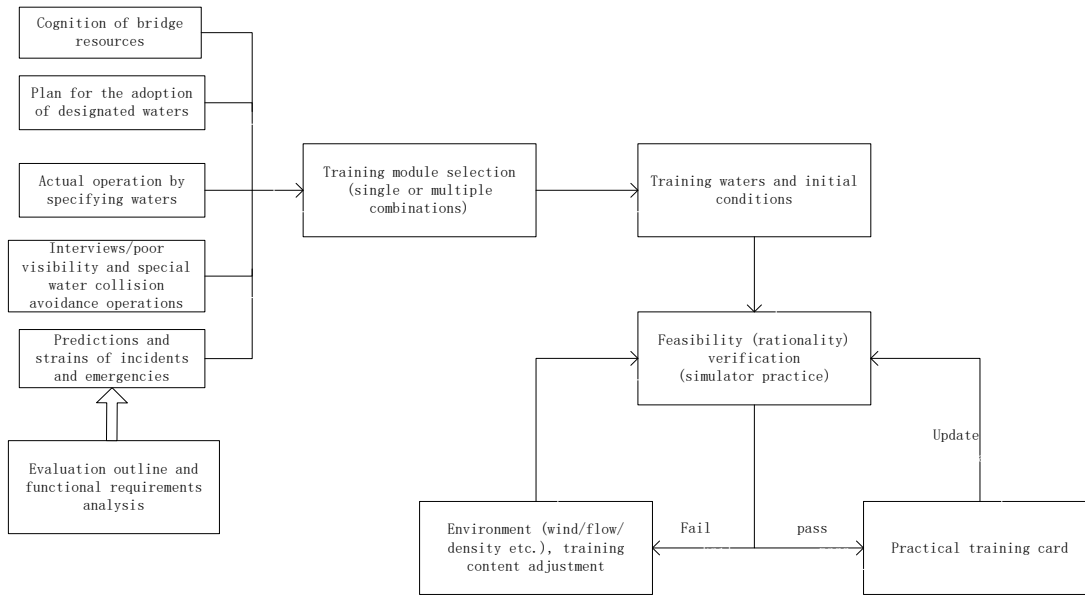


Figure 1, design

program of the card

Table 2: Design of the outbound sailing practice flow for the North Channel of Shanghai Port

object	Student or two/three officer				
Scenes	outbound of Shanghai Port North Channel				
Initial scene	Waters	Ship type	Initial position	course/speed	environment
	Shanghai Port North Channel	Fully loaded with 10,000-ton ships	31°06.093'N 122°24.037'E	course 085° speed 10Kn	Wind: 3 north, flow : 1.5 120 °
Setting basis	1. The mandatory minimum requirements for the issuance of certificates by the senior crew responsible for navigational duty of ships of 500 gross ton or more in STCW Convention No. A-II/1;				
	2. The mandatory minimum requirements for the second/third sublicensing of ships of 500 gross tonnage or more by STCW Convention A-II/1;				
	3. Relevant contents of the provisions of the “Interim Seafarers' Replenishment Outline” and the “Driving Platform Resource Management Evaluation Specification” formulated by the Maritime Safety Administration of the People's Republic of China				

Practic e conten ts	1. Narrow waterway navigation
	2. In operation, set the situation of cross and chase
	3. Set poor visibility during operation
	4. Incidents and emergency (man over board)
Practic e proces s	Initial time: 1000
	1000: Run, own ship and the target ship navigate normally;
	1005: set fog;
	1006: Reduce the speed of each target ship appropriately;
	1008: Add fishing boats near the channel and cross channel, forming a dangerous situation with own ship;
	1012: Add target ships in the channel, increase the density of navigation, and form a meeting situation with own ship;
	1015: Cancel the fog and each ship navigate normally;
	1025: Set man over board on starboard side;
	1030: According to the notification, adjust the target ship's course, assist the ship in searching and rescue the man over board;
	1035: The end of the search and rescue process, exercise ends.

The training content should include:

Complete the planned route of outbound of Shanghai Port North Channel;

Complete the preparation before sailing, familiar and use the equipment;

Judgment the situation of ship encounter, avoidance operation, navigation watch;

Navigate operation in poor visibility (such as fog);

Disposal and operation of the man over board during the ship's navigation.

Through the training, students can understand and master the determination of planned routes in traffic separation system and narrow waterway; Method and steps for drawing a plan route and precautions; Method of handing and avoiding in narrow waterway navigation; Communication and communication methods in navigation; Disposal procedures and methods for emergency events such as poor visibility and man over board in navigation; Positioning, logbook, telegraph book, etc; Use of bridge resources; improve the ability for teamwork <sup>[6][7]</sup>.

When the training card is used in the offline simulator laboratory, we can adjust the simulator scene in real time according to the actual operation of the students, make the simulator more practical. If online, the training card is set and cannot be changed in real time. However, online practice can be infinitely repeated, and can also strengthen training on individual points, regardless of time and space constraints, reflecting the greatest advantage of the virtual



simulation platform.

### **Teaching scheme under the integrated virtual simulation mode**

In the mixed teaching mode of "online and offline, virtual and real", this paper explores the practical training and teaching scheme of Ship handling Collision Avoidance and Bridge Resource Management based on the platform of virtual simulation.

Through the previous analysis, each knowledge point can be "independent" during the teaching process. Create a micro-course video for each operational, 5-10 minutes per video, demonstration with flash. Students can target learning based on their own situation. Guide and demonstrate in the video, students can familiarize themselves with the actual operation process through the micro-course video before the operation, and then strengthen and deepen the actual operation process through the micro-course video after the practice. On the one hand, this intuitive way can enhance students' perception of navigation, make up for the lack of navigation experience of students in school, and on the other hand can accelerate students' adaptation to the practical environment, reduce exploration time and improve learning efficiency. The micro-course video mode can be applied to both online and offline operations.

It can take watching and learning in offline practical training, students can be divided into two groups. First, the instructor will demonstrate the operation process, explanation details and precautions. One group of students in operation and the other one take watching. The operation group to self-summary when finish the training. The observation group comments on the problems in the operation group. Finally, the instructor will summarize and comment, and solve the problems in practice one by one <sup>[8]</sup>.

Online practice, student can training with comprehensive or individual according to their own needs. The system provides practical guidance, micro-course video, process evaluation, etc. The practice operation process has "hyperlink". The details of each practical process should have a jump path to the relevant knowledge points, and the knowledge points are displayed in text form, which is convenient for students to give inferences. Using theory to guide practice, the knowledge points can be more conveniently and quickly applied to practical operations, and stimulate follow-up learning.

The integrated virtual simulation practice teaching scheme is shown in Figure 2 below.

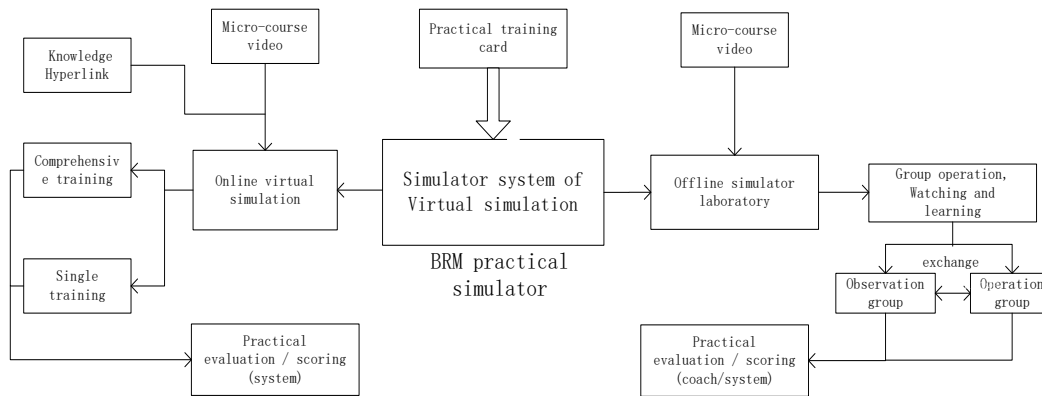


Figure 2

### Practice teaching scheme of integrated virtual simulation

Through the implementation of integrated virtual simulation experiment project, students can effectively improve their knowledge of professional knowledge. During the practical training process, students can increase the class according to their needs. Study time can be arranged by self, learning is more flexible and no limited. In this process, the students' practical ability has been greatly improved. At the same time, it also increases the interest in experiments, improves enthusiasm for learning, promotes creative thinking, and cultivates innovative abilities.

### Conclusions

Through analysis and practical experience, the practical training card is more important in teaching scheme. It is related to the effect of virtual simulation practical teaching. However, for the designers who provide virtual teaching experimental teaching content, it is necessary to understand the purpose, knowledge points, operation process, key materials, and has a wealth experience on the ship and experimental teaching. Universities and training institutions should set up experimental teaching centers, organizing a large number of teachers to complete the experimental design. The core of the virtual simulation practice teaching is the selection of experimental content and the design of the card. The teaching scheme proposed in this paper can be improved on the basis of a large number of practical experiences and combined with effect of the practical operation, which can provide reference for the practical teaching of similar courses.

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## Study of Developing Automatic Evaluation System about Crews' Practical Operation Skills on Sailing

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### Abstract

limited by many factors like waterway condition, assessment setting and traffic safety, real ships cannot be usually applied flexibly and efficiently in crews' competence assessment in large scale. The current sailing assessment, being conducted in virtual channel environment provided by shiphandling simulator, and depending on evaluators' subjective opinions and different training standards, may lead to some unconvinced evaluated results. With the trend of developing artificial intelligence in maritime transportation, ship management and crews training, it is future-oriented to analysis the necessity and feasibility of developing crews' automatic assessment system. In some levels, design a system of evaluating automatically crews' performance to be consistent with the development of crews' resource market. Use expert survey method and analytic hierarchy process to build index system. Use fuzzy comprehensive evaluation method to assess objective maneuvering information and subjective behavior. The final result is consisted of a score and some comments. This design provides an idea and process to evaluate automatically crews' performance during sailing, and may improve the crews' training efficiency. Wish this design be a foundation to develop automatic comprehensive assessment of bridge resource management in future.

**Keywords:** sailing maneuvering, automatic assessment, shiphandling simulator, expert survey method, analytic hierarchy process

### Introduction

By 2017, the total number of crews in China had reached more than 1.483 million<sup>[1]</sup>, and reached first in world. Crews' training institutions hold lots of skill training to prepare for the better shipping market after this downturn, and accumulated rich teaching ideas and practical experience<sup>[2],[3]</sup>. However, crews' overall quality still needed to be improved and ship officers were still scarce<sup>[4],[5]</sup>.

At present, the basic education of navigation in China is mainly completed by maritime colleges, and the relevant crews' job training is held by maritime colleges and training institutions. During

the practical skill training, the assessor summarizes every trainer's behavior and points out the weaknesses and strengths. The limited number of assessors makes the assessment process be held only in some limited area, which could hardly meet the rapid development of shipping education and the situation that lots crews need performance assessment to grasp practical skill and management knowledge for job promotion. The high development in information technology makes intelligence examination possible. Applying sailing data produced by marine simulator to develop automatic evaluation system should be one of the emphases for study.

### **Evaluation factors analysis**

The foundation and premise of carrying out sailing evaluation is to build a reasonable and scientific index system. There are many factors in influencing sailing safety. Adopting existed index systems to optimize and rebuild a sailing evaluation index system is not a bad choice, and most these existed popular index systems were developed by other scholars in China.

### **Recent studies on assessment system of sailing operation**

In the background that the high development of information technology makes intelligence examination possible in future, developing crews' performance automatic assessment caught more and more attention from researchers. For example, Fang Xiwang<sup>[6]</sup> used fuzzy synthetic evaluation method to build the assessment model of unberthing operation. Tao Jun et al.<sup>[7]</sup> used Delphi method to analysis process of entering port. Wang Delong et al.<sup>[8]</sup> successfully developed an automatic assessment system for the maneuvering of entering and leaving port. Jiang Xiaobin et al.<sup>[9]</sup> successfully developed an automatic evaluation system of anchoring operation. Shen Yonghui<sup>[10]</sup> researched on automatic evaluation system of BRM. Liu Jingjing et al.<sup>[11]</sup> used steps assessment method and analytics hierarchy process( AHP) method for practical evaluation. All these recent studies in China built evaluation index system and optimized model and algorithm in some levels. In dealing with some uncertain influence factors, these scholars usually combined experiential method and Delphi method. These studies built evaluation index system from two sides, the state of sailing conditions and the influence from maneuvering factors. The state of sailing conditions included wind, flow, wave, visibility, traffic density, etc., and the maneuvering factors included starting performance, barking performance, swing performance, stability, etc.

## Determining the evaluation factors

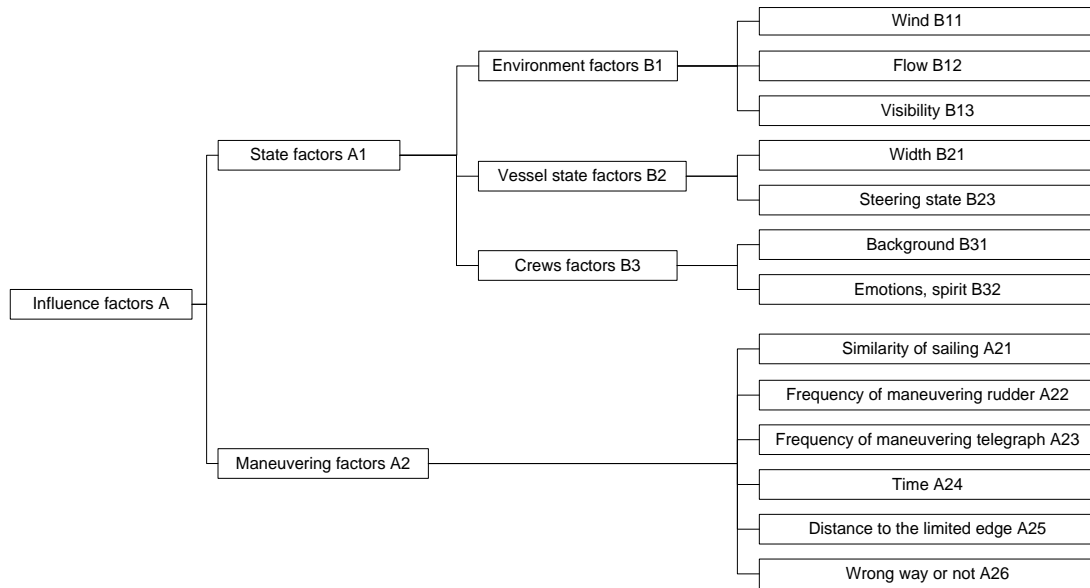


Figure 6 index system for assessing sailing operation

Sailing a simulated ship in channel, it is necessary to fully consider the influence from many factors such as marine hydrometeor, width of channel, depth of water, other nearby simulated ships and so on, or it may cause danger even traffic accident in waterway. Analyzed the commons and differences of these index system, built by other scholars. Investigated experienced crews and coaches to optimize and rebuild a valid index system. Figure 1 shows the rebuilt evaluation index system. According to experts, evaluated sailing safety and efficiency from outside state and maneuvering performance. Outside state could be processed from environment factors, vessel condition and crews' performance. Maneuvering performance could be in further divided into similarity of sailing, frequency of operation, whole time, distance to the limited edge and whether wrong way or not.

### Determining factors weight

Table 6 weight of influence indexes

	First grade	Weight	Second grade	Weight	Third grade	Weight	
Purpose	A1	0.15	B1	0.4	B11	0.409	
					B12	0.409	
					B13	0.182	
			B2		0.37	B21	0.708
						B22	0.292
			B3		0.23	B31	0.65
						B32	0.35

	A2	0.85	A21	0.512
			A22	0.225
			A23	0.142
			A24	0.064
			A25	0.025
			A26	0.025

To solve multi-criteria problem in practical situations, analytic hierarchy process (AHP) is known as a common method. Developed by Saaty, AHP have been used in many disciplines, and it combines well qualitative descriptions and quantitative calculations. The weight of an index refers to its relative importance, and it was determined by applying AHP in this paper. According to index system for assessing sailing operation, the weight of influencing factors was divided to three levels. The first level is  $U = \{A_1, A_2\}$ , and the second level is  $A_1 = \{B_1, B_2, B_3\}$ ,  $A_2 = \{A_{21}, A_{22}, A_{23}, A_{24}, A_{25}\}$ . The third level is  $B_1 = \{B_{11}, B_{12}, B_{13}\}$ ,  $B_2 = \{B_{21}, B_{22}\}$ ,  $B_3 = \{B_{31}, B_{32}\}$ . The weight of each factor is listed in table 1. In applying AHP to determining factors weight, delivered questionnaires to experienced coaches and crews from maritime training institutions and companies. A total of 160 questionnaires were issued, and 158 were recovered. Among these questionnaires, 150 were valid recovery. The recovery rate was 98.75%, and the valid rate was 93.75%.

## Methodology

Fuzzy comprehensive evaluation method (FCE) uses the synthesis principle of fuzzy relations to quantify factors which have no clear boundaries<sup>[12]</sup>. It evaluates the target comprehensively from the perspectives of various factors. The evaluation process is a double factor system which contains the affected factors and their causes. The steps of Applying FCE are described as follows.

### Establishment of Judgment set

By convention, took a 5-level judgment set,  $V = \{v_1, v_2, v_3, v_4, v_5\}$  to describe the states of these factors. The grading rules are listed in table 2.

Table 7 Judgment set for state

Judgment	Easier	Easy	Normal	Hard	Harder
Wind speed(m/s)	[0,7]	(7,20]	(20,30]	(30,40]	>40
Flow speed (kn)	[0,0.5]	(0.5,2.0]	(2.0,5.0]	(5.0,7.0]	>7.0
Visibility distance(km)	>6	(4,6]	(2,4]	(1,2]	<1
Channel width/vessel width (Bc/Bs)	>14	(6,14]	(4,6]	(2,4]	<2
Electro-hydraulic steering	0	0	0.6	0.4	0

Electric steering	0	0	0.3	0.7	0
Captain	0.8	0.2	0	0	0
First mate	0	0.7	0.3	0	0
Second, third mate	0	0	0.75	0.25	0
Emotions spirit	Very good	Good	Normal	Bad	Very bad

**Establishment of membership function**

After determining the judgement set V, need to grade each factor to get membership set  $R_i = [r_1 \ r_2 \ r_3 \ r_4 \ r_5]$ . In order to avoid lost important information in converting a continuous value to a single categorical value, several geometric mapping functions have been proposed to rank measure value, such as some variations of the triangular or trapezoidal mapping functions. Figure 2 shows the curve of mapping function combining triangular and trapezoidal, adopted in this paper.

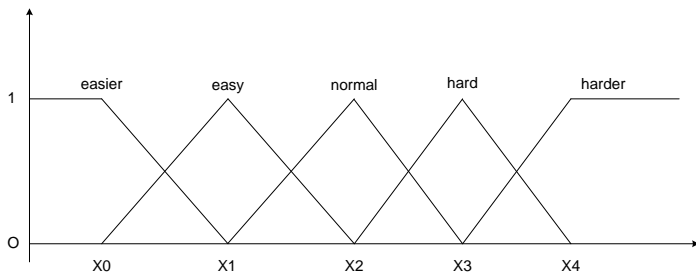


Figure 7 curve of membership function

If r is used to represent the subsets of appraisal set R, the fuzzy membership functions could be defined separately as below:

$$r_{i1} = \begin{cases} 1 & , \quad x \leq x_0 \\ \frac{x-x_1}{x_0-x_1} & , \quad x_0 \leq x \leq x_1 \end{cases} \quad (1)$$

$$r_{i2} = \begin{cases} \frac{x-x_0}{x_1-x_0} & , \quad x_0 < x \leq x_1 \\ \frac{x-x_2}{x_1-x_2} & , \quad x_1 < x \leq x_2 \\ 0 & , \quad x > x_2 \end{cases} \quad (2)$$

$$r_{i3} = \begin{cases} \frac{x-x_1}{x_2-x_1} & , \quad x_1 < x \leq x_2 \\ \frac{x-x_3}{x_2-x_3} & , \quad x_2 < x \leq x_3 \\ 0 & , \quad x \geq x_3 \end{cases} \quad (3)$$



$$r_{i4} = \begin{cases} \frac{x-x_2}{x_3-x_2} & , \quad x_2 < x \leq x_3 \\ \frac{x-x_4}{x_3-x_4} & , \quad x_3 < x \leq x_4 \\ 0 & , \quad x > x_4 \end{cases} \quad (4)$$

$$r_{i5} = \begin{cases} \frac{x-x_3}{x_4-x_3} & , \quad x_3 < x \leq x_4 \\ 1 & , \quad x > x_4 \end{cases} \quad (5)$$

In the above equations,  $r_{ij}$  represents rank value of the  $i$  factor for  $V_j$  judgment, and  $x$  represents the real value. In the implementation process, the threshold parameters (i.e., the value of  $x_0$ ,  $x_1$ ,  $x_2$ ,  $x_3$  and  $x_4$ ) in the membership functions can be determined in table 2.

For evaluating maneuvering performance factors,  $A_2 = \{A_{21}, A_{22}, A_{23}, A_{24}, A_{25}\}$ , their membership functions are similar to normal distribution<sup>[13]</sup>. The important part to determine mapping function is to determine the standard value, which is usually set during the shipping industry developing. The standard value influences the distribution of membership function, which is defined as follows:

$$f(x) = \exp\left(\frac{-(x - \text{standU})^2}{k}\right) \quad (6)$$

$$k = \frac{-(\text{passU} - \text{standU})^2}{\ln 0.6} \quad (7)$$

Where,  $x$  represents the real value, and  $\text{standU}$  represents the best value, and the  $\text{passU}$  represents the pass value. 0.6 is usually the pass mark.

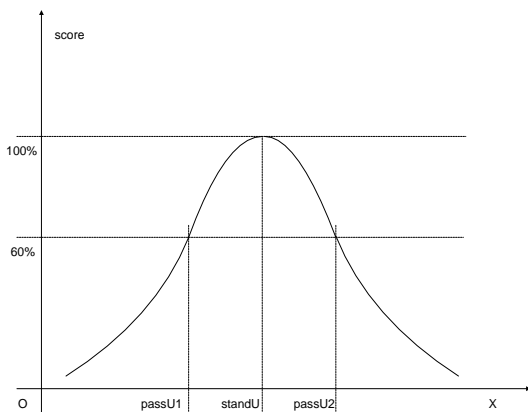


Figure 8 curve of relationship between real value and ideal value

Figure 3 shows the distribution of a maneuvering factor. When the real performance value reaches near to the best value ( $\text{standU}$ ), the evaluation result is close to 100%. When the real performance value drops near to the pass value ( $\text{passU}_1$  or  $\text{passU}_2$ ), the evaluation result is close to 60%.

**Evaluation result vector**

There are some synthesis algorithms to calculate the result vector U, and each algorithm is applied in different scope with kinds of characteristics. Among these algorithms, multiplication is convenient and widely used. With weight vector W and evaluation matrix R, the results of the comprehensive evaluation U can ultimately be calculated by the following equation:

$$U = [w_1 \ w_2 \ \dots \ w_7] \bullet \begin{bmatrix} r_{11} & r_{12} & r_{13} & r_{14} & r_{15} \\ r_{21} & r_{22} & r_{23} & r_{24} & r_{25} \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ r_{71} & r_{72} & r_{73} & r_{74} & r_{75} \end{bmatrix} = [c_1 \ c_2 \ c_3 \ c_4 \ c_5] \quad (8)$$

And state evaluation value C can be gotten by using maximum membership degree method as follows:

$$C = \max(c_1 \ c_2 \ c_3 \ c_4 \ c_5) \quad (9)$$

The mapping function between the state evaluation value and the evaluation score is  $S_1 = f(C)$ , which is listed in table 3.

Table 8 relationship between state and score

State judgment C	easier	easy	normal	hard	harder
Score $S_1$	0.6	0.7	0.8	0.9	1

Similarly, to evaluate maneuvering performance result, multiplication is used to process weight vector w and evaluation matrix R. The result value is calculated as follows:

$$S_2 = [w'_1 \ w'_2 \ w'_3 \ w'_4 \ w'_5 \ w'_6] \bullet [r'_1 \ r'_2 \ r'_3 \ r'_4 \ r'_5 \ r'_6]^T \quad (10)$$

Base on the first level factor  $U = \{A1, A2\}$ , the state evaluation score and the maneuvering performance evaluation value were processed with their weight to get the final evaluation value.

The equation is as follows:

$$S = \sum_{i=1}^2 A_i * S_i \quad (11)$$

**Case study**

In order to test whether the model was validity, took data produced from second mate training on shiphandling simulator and compared the final evaluation result with the actual comments from coaches.

**Data collection**

Table 9 ship parameters

Ship type	Length(m)	Width(m)	Draft(m)	Weight(m)	Steering kinds
10000 ton	148	27	8	12000	Electro-

bulk					hydraulic
------	--	--	--	--	-----------

Figure 4 shows an entering-port training in Shanghai Waigaoqiao waterway. The training owner ship was anchored in Hengshaxi anchorage with a heading of 120. Within a course hour, the training owner ship was sailed to Waigaoqiao and docked to the 12 berth. During the whole sailing, much maneuvering data were produced and they would be used to evaluate later. The configuration of simulated ship is listed in table 4, and the state of crews and sailing area are listed in table 5.

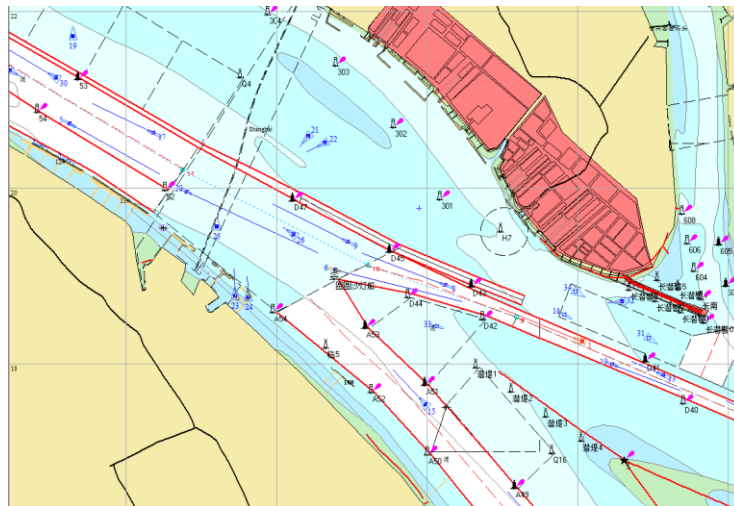


Figure 9 water area designed in marine simulator

Table 10 state of crews and sailing area

Pa. No.	Crews state		Wind		Flow		Visibilit y km	Channel Width (m)
	Spiri t	Backgroun d	Spee d (m/s)	Directio n (°)	Spee d (kn)	Directio n (°)		
1	Very goo d	Second mate	8	315	1.5	190	5	380

### Evaluating sailing condition and environment

Based on table 1, the weight vector of state factors was calculated as follows:

$$W_1 = [B_1 * B_{11} \quad B_1 * B_{12} \quad B_1 * B_{13} \quad B_2 * B_{21} \quad B_2 * B_{22} \quad B_2 * B_{23} \quad B_3 * B_{31} \quad B_3 * B_{32}] \quad (12)$$

Based on table 4 and table 5, the fuzzy evaluation matrix was calculated from membership functions as follows:

$$R_1 = \begin{bmatrix} 0 & 0.923 & 0.077 & 0.24 & 0 \\ 0 & 0.33 & 0.67 & 0 & 0 \\ 0.5 & 0.5 & 0 & 0 & 0 \\ 0.12875 & 0.87125 & 0 & 0 & 0 \\ 0 & 0 & 0.6 & 0.4 & 0 \\ 0 & 0 & 0.75 & 0.25 & 0 \\ 1 & 0 & 0 & 0 & 0 \end{bmatrix} \quad (13)$$

The comprehensive evaluation vector U of state was calculated as follows:

$$U = W_1 \bullet R_1 = \begin{bmatrix} 0.1636 \\ 0.1636 \\ 0.0728 \\ 0.26196 \\ 0.10804 \\ 0.1495 \\ 0.0805 \end{bmatrix}^T \bullet \begin{bmatrix} 0 & 0.923 & 0.077 & 0.24 & 0 \\ 0 & 0.33 & 0.67 & 0 & 0 \\ 0.5 & 0.5 & 0 & 0 & 0 \\ 0.12875 & 0.87125 & 0 & 0 & 0 \\ 0 & 0 & 0.6 & 0.4 & 0 \\ 0 & 0 & 0.75 & 0.25 & 0 \\ 1 & 0 & 0 & 0 & 0 \end{bmatrix} \quad (14)$$

$$= [0.1506 \quad 0.4696 \quad 0.2992 \quad 0.1199 \quad 0]$$

On maximum membership degree method, the vector U was converted to a value  $C = \max(0.1506 \quad 0.4696 \quad 0.2992 \quad 0.1199 \quad 0) = 0.4696$ , and it represented the training state was easy.

On mapping function listed in table 3, the evaluation score of training state was  $S_1 = f(C) = 0.7$ .

### Evaluating maneuvering

Many groups of training data were stored in marine simulator system, and invalid data must be eliminated for calculating. One group of valid training data is listed in table 6.

Table 11 state of maneuvering

Value State	Ideal data		Real data	
	Best	Pass	1	2
Offset to plan	0	81.5	9.5	
Frequency of maneuvering rudder	1	30	27	
Frequency of maneuvering telegraph	1	6	6	
Whole sailing time	943	1572	865	
Distance to the limited edge	95	13.5	65	
No wrong way	1	1	1	

On the mapping relations of maneuvering performance factors, evaluation vector was calculated on table 6, and the performance value  $S_2$  was gotten by processing multiplication between weight vector  $W_2$  and evaluation vector  $R_2$ , as follows:

$$S_2 = W_2 \cdot R_2$$

$$= [0.512 \ 0.225 \ 0.142 \ 0.064 \ 0.025 \ 0.025] \cdot [0.972 \ 0.663 \ 0.6 \ 0.992 \ 0.899 \ 1.0]^T \quad (15)$$

$$= 0.843$$

## Result and discussion

Conclusion was come that the evaluation value of maneuvering performance was 84.3% under an easy training state. According to the first level  $U=\{A1,A2\}$ , The final evaluation value was gotten by processing their weights, as follows:

$$S = A_1 * S_1 + A_2 * S_2 = 0.15 * 0.7 + 0.85 * 0.843 = 0.82155 \quad (16)$$

In the competency examination of seafarers, crews' behaviors were summarized by coaches. This model quantified the process of sailing evaluation to some extent, and it would aid coaches in evaluating efficiently.

## Software introduction

The evaluation model was the foundation of developing software to finish evaluating automatically. With characteristics of great speed and accuracy in calculation, evaluation software would reduce errors and improve efficiency.

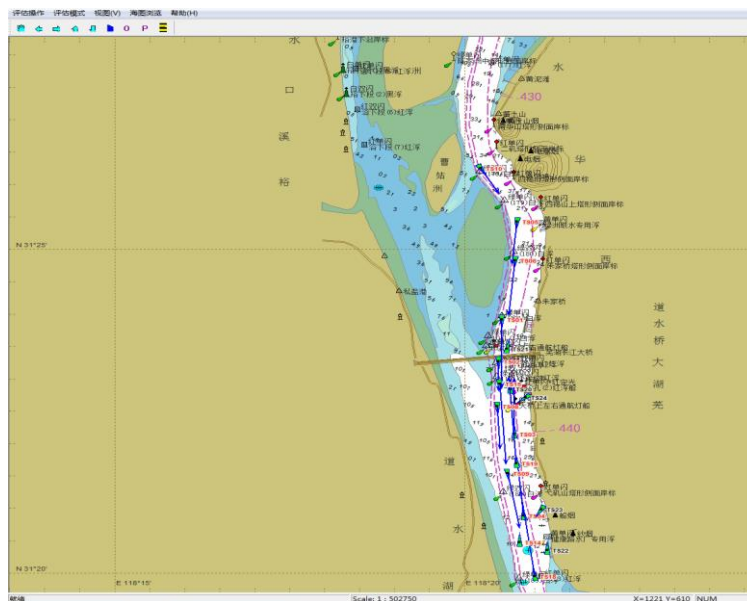


Figure 10 evaluation on sailing in wuhu water area

## Evaluation process

Figure 5 shows another evaluation on sailing with aid from software. Simulated training owner ship sailed near Wuhu water area in the Yangtze River, and training data was stoned in simulator system. Evaluated index system and weights vector were optimized before in the automatic evaluation software. Figure 6 shows the setting of influence factors and state condition, vessel parameters and water environment are also listed.

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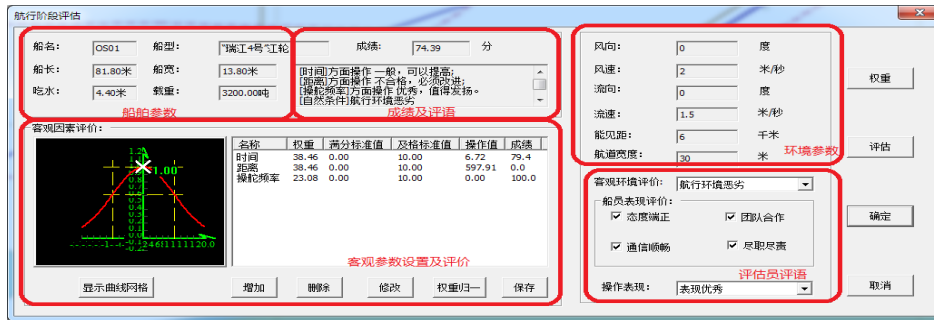


Figure 11 state factors and maneuvering data displaying

**Evaluation result**

The final evaluation result on sailing was displayed in user interface, showed in figure 6. The evaluation software summarized the evaluation result including evaluation value and comments for each maneuvering performance factor, which could be listed in a report, just as showed in figure 7.



Figure 12 evaluation report

**Conclusion**

In recent years, it has attracts much attention from researchers and scholars in China to develop automatic evaluation system on sailing, and many studies have built good evaluation models. After comparing these studies and combining suggestions from crews and maritime training institutions, constructed a sailing evaluation index system from state condition and maneuvering performance. Applied fuzzy comprehensive evaluation method to evaluate state condition and maneuvering performance partly, then calculated the final result with weights. Took a group of datum from crews' training sailing to test whether the evaluation model was validity. Also, provided an automatic evaluation software as development paradigm. Beyond questions, constructing appropriate evaluation index system needed consulting lots of suggestions, and evaluating maneuvering performance needed determining standard value first. All these process required a lot of survey datum and training samples. Wished this study be as one instance of developing automatic evaluation system.

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## **A Need for Some Changes in the COLREGs, its Teaching and Learning For Preventing Collisions at Sea**

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## **Abstract**

The term "navigation" implies actions undertaken to enable a vessel to sail safely from the port of departure to the port of arrival in a defined period of time. The navigation of the vessel is exposed to many dangers and accidents which can occur and may have far reaching consequences on people, society, property and the marine environment. By analysing maritime accidents in the past, it has been established that human error and incorrect interpretation of the Rules are the most frequent causes of vessels collisions. Recognizing this, the European Union approved the project "Avoiding Collisions at Sea" (ACTs) funded by the European "Leonardo da Vinci" programme. The purpose of this research was to identify skill gaps in the knowledge and teaching of COLREGs (International Regulations for Preventing Collisions at Sea 1972 - Rules) for maritime professionals. The results have clearly identified gaps in the understanding of some parts of COLREGs due to the misinterpretation and misapplication of the Rules. The only way to change this in the future is to improve learning methods, understanding and proper application of COLREGs inter alia using these research results. An investigation into collisions in multi-ship environments and situations in which more than one Rule is applicable, has shown that new learning materials and ship simulation scenarios could help in better understanding and application of the Sea Rules of the Road.

**Keywords:** COLREGs misunderstanding, skill gaps, training needs, improving teaching methodology.

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## **Introduction**

This project was initiated by the Centre for Factories of the Future based in the UK. The Faculty of Maritime Studies in Rijeka was the leader of the first project called "Avoiding Collisions at Sea" (ACTs); the project was funded by EU Leonardo programme. The other partners were maritime training institutions from Great Britain, Spain, Slovenia, Bulgaria and Turkey. The second ACTs project known as ACTs+ was funded by the EU Erasmus+ programme. From the research evidence, 85% of all accidents are either directly initiated by human error or are associated with human error by means of inappropriate human response. Analysis shows that mistakes are usually made not because of deficient or inadequate regulations, but because the regulations and standards that do exist are often ignored. The IMO MSC clearly indicates that the causes of many of the accidents at sea are to result of deficiencies in the maritime

education and training of seafarers or disregard for current standards and regulations. The MAIB (Marine Accidents Investigation Branch) safety study analysed accidents from 1994 to 2003, and established that 55% of all accidents were collisions. It also noted that 19% of the vessels involved in a collision were completely unaware of the other vessel until collision and 24% of them were aware too late (the remaining 57% were aware of the other vessel). The EMSA (European Maritime Safety Agency) safety report also analysed accidents from 2007 to 2010. It shows that the total number of accidents, including collisions, is falling. However if the number of collisions is compared with other types of accidents it can be seen that collisions constitute 40% of all accidents.

By using a questionnaire, the authors studied the knowledge and understanding of COLREGs by nautical students and maritime professionals and non-professionals. The questionnaire was designed to test understanding of the Rules in order to see which parts were misunderstood. The questionnaire, in a paper form and on-line, was distributed within the EU and all over the world. All the various methods of learning the Rules used in different countries, therefore, have been included in the research.

Regardless of the learning methods used, the results of the questionnaire confirmed skill gaps among nautical students and experienced maritime professionals and non-professionals from all over the world. Identifying such gaps through the research results, allows for the development of a comprehensive and appropriate learning methodology.

### **Identification of the training needs**

The questions were designed to determine which Rules are difficult to understand and which are most often broken in practice. Such questions are more difficult to construct than those which simply check knowledge. In a technical sense, the questionnaire was prepared in accordance with instructions from the professors from the Faculty of Humanities and Social Sciences in Rijeka, who are experts in dealing with teaching and assessment methods. Nevertheless, this was a very difficult task. Only 4 questions from the total of 372 from the MCA COLREGs test were included. Some graphical scenarios were also prepared and used in the questionnaire. This decision proved to be the right one as the graphical scenarios were the subject of many positive comments. Some respondents also referred to the language used in the questionnaire as being "archaic", but it was agreed between the Partners that the questionnaire should use words and phrases from COLREGs (IMO) as much as possible.

The aim was to examine the understanding of certain Rules in which only two vessels were used in the scenarios. In practice, of course, multi-encounter scenarios are very common, but they were not used in the ACT project questionnaire. Once the final version of the questionnaire in the English language was prepared, partners from Croatia, Slovenia, Turkey and Spain translated it into their languages. The Slovenian Partner also produced the version for non-professionals. The questionnaire was made up of four groups of questions:

- General questions about respondents (12 questions).
- Questions that had an answer in COLREGs (34 questions).
- Questions for testing the opinions and actions of seafarers (12 questions).

This type of question was intentionally put to students in order to check if the professors had presented them with some situations and explained what they should do when appointed as junior officers.

- Optional questions for teachers and lecturers at maritime colleges (4 questions). General questions aimed at enabling the analysis and extraction of desired characteristic groups of participants in order to obtain detailed conclusions and comparisons among groups.

The group of questions that have an answer in COLREGs was the most important for determining which Rules are hard to understand. It was also the subject of some comments because of its use of multiple-choice answers.

### **Data collection**

The questionnaire was distributed from January to the end of March 2014 through Lime survey and in a printed form. The results from the printed form were inserted into the Lime survey. The questionnaire was distributed to all maritime schools and colleges, as well as to seafarers on board merchant ships, teachers and lecturers at maritime institutions, VTS operators, employees of port authorities, and pilots, as well as to masters of fishing boats and yachts.

The Partners contacted crew managers who sent questionnaires both to all their vessels and to seafarers ashore as well. They also asked some seafarers to complete the questionnaire in their offices. High school and faculty students completed the questionnaire in their classrooms. The questionnaire was introduced and respondents were allowed to use books when filling it in. There was no time limit for completing the questionnaire. Using this approach, it was possible to fully test understanding of the Rules, because respondents were allowed to use all possible

literature with no time restrictions. On average, respondents took 30-40 minutes to complete the questionnaire. This type of testing also avoided the stress that is usually present on board a vessel. By the end of March 2014, the questionnaire had been completed by 1280 participants (professional seafarers, maritime high school and faculty students) and 285 holders of licenses for various types of ships/boats (pleasure craft and small fishing vessels). By January 2015, the questionnaire had been completed by 1498 seafarers and 288 non-professionals.

Most of the participants were maritime faculty students, ships officers and masters. Their ages ranged from 19 to more than 63 years and the most were from Croatia, Turkey, Spain and UK. On average, participants had over 5 years of sea going experience and most of them navigated on liquid cargo vessels, containers and bulk carriers. Also, 9% of participants had been involved in a collision and most of those collisions occurred in coastal waters or harbour areas and when visibility was over 6 miles. Only 34% of participants had attended some additional COLREGs training course.

### **Analysis of the questionnaire results**

Analysis on the understanding of the Rules showed that maritime education and training lecturers had the best results, followed by seafarers with sea-going experience, who had on average 15% better results than participants with no sea-going experience. The percentages of correct answers by participants with and without sea-going experience, and by maritime education and training lecturers, are shown in Figure 1. In the questions regarding Rule 10 (TSS), participants with no sea-going experience had more correct answers, while in the questions regarding Rule 17 (Action by Stand-on Vessel) and Rule 18 (Responsibilities between Vessels) the results obtained from all participants were similar. Moreover, the results obtained from high school and maritime faculty participants showed no difference in understanding of the Rules. Questions for testing the opinion of seafarers, like a minimum CPA, parallel course overtaking, and distance to start avoiding collision received various answers because there are no correct answers in the Rules, but again a difference between participants with and without sea-going experience was noted.

### **Outcome of the research evidence,**

This paper proposes a complete set of solutions based on research evidence of ACTs and ACTs+ projects.

In the ACTs project, an e-learning model was outlined for an encounter between two vessels and actions to be taken as per each collision regulation. In the ACTs+ project, for e-learning of COLREGS, the model was developed to include the simulation of the behaviour of more than two ships, at the entrance to harbours, in narrow channels and in high seas, so that the rules can be interpreted precisely, and can be understood in the same way by everyone, so avoiding ambiguity.

The COLREGs rules and regulations include 5 parts and 38 rules. Among these rules and regulations, this paper mainly focuses on the Part B of the Steering and Sailing rules. According to the COLREGs, the collision situations between two ships can be divided into head-on, crossing and overtaking to the starboard side. And the own ship needs to give way to all ships that appear on its starboard side, and is not a stand-on ship until all ships are on the port side.

In multiple ships scenarios, it is important to determine the relationships and hierarchy of the Rules to be applied for collision avoidance. Rules that have priority over others have to be clearly determined so that officers are able to apply them without difficulty.

In addition to explaining the rules, the manoeuvring characteristics of the vessel must also be included in order that correct decisions on taking appropriate actions to avoid collision can be made. Attempts were made in the on-going ACTs+ e-learning COLREGs course, to add as many as possible scenarios encountered in real life as possible, in order to improve learning methodologies for students and seafarers in a situation of multiple ships scenarios.

Under the general requirements of the International Regulations for Preventing Collisions at Sea (COLREGs), decision-making for anti-collision was analysed for both give-way and stand-on ships situations, including the emergency actions taken by ships. The stand-on ship is the ship which should get through the area as soon as possible by keeping its speed and course. Meanwhile, the give-way ship should change its speed and course in order to clear the area for the convenience of stand-on ship's passage. There are three kinds of the ship meeting scenarios, which are the head-on, overtaking and crossing. In the study of ship collision problems, it is important to establish the shortest distance at which collision does not occur and the nearest distance that two ships can pass each other safely.

CPA is the simplest and most effective means of predicting the target ship's position and estimating collision risk. In this paper, CPA is calculated every time to make sure that the path planning decision is safe and the ships have sufficient space to move, no matter whether ships

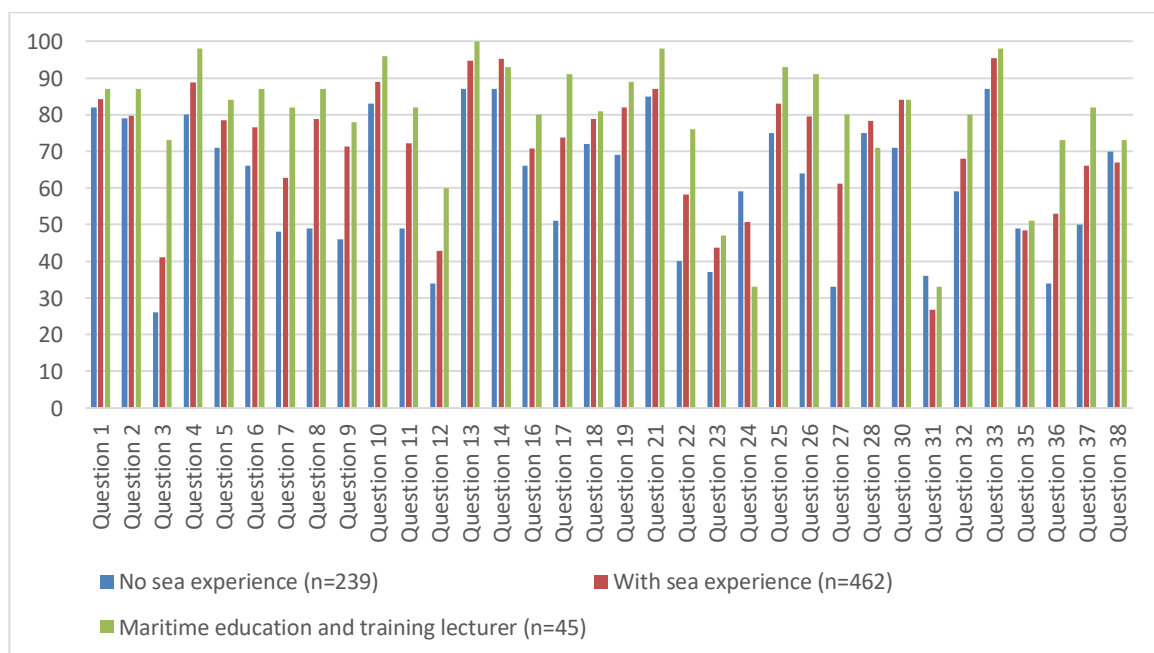
change their speeds and courses. This means that during the time ships are take anti-collision actions, the CPA should keep larger distance than the set minimal value.

In case of collision avoidance of give-way ships, it is important to determine whether the own ship is the stand-on ship or the give-way ship, and then make the decision to make changes on the range and speed of the give-way ship and the stand-on ship if necessary.

A multi-ship collision avoidance decision-making and path planning formulation was studied in a distributed way. This paper proposes a complete set of solutions for multi-ship collision avoidance in intelligent navigation, by using a top-to-bottom organization to structure the system. The system was designed with two layers: collision avoidance decision-making and path planning. Under the general requirements of the International Regulations for Preventing Collisions at Sea (COLREGs), the performance of distributed path planning decision-making for anti-collision was analysed for both give-way and stand-on ships’ situations, including the emergency actions taken by the stand-on ship in case of the give-way ship’s fault in relation to collision avoidance measures.

### Grphfical analysis of the questionnaire results

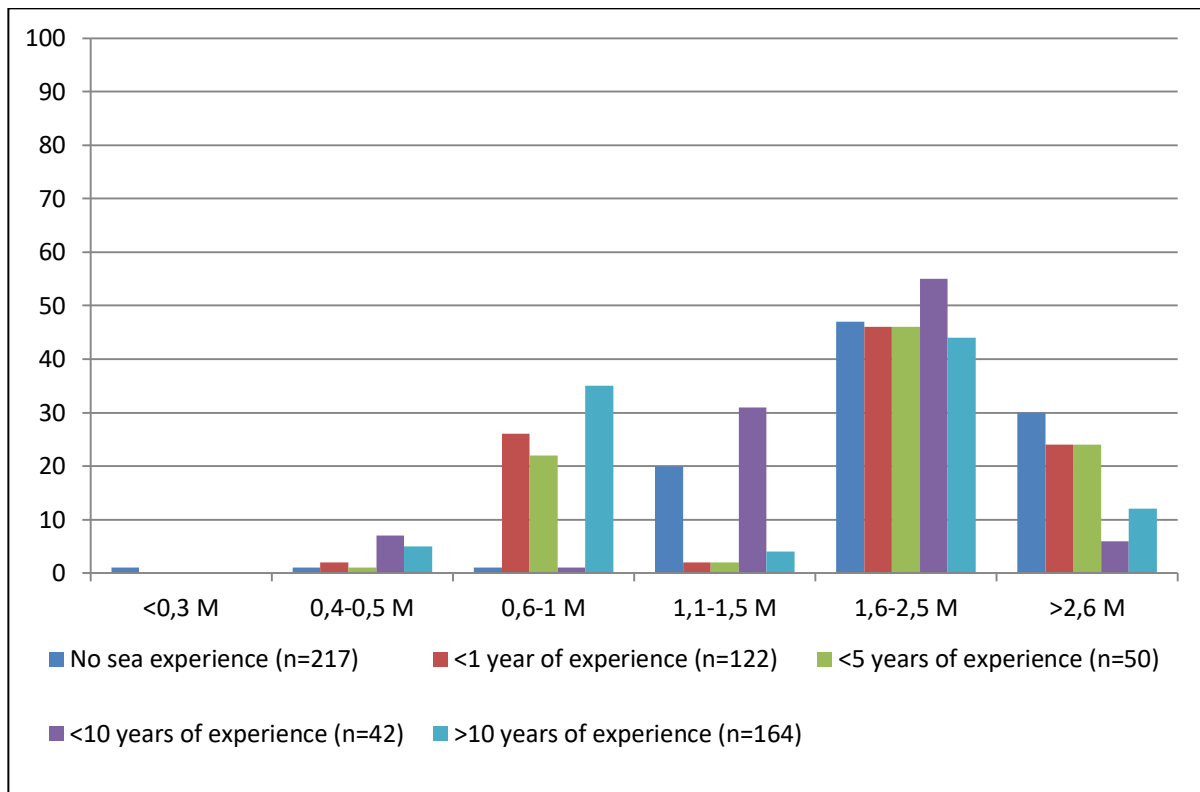
The questionnaire results analysis for the understanding of the Rules showed that maritime education and training lecturers had the best results, followed by seafarers with sea-going experience who had on average 15% better results than participants with no sea-going experience. The results are shown in Figure 1.



**Figure 1: Percentage of correct answers by participant without and with sea experience and by maritime education and training lecturers**

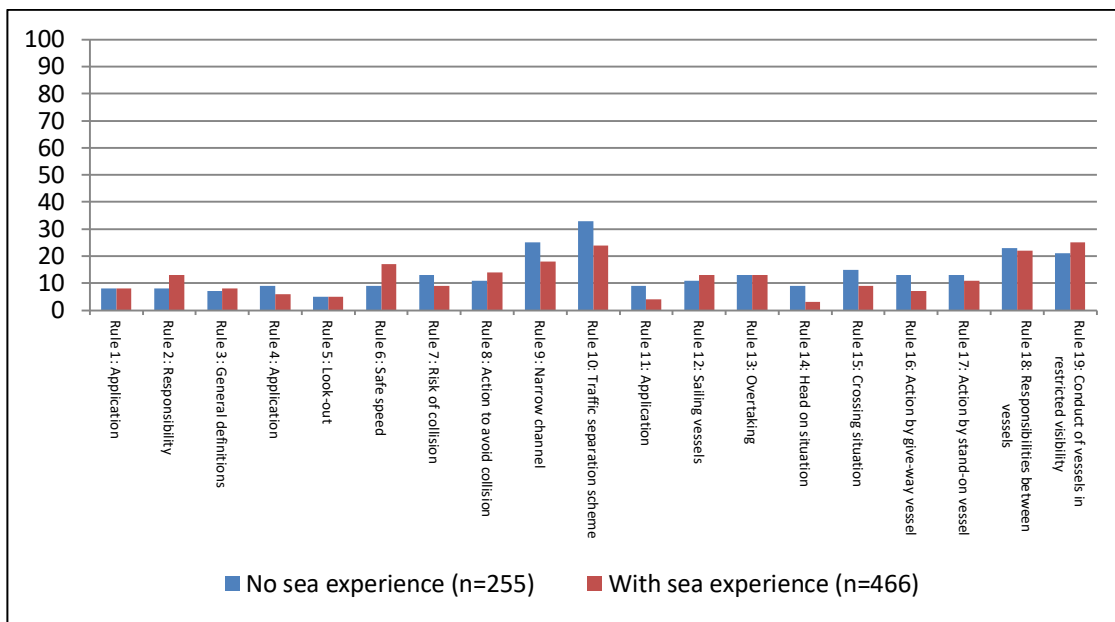
However, in the questions regarding Rule 10 (TSS), participants with no sea-going experience had more correct answers, while in the questions regarding Rule 17 (Action by Stand-on Vessel) and Rule 18 (Responsibilities between Vessels) the results obtained from all participants were similar. Moreover, the results obtained from high school and maritime faculty participants showed no difference in understanding the Rules.

Questions for testing the opinion of seafarers, such as in relation to a minimum CPA, parallel course overtaking, and distance for starting to avoid a collision, received various answers because there are no correct answers in the Rules, but a difference between participants with and without sea-going experience was again apparent as shown in Figure 2.



**Figure 2: Percentage of answers for a minimum CPA opinion testing by different respondent groups**

Rules which are hard to understand according to all participants are Rule 6 (Safe Speed), Rule 8 (Action to Avoid Collision), Rule 9 (Narrow Channel), Rule 10 (Traffic Separation Scheme), Rule 13 (Overtaking), Rule 18 (Responsibilities between Vessels) and Rule 19 (Conduct of the Vessels in Restricted Visibility). The results are shown in Figure 3.

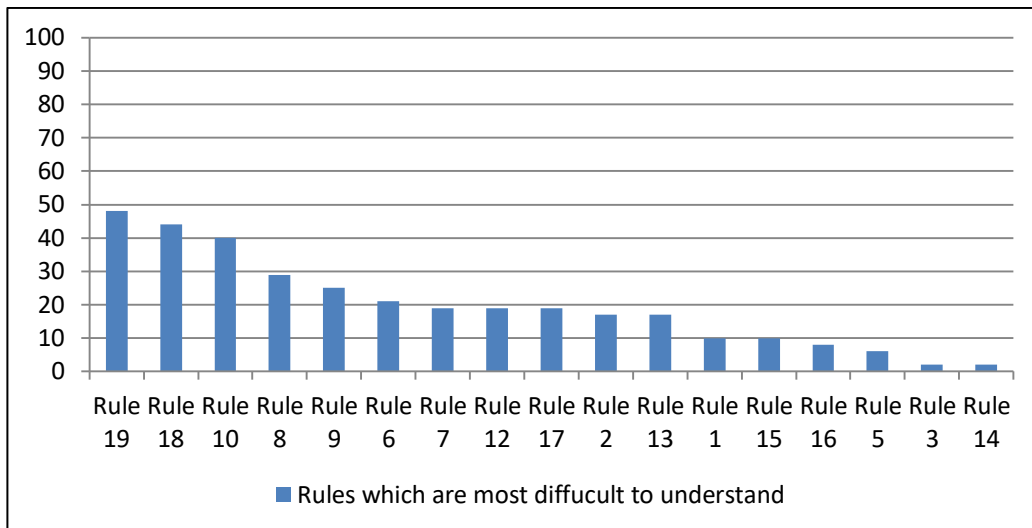


**Figure 3: Rules which are most difficult to understand for participants without and with sea experience**

Questions about using VHF in collision avoidance showed that participants with sea-going experience of less than 10 years more often use VHF in collision avoidance than participants with over 10 years of sea-going experience. Moreover, only 40% of those with sea-going experience used more VHF communication after AIS equipment became mandatory, and 70% believes that VHF contact could be useful for preventing collisions at sea. Questions for maritime education and training lecturers showed that over 63% of students had problems interpreting the Rules.

According to maritime education and training lecturers, Rules which are most difficult for students to understand are Rule 19 (Conduct of the Vessels in Restricted Visibility), Rule 18 (Responsibilities between Vessels), Rule 10 (Traffic Separation Scheme), Rule 6 (Safe Speed) and Rule 7 (Risk of Collision). These answers are very similar to those given by other participants. The results are shown in Figure 4.





**Figure 4: Rules which are most difficult for students to understand – answered by lecturers**

**Validation of the questionnaire results**

In order to validate the results of the questionnaire, workshops were organized in all of the partners’ countries. The workshops aimed at presenting the results of the research, validating the results through discussion, discussing the methods of learning the Rules and determining the best way to use the results of the project for long-life learning.

In total, workshops were attended by 102 participants: teachers and professors at maritime colleges and faculties, seafarers, representatives of government authorities and maritime companies, pilots and members of various professional associations related to maritime shipping.

It was concluded that the results obtained were in accordance with the workshop participants’ opinions and that there is a strong need for the implementation of new methods of learning and teaching of COLREGs.

The questionnaire results and the conclusions from workshop discussions clearly confirmed that there are significant differences in the understanding and application of the Rules.

## Findings of the research

Taking into account all the finding described above, the following conclusions can be drawn:

1. There is a need for change or review of the COLREGs. The rules need some minor changes or updates in accordance with evolving technology, and some drastic changes that are unlikely to be implemented. What is more important is that the existing rules must be interpreted precisely, so that they can be understood in the same way by everyone.
2. It is essential to determine the relationships and hierarchy of the Rules. Rules that have priority over others should be clearly determined and navigation officers should be able to apply them without difficulty. A flow chart showing the priority of the rules is suggested. This would also lead to the development of a sequence for learning/teaching the rules.
3. A common understanding of the Rules – a set of COLREGs guidelines – should be established. Establishing a common understanding of an individual rule through some clear Guidelines is needed, along with standardizing the education, training and assessment of COLREGs through the COLREGs Model Course. The COLREGs model course should be an integral part of the STCW. It is interesting that professional seafarers think that the Rules and literature for learning the Rules should be clarified, while non-professionals are satisfied with the learning materials. This has to be borne in mind when preparing the COLREGs Model Course.
4. There is a need for further clarifications of some Rules. At each workshop, it was pointed out that certain rules should be clarified. In some cases, specific definitions should be added in order to clarify the rules. While explaining the rules, the manoeuvring characteristics of the vessels should be included in order to make correct decisions on taking appropriate actions to avoid collision.
5. A brief COLREGs course a COLREGs e-course should be developed. The COLREGs course should be easy to use through simple information technology means, rather than requiring expensive simulators.
6. Considering the results of the ACTs questionnaire and the analysis of actual collisions, it is clear is that the Rules are not easy to understand or apply in certain cases.

7. In order to improve learning methodologies for the Rules for students and seafarers, the following is suggested:
  - Use case study scenarios to cover each individual rule
  - Include as many real-life scenarios as possible as within COLREGs training case studies
  - Include both radar and bridge view in the case studies
  - Use Court decisions for the interpretation of case studies
  - Use as many visual images as possible to make teaching COLREGs more effective
  - Use images, simulators, CADs and visual aids in training methodologies
  - Use former accidents scenarios in an animated form
  - Use 3D dynamic animations, covering day and night scenarios, in cases and examples used to support explanations of the rules
  - Use multi-ship situation scenarios
  - Use materials such as animated scenarios of the Rules so that cadets can see the Rules in action, and role play as vessels so that they can see the results of their decisions
  - Scenarios must always be based on impartial reports (e.g. MAIB reports or similar) to ensure impartiality in the decisions and report findings used for the scenarios
  - Use e-learning solutions, software, mobile apps to let students run short COLREGs
8. There is a need for official translation of COLREGs. Official translation of COLREGs into multiple languages could be carried out, but it is even more important that this is implemented for the explanations of the Rules.
9. COLREGs tests should be prepared in the mother tongue language as well as in English.
10. Special learning material and ship simulation scenarios are helpful in multi-ship collision environments and where more than one rule applies.

In Annex 1, the reasons behind the suggested changes to the COLREGs and/or teaching practice are presented for reference purposes.

## Conclusion

The questionnaire results and conclusions of workshops clearly indicate problems in the understanding and application of COLREGs by nautical students and maritime professionals and non-professionals. As the research was conducted in the EU and worldwide, the results are particularly important because different learning methods were included in the survey and all showed the same deficiencies. This clearly shows that it is essential that the learning methods of COLREGs are improved in the future.

The ongoing work on the ACTs project includes the development of a new learning methodology which takes into consideration the research results and tries to improve the learning method by using scenarios created for each Rule. Reducing collisions at sea is possible through achieving a better understanding and application of the Rules by professional and non-professional seafarers, and it is believed that this new teaching methodology will contribute to that goal.

The second ACTs project (ACTs+) contains several scenarios for multi-ship environments and situations in which more than one Rule applies. Further information on the ACTs and ACTs+ projects can be found on the web page: [www.advanced.ecolregs.com](http://www.advanced.ecolregs.com). The site presents all ACTs and ACTs+ scenarios supported by quizzes and more demanding assignments. The summary details of ACTs Plus are given in Ziarati et al (2017) and showing the efforts and endeavours put into improving the Sea Rules of the Road and hence making seas safer, is presented in Annex 2.

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**For Annexes 1 and 2 see the following pages.**

**Annex 1**

**Joint report from all ACTs+ workshops regarding the proposals for improvements of COLREGs training needs**

1 – Determine relationships and hierarchy of the rules

The present collision regulation does not cover multiple ship scenarios.

In a case in which more than one rule is involved/referred to (when one rule states the exceptions to this specific rule) seafarers tend to misinterpret and may get confused. This causes a problem in prioritizing the rules according to the given situation and defining the relationships and hierarchy of the rules. (PRU, C4FF)

Conclusion 1: rules which have advantage. Is it possible to show this with a flow chart? Determine the sequence of learning rules. Rules should be taught in sequence, and then each rule and its hierarchical position should be explained.

## 2 - Need for change or review of the COLREGs

1. The principle of evolution not revolution should be applied in reviewing the rules because the current COLREGs rules have been tested in courts and developed a body of precedents and case law. (C4FF)

2. The existing rules are deemed to be sufficient. (PRU)

3. The Rules are hard to understand and to apply, but it is not likely that they will be changed in the light of different conditions on ships, equipment, situations. (UoR)

4. As can be seen from our discussion, the Rules are a bit archaic and require certain changes and improvement / upgrading. (UoR)

5. Regarding the COLREGs review, opinions range from hard rejection through cautious consideration to acceptance. Most of the masters with long experience consider COLREGs to be good enough. Some agree that some clarifications are needed in the COLREGs text. (NVNA)

6. Maybe the rules could be changed, but maybe, as with the aviation system, the coastal and harbor areas of the sea could be controlled by regional/national traffic controllers. (Sea Teach)

Conclusion 2: The rules would have to have some minor changes or updates in accordance with technology, but drastic changes are unlikely. It is more important that existing rules are well explained so that they are understood in the same way. Who has to change the Rules? IMO?

## 3 – Establishing a common understanding of the rules – COLREGs guidelines?

1. Establishing a common understanding of an individual rule (PRU)

2. It was generally agreed that standardizing of the training and assessment of COLREGs would be useful and important. (NVNA)

3. Better Train the Train resources should be made available for COLREGs, e.g. what to teach, how to teach it, who to assess that the students have understood and can apply what was taught etc. (C4FF) Trainers should use several real-life case studies so that learners can learn and have the confidence to take appropriate action when required.

4. It would be good to develop IMO guidelines which explain the Rules. Every additional explanation is good, but that requires lot of hard work and unification of the application of the Rules. (UoR)

5. Are existing tools for teaching COLREGs useful? Answer: Acceptable. (Sea Teach)

Conclusion 3: Establishing a common understanding of an individual rule through a set of Guidelines. Who should make this manual? An expert group organized by the IMO? Standardizing of the training and assessment of COLREGs through a COLREGs Model Course is a way forward. Who should make the content of COLREGs Model Course? An expert group organized by the IMO? The COLREGs model course should be an integral part of the STCW. It is interesting that professional seafarers think that the Rules and literature for learning the Rules should be clarified, while non-professionals are satisfied with materials for learning. Is the reason for this conclusion the fact that the application of the rules on small and large vessels differ? Since every close-quarters situation is different, the action to be taken by seafarers depends a lot on the experience and judgment of the officer on watch.

4 – The need for an explanation of some rules

1. The problem with implementation of the COLREGs seems to be *individuals' different interpretation of the rules* as well as *the way seafarers perceive the situation*. (PRU)

2. Short explanations on vague items, such as safe speed, impede, ordinary practice of seaman etc., could be introduced. (PRU)

4. The problem in the application of Rule 10 in the TSS is that there is no particular way to determine if the vessel is less than 20 m or Inot. The problem for larger vessels when encountering smaller vessels is in bridge visibility which depends on ship type, trim, deck cargo. (UoR)

5. In the Rules, there is no clear statement about when the obligation for collision avoidance starts (When you first see it? When you first see it in what way? Visually? On the radar? What if visibility is bad? What if ships change their course due to configuration of fairway?). (UoR)

6. It is recommended that numeric values of safe speed be determined, because one of the most common reasons for collision is excessive speed. It is interesting that ISM define many things on the vessel. By company regulation CPA is defined, but there is no mention of safe speed. That decision is left to the Master or OOW. (UoR) Safe speed may differ depending on the size and maneuvering ability of the ship.

7. It would be good to explain terms which are used on vessels, for example Sea speed, Maneuvering speed, Engine ready for immediate use, Crash man oeuvre. Defining these terms would minimize commercial pressure on the Master and OOW. (UoR)

8. Areas with thicker traffic (such as TSS), where there is not enough maneuvering space, navigational dangers are not recognized and there is no knowledge in ship maneuvering characteristics (turning circles, stopping way, slow down, crash maneuvers), are problematic. (UoR)

Conclusion 4: At each workshop, it was pointed out that certain rules should be clarified. In some rules specific definitions should be added in order to clarify the rules. In explaining the rules, the maneuvering characteristics of the vessel should be included in order to that correct decisions about taking appropriate actions to avoid collision can be taken.

#### 5 – Establishing a short COLREGs course

1. In developing a COLREGs E-course, special attention should be given to interactive 3D case studies in support of COLREGs Rules explanations. (NVNA)

2. It would be good to have COLREGs as a separate short course (Assessed and Certified) supplemented to any education and training program. (C4FF)

3. It would be good to have COLREGs as a separate short course (Assessed and Certified) supplemented to any education and training programme. Answer from non-professionals: Yes, good idea. (Sea Teach)

4. Would it be good if there was a special course about the rules in addition to existing training programs for seafarers? Each learning and "refreshment" of knowledge is positive - ships are



getting bigger, traffic is thicker, speed is increasing and therefore there is no room for mistakes.  
(UoR)

Conclusion 5: Develop a COLREGs e-course. A COLREGs course should be possible using simple information technology, rather than expensive simulators. Should extra courses be mandatory or optional? Professionals disagree with mandatory courses!

6 – Are the Rules easy to use or not?

1. Are the existing COLREGs rules clear and easy for all to use? Mostly: Yes they are. Some rules may need further explanation, however making the rules any longer than they already are will not help. (PRU)

2. Most of the workshop participants agree that the Rules are not easy to use. (UoR)

3. Are the existing COLREGs rules clear and easy for all to use? Answer from non-professionals: Yes (majority decision). (Sea Teach)

Conclusion 6: Opinions about this issue are much divided. Our opinion from the ACTs questionnaire and analysis of actual collisions is that the Rules are not easy to understand or apply in certain cases.

7 – Methodology for learning the Rules for students and seafarers

1. Having multiple case study scenarios to cover each individual rule and practicing with them was suggested as a solution. (PRU)

2. The common suggestion to help overcome COLREGs difficulties was to include as many real-life scenarios as possible within COLREGs training case studies. (PRU)

3. The workshop participants stated that the radar scope together with the bridge visual can be good assets to include in the case studies. (PRU)

4. For teaching purposes, court decisions may lead the way for interpretation. (PRU)

5. There should be more visual images to make them more effective. (PRU)

6. Which training methodologies would make learning and interpreting the rules better? Mostly: Images, simulators, CADs and visuals may help. (PRU)

7. Past accident scenarios in an animated form aid teaching/learning COLREGs. (PRU)

8. Suggested using 3D dynamic animations, covering day and night scenarios, when cases and examples are used to support explanations of the rules explanations. (NVNA)
9. Most teaching scenarios for COLREGs are based on two ships. However in the real world, it is very common to be in a multi ship situation. Students should be taught COLREGs in these situations because then the answer isn't so simple. (C4FF)
10. Need to engage the cadets, so use materials such as animated scenarios or gamefication of the rules so cadets can see the rules in action and role play as the vessels to see the results of their decisions. (C4FF)
11. Using past accident scenarios in an animated form aids teaching/learning COLREGs. It makes COLREGs more practical when cadets can apply the theory of the COLREGs rule to real life situations they may encounter. (C4FF)
12. Scenarios must always be based on impartial reports (e.g. MAIB reports or similar) to ensure impartiality in the decision and report findings used for the scenarios. (C4FF)
13. The point of learning based on past scenarios is to recognize the chain of events that led to the accident. (C4FF)
14. There are currently no engaging e-learning solutions, software, mobile apps to let students run short simulations and test out their COLREGs knowledge. This could be a very valuable tool. (C4FF)
15. Scenarios that are possible in practice in the Rules are not clearly defined. Does that mean that the Rules are not clear enough and should be more specific? How can such cases be explained to the students? (UoR)
16. Interpretation of the Rules or specific scenarios should more often refer to court order practice. This gives clearer answers on real situations. (UoR)
17. During the teaching of the Rules in schools and faculties, court practice should be used more often in the analysis of collisions which have occurred. (UoR)
18. First, the rules should be learned with understanding, and then the rules should be applied on simulators starting from their basic application and use (overtaking or opposite course with one ship and in good visibility conditions) to more demanding situations and multiple applications of more rules. (UoR)

19. In the development of scenarios used to explain the rules, VDR data should be used. The question is how to get these data, as we are limited in time and VDR application on board.

20. The participants agreed that this is a boundary case which cannot be explained clearly without a video presentation. (SPIN)

21. Access to video supported explanations of COLREGs would be beneficial, but it must be effective as non-professionals won't invest too much time refreshing the COLREGs regularly. (SPIN)

22. Past accident scenarios would also be ok, but only if they could be simplified to be shorter. (SPIN)

23. For better learning and interpreting the rules, we suggest that animations of real collision situations (past accident scenarios) be produced to see what went wrong, who made mistakes, and when? (Sea Teach)

Conclusion 7: The suggested way to improve learning methodologies is:

1. Multiple case study scenarios to cover each individual rule
2. Including as many real-life scenarios as possible within COLREGs training case studies
3. Including the radar scope together with the bridge visual in case studies
4. Court decisions may lead the way for interpretation of case studies
5. More visual images to make teaching COLREGs more effective
6. Training methodologies: use of images, simulators, CADs and visuals
7. Past accident scenarios in an animated form
8. Using 3D dynamic animations, covering day and night scenarios, when cases and examples are used to support explanations of the rules
9. Use of multi ship scenarios
10. Use of materials such as animated scenarios or gamification of the rules so Cadets can see the rules in action and role play as the vessels to see the results of their decisions
11. Scenarios must always be based on impartial reports (e.g. MAIB reports or similar) to ensure impartiality in the decision and report findings used for the scenarios. Our opinion is that

court decisions (suggested by many participants are the workshops) and other sources should only be used when we are 100% certain about conclusions.

12. VDR data should be used in the development of scenarios to explain the rules.

13. Use e-learning solutions, software, mobile apps to let students run short COLREGs simulations and tests

14. Court practice and analysis of collisions which have occurred should be used more during the teaching of the Rules

15. Case studies should use video presentation

16. Video supported explanation of COLREGs would be beneficial, but they should be effective as non-professionals won't invest too much time to refresh the COLREGs regularly. For non-professionals, prepare simplified video supported explanations.

8 – There is a need for official translation of COLREGs

1. Issue official translations of the COLREGs (COLREGs already has 3 official translations: English, French and Spanish). (C4FF)

Conclusion 8: Official translation of COLREGs into multiple languages could be made, but it is even more important that the explanations of the rules are translated. Who is authorized to arrange an official translation of COLREGs? IMO?

9 – Rules which are hardest to understand

1. Most of the participants agreed with the results. According to the results, the Rules which are hardest to understand are Rules 9, 10, 18 and 19. Rule 13 is also hard to understand. Rule 6 is also one of the Rules which are hard to understand for participants with seagoing experience. (UoR)

2. The participants confirmed that the rules which came out of the survey as the hardest ones to understand are the hardest to them as well. These are: Rule 4, Rule 10, Rule 18, Rule 19. (SPIN)

Conclusion 9: Professional and non-professional seafarers find a similar set of rules particularly hard to understand. Should we primarily focus on these in preparing scenario explanations of

COLREGs? We think this would not be enough and that such explanatory scenarios should be developed to cover all the rules.

10 – COLREGs test in English and the mother language

1. Should the COLREGs test be in English? Other nationalities may object to the test being in English. What are your thoughts on this? Answer: The test should be in English and in the mother tongue. (Sea Teach)

2. A Global COLREGs online test would be strongly supported and is recommended. The test should be taken in English and in the mother tongue (so there is no misunderstanding of the rules) and the test should be re-taken at regular intervals, say every three years. (Sea Teach)

Conclusion 10: The COLREGs test should be prepared in the mother language and in English.

## **Annex 2**

### **The Brief History of COLREGs**

The main reason for including an annex on the history of COLREGs developments is to show the past struggles and endeavours in trying to make the sea safer for the seafarers and indeed for all users of the sea, as a passenger on a liner or a sailor in a small craft.

COLREGs, or The International Regulations for Preventing Collisions at Sea, is the latest official name for the Regulations. In a book by David Thomas it is stated that the collision-prevention regulations are not very clear to nor confirmed by all seafarers. There has been a lot of confusion among mariners but, due to lack of time or sometimes even confidence, no one seems to feel comfortable enough to raise questions. Because seafarers do not fully understand the rules, they do not know how to act accordingly, resulting in a job half done.

In the late 1970's David Thomas became involved in research on the use of VHF R/T communication between ships avoiding collision and in collaboration with Dr. Andre Corbet published a few articles criticising the published rules. As a result, some recommendations were made about giving more definite guidance to seafarers navigating through fog. Unfortunately, despite the overwhelming number of simulating exercises proving the flaw in the existing rules, the proposed change was not approved.

Evidence of the first rules or laws regarding collisions at sea dates to back to the 3<sup>rd</sup> to 2<sup>nd</sup> Century BC. However, the problem was that the laws concerned discipline on board of the ship,

the safety of freight and liability for property damage. No specific guidance on avoiding collisions at sea was mentioned. In the 13<sup>th</sup> Century the laws were adopted across Europe, including the by English Court of Admiralty.

1338 – The appearance of the first true rule for collision avoidance. It concerned the senior ship having the right of way and meant that, for instance, a captain had to give way to an admiral.

At the beginning of 18<sup>th</sup> century, the next important rule, the 'port-tack' rule, came into practice. It was mandatory for warships and required ships on the port tack to bear up for others on the opposite tack.

1831 - It was ruled that "steamships approaching each other end-on modify course to port to pass starboard to starboard".

1839 - Steamships were required to keep to starboard in open waters as well as narrow channels. In other words, ships were to take action to avoid the collision even before the threat for collision appeared.

1846 – An act came into law which required a steamship's helm to be turned to port when meeting another end-on. Moreover, it was required from then on for the ships to keep to starboard in rivers, narrow channels and when meeting at any angle in open waters.

Many believed that the rules were useless or dangerous and therefore in 1860 the Commons Select Committee on Merchant Shipping reported that the rules were unsatisfactory. Two years later the new rules appeared as an amendment in the Merchant Shipping Act. These rules discussed the appropriate actions for eight collision risks and by 1865 they were all adopted by more than 30 countries. It was only at that time that special circumstances were mentioned in the rules, allowing a ship's crew to go against the rules all together if that made for a better chance of avoiding collision. The rules also abandoned the need to keep to starboard in narrow channels: there was no mention of the speed of the stand-on vessel which could cause a potential hazard. In 1879 the rules were amended again and the rule of keeping to starboard in narrow channels came back into force.

1889 - More changes were made at the International Maritime Conference in Washington DC. From then on the stand-on vessel was to keep its speed and course and any crossing steamships were to give way.

1910 – The rules are redrafted at an International Conference in Brussels, allowing the stand-on vessel to take action if the action from the other ship was insufficient to avoid collision.

1933 – A new rule was put in place requiring that the helm order would apply in any case to the direction in which rudder was to be turned.

1948 – More changes were made at the SOLAS conference. It was stated that the possession of radar should not excuse the ship's crew from using the rules. There were also some more changes regarding whistle and lighting

1960 – At the next SOLAS conference discussions about radar were held but it was clearly stated that radar is inferior to the rules and should only be taken into account when the other vessel cannot be seen or heard.

1977 – Another version of rules came into existence. From then on the stand-on vessel was allowed to take collision avoiding action as soon as the watchkeeper decided the other vessel was not taking appropriate action or was not doing so fast enough. Radar was recognized but it was pointed out that the information taken from radar alone was not sufficient to allow the watchkeeper to apply the rules accordingly.

According to the author, most of the rules did not make much sense. They were telling the ship to sit its course when in fact the natural way of avoiding collision would be to turn away from the threat, so mariners needed to decide whether to follow the ridiculous rules or their own self-preservation instincts. It was very difficult for mariners to make the right decision: avoid collision by going with what's right or simply follow the rules and collide with the approaching ship. Either way they could face serious consequences and end up in court defending their actions because the rules were not fit for the purpose of helping seafarers to avoid collisions. A single collision should be enough reason to question such rules, and if there are many more collisions it is clear that those rules do not really work and should be changed. The aim of the rules should be to prevent collisions from happening, not to be used to settle disputes after a collision has happened. This would definitely help mariners to make the correct decisions and it would also help court to make the right judgment if it comes to disputes.

## Seafarer Training in Turkey

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### Abstract

Turkey is a party to the STCW-78 contract. The training of ratings in Turkey is in accordance with national legislation based on international agreements. The minimum level of graduation to be rating (seaman or oiler) in Turkey is the primary school level and training time to be rating is 32 working days. The minimum required graduation level and the training period is too short for the learning adequate maritime knowledge and English. The deficiencies in these issues are clearly seen in the working environment, drills and inspections on board. The ratings that started to work without get enough of the maritime culture, while causes problems in many issues such as work accidents and environmental pollution, they also challenge with their physical and mental problems. In this study, it has been tried to offer solutions to the education deficiencies of Turkish ratings by using Analytical Hierarchy Process method with the contribution of an expert group consisting of Harbor Master personnel, academicians and ship masters.

**Keywords:** Seafarer, Training, Analytical Hierarchy Process, Türkiye

### Introduction

Maritime shipping accounts for close to 90 percent of all world trade. Seafaring is not only labor-intensive, it is also among the most dangerous professions in the world (URL-1, 2019). Compared to most other professions, the human factor plays a significant role in seafaring, making training critical in the shipping industry. The lack of maritime training significantly increases the risk of accidents and potential losses in shipping (Davy and Chang, 2011). To mitigate this risk, the IMO established the STCW 78/95 guidelines as a means of standardizing maritime training worldwide (IMO, 2011).

According to the 2018 RMT report published by UNCTAD, as of January 1, 2018, the world trade fleet consists of 94,171 ships with a total deadweight of 1.92 billion tonnes (URL-2, 2019). When it comes to the number of seafarers in the global fleet, the 2015 Manpower Report prepared jointly by BIMCO (Baltic and International Maritime Council) and ICS (International



Chamber of Shipping) states that seafarer numbers have increased over the last 5 years, with a steady rise in the number of qualified officers and crew available to the global trade fleet.

Table 12: Summary of the estimated global supply of seafarers 2005–2015 (URL-3, 2019)

Rank	2005	2010	2015
Officers	466000	624000	774000
Ratings	721000	747000	873500
Total	1187000	1371000	1647500

As Table 2 shows, the five countries training the largest numbers of seafarers for this global workforce are China, the Philippines, Indonesia, Russia, and Ukraine (URL-3, 2019).

Table 13: Estimated five largest trainers of seafarers (URL-3, 2019)

	For all seafarers	For Officers	For Ratings
1	China	China	Philippines
2	Philippines	Philippines	China
3	Indonesia	India	Indonesia
4	Russian Federation	Indonesia	Russian Federation
5	Ukraine	Russian Federation	Ukraine

The term “seafarer” is used to describe the officers and crew employed on a ship, and the Regulation on Seafarers and Maritime Pilots (2018) defines the term as follows: “the captain of a ship, its officers, auxiliary officers, trainees, crew, and service staff” (URL-5, 2019). The term “crew refers to seafarers other than the captain, officers, auxiliary officers and trainees, who are employed deck, in the engine room or in the steward’s department of the ship (URL-5, 2019).

Table 3, compiled from a 2018 report by the Turkish Ministry of Transport and Infrastructure, shows that there were 47,310 officers and 71,229 crew in 2018, putting the total number of seafarers at 118,539.

Table 14: Number of seafarers in Turkey by years (URL-6, 2019)

		2014	2015	2016	2017	2018
The number of seafarer in Turkey	Officers	31135	29310	31830	36500	47310
	Ratings	112883	86464	75652	79750	71229
Total		144018	11574	107482	116250	118539

In a report published by the Turkish Ministry of Transport and infrastructure comparing the supply and demand of seafarers in the Turkish merchant fleet, it was stated that the Turkish-owned commercial shipping fleet in 2003 ranked 19th in the world in terms of capacity, amounting to 2.9 million DWT, but moved up to 15th place in 2018 with a capacity of 27.2 million DWT and 1,511 ships in total (URL-4, 2019). The number of seafarers in Turkey greatly exceeds local demand, and to find employment this excess supply in Turkey must compete in the international market. This requires them to be highly qualified, which is highly dependent on the quality of maritime training provided.

Maritime training in Turkey is carried out on the basis of the STCW-78 Convention, to which Turkey is a party. Training is provided both by official agencies and by training centers authorized by the Ministry of Transport and Infrastructure. As of 2019, there are a total of 71 authorized seafarer training centers currently operating in Turkey (URL-7, 2019). The training provided in Turkey is governed by the Regulation on Seafarers and Maritime Pilots, and the Directive on the Training and Examination of Seafarers and Maritime Pilots, both of which are based on the STCW-78 Convention (URL-5, 2019).

The present study aims to develop solutions to improve the training of maritime crews in Turkey using an AHP model that is based on the input of five experts, and that has been found to increase the minimum level of education required for receiving seafarer training, to improve training content, to increase training duration, to provide English training and to provide testing, in order of importance, as the most important recommendations put forward by the model.

### **1. Training of Deck Crew in Turkey**

The Regulation on Seafarers and Maritime Pilots defines "crew" as seafarers other than the captain, officers, auxiliary officers and trainees, who are employed on the deck, in the engine room or in the steward's department of a ship (URL-5, 2019).

Maritime crew training in Turkey is provided by authorized seafarer training centers, and is given in compliance with the minimum conditions of the STCW78-95 standards. The minimum conditions and the curriculum for seafarer training in Turkey are as follows.

People who apply to receive maritime crew training must

- a) Be at least 16 years of age and, at a minimum, to have graduated from primary school.

To be qualified as a seafarer, they must

- b) Receive the seafarer training, as specified in the Directive, from authorized training centers, or
- c) Be in possession of documentation showing that they served as a deck rating during their military service, for at a minimum of nine months.

The seafarer training curriculum covers the following topics:

- Watchkeeping Arrangements and Methods
- Use of magnetic and gyro compasses
- Steering and Switching between Auto-Pilot or Manual Control
- Understanding and Implementing Steering Commands, both in English and Turkish
- Fulfilling the Requirements of a Comprehensive Audio and Visual Observation
- Signals and Systems
- Basic Knowledge of the Regulations on Preventing Collisions at Sea
- Defining and Reporting on Navigational Aids such as Lights and Buoys
- Contributing to a Safe Navigation Watch and its Follow-Up
- Using On-Board Communication and Alarm Systems
- Points to be Considered during Navigational Watch
- The Definitions of Dangers of Collision and Grounding, and Explanations of Further Responsibilities
- The Knowledge Required to Establish Proper Communication with the Watchkeeping Officer and to Keep a Safe Watch
- The General Structure of the Bridge, Equipment and Apparatus in Use
- Usage of the Emergency Equipment
- Hierarchical Order, Manners and Traditions on Board
- Life on Board, Common Spaces, Unrestricted Ship Sections
- Terminology Used on Board, Definitions Regarding Ships and Seamanship
- Lines, All Kinds of Knots, Rope Strops and Slings
- Rigging, Running Rigging and their Maintenance
- Maintenance to Windlass, Anchor and Locks
- Terminology, Controls and Signals of Anchoring
- General Structure of the Ship
- Cargo Gear and its Maintenance
- Carriers and Loaders
- Common Steering Gear and its Maintenance

- Holds, Cleaning of Holds, Stowing and Lashing of Cargoes
- Carrying Dangerous Cargoes
- Maintenance of Bilge and Tanks
- Receiving Bilge and Tank Echosounders
- Scraping and Painting Techniques
- Deck Machinery and their Maintenance
- Watchkeeping at Port
- Effects Leading to Marine Pollution
- Preventing Environmental and Marine Pollution, Methods of Environmental Protection
- Taking Charge of Liferrafts or Lifeboats During and After Launch
- Operating a Lifeboat Engine
- Management of Survivors and Liferrafts and Lifeboats after Abandoning Ship
- Using Locating Devices, Including Communication and Signaling Apparatus and Pyrotechnics
- First-Aid to Survivors

Mandatory training cannot be less than 256 hours over a minimum period of 6 weeks (URL-5, 2019).

The Basic Marine Safety curriculum consists of

First-aid training,

- Basic fire prevention and fire-fighting training,
- Training in personal survival techniques at sea,
- Training in personnel safety and social responsibility, and
- Training in the use of life saving equipment.

This mandatory training is to be provided over at least 90 hours, with a minimum of 24 hours devoted to applied training (URL-5, 2019)

### **Methodology - AHP**

This study aims to contribute to the improvement of maritime crew training in Turkey through the use of a scientific methodology to identify the main shortcomings in training, and to recommending solutions. An AHP questionnaire was prepared to this end, and was administered to a group of five experts consisting of port authority personnel, academicians and ship captains.

The Analytic Hierarchy Process (AHP) was first developed in 1968 by Myers and Alpert (Min, 1994), and was developed into a model in 1977 by Saaty (Saaty, 1980) for use in the resolution

of decision-making problems. AHP can be described as a decision-making and estimation method that clarifies the percentage distribution of decision points in terms of the factors that affect the decision, and is used when a decision hierarchy can be defined. AHP is based on pairwise comparisons both of the factors that affect the decision and of the importance levels of the decision points for these factors, and makes use of a pre-defined comparison scale on a decision hierarchy (Saaty, 1990). At the end, differences in importance are turned into a percentage distribution of decision points.

In AHP theory, a matrix of comparisons between factors is created after defining the decision-making problem. This is an  $n \times n$  dimensional square matrix. The comparison matrix is shown below (Saaty, 1982).

$$A = \begin{bmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ \cdot & & & \cdot \\ \cdot & & & \cdot \\ \cdot & & & \cdot \\ a_{n1} & a_{n2} & \dots & a_{nn} \end{bmatrix}$$

Comparison values are assigned using the value ranges shown in Table 4 below.

Table 15. Importance levels used in the comparison (Saaty, 1982)

Importance Values	Importance Values
1	Just equal
3	Weakly important
5	Essential or Strongly important
7	Very strongly important
9	Extremely Preferred
2,4,6,8	Intermediate values

The comparison matrix shows the relative importance of factors according to a certain logic, but to identify the overall weights of these factors, or the percentage distribution of their importance, the column vectors that make up the comparison matrix are used, and  $n$  column vectors  $B$  with  $n$  components are created.

This vector is shown below:

$$B_i = \begin{bmatrix} b_{11} \\ b_{21} \\ \cdot \\ \cdot \\ \cdot \\ b_{n1} \end{bmatrix}$$

The following equation is used in for the calculation of column vectors B.

$$b_{ij} = \frac{a_{ij}}{\sum_{i=1}^n a_{ij}}$$

When this is repeated for other evaluation factors, there will be as many column vectors *B* as there are factors. When *n* column vectors B are brought together in the form of a matrix, matrix C shown below would be obtained.

$$C = \begin{bmatrix} c_{11} & c_{12} & \dots & c_{1n} \\ c_{21} & c_{22} & \dots & c_{2n} \\ \cdot & & & \cdot \\ \cdot & & & \cdot \\ \cdot & & & \cdot \\ c_{n1} & c_{n2} & \dots & c_{nn} \end{bmatrix}$$

Matrix C can be used to obtain the percentage importance distribution, which shows the relative values of factors. This is done by taking the arithmetic mean of the row components that make up matrix C, as in the following equation, and obtaining the column vector W, which is referred to as the Priority Vector. (Saaty,1990)

$$w_i = \frac{\sum_{j=1}^n c_{ij}}{n}$$

Vector W is shown below.

$$W = \begin{bmatrix} w_1 \\ w_2 \\ \cdot \\ \cdot \\ w_n \end{bmatrix}$$

Even though AHP has an internally consistent systematic, the accuracy of the results will naturally depend on the consistency of the pairwise comparisons made between factors by decision-makers. AHP offers a process for measuring the consistency of these comparisons. The Consistency Ratio (CR) obtained at the end allows testing the consistency of the obtained priority vector, and thus of the pairwise comparisons made between factors. In AHP, calculating the CR essentially depends on comparing the number of factors with a coefficient called the basic value ( $\lambda$ ). To calculate  $\lambda$ , first, comparison matrix A is multiplied with priority matrix W to obtain column vector D (Buckley, 1985).

$$D = \begin{bmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ \cdot & & & \cdot \\ \cdot & & & \cdot \\ \cdot & & & \cdot \\ a_{n1} & a_{n2} & \dots & a_{nn} \end{bmatrix} \times \begin{bmatrix} w_1 \\ w_2 \\ \cdot \\ \cdot \\ w_n \end{bmatrix}$$

As defined in the following equation, the elements of column vector D and column vector W are divided by one another to obtain the basic value E for each of the evaluation factors. The arithmetic mean of these values is the basic value for comparison ( $\lambda$ ).

$$E_i = \frac{d_i}{w_i} \quad (i = 1, 2, \dots, n)$$

$$\lambda = \frac{\sum_{i=1}^n E_i}{n}$$

After calculating  $\lambda$ , the Consistency Index (CI) can be calculated using the equation below.

$$CI = \frac{\lambda - n}{n - 1}$$

CI is divided by the standard correction value shown in the table below, referred to as the Random Indicator (RI), to obtain CR. Table 2 is used to select the value that corresponds to the number of factors. For example, the RI value to be used in a three-factor comparison is shown in the table to be 0.58.

Table 16. RI Values (Saaty, 1982)

N	RI	N	RI
1	0	7	1,32
2	0	8	1,41
3	0,58	9	1,45
4	0,90	10	1,49
5	1,12	11	1,51
6	1,24	12	1,48

$$CR = \frac{CI}{RI}$$

Calculated DR values of less than 0.10 show that the decision-maker was consistent in the comparisons they made. CR values above 0.10, on the other hand, indicate either a calculation error in AHP, or an inconsistency in the comparisons made by the decision-maker (Saaty and Vargas, 1994).

### Creation of the decision hierarchy

The hierarchical structure, in other words the goal, criteria, sub-criteria and alternatives were defined by a group of five experts. In the constructed decision hierarchy, three main criteria were identified as reasons for improving maritime crew training in Turkey. These are safety, social values and level of knowledge, in this order. The main criteria were then detailed in the form of sub-criteria. The sub-criteria for Safety were: culture of safety, occupational health and safety, and emergency; the sub-criteria for Social Values were: communication, foreign language and professionalism; and the sub-criteria for level of knowledge were: speaking



English, ship operations and professional competence. After identifying the criteria and the sub-criteria, common solutions were discussed under these criteria, and alternatives were created. The alternatives were: improving the content of training and increasing training duration, increasing the minimum level of education requirement, and English education and examination. The created AHP model is shown in Figure 1.

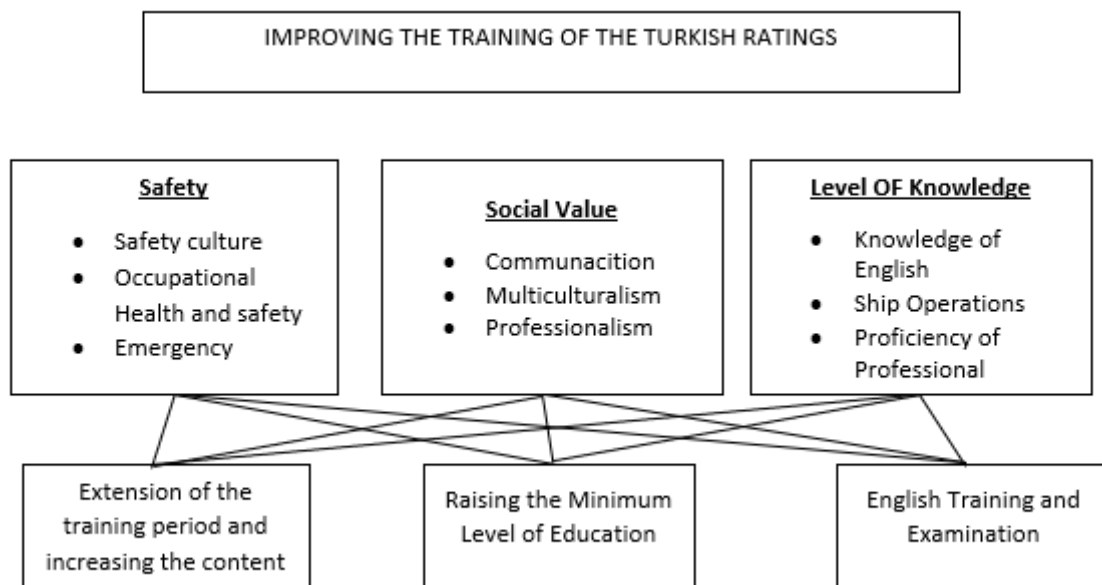


Figure 13: The hierarchical structure of the study.

**Safety:** Safety refers to measures taken to mitigate incidents with the potential to lead to life or death situations. It refers mostly to measures to prevent accidents.

**Safety culture:** This term refers to the totality of the perceptions, attitudes, rules, roles, beliefs, techniques, policies, competences and feelings of responsibility that prioritize the element of safety and that aim to minimize damage to life or property in an area affected by practices and behaviors that threaten safety.

**Occupational health and safety:** Occupational health and safety refers to the conducting of analyses and taking action to eliminate or minimize health issues or occupational hazards that workers may face as a result of the physical environmental conditions or working conditions in the workplace.

**Emergencies:** These are incidents such as fire, water intake, collision, conflict, explosion, falls into the sea, sinking, engine-helm failure, load shift, sea pollution and personnel accidents.

**Communication:** This refers to the transmission of ideas, feelings, information or news in any way or by any method imaginable between persons.

**Professionalism:** This term refers to members of a profession using the knowledge and skills required to carry out their roles by keeping their feelings and opinions under control, without letting them be reflected on their work.

**Multiculturalism:** This refers to the ability of seafarers to operate in a work environment with a multinational crew, and to respect and adapt to different cultures.

**Speaking English:** English proficiency of the crew regarding the profession, and when communicating with people aboard ship or elsewhere.

**Ship Operations:** These are such aboard ship operations as refueling, shifting, maneuvering, loading and unloading.

**Professional Competence:** The creation of professional standards, the professional and technical training programs prepared on the basis of these standards, and documentation of such training.

## 2. Matrices of Pairwise Comparisons between Criteria

The matrices of pairwise comparisons that form the basis of the AHP method will be shown in this section of the study. First, the importance levels of criteria will be identified by creating matrices of pairwise comparisons between the criteria.

Table 6: Cross-criteria comparison matrix

Decision Criteria	Safety	Social Value	Level of Knowledge	Weight
Safety	1	5	3	0,633346
Social Value	1/5	1	1/3	0,106156
Level of Knowledge	1/3	3	1	0,260498
Consistency Ratio=	0,033374725		Total	1,000000

### 2.1. Matrices of Pairwise Comparisons between Sub-Criteria

These importance levels will be used as weights in the matrices of comparisons between the sub-criteria in the next step.

Table 7. The comparison matrix and importance level of the sub-criteria according to the Safety Criteria

Safety Criteria	Safety Culture	Social Value	Level of Knowledge	Weight
Safety Culture	1	5	3	0,63334
Occupational Health and Safety	1/5	1	1/3	0,10615
Level of Knowledge	1/3	3	1	0,26049
Consistency Ratio	0,033374725		Total	1,000000

Table 8. The comparison matrix and importance level of the sub-criteria according to the Social Value Criteria

Social Value	Communication	Multiculturalism	Professionalism	Weights
Communication	1	3	1/3	0,243100985
Multiculturalism	1/3	1	1/7	0,08820212
Professionalism	3	7	1	0,668696895
Consistency Ratio	0,006060675		Total	1,000000

Table 9. The comparison matrix and importance level of the sub-criteria according to the Level of Knowledge Criteria

Level of Knowledge	Knowledge of English	Ship Operations	Proficiency of professional Knowledge	Weights
Knowledge of English	1	1/5	1/7	0,0737721
Ship Operations	5	1	1/3	0,2828390
Proficiency of professional Knowledge	7	3	1	0,643388
Consistency Ratio	0,006060675		Total	1,000000

The values obtained from the matrix of comparisons between sub-criteria are multiplied with the importance values of criteria in Table 10 to obtain weights in the final table.

Table 10. Importance Values of Criteria

Criteria	Weights	Subcriteria	Values	Importance Level
Safety	0,63334572	Safety Culture	0,63334572	0,401126801
		Occupational Health and Safety	0,106156324	0,067233653

		Emergency	0,260497956	0,164985266
Social Value	0,10616	Communication	0,243100985	0,025806707
		Multiculturalism	0,08820212	0,009363213
		Professionalism	0,668696895	0,009363213
Level of Knowledge	0,260497956	Knowledge of English	0,073772106	0,019217483
		Ship Operations	0,282839025	0,073678988
		Proficiency of professional Knowledge	0,643388869	0,167601485

## 2.2. Matrices of Pairwise Comparisons between Decision Alternatives

Following the comparison of sub-criteria, all alternatives will be compared with one another in terms of all sub-criteria.

Table 10. Comparison matrix and importance levels of alternatives according to the safety culture criteria

Safety Culture	Extension of Training Time	Raising the Minimum Level of Education	English Training and Examination	Weights
Extension of Training Time and Increasing the Content	1	1	9	0,489920881
Raising the Minimum Level of Education	1	1	7	0,450705194
English Training and Examination	1/9	1/7	1	0,059373925
Consistency Ratio	0,006058126		Total	1,000000

Table 10 shows a matrix of decision alternatives to serve as an example. Table 12 was obtained after creating matrices for all sub-criteria in the same manner. In Table 12, the importance levels of the sub-criteria weighted by the importance levels of the criteria were multiplied with the importance levels of each alternative to obtain final importance levels. The importance levels of alternatives were then summed up to obtain the weights that will guide decisionmaking

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Criterion Priority value	Sub Criterion	Extension of Training Time and Increasing the Content	Raising the Minimum Level of Education	English Training and Examination	Consistency Ratio	Extension of Training Time	Raising the Minimum Level of Education	English Training and Examination
0,401126801	<b>Safety Culture</b>	0,489920881	0,450705194	0,059373925	0,003513713	0,196520396	0,180789933	0,023816473
0,067233653	<b>Occupational Health and Safety</b>	0,435275835	0,486557887	0,078166278	0,006304265	0,029265185	0,032713064	0,005255404
0,164985266	<b>Emergency</b>	0,243100985	0,668696895	0,08820212	0,003515192	0,040108081	0,110325135	0,01455205
0,025806707	<b>Communication</b>	0,08820212	0,243100985	0,668696895	0,003515192	0,002276206	0,006273636	0,017256865
0,009363213	<b>Multiculturalism</b>	0,114959115	0,405483405	0,47955748	0,014564825	0,001076387	0,003796627	0,004490199
0,070986404	<b>Professionalism</b>	0,114959115	0,405483405	0,47955748	0,014564825	0,008160534	0,028783809	0,034042061
0,019217483	<b>Knowledge of English</b>	0,08820212	0,243100985	0,668696895	0,003515192	0,001695023	0,004671789	0,012850671
0,073678988	<b>Ship Operations</b>	0,643388869	0,282839025	0,073772106	0,032755914	0,047404241	0,020839293	0,005435454
0,167601485	<b>Proficiency of professional Knowledge</b>	0,282839025	0,643388869	0,073772106	0,032755914	0,047404241	0,10783293	0,012364315
<b>Total</b>						<b>0,373910292</b>	<b>0,496026216</b>	<b>0,130063491</b>

Table 12: Priority values of criteria and alternatives |

## Results

The present study used the AHP method to make recommendations for improving the training of maritime crews in Turkey so that the country’s seafarers can better compete in the international market. Using the AHP method, the alternative of increasing the minimum education requirement was assigned a weight of 0.50, the alternative of improving the contents of training and increasing training duration was assigned a weight of 0.37, and the alternative of English education and examination was assigned a weight of 0.13. On the basis of these findings, it is recommended that the minimum education level requirement should be increased to high school graduation to improve the quality of seafarers. In the long term, increasing this requirement to associate’s degree, as is the case in the Philippines and India, would be beneficial for the Turkish maritime sector. The duration of training should be increased to at least 6 months, and the curriculum should be expanded to try to instill a culture of safety. It may also be a good idea to demand a minimum English language score from a centrally administered exam for crew members, as is required for officers. The minimum education level requirement of high school graduate would also contribute to achieving the goal of English proficiency. Future studies are recommended to look also into the training of engine room crew, and to come up with ideas to make Turkish maritime crews more competitive globally by reviewing the promotion criteria for deck/engine crews.

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## **Importance of ESP in Language Training for Maritime Students**

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### **Abstract**

Presented paper highlights the importance of English for Specific Purposes (ESP) in language training for Maritime Students. The work provides definition of the terms, its origin, division into different group, analyzes various types of ESP and in particular, proves the importance of ESP in specialties related to specific skills and training.

The work at the same time serves as an initial attempt to show the importance of ESP for language teachers as well as students and to highlights was growing demand for ESP at the global employment market, being a main medium for professional and business communication across the world. The paper also demonstrates the deficiency in ESP area which can result in the professional and personal development of the graduates. ESP mostly focuses learners' attention to the language and the needs for communication in English in a specific vocational area.

### **Introduction**

Language Training of English for Specific Purpose (ESP) recently has gained a particular popularity in English as a Foreign Language community, which is considered as an individual activity within the field. It is globally recognized that ESP Teachers have elaborated their own teaching methodology and have categorized it as an independent field within the applied linguistics with its characteristics. Therefore, ESP even if separated from the well-established

standards of ELT, has always attempted to effectively communicate in the assignments given according to relevant study field and job-related surrounding. Major impact of the ESL based on applied practice results, through incorporating ESP theoretical fundamentals can be designed on its peculiar results, though ESP theory can be designed on its peculiar nature that it is oriented on needs-related teaching.

## Literature Review

Definitions of ESP or English for Specific Purposes date back to 60s of the XX century, when it became evident that General English Courses failed to meet the learners and consequentially, employers' needs. As English was dominating as the Lingua Franca in the field of business, media, technology, science, medicine education and research, the growing demand for ESP was observed in the countries where EFL was used basically served to the instrumental and supplementary aims.

As it is generally recognized, ESP generally refers to teaching and studying English for a particular career (e.g. engineering, legal, medical) or for Business in General (Business English). Anyway, in case of ESP learning there is always a specific cause for learning. Therefore, some authors define ESP as "Goal Oriented Language Learning" (Robinson, 1991:263). From this viewpoint, the purpose of learning English became the starting point for the emerging field.

According to Hutchinson and Water's definition the fact that "learners know specifically why they are learning a language" (Hutchinson and Waters, 1987:6) is indeed mutually beneficial for the teachers and learners and makes it more feasible and realistic for both of them to achieve the set goals. Though, the learner and the method of learning play a crucial role in the above-mentioned process.

Definitions of ESP in the literature are relatively late in time, if we assume that ESP began in the 1960s. Hutchinson and Waters define ESP as an approach rather than a product – meaning that ESP does not involve a particular kind of language, teaching material or methodology. The basic question of ESP is: Why does this learner need to learn a foreign language? The purpose of learning English became the core.

Definition of ESP makes a distinction between 1) absolute characteristics (language teaching is designed to meet specified needs of the learner; related in content to particular disciplines, occupation and activities; centered on the language appropriate to those activities in syntax, text, discourse, semantics, etc., and analysis of the discourse; designed in contrast with



General English) and 2) two variable characteristics (ESP may be restricted to the language skills to be learned, e.g. reading; and not taught according to any previously intended methodology).

According to Robinson's definition of ESP is based on two criteria: 1) ESP is normally 'goal-directed', and 2) ESP courses develop from a needs analysis which aim to specify what exactly it is that students have to do through the medium of English, and a number of characteristics which explain that ESP courses are generally constrained by a limited time period in which their objectives have to be achieved and are taught to adults in homogenous classes in terms of the work or specialist studies that the students are involved in.

When talking about the importance of ESP in the Maritime Education and in particular, for the Maritime Students we need to be aware of the approaches to be applied while teaching it which should be in compliance with the needs and constraints of the Maritime Students. But what is ME? Maritime English is basically limited to the language that is used at sea, being at the time applied in the marine industry and characterized by its language system with specific vocabulary and grammar. Maritime English is an example of ESP, which as it was said above is mainly used in the marine field.

ESP course should focus on the learners' immediate and future wants and needs, learner centeredness, authentic materials. The principle aim of ME is to boost communication at sea as well as in other vocational positions. Therefore, Maritime English has specific linguistic peculiarities, primarily its lexical and writing styles varies from Standard English. Referring to one of the commonly spread example of the word "ship" in the English Dictionary, the meaning shows "vessel, tanker, ferry, yacht", whereas in maritime English 'Vessel' is used for cargo ships, 'tanker' for oil tanker, 'ferry' denotes 'boat' and 'yacht' – mostly denoted a barge. Another difference, which refers to writing styles can be exemplified through the difference between quantity and quality. E.g. Greetings in GE, 'Good morning/afternoon/evening' can be misinterpreted at sea depending on the time difference of the sender/receiver of the message and can be easily substituted by 'good day'. As for the vocabulary style selected for marine communication, it is characterized by politeness and respect. Besides, this clear and concise messages is characteristic for maritime communication, i.e. it is important for the senders to express themselves clearly enabling the receiver of the message to get the intended message. Besides this, other parties' opinion and attitude to be given a high esteem. So, it is very important to express negative responses in an inoffensive manner, i.e. instead of saying "Your proposal was fully rejected", the phrase "I do not think your proposal will be accepted" should be

used in order to avoid unpleasant situation. And finally, redundant words and repetitions should be avoided in marine communication and of course attentively checked before sending in order to avoid miscommunication and finally, not lead to fatal consequences.

Therefore the importance of developing ESP programs, in our case MET programs meeting international standards is rather huge which should be in compliance with STCW (The International Convention on Standards of Training, Certification and Watch keeping for Seafarers) and IMO (International Maritime Organization) requirements.

According to the Oxford the learning strategies for Maritime English must be easier, faster, more relaxing and enjoyable, self-directed, effective and more adaptable to the situations. Therefore, usage of cognitive, metacognitive and social-cognitive strategies should be necessarily mentioned during ESP learning process. As the result of this, Maritime English Teachers can apply the pedagogical approaches focusing on learner's needs and delivered high quality engineer training, at the same time it stimulates the knowledge about the engine systems on board the ship and within the maritime industry. Therefore, this is it very important for the ESP Teachers to use learner-centered approach and ensure high-quality engineering training for the students mastering ME, as it is important for the ME Teachers to train the EST teachers taking into account local needs and letting them think globally. For achieving this, it is of significant importance to achieve a global teaching approach, as well as face globalization of the maritime institutions.

It is also important for the ESP teachers to have profound knowledge and expertise in the maritime filed, as well as to develop special teaching skills for Specific Subject and to organize training. From this viewpoint, main task of the ME teacher is to select to design the text books which meet the requirements and demands of latest developments in the field and are closely linked with the marine technological specifics as well acting regulations.

On the whole, the Teachers of Maritime English have to meet the requirements set by the STCW (Convention on Standards of Training, Certification and Watch-Keeping for Seafarers) through elaborating organized syllabi, materials to be used inside the classroom and adapting effective teaching approaches.

In addition to the conformity of the above-mentioned standards, it is also vital that that the teachers of ME should make use of collaborative learning strategies, in order to make maritime training more interactive, through applying real-life situations and examples. From this viewpoint, in order to achieve developing producing skills (Reading and Writing) among the

student's, initially strict focus is to be made on boosting receptive skills, i.e. Reading and Listening, in our case with more emphasis on listening skills, as the latter is considered to be a priority one and being an object of Future Research by the Research Language Laboratory of the Institute of English Studies of Wroclaw University and Foreign Languages Department of Batumi State Maritime Academy (agreed by the MoU between the institutions concluded in 2018). The study of the importance of boosting receptive skills, in particular Listening aims at forming special target groups of the students attending the Faculty of Navigation at BSMA in cooperation with the Seafarers' Training Center to be initiated from the academic year 2019-2020, which we believe will greatly contribute to achieving better results in terms of mastering and further application of the Maritime English among the students and will guarantee a safe navigation for the graduates of the course.

As for the ongoing practice and experience of Teaching ME at the example of BSMA, from the receptive skills much attention as paid to developing Reading skills, i.e. reading, comprehending and further producing specific texts relative to the marine field. Though, we can say, that productive skills have been actively incorporated into the ME programs and course books enabling the future mariners to boost their fluency while communicating orally in English and at the same time accuracy while leading a written communication at the sea.

Though, it is very important for the teachers of ESP, in particular ME to improve and accomplish fluency and aim at leading an effective business communication during navigation through being exposed to Authentic materials applied in the classroom. Though, selecting and offering authentic materials especially while teaching ME can be a rather challenging task. First of all, one of the emerging challenges faced by ME teachers is to be supplied with contemporary and up-to-date teaching resources. Next challenge is related to being exposed to different learning approaches used by the learners, tasking the teachers to be oriented and focusing on mostly-widely applied learning strategies, later modify and adapt their teaching style and method accordingly and finally organize classroom materials, i.e. texts, records, etc. accordingly from time to time. Apart from taking into account the above-listed factors, while speaking about the importance of ESP in language training of Maritime Education, together with purely linguistic, other extra-linguistic factors need to be taken into account, i.e. learner's age, gender, personality, motivation, self-image, experience and other influential factors. On the whole, boosting communicative competence and cultural awareness serves as the basement for the learners, which finally leads to and naturally guarantees an effective and safe working environment for the professional engaged in the marine industry. So, we think that correctly

teaching receptive skills, and in particular listening will result in boosting productive skills, i.e. developing clearer verbal communication among the Maritime Students. Therefore, we can agree that effective communication can be achieved through exercising a set of strategies, i.e. correction, interaction, balance and understanding between the learners and in further prospect among maritime professionals. Therefore, we must be aware that interaction also considers certain emotions, creativity, agreement, disagreement, patience to take a turn and express one's opinion, as well as applying non-verbal signals, i.e. gestures and mimes. From this viewpoint, the term "Communicative Competence" is something to be regularly referred to by the teachers while boosting effective communication skills among the learners, which first of all represents the ability to understand and use language in social and academic environment, which not only encompasses teaching grammar structures, but also the rules on the ways of using the structures. As together with general communicative competence, intercultural communicative competence is of particular importance, which are directly linked to the cultures.

## **Conclusion**

Based on the above-mentioned discussions we can say that it is of crucial importance for the Maritime Students to have a good command of English together with a clear understanding of the social and cultural issues, as they mostly act in the multicultural and multinational surrounding and majority of errors are conditioned to misunderstanding the cultures not directly from the accuracy reasons. Therefore, the teacher's role as a facilitator is inevitable, who mainly assist the learner to boosting the confidence of losing one's own identity, raising cultural awareness among the maritime students, together with planning the whole content of the course in compliance with students' proficiency level. Besides this, ESP teachers should also share the knowledge and experience having obtained in the field, as well as develop efficient teaching strategies through being introduced with internal teaching methodology and based on previous experience through attending various seminars and international conferences, being aware of the need of effective communication in ESP for marine specialists and for the purpose of safe navigation at sea. As English represents a Lingua Franca for the seafarers and maritime Students, the teachers' competence in ME is also highly recommended and required, integrating and incorporating CLT (Communicative Language Teaching), CBI (Content Based Instruction) and TBLT (Task Based Teaching) when teaching the students ME. Besides this, Intercultural communication should be also taken into account, encouraging the learners to use different strategies for boosting better results. While teaching the vocabulary it is important to focus on their technical usage rather than literary meaning. It is recommended to increase

oral communication hours which can be achieved through applying modern teaching equipment, multimedia, audio-clips an internet as well as various simulation equipment, leading to improving listening skills among the Maritime Students. And finally, it is very important to explain to the Maritime Students the crucial importance and characteristics of the ME, its stylistic and linguistic peculiarities, they also need to be aware of the principles of politeness and social and cultural factors, integrity of which leads to better outcomes in terms of achieving the competence level necessary for safe navigation

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## **Ensuring the Teaching of Electro-technical Rating's Profession in the Scope of Vocational Educational Program Existing in Georgia**

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### **Abstract**

Simultaneously with the development of Marine Industry, ship's power and dimensions and accordingly automation class of plants are increased. This stipulates increasing of requirements on the high-qualified specialists. Taking into account the existing problems, several amendments were taken in the seafarers training and certification international convention at the Manila meeting, held on the 21-25 of June, 2010. According to the amendments, requirements for training and education of electro-technician officer and electro-technician rating and accordingly their qualifications were subordinated to the convention regulations (I/CONF/STCW/2/34/.doc. Table A-III/6. Specification of minimum standard of competence for electro-technical officers. Function: Electrical, electronic and control engineering at the operational level; I/CONF/STCW/2/34/.doc. Table A-III/7. Specification of minimum standard of competence for electro-technical ratings. Function: Electrical, electronic and control engineering at the support level) [1].

The accredited Bachelor's program „Ship's electrical engineer“, existing nowadays in Georgia meets all the requirements for the electrical engineer officers. Accordingly it can ensure and meet all the requirements for the electrician rating. Taking into account the great experience of foreign marine colleges and seafarers' training centres we suppose that it's absolutely possible and it will be effective to receive/master electro-technical rating's profession in the vocational education system. It will be implemented in the shorter period of time than in the scope of bachelor's program.

In the following article, on the basis of international experience, we will discuss how to train and certify of electro-technical rating's profession integrated with the basic(secondary) vocational qualification in electricity and retraining program. It will promote to train the personnel, oriented on the international market, competitive, well-qualified in short period.

**Keywords:** ship's electro-technical rating, maritime education, vocational study.

## **Introduction**

The aim of the Georgian vocational educational system is to create one united vocational-educational space taking into consideration multi-stage level and variety of teaching [2]. This will promote person's professional development and will prepare staff who is oriented on labour market, competitive, well-qualified professionals and they will be able to work either in the labour market or get self-employed, start their own business.

As a result of the changes taking place in Georgian vocational education, the basic principles and characteristics of the current vocational educational system must be in compliance with "Copenhagen Declaration" [3]. The aim of the Declaration which was created by Euro Commission and 30 countries (now involves 30 countries), on the 30<sup>th</sup> of November, 2002, is systematization, development and popularization of the vocational education. The declaration provides guidelines related to the curricula and credit system, teachers' professional trainings, Quality Management System and the management of the vocational education and other basic questions.

The strategy for the development of vocational education, the law of Georgia on „vocational education” and other regulating normative acts and international guidelines of this field were created in Georgia, 2013-2020, to promote the development of vocational education in Georgia.

From September 2016, Batumi State Maritime Academy carries out the project funded by the Millennium Challenge Fund: Georgian labour power and the Assistance strategy of vocational education (G-WAVES)". The project includes the following programs: "Crane operation", "Welding", "Navigation of fishing vessels" and others.

## **Main text**

There is a great demand on electro-technician officers on board modern vessels. It should be noted, that the growth of ships' sizes increases the requirement on rating electricians. Some amendments were taken in the STCW International Convention the meeting of International Maritime Organization held in Manila on June 25, 2010, in particular about electro-

technician officer's (I:\CONF\STCW\2\34.doc. Table A-III/6. Specification of minimum standard of competence for electro-technical officers. Function: Electrical, electronic and control engineering at the operational level) and rating electrician's specialities (I:\CONF\STCW\2\34.doc. Table A-III/7. Specification of minimum standard of competence for electro-technical ratings. Function: Electrical, electronic and control engineering at the support level) became conventional [1].

Marine specialties are regulated educational programs and accordingly Model Courses are created by the International Maritime Organization, where all details related to qualifications are strictly defined: the list of compulsory and elective subjects, amount of contact hours, list of practical courses, detailed information about granted qualification and learning outcomes, etc. The similar model course is created for rating electrotechnician specialities ([4], [7]).

BSM Academy has applicable accredited bachelor program: "the ship's Electrical engineering" and it meets all the requirements for the ship's Electrical engineering officer. Actually, it can meet all the requirements for the rating electrician. However, taking into account the experience of foreign maritime education institutions and maritime training centers, it is possible to ensure learning of rating electro-technician's speciality on the vocational education level.

Georgia's vocational educational program, electricity, (registration number 07313 p) provides preparing professional personnel, who will be able to mount, exploit, repair diagnose defects in the industrial and commercial enterprises as well as household conditions. According to the existing framework document of the program [5], the following personnel will be prepared both in high-voltage electronics and in mechatronics and accordingly they will be granted the following qualifications:

- Basic Vocational Qualification in Electricity;
- Secondary Vocational Qualification in Electricity;
- Higher Vocational Qualification in Mechatronics.

The owner of Basic Vocational Qualification in Electricity can work in any organization as a person who maintains electrical equipment and electrical apparatus - as an electrician, fitter of electro-technical system, electrician of the building, supplier electrician, electrical engineer, fitter of the electrical cables and fittings, fitter of lighting and signalization system, fitter of the solar energy electrical manifold. The owner of Secondary Vocational Qualification in Electricity can additionally be employed in electrical stations and he/she can maintain high voltage cables.

On the basis of comparison of Model Course - Validated Model Training Courses, Draft New Model Course on Electro-technical Rating and current vocational program it is possible to



create compatibility grid, where will be described compatibility of basic and secondary Vocational Qualifications in Electricity [5] with ship's rating electro-technician Model Course learning courses [4] and the amount of contact hours of each program (table 1).

Table 1. Compatibility grid of program basic and secondary Vocational Qualifications in Electricity with ship's rating electro-technician Model Course learning courses

№	Common professional modules- basic, secondary and higher	credits	Contact hours	Additional hours	Ship's electro-technician	Contact hours	
						Theory.	Practice
1	Introductory practice in electricity	2	46	4	Function 1. 1.Course Introduction <b>22. Safe use of electrical equipment</b> 22.1. Safe Use and operation of electrical equipment 22.1.1 Safety precautions 22.1.2 Isolation procedures 22.1.3 Emergency procedures 22.1.4 Voltage levels	0,5  1,5 2,0 2,0 2,0	4,0
2	Engineering drawing	4	60	40	Function 2 3.1 Basic knowledge of electro-technical drawings and safe isolation of equipment and associated systems required before personnel are permitted to work on such plant or equipment	2,0	4,0
3	Electric and electronic principles	4	60	40	3.2 Basic knowledge of: 3.2.1 Electro-technology and electrical machines theory	12	12
4	communication in electricity field	4	60	40			
	<b>total</b>	<b>14ECTS</b>	<b>226 h</b>	<b>124 h</b>		<b>22h</b>	<b>20h</b>

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<b>№</b>	<b>General vocational qualification general modules</b>	<b>credit</b>					
1	Foreign language	4	60	40			
2	Enterprising 1	2	30	20			
3	Informative knowledge 1	3	45	30			
4	Personal and interpersonal skills	1	15	10			
	<b>total</b>	<b>10</b>					
<b>№</b>	<b>Professional modules – Basic Vocational Qualification in Electricity</b>	<b>Credit</b>					
1	Health and safety in electricity	4	60	40	2.2 Knowledge of the causes of Electric shock and precautions to be observed to prevent shock 2.2.1 Causes of electric shock 2.2.2 Precautions to prevent electric shock	2,0 2,0	
2	Electrical technology	4	60	40	4.2. Application of safe working practices	2,0	2,0
3	The properties and usage of electrical machines	4	60	40	Basic knowledge of: 4.4. Use of measuring instruments, machine tools, and hand and power tools	8,0	24
4	Electrical mounting	4	60	40	3.2.2 Electrical power distribution boards and electrical equipment Function2: 3,7. Maintenance and repair of lighting fixtures and supply systems	12,0 1,0	12 2,0
5	Maths for electrical	4	60	40			

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	engineers						
6	Engineering project	8	120	40			
	<b>total</b>	<b>28ECTS</b>	<b>420 h</b>	<b>240 h</b>		<b>27 h</b>	<b>40 h</b>
<b>№</b>	<b>General modules – Secondary Vocational Qualification in Electricity</b>	<b>Credit</b>					
1	Foreign language	5					
2	Enterprising 2	2					
3	informative knowledge 1	3					
4	personal and interpersonal skills	1					
	<b>Total</b>	<b>11ECTS</b>					
<b>№</b>	<b>Professional modules – Secondary Vocational Qualification in Electricity</b>	<b>Credit</b>					
1	Safety in high voltage electricity	3			Voltage levels 1 describe the procedures and precautionary measures associated with various voltage levels and sources on board ship 2 explain safe voltages for handheld Equipment 3 explain the risks associated with high voltages	2	
2	Electro-technical materials	3					
3	electrical	2					

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	functions and analysis						
4	Carrying out locksmith operations	2					
5	Programming program logic controllers	10					
6	Theoretical principles of building and maintaining high voltage electricity transferring cable.	3					
7	Building and maintaining high voltage electricity transferring cable.	8					
8	Theoretical principles of mounting, diagnostics and maintaining of sub-station	4			3.2.7 Coupling, load sharing and changes in electrical configuration	8,0	12
9	Mounting, diagnostics and maintaining of sub-station	10					
	<b>total</b>	<b>45ECTS</b>				<b>10 h</b>	<b>12 h</b>
					<b>Different Learning hours</b>		
					3. Contribute to monitoring the operation of electrical systems and machinery	8,0	8,0

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					3.1 Basic knowledge of the operation of Mechanical engineering systems: 3.1.1 Prime movers, including main propulsion plant		
					3.1.2 Engine-room auxiliary machinery	8,0	8,0
					3.1.3 Steering systems	4,0	4,0
					3.1.4 Cargo-handling systems	4,0	4,0
					3.1.5 Deck machineries	4,0	4,0
					3.1.6 Hotel systems	4,0	4,0
					3.2.3 Fundamentals of automation, automatic control systems and technology	8,0	22
					3.2.4 Instrumentation, alarm and monitoring systems	8,0	12
					3.2.5 Electrical drives	8,0	12
					3.2.6 Electro-hydraulic and electro-pneumatic control systems	12,0	12
					4.1 Safety requirements for working on shipboard electrical systems	2,0	2,0
					4.3. Construction and operational characteristics of shipboard AC and DC systems and equipment	4,0	4,0
					Function 2: Maintenance and repair at the support level		
					<b>1. Course Introduction</b>	0,5	
					<b>2. Contribute to shipboard maintenance and repair</b>		
					2.1 Ability to use lubrication and cleaning materials equipment	1,0	1,0
					2.2 Knowledge of safe disposal of waste materials	1,0	1,0
					2.3 Ability to understand and execute routine maintenance and repair procedures	1,0	2,0
					2.4 Understanding manufacturer's safety guidelines and shipboard	1,5	2,0

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				instructions		
				<b>3. Contribute to the maintenance and repair of electrical systems and machinery on board</b> <i>Safety and emergency procedures</i> Test, detect faults and maintain and restore electrical control equipment and machinery to operating conditions 3.2. Test, detect faults and maintain and restore electrical control equipment and machinery to operating conditions	4,0	6,0
				3.3 Electrical and electronic equipment operating in flammable areas	2,0	4,0
				3.4 Basics of ship's fire-detection system	1,0	2,0
				3.5 Carrying out safe maintenance and repair procedures	1,0	2,0
				3.6. Detection of machinery malfunction, location of faults and action to prevent damage	2,0	2,0
				<b>Function 3. Controlling the operation of the ship and care for persons on board at the support level</b>		
				<b>1. Course Introduction</b> <b>2. Contribute to the handling, stowing and securing of stores</b> 2.1 Knowledge of procedures for safe handling, stowage and securing of stores	0,5 2,5	2,0
				<b>3. Apply precautions and contribute to the prevention of pollution of the marine environment</b> 3.1 Knowledge of the precautions to be taken to prevent pollution of the marine environment	4,0	4,0
				3.2 Knowledge of use and operation of anti-pollution equipment/agent	4,0	4,0

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					3.3 Knowledge of approved methods for disposal of marine pollutants	2,0	2,0
					<b>4. Apply occupational health and safety procedures</b>	1,0	1,0
					4.1 Working knowledge of safe personal shipboard safety, including:	working practices	
					4.1.1 Electrical safety		
					4.1.2 Lockout/tag-out	1,0	1,0
					4.1.3 Mechanical safety	1,0	1,0
					4.1.4 Permit to work systems	1,0	1,0
					4.1.5 Working aloft	1,0	1,0
					4.1.6 Working in enclosed spaces	1,0	2,0
					4.1.7 Lifting techniques and methods of preventing back injury	1,0	2,0
					4.1.8 Chemical and bio-hazard safety	1,0	1,0
					4.1.9 Personal safety equipment	1,0	2,0
					<b>Total</b>	<b>111 h</b>	<b>138 h</b>

As it is seen from the comparison, from the basic vocational electricity qualification program 109 contact hours, pretended by the Model Course (credits accordingly) can be recognized. From the Secondary Vocational Qualification in Electricity - 131 contact hours (credits accordingly) can be recognized.

On the basis of other academic disciplines pretended by Model Course it is possible to create training program, which with integration into existing vocational program "electricity" can meet all the conventional requirements.

One of the main components of the training program should be 3 months sailing practice. Dual vocational education system together with industrial practice gives opportunity to take learning courses [6]. This ensures to complete different learning components pretended by Model Course effectively and in a short period of time.

On the basis of Basic vocational qualification electricity program 271 contact hours (121 theoretical hours +150 practical hours) must be completed. While, on the basis of Secondary vocational qualification electricity program 249 contact hours (111 theoretical hours + 138 practical hours) must be completed.

## Conclusion

On the basis of international experience, it is possible to gain ship's rating electro-technician qualification with integration of current vocational education program – Basic (or Secondary) Vocational Qualification in Electricity into training program. The usage of dual vocational educational system will promote to prepare competitive, labour-market oriented well-qualified personnel in short period of time.

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## **Research on the Impacts of Marine Autonomous Surface Ship on Maritime Education and Training**

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### **Abstract**

As the rapid development of modern science and technology, significant advancement has been made in the research and testing of the Marine Autonomous Surface Ship(MASS). The application of new technologies on MASS will in no doubt bring new requirements to seafarers' navigation knowledge and skills, and pose great impacts on the Maritime Education and Training(MET). Based on the new science and technology, this paper analyses the competence requirements of seafarers on MASS in different development level, predicts the impacts of MASS on MET and put forward the direction of seafarers' MET in future.

**Keywords:** Impacts, MASS, Seafarers, MET, Navigation Knowledge.

### **Introduction**

Human beings have enjoyed a nearly 5000 years history of using ships as means of transport from ancient canoes to modern ships. Each leap in ship technology impose a certain impact on shipping industry.

The emergence of Marine Autonomous Surface Ship, MASS in short form, is the result of modern science and technology. As the rapid improvement of Artificial Intelligence, Information Geographical Systems, environmental information perception, satellite and communication, the Big Data, Remote control, Debugging diagnosis technology, Internet of Things, a great progress of MASS has been made in recent years. Some major shipping countries and many equipment manufacturers invest a great deal of time, energy and capital to research and develop MASS. It is reported that the first fully autonomous ship will be put into operation around 2020. Meanwhile, the International Maritime Organization (IMO) begins the legislative research on at 99th Session of the Maritime Safety Committee (MSC).

The operation of traditional ships is based on human, who makes all the decisions and operations. In the future, ships can be controlled and operated autonomously if MASS can

reach the level of unmanned control. The development of MASS involves the integrated application of technologies such as Cyber-physical Systems, Integrated Bridge Systems, environmental information perception, collision avoidance path planning, track control, Internet of Things, cloud computing, big data, sensors, automation technology, network information security, remote control technology, satellite and communication technologies, big data analysis technologies for processing decision support, state analysis and fault diagnosis technologies for equipment and systems and hull condition monitoring and analysis technologies. It can be predicted that the wider application of MASS will bring great change to the shipping industry, and pose great impacts to maritime personnel on knowledge structure, talent cultivation and etc

### **Definition and classification of marine autonomous surface ship**

#### **Definition of marine autonomous surface ship**

Nowadays, Marine Autonomous Surface Ship is under testing stage and improving. International Convention and Domestic laws do not give an authoritative definition. In academia, some research institutes defined Marine Autonomous Surface Ship from different perspective.

The autonomous ship (intelligent ship) understood by the China Classification Society refers to the use of sensing, communication, Internet of things and other technical means to automatically perceive and obtain information and data about the ship itself, the marine environment, logistics, ports, etc. And on the basis of computer technology, automatic control technology, big data technology, intelligent technology, the ships that operate intelligently in navigation, management, maintenance, cargo transportation, etc., in order to make the ships safer, more environmentally friendly and more economical, more reliable. The development of autonomous ship is a gradual process, so the China Classification Society uses the phrase "safer, more environmentally friendly, more economical and more reliable".

In the proposal of related principle about Marine Autonomous Surface Ship in MSC 99th Conference submitted by Japan, the term "unmanned ship" refers to a ship that has no crew members on board. Depending on the level of automation, the ship may be operated either remotely by one or more shore-based remote controllers, or in a fully automated mode without human intervention. The level of automation of the operation is not fixed but may change during a single voyage.

In December 2018, the IMO MSC 100th meeting (MSC100) defined marine autonomous surface ship(MASS) from the view of legislation as a ship that can operate independently of human-machine interaction in some extent.

## **Features of marine autonomous surface ship**

MASS is a trend of the shipping development, and with the improvement of the ship automation, the shipping mode will have great changes. MASS have the following features:

- 1) With perceptive ability, the ability to perceive the information of the ship itself and the surrounding environment.
- 2) With memory and thinking ability, that is, the ability to store perception information and manage knowledge, and the ability to analyze, calculate, compare, judge, associate and make decisions with existing knowledge.
- 3) With learning and adaptive ability, that is, through the interaction of expert knowledge and environment, constantly learn and accumulate knowledge and adapt to the change of environment;
- 4) With the ability to make decisions, that is, to respond to one's own situation and external environment, to make decisions and guide the on-shore personnel, and even to control the ship.

## **Classification of marine autonomous surface ship**

Nowadays, academia researchers have made a variety of classification to autonomous ship when they are making relevant researches according to their own needs.

Coordinated by Maritime Human Resource Institute (MHRI), the IMO working group, when studying the necessary amendments to the provisions of the STCW Convention relating to autonomous ships, divided the autonomous ships into three cases.

Case 1: Conventional ships with remote control option from shore (seafarers on board)

Case 2: Ships equipped with highly automated bridge/engine watch-keeping system in order for officers/crew to mitigate workload on watch-keeping duties (seafarers on board)

Case 3: Unmanned ships, operated by shore-based remote operator (no seafarer on board)

Lloyd's Register of Shipping classifies 7 levels according to Autonomy Level, they are AL0-Manual steering, AL1-Decision supported on board, AL2-Decision supported on board or on shore, AL3-Execution with human being who monitors and approves, AL4-Execution with human being who monitors and can intervene, AL5-Monitored autonomy, AL6-Full autonomy. Classification by Lloyd's Register of Shipping is based on the difference between used technology and role of operator, and this classification method only relates to navigation.

The Danish Maritime Authority, from the perspective of maritime supervision, has divided MASS into four grades according to the level of autonomy of the ships in the research report "Analysis of Regulatory Barriers for the Use of Autonomous ships". They are M, R, RU, A. M stands for manual navigation with automated process and decision support, R stands for remote control ship with crew on board, RU stands for remote ship with no crew on board, and A stands for fully automated ship.

In the report of the working Group of the 99th meeting of the MSC, MASS is divided into four levels.

1) Ship with process automation and decision support:

The ship is equipped with some systems or equipment that can help seafarers to realize the process automation and decision support of navigation tasks. The navigation decisions of ships are made by the seafarers themselves, and the information obtained from the outside world only plays a supplementary role in the decision-making of seafarers.

2) Remote-controlled ship with seafarers:

The ship is equipped with remote control systems or equipment that can help off-board personnel (e.g. personnel on shore or other equipment) complete the task of navigation. The navigation decisions of ships are made by the off-board personnel, and seafarers are supposed to implement in accordance with the commands by remote-controlled personnel.

3) Remote-controlled ship without seafarers

The ship is equipped with remote control systems or equipment that can help off-board personnel (e.g. personnel on shore or other equipment) complete the task of navigation. The navigation decisions of ships are made by the off-board personnel completely, and there are no personnel on board.

4) Full Autonomous ship

The operating system of MASS in this level calculates consequences and risks. The system is able to make decisions and determine actions by itself. The operator on shore is only involved in decisions, if the system fails or prompts for human intervention, in which case the autonomy level will shift to level R or RU, depending on whether there is crew on board or not.

This classification is the most scientific and authoritative method at present. It has been adopted by MSC on its 100th meeting. The research and analysis of MASS in this paper is based on this

classification method.

## Analyses of impacts of MASS on MET

### Analyses of knowledge and skills needed to manage and operate MASS

The current STCW convention and code stipulates the requirements of the training, certification, watch-keeping and competence for seafarer. MET in most countries in the world are basically conducted in accordance with the requirements of STCW convention and code. According to the positions on board ships, seafarers are divided in STCW code into three levels: management level, operation level and support level, and the table of KUP(Knowledge, Understanding, Proficiency) specifies the competence requirements of the three levels.

The application of new knowledge and new technology on MASS is bound to produce new requirements for the competence of seafarers. The requirements of the current STCW convention and code will not meet the development of MASS in no doubt. In order to further analyze the specific influence of MASS on seafarers' MET, this paper, according to the development trend of MASS, divides the knowledge and skills needed by navigators<sup>6</sup> in the future to manage and operate MASS into three aspects: Ability, Knowledge and Technology. Each aspect includes a number of elements, as shown in Table-1.

Table-1 knowledge and skills needed to manage and operate MASS in the future

<b>Knowledge and skills needed to manage and operate MASS in the future</b>	<b>Aspect of ability</b>	Leadership and communication
		Obedience and execution
		Psychological stress resistance
	<b>Aspect of knowledge</b>	Traditional nautical knowledge
		Network communication knowledge
		Automatic control knowledge
		Data mining knowledge
		Artificial intelligence knowledge
	<b>Aspect of technology</b>	Autonomous navigation
		Fault diagnosis
		Remote control

Those knowledge and skills listed in table-1 are essential and minimum requirements for

<sup>6</sup> The word “navigator” is used here instead of “seafarer”, because “seafarer” refers to persons manned on board ships to management and navigate the ship. However, when MASS develops to a certain stage in the future, the ship will no longer be manned, and it would be inappropriate to use the word of “seafarer”.

navigators in future to manage and operate MASS. The mastery degree of the knowledge or skills required by navigators varies according to position of navigator and the level of MASS.

### **Mastery degree of knowledge and skills for navigators on MASS in different level**

On the basis of fully studying the safety of navigation and the knowledge structure of seafarers, this paper, by referring to Bloom's taxonomy<sup>7</sup>, divide the mastery degree of the knowledge listed in table-1 into five levels, and assigns different values to each level (0-no need for grasp, 1-remember, 2-understanding, 3- familiarization, 4- proficiency). As to the knowledge and skills required by navigators with different positions on MASS of different levels, a table of "Knowledge classification and degree of mastery of navigators on marine autonomous surface ships" is made. See table-2

**Note:** Mastery degree of knowledge related to marine autonomous surface ships listed in the above table is different for the personnel in different posts required on different types of ships. The mastery degree of knowledge listed are assigned with different values. **0-no need for grasp , 1-remember, 2-understanding, 3- familiarization, 4- proficiency**

The table-2 systematically predicts and shows the knowledge and ability requirements to seafarers at different levels of MASS. In the level of "ship with process automation and decision support" , there is no shore-based intervention in the navigation of the ship, and all operations are completed by seafarers on board, so the seafarers have only three levels: management level, operation level and support level on the ship. In the level of "remote-controlled ship with crew on board", the operation of the ship is completed by the crew and the shore-based remote control personnel, so the seafarers are divided into six levels: management level, operation level and support level on board and onshore. In the level of "remote-controlled ship without seafarers on board", the ship is no longer manned with crew, and all the operations are carried out by the shore-based remote control personnel, so the navigators are divided into three levels: Management level onshore , Operation level onshore and Support level onshore. In the last level "Full autonomous ship" , all the operations are done by the system itself, and basically no one is required to intervene unless the system fails, so only supervision level onshore is set up.

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<sup>7</sup> The Bloom's taxonomy is the universally accepted approach used in the design of teaching syllabi. The early Bloom's taxonomy classifies the teaching goals into five levels (Knowledge, Comprehension, Application, Synthesis and Evaluation) from the perspective of cognition, and then evolved into the revised Bloom's taxonomy with a renewed six levels set (Remember, Understand, Apply, Analyse, Evaluate and Create)

## **Prediction of impacts of MASS on MET**

Through the study on the definition of existing marine autonomous surface ships and the content in table-2 , different levels of MASS have different impacts on the future career development of seafarers and the maritime education and training.

### 1) Impacts of ships with process automation and decision support on MET

Ships with process automation and decision support are equipped with some systems or equipment that can help seafarers to achieve the process automation and decision support of navigation tasks. The navigation decision-making of ships is entirely made by the seafarers themselves, and the information obtained from outside only plays a supplementary role in the decision-making of seafarers.

The operation of ship with process automation and decision-support remain largely dependent on the operation and management of seafarers. MASS in this level has limited impacts on modern maritime education and training. However, as the automatic control system and decision support system are widely applied in this type of ship, new requirements will be put forward for the knowledge system and training method of education training.

Table-2 Knowledge classification and degree of mastery for navigators on MASS

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		Ability			Knowledge					Technology			Sea service experience
		Leadership and communication	Obedience and execution	Psychological stress resistance	Traditional nautical knowledge	Network communication knowledge	Automatic control knowledge	Data mining knowledge	Artificial intelligence knowledge	Autonomous navigation	fault diagnosis	Remote control	
Ship with process automation and decision support	Management level onboard ship	3	3	3	4	2	2	2	1	1	1	0	Yes
	Operation level onboard ship	2	3	2	3	1	1	1	1	1	1	0	Yes
	Support level onboard ship	1	3	2	3	0	0	0	0	0	0	0	Yes
Remote-control led ship with crew onboard	Management level onshore	3	4	3	3	3	3	3	3	4	4	4	Yes
	Operation level onshore	2	4	3	2	2	2	2	2	4	4	4	Yes
	Support level onshore	1	4	2	2	1	1	1	1	2	2	2	No
	Management level onboard ship	4	3	4	4	2	2	2	2	3	3	3	Yes
	Operation level onboard ship	2	3	3	3	1	1	1	1	3	3	3	Yes
	Support level onboard ship	1	3	3	3	1	1	1	1	1	1	1	Yes
Remote-control led ship without crew onboard	Management level onshore	4	4	4	4	3	3	3	3	4	4	4	Yes
	Operation level onshore	2	4	3	3	2	2	2	2	4	4	4	Yes
	Support level onshore	1	4	3	3	1	1	1	1	2	2	2	No
Full autonomous vessel	Supervision level onshore	4	4	4	4	4	4	4	4	4	4	4	Yes

**2) Impacts of Remote-control ships with crew on MET**

When the marine autonomous surface ships develop to the second level, i.e. the Remote-control ships with crew, the personnel allocation of the ships will be greatly changed compared with that of traditional ships: shore-based Remote-control personnel appeared and the number of the personnel on board was reduced, and the working mode and division of labor will greatly be changed. Marine navigators need to complete the learning or practice of relevant knowledge and skill in accordance with the requirements in table-2, and meet the corresponding standards



of competency. As can be seen from table-2, the knowledge structure required by maritime practitioners on Remote-control ships with crew members has changed greatly. In addition to the corresponding traditional maritime knowledge, marine navigators should master new knowledge and technology related to marine autonomous surface ship or apply them in practice to different degrees, such as network information knowledge, automation knowledge, information physical system knowledge, big data knowledge, autonomous navigation and collision avoidance technology, remote control knowledge etc, which will have a considerable impact on the future maritime education and training, requiring the future maritime education and training to include the above new knowledge and technology in addition to the traditional maritime knowledge.

### 3) Impacts of Remote-control ships without crew on maritime education and training

Ships with this stage are equipped with remote control system or facilities that can help personnel being not onboard such as remote control navigators on shore or on other facilities to fulfill navigation tasks. Decisions will basically be made by personnel being not onboard and the ship will be unmanned. Compared with the Remote-controlled ships with crew, the Remote-control ships without crew are completely dependent on the operation of the qualified personnel on shore. Therefore, the qualified personnel on shore need to have a deeper understanding of the knowledge of network information technology and automation technology, as well as a extensive knowledge reserve to cope with the remote and changeable marine navigation environment.

### 4) Impacts of full autonomous ships on maritime education and training

Ships in this level are equipped with the system or equipment that can enable it to accomplish the tasks of navigation autonomously. The navigation decision-making is completed autonomously. There is no crew on the ship. Control personnel on shore mainly play the role of monitoring the ship's navigation performance, when necessary, can get involved in controlling the ship. Higher requirements have been put forward for suitable personnel of full autonomous ships. The supervisors need to be proficient in all the knowledge and skills listed in paragraph 2.

## **Conclusion**

Shipping is now stepping into the first stage of MASS, i.e. ships with the process automation and decision support. MASS in this stage is mainly dependent on operation and management of crew. which has a limited impact on modern maritime education and training. As the automatic control system and decision support system have been applied widely, new knowledge and skill

needs to be increased in the existing education training mode.

As the MASS develops into higher level, MET will be changed greatly. In addition to the corresponding traditional maritime knowledge, marine navigators should master new knowledge and technology related to marine autonomous surface ships or apply them in practice to different degrees, such as network information knowledge, automation knowledge, information physical system knowledge, big data knowledge, autonomous navigation and collision avoidance technology, remote control knowledge, etc. Maritime universities, colleges and training institutions and maritime authorities should closely track the development of MASS and provide relative new knowledge and improve modes of maritime education in order to produce talents suitable for the development of navigation technology.

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## **An investigation into the Use of Multiple Choice Questions in Maritime English Tests – RZ Confidence Validation: Paper 2 - with Specific Test Questions Relating to Maritime English**

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### **Abstract**

This second paper on the same subject uses the validation method described in the previous paper for the use of 'Multiple Choice Questions' in specific test questions used in Maritime English competence-based testing. As stated in the previous paper the described methodology can in fact be applied in the validation of multiple Choice questions in any other tests developed for subjects other than Maritime English. Furthermore, the methodology can be used in 'true or false' type questions or similar types of testing. The methodology is based on the one developed by Professor Ziarati in 1981 for the testing of the knowledge of ship officer cadets at Highbury College when he noticed that some students often guessed the answers in some cases. The method he developed not only deterred guessing but also offered an opportunity for students taking these type of tests to inform the test developer/setter as to whether the test was easy, average or hard and identify which question posed the greatest challenge. This approach then enabled the test developer/setter to learn from the feedback received and make sure the future tests developed are more balanced and fair.

### **The context**

This second paper is written as an independent paper for ease of use and referencing. To this end, some of the content has been copied from the first paper (Ziarati. 2018).

In developing competence-based tests in the subject of Maritime English for ship officers in the past, often two options were considered:

- 1) Review of the Job specification of the ship officer for whom the test is designed and developed for, to ensure Relevance, Scope and Validity. These latter terms mean that the content of the test question/item is relevant, that is, it is in line with the jobs they are/will be doing with a 'scope' that encompasses the core of their duties and at a depth 'valid' to their status viz., cadet, officer or senior officer;

- 2) Inclusion of peripheral subjects of interest to ship officers such energy management on board of vessels or in ports in addition to content outlined in 1) above. Examples of these were given in the first paper. The idea was that ship officers through their competence assessment regime of their core subjects which is directly related to their job functions are expected to be competent in doing their job as outline in IMO STCW, hence no need to relate the test content always to their job specification and hence also include test questions/items on related subjects,

such as ship pollution, environment protection and so forth, which are more generic topics and would add value to their education and training. Including subjects such ship energy management could help them to opt to become responsible for ship energy efficiency team and help to save energy or reduce harmful emissions into atmosphere. As was the case the current context of teaching and assessing Maritime English has been determined by the latest amendments (Manila, 2010) to the original International Maritime Organization (IMO) International Convention on Training, Certification and Watchkeeping for Seafarers, known within the Maritime community as the STCW-78 Convention [1]. These amendments were made in response for the need of international standards in training seafarers towards acquiring practical skills and competences in addition to professional knowledge.

The shift to the competence-based approach to teaching and learning Maritime English implies that the goal of assessment should be communicative competence. The IMO recommends in the newly revised (2015) IMO Model Course 3.17 Maritime English that "Tests of English language competence should aim to assess the trainee's communicative competence. This will involve assessing the ability to combine knowledge areas of English language with the various language communication skills involved in order to carry out a range of specific tasks. Assessment should not test the trainee's knowledge of separate language areas alone." [2]

Assessing linguistic competence in Maritime English adequately and reliably at internationally recognized levels has been brought to the attention of the IMLA-IMEC audience in the recent years. Research work in Maritime English Training (MET) studies suggests that numerous attempts and efforts to address the complexity of the issue and explore the process of developing assessment instruments have been made throughout the years. Research into existing tests of Maritime English (both teacher-made and commercial) suggests that each training institution or company uses its own resources, experience and understanding of how and when Maritime English competence should be measured and how results should be interpreted and used. This, in turn, shows that despite the major breakthrough of the Maritime English competence Yardstick [3] as a standard it hasn't been applied properly and consistently yet. Furthermore, little is known about the extent to which assessment literacy of Maritime English teachers and providers has been the focus of any specific training and monitoring. The main focus of teacher training seems to be the methodology of teaching English for Specific Purposes (ESP) and acquiring the specific subject matter knowledge from the maritime professional working environment. An ESP teacher is often a course and task designer, a teacher, a researcher and evaluator and his/her role "... becomes more pronounced as the

teaching becomes more specific" [4]. It is generally assumed that as teaching and testing go together, and are inherent parts of the educational process in any content area; ESP teachers have the necessary knowledge and skills to produce valid and reliable tests. Most online maritime English tests extensively use Multiple Choice or True or False questions; this is because in online testing systems the use of Multiple Choice or True or False questions are common place and often inevitable. However, considering the IMO requirement that these tests should assess the competence of the test taker over a wide range of knowledge and skill areas these types of tests have not and will not satisfy the stated competence assessment validation of the IMO without a safeguard to ensure test takers are deterred from guessing.

### **Methodology**

As safety at sea is of crucial importance [5], it should not be put at risk by the random production and use of unreliable and invalid tests of Maritime English proficiency. All decisions made in the process of test development and implementation should be based on solid testing principles. If the knowledge of cadets and seafarers in Maritime English is to be competence based then there are primarily two choices. One to take the arduous path of the efforts such as those made by a collaborative project involving partners from six countries and is a core outcome of the EU-funded Erasmus+ MariLANG Project; producing an assessment methodology as a result of extensive research work in the field of language testing and experience in teaching and assessing Maritime English; or developing a validation practice for 'Multiple Choice' or 'True or False' questions as reported in Ziarati (2018). The information about the former approach will be described in detail in the project reports and in their website [www.marilang.eu](http://www.marilang.eu) in near future. This paper primarily describes a methodology based on MarTEL [6,7,8] Phase Tests incorporating also the MariLANG findings as well as allowing use of Multiple Choice or True or False questions validated by the RZ Confidence Validation methodology.

The following are sample test questions/items typically used in MariLANG test bank.

By 21.00 UTC a low pressure system will move

- A. 48°N, 47°W, 987 mb
- B. 62°N 25°W, 987 mb
- C. 48°N, 47°W, 962 mb
- D. 62°N, 25°W, 962 mb

How confident are you that your answer is correct? 100%? 75%?, 50%? or 25%?

Was this question easy, average or hard? Please comment.

By 23.30 UTC winds will occasionally

- A. become stronger
- B. become weaker
- C. change direction
- D. move to the low centre

How confident are you that your answer is correct? 100%? 75%?, 50%? or 25%?

Was this question easy, average or hard? Please comment.

The RZ Confidence Validation statement viz., How confident are you that your answer is correct? 100%? 75%?, 50%? or 25%? And fairness question namely, 'How confident are you that your answer is correct?' did not deter some test takers in a pilot study guessing but when the students realised that this a competence based test and that if they are not 100%, sure even if they answer the question correctly, they will not get a mark and in fact if they are only 75% sure they get -0.25 and, for 50% and 25% they get a -0.5 and -0.75 mark respectively; this did deter them from guessing the answers. If they answered incorrectly and that they were 100% sure or 75% sure these will also be applied as penalties. The penalty system for an incorrect answer or reward for a correct answer can be adapted by the test developer, and they can decide the scheme that they consider reasonable, that is to say that they can be assured that competence is tested fully and the RZ Confidence Validation is primary there to identify specific learning issues and above all make sure students do not try to guess the answer to a 'Multiple Choice' or 'True or False' question.

The provision of asking 'Was this question easy, average or hard? Please comment' ensures that feedback is obtained on the degree of difficulty or ease the test taker has found a particular question.

***Read the short text below and decide whether the following statements are TRUE (T), FALSE (F) or NOT GIVEN (NG).(2 marks)***

All the islands surrounding Hulls Cove on the NE side are high and wooded, and have no prominent marks. When approaching from southward, Bold Island is easily distinguished because of its bare rocky slopes. Some shelter from southerly winds is afforded by the breakwater. Depths to the N of the breakwater decrease from between 3 and 4 m to less than 1 m on the N side of the harbour. SE winds raise a heavy swell and vessels should not attempt to ride out a gale from that direction.

1. The islands in the vicinity of Hull Cove are easily recognizable due to their landmarks.

2. When SE winds are blowing, vessels should avoid the north side of the harbour.

\_\_\_\_\_

How confident are you that your answer is correct? 100%? 75%?, 50%? or 25%?

Was this question easy, average or hard? Please comment.

**Read the short text below and decide whether the following statements are TRUE (T), FALSE (F) or NOT GIVEN (NG).(2 marks)**

**Notice to Mariners**

**Swona Light.** Temporary alteration of character, position and elevation.

The Commissioners of Northern Lighthouses hereby give notice that on 6 June 20xx the above light will be discontinued and replaced by a Temporary Light exhibiting the following characteristics:

**Flashing every 8 seconds; Duration of flash 0.4 seconds**

The Nominal Range will remain unchanged. The Temporary Light will be exhibited from a framework tower located 60 metres to the south-south-east of the present structure and at an elevation of 20 metres.

3. The distance from which the light can be seen will be the same. \_\_\_\_\_  
4. The height of the Temporary Light will be 60m. \_\_\_\_\_

How confident are you that your answer is correct? 100%? 75%?, 50%? or 25%?

Was this question easy, average or hard? Please comment.

**Read the short text below and decide whether the following statements are TRUE, FALSE or NOT GIVEN (NG).(2 marks)**

Tidal streams off the entrance to the port are shown on the chart. There are strong eddies off the entrance. Mariners in small vessels should exercise caution and avoid entering when eddies move in an anti-clockwise direction.

Local weather: the port is sheltered from N winds; SE winds cause a swell to set into the bay. Occasionally, between November and March, strong S winds, lasting approximately 10 days, may be experienced. These strong winds cause a rough sea and hinder port operations.

5. Small vessels may anchor in strong winds. \_\_\_\_\_  
6. In December, the weather may affect port operations. \_\_\_\_\_

How confident are you that your answer is correct? 100%? 75%?, 50%? or 25%?



Was this question easy, average or hard? Please comment.

The idea of this article is not to embarrass the ship cadets or officers but to ensure they are deterred from guessing.

## Conclusion

Developing a valid and reliable Multiple Choice or True or False test is a challenge faced by many instructors, teachers and test developers. While we are not discouraging test developers or instructors/teachers to develop or use proven methodologies such as those developed by MarTEL and more recently by MariLANG partners, the application of the RZ Confidence Validation makes guessing almost impossible hence enables the use of Multiple Choice or True or False questions in a competence based test. It also provides a means of identifying learning issues both in terms of the test takers knowledge or skill in a particular area of a given subject or more and in identifying a specific learning difficulty in a particular question. Decisions related to one aspect may have serious consequences for others [9]. Being fair to all test-takers demands that all steps in test preparation are carried out professionally, this is because decisions made are about real people and fairness has to be the issue if a test is to be fit for its purpose.

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## **The Scaffolding Effect on the Oral Discourse of Maritime Radio Communications**

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### **Abstract**

The paper deals with the scaffolding in teaching students of Maritime English in performing dialogues used over the radio at sea, while using SMCP. The importance of the SMCP has

been pointed out referring to the safety of shipping as well as the importance of English and especially the importance of Maritime English in communication at sea is stated indisputable. The problem of effectively teaching SMCP in real-life context limited dialogues calls for developing new and effective methods and techniques of teaching. Firstly, the model of open language experience task is developed in the frame of General English. Then the model is used to work upon it and enlarge to suit the needs of oral discourse of the Maritime Radio Communications.

The problem outlined in the title needs to focus attention first of all on one of its constituents in the wording. It need not say that maritime communications are playing an important role in shipping, and in this sense the ability of seafarers to reliably communicate on board the ship, between ships and with shore personnel is of utmost importance. The correlation between the importance of maritime communication reliability and the safety of shipping has long been realized by all involved in the shipping industry, associating it with the correlation of reliability of communication and economics. Actually, this is already an indisputable fact per se and does not need justification as it is clearly pointed out by Trenkner and Cole" Today, more than ever before, we are all practiced communicators. Indeed communication, supported by an array of technical devices, is at the very heart of our modern existence allowing us to instantly access almost anywhere in the world. It may be a question of chickens and eggs but certainly communication and globalisation go hand in hand, as do the resulting increases in trade and the need for shipping to satisfy the demands. That competent (English) language skills not only facilitate but enhance our communication needs is surely indisputable."(Cole & Trenkner, 2008).

The maritime radio communications and their standardized language. The key phrase in defining Maritime English related to the standardization of this language is " safety of shipping ". The formal reflection of this language is the International Maritime Organization's (IMO) standardized maritime communication phrases. When developing these phrases, attention is focused on the safety of shipping and they are designed to be used in situations of safety to be applied in ship-to-shore, shore-to-ship, ship-to-ship and onboard communications. They are adopted to support the verbal exchange of information, to reduce the risk of misunderstanding in an emergency or to prevent such a situation becoming more difficult. Standardized marine phrases are adopted by IMO legislation and should therefore be understood and used as required by the 1978 STCW Convention with the 1995 Amendments. On 29 November 2001,

the Standard Phrases were formally endorsed by the IMO 22 Assembly as Resolution A 918 (22).

Following Alison Noble and her research in Maritime English, we would focus on the MARCOM project report (1999), which warns that “ one of the basic lessons of sociolinguistics is that it is an impossible task to impose linguistic uniformity on any population, let alone one as diverse as seafarers” (Noble, 2017).

However, SMCP must be imposed as the standard language used over the radio and seafarers must be taught in that language. That provokes for developing more and newer methodological methods in order to achieve better knowledge of the trainees in the teaching institutions. One of the steps in teaching the students SMCP at the Naval Academy, Varna, Bulgaria is developing a true to life discourse of Maritime radio communications using the so-called cue cards.

**Example:**

<b>This is m/v FLAME. She is approaching the fairway.</b>	<b>This is Varna Pilot Station. It is acquiring information and giving instructions of the vessel.</b>
<ul style="list-style-type: none"> <li>• the vessel requires the pilot.</li> <li>• Ship’s position is....</li> <li>• Ship’s distance to the pilot station....</li> <li>• Pilot boat on station. Where can the pilot boat be taken from.</li> <li>• At what time pilot will come on board.</li> <li>• Confirm.</li> <li>• The freeboard’s height is....</li> <li>• Confirm.</li> </ul>	<ul style="list-style-type: none"> <li>• Ask if the vessel requires a pilot.</li> <li>• Ask what her position is.</li> <li>• Ask about the distance to the pilot station.</li> <li>• Ask if the pilot boat is on station.</li> <li>• The pilot can be taken at .... (Pilot Station)</li> <li>• at .... hours local time. Pilot boat coming to your vessel. Keep pilot boat on port side.</li> <li>• Ask about the height of the freeboard.</li> </ul> <p>Vessel must stop in position and wait for the pilot.</p>

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The task is using bullets of the speech acts of the communicants to develop a real-life dialogue to be led at sea over the radio. That method has proved its usefulness. Yet, by providing the trainees with the description of the speech act that should be transferred into SMCP model, some limitations occur that prevent them from being able of developing a procedure of the dialogue by themselves. In search of a more creative technique, the scaffolding effect was considered in order to annihilate the limitations and make students prepared for the real communications on board.

The term scaffolding refers to a process in which instructors' model or demonstrate how to solve a problem, and then step back, offering support as needed. Psychologist and instructional designer Jerome Bruner first used the term 'scaffolding' in this context back in the 1960s.

In order for Jordanian EFL learners to meet the changing demands of the society, they should learn how to construct their knowledge, understand through interaction, and connect their experience with the current situations using metacognitive strategies that guide them to think, plan, and evaluate their learning. This entails the necessity of English mastery in its whole and in its specific components. In this perspective, the active role of students is the backbone of the success of learning.

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The Concept of Scaffolded Instruction is the systematic sequencing of prompted content, materials, tasks, and teacher and peer support to optimize learning. Some form of scaffolding is

essential for helping students to develop thinking skills and higher-order thinking skills. Scaffolded instruction can be integrated with other strategies such as peer tutoring, cooperative learning, and direct instruction.

When applying scaffolding theory in the teaching activities, instructors should give students higher level support and help, and teach them some principles or rules that can be used to solve some problems in order to let learners strengthen the sense of learning independently, build the learning ability of self-control and self-responsibility. With scaffolding, the learning task is transferred to the students gradually and finally it is withdrawn from the learning process.

To a greater extent than usually is realized, in second language teaching and literacy instruction the fundamental objective is to enable students to make the connection between certain language forms and their own experience.

Firstly, having in mind the above said, we would like to focus on the materials used in the English language classroom (Rodrigues, White, 1993). It has become obvious for many teachers of ESL trainees that most of the available texts and materials are based on artificial situations following grammatical structures and sometimes irrelevant dialogues and topics. Actually, the idea is that we, instructors of English as a Second language should thrive for using texts that would meet the needs and requirements of the students, the language they need to function successfully in everyday situations and settings where they will use English. Thus, stratifying the communicative approach in teaching as stated by Zhelezova-Mindizova: "According to the object of labor the main types of occupations can be professions dealing with the social dichotomy: "man-nature", "man-technique", "man-sign system", "man-artistic image" and "man-man". The teaching profession, as is known, belongs to the latter type, called a more communicative profession. Why is this so? Communication on all levels and formats is "embedded", "fit in", "coded" in pedagogical interactions."(2016) These holds true even more for the students of Maritime English as their needs are closely connected with their profession and they must be able to communicate successfully in their future professional settings and situations. Consequently, it is necessary to follow open language experiences with more intensive structured situations, dialogues and roleplaying.

According to Zhelezova-Mindizova: "Pedagogical situations, regardless of location, type of school and professional orientation, are similar in nature. (2016) Based on this premise we will deal first with the model in the environment of the classroom for General English, then our

approach will be to have some changes in order to adapt the model for the purpose of Maritime English and more exactly, for the purpose of studying SMCP.

In the structured situation phase of model of open language experience, students are presented with simple but natural narratives of no more than 100 words based on the open language experience. Such a material is found to be too long for quick memorization, thus the emphasis in this phase for the students is to concentrate on the meaning of the material. In addition, guide questions are presented to the students following the narration. Furthermore, an additional stage involving learning of short dialogues will be helpful for the students to build their confidence in participating in the role-playing activities. Reading and writing in this stage will be very useful and should be started with the assistance of the instructor. Visual materials, word cards and others can be used to help students transition from the narration to the oral task. Some students may be assigned to practice the dialogue until they feel confident to present it to the class.

Memorizing these presentations will build students 'confidence in role playing. After being involved in several structured situations and after mastering some related dialogues, students will be able to respond to the role-playing situations planned by the instructor. Usually, they should be directly related to some parts of the original open language experience. Students will be given short description of a situation and asked to act out the roles of the people in these setting without looking at the printed dialogue material memorized previously. The role-playing activities should be similar to the narratives, but sufficiently different to encourage free use of the language.

### **Model of the open language experience task**

#### Structured Situations

##### Text A

I want to make a grocery list. I get a pencil a piece of paper to write down what I need, Let's see. What do I need? I open my refrigerator. I need milk. I need eggs. I need butter. Also, I need orange juice. I have plenty of vegetables-onions, carrots, celery, and tomatoes. So, I don't need to buy any vegetables. Do I have any fruit? I have oranges. But I don't have any apples. I need apples. So, here is my grocery list.

*Guide questions*

1. What is a grocery list?
2. How do I make grocery list?
3. What do I open to see what I need?
4. What vegetables do I have?
5. What vegetables do I need to buy?
6. What fruit do I have?
7. What fruit do I need to buy?
8. Which three dairy products do I need to buy?
9. What kind of fruit juice do I need to buy?
10. What items are on my grocery list?

**Dialogue**

***Making a Grocery List***

A: What do you need at the grocery store?

B: I don't know. Let me see.

A: Do you need any vegetables?

B: No, I have plenty.

A: Do you need some fruit?

B: Well, I have oranges, but I don't have apples.

A: Then you need some apples.

B: Yes, I need some apples.

A: I'm going to make my grocery list

B: Here's a pen and a paper. Let me write it for you.

A: Okay. Write down milk, eggs and butter.

B: Okay. Milk, eggs and butter. What else?

A: Write down apples.

B: Okay. Apples.



A: Write down orange juice. That's all.

B: Okay. I've got milk, eggs, butter, apples, and orange juice.

### **Role-Playing activity**

This is the stage where students built their own dialogues with the guidance of the instructor.

### **Model of the open language experience task referring to maritime discourse**

Considering the task designed for students in General English, we developed a similar task referring to maritime discourse, particularly connected with the acquisition of SMCP.

#### Structured Situations

##### Text A

##### Berthing alongside

A ship may berth port or starboard side to, with no wind or tide, with the tide ahead with the wind onshore or offshore. It should proceed towards the pier at slow speed and at an angle of 20-30 degrees. When the ship approaches the berth, the engine is stopped and the ship's headway is used to bring her alongside. During the mooring operations should run astern to counteract the ship's headway. The mooring lines used to secure the ship to the bollards on the pier are named according to their use, e.g. head line, stern line, breast line, or spring line. The head line and the forward spring lines prevent the ship from drifting astern. The stern line and aft spring lines prevent the ship from drifting forward. Breast lines control the distance to the pier.

#### *Guide questions*

1. What is berthing?
2. How does the ship approach the berth?
3. How do the engines assist in berthing?
4. What are the main mooring lines?
5. What is the purpose of each line?

#### **Dialogue**

The Master of m/v Rila receives mooring instructions from the pilot on board,

M: Pilot, what is her berth?

P: Her berth is ahead of the white ship, next to the four cranes.

M: Pilot, the speed should be decreased.

P: Slow astern!

M: Pilot, the speed is too high to run off her headway. Half astern should be ordered.

P: Don't worry, Master. The stern tug is powerful enough.

Let go the forward spring!

Pass the heaving line ashore!

M: Pilot, Keep the ship's bow away from the pier.

P: Let go the breast line!

**Dialogue with cue cards**

<b>You are the Master of m/v Rila. Receive mooring instructions from the pilot</b>	<b>You are the pilot. Give mooring instructions</b>
<ul style="list-style-type: none"> <li>• Confirm</li> <li>• Agree and say that the engine is ready.</li> <li>• Give instructions to the mooring party all lines on the stern and the bow to be on shore.</li> <li>• Confirm that all lines are cast off.</li> <li>• Tugs are moored.</li> <li>• All lines are recovered. There is nothing behind the stern.</li> </ul>	<ul style="list-style-type: none"> <li>• Ask if the vessel is ready to sail</li> <li>• Tell the Master to have the mooring party prepare the ropes. Ask if the engine is ready.</li> <li>• Give the following instructions: Front positions to have the head line and the spring line on shore, Back positions to have the head line and the spring line on shore.</li> <li>• All lines on the stern and the bow to be on shore.</li> <li>• Say that the tugs are coming to the ship. Front and Back positions to pass the lines to tugs.</li> <li>• Recover all lines on board.</li> </ul>

**Conclusion**

The scaffolding effect on the oral discourse of Maritime English is a perfect tool for the language instruction. The students can comprehend the target language forms in the beginning stages and then they can perform what is required from them to construct real life dialogues performed over the radio. The benefit gained is to see how the language connected to the maritime radio conversations, using SMCP, so students learn the relevant forms and access them whenever they are actually in the appropriate context.

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**Assurance compliance of learning outcomes with level of education, industry specification and national qualification framework.**

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**Abstract**

The Presented paper aims to identify compliance of industry specification and national qualification framework requirements for level 6 of maritime education learning outcomes. The research is based on the theory of cognitive process of Bloom's taxonomy, which is a unique basis of the European and National Qualification Frameworks. The offered research is fulfilled on the examples of the learning courses of Bachelor degree of "Maritime Navigation" Educational Program of Batumi State Maritime Academy.

## **Introduction**

Learning is an indispensable tool of education. Learning process is a lifelong procedure for acquiring proper education, which is definitely linked to one's prosperous future and successful professional career though it requires time and patience. Figuratively saying it is a "journey" in a wonderland of books and papers with its ups and downs having positive impact on one's career ladder. An individual desiring for education is always in quest of finding and obtaining new information, developing weak or strong skills, forming own awareness and viewpoint in regard to specific subject areas or interest spheres.

Back in 1956, Benjamin Bloom, an educational psychologist at the University of Chicago proposed taxonomy, which was later called „Bloom's Taxonomy“ (Bloom et al., 1956:1). It is a classification of different types of objectives and skills, or learning objectives that educators determine for their learners.

As Robert J. Marzano and John S. Kendall mention in their book "the taxonomy of educational objectives" after half century Bloom's monographs "the Taxonomy of Educational Objectives" still residue and is compiled with modern methods „a standard reference for discussions of testing and evaluation, curriculum development, and teaching and teacher education" (Marzano et al., 2007:1).

## **Main Text**

Each learning lectures or practical classes of any course on Bachelor program should be based on level 6 of cognitive process of Bloom's taxonomy in order to properly structure the objectives and assessments of the courses. The original Taxonomy as is follows are: Knowledge, Comprehension, application, analysis, synthesis and evaluation (Bloom et al., 1956:18). These levels are well integrated and applied in learning process which graphically is more distinguishable on the below shown pyramid.



Bloom mentions: “Abilities and skills refer to organized modes of operation and generalized techniques for dealing with materials and problems. The materials and problems may be of such a nature that little or no specialized and technical information is required. Such information as is required can be assumed to be part of the individual’s general fund of knowledge. Other problems may require specialized and technical information at a rather high level such that specific knowledge and skill in dealing with the problem and the materials are required. The abilities and skills objectives emphasize the mental processes of organizing and reorganizing material to achieve a particular purpose. The materials may be given or remembered” (Bloom et al., 1956:204). Authors’ brief explanations of these main categories are:

- **Knowledge** “involves the recall of specifics and universals, the recall of methods and processes, or the recall of a pattern, structure, or setting (Bloom et al., 1956:204).”
- **Comprehension** “refers to a type of understanding or apprehension such that the individual knows what is being communicated and can make use of the material or idea being communicated without necessarily relating it to other material or seeing its fullest implications (Bloom et al., 1956:205).”
- **Application** refers to the “use of abstractions in particular and concrete situations (Bloom et al., 1956:206).”
- **Analysis** represents the “breakdown of a communication into its constituent elements or parts such that the relative hierarchy of ideas is made clear and/or the relations between ideas expressed are made explicit (Bloom et al., 1956:206).”
- **Synthesis** involves the “putting together of elements and parts so as to form a whole (Bloom et al., 1956:206).”
- **Evaluation** engenders “judgments about the value of material and methods for given purposes (Bloom et al., 1956:207).”

According to the Guidelines for the Description of Learning Outcomes, the term “Learning outcome” is defined as statements of what a learner knows, understands and is able to do upon completion of a learning process.

The Degree-level expectations specify six areas, which include:

1. Depth and Breadth of Knowledge
2. Knowledge of Methodologies
3. Application of Knowledge
4. Communication Skills
5. Awareness of Limits of Knowledge
6. Autonomy and Professional Capacity

One example of a degree-level expectation for the “depth and breadth of knowledge” area would be “by the completion of the program students will have acquired the following set of skills: a developed knowledge and critical understanding of the key concepts, methodologies, current advances, theoretical approaches and assumptions in a discipline overall, as well as in a specialized area of a discipline” (Kennedy, 2007:30-31).

The intended learning outcomes development is applied on bachelor level Maritime Industry programs. The most important factor is to comply with the industry specifications and national qualification framework requirements. According with the NQF for Level 6 is described as following (Plymouth, 2015:18-21):

Learning Outcomes	Level 6	Examples
Knowledge and understanding	Wide knowledge (following full general education) of study or/and work field, which includes critical analysis of theories and principles and some latest aspects of knowledge	factual knowledge basic precepts comprehension theories methodologies
Skill	Using cognitive and practical skills characteristic to the field of study or/and work in order to solve complex and unpredicted problems. Implementing project/paper of research or practical following predetermined suggestions. Collecting and explaining data characteristic to the field, also analyzing conceptual data or/and situation by using standard and some	application of methodology critical analysis synthesis evaluation communication numeracy teamwork learning to learn appropriate

	<p>latest methods; Elaborating proper judgments, which consider particular social, scientific or/and ethical issues.</p> <p>Communicating the ideas, existing problems and ways of solving them with specialists and non-specialists, with the forms relevant to the context, by using information and communication technologies.</p>	<p>selection of methodology position determination navigation strategies</p>
<p>Responsibility and Autonomy</p>	<p>Directing work oriented on improvement in complex, non-predictable learning or/and working environment and taking responsibility for it.</p> <p>Performing own activities by following principles of ethics.</p> <p>Planning own and others' continuous professional improvement and supporting its implementation.</p> <p>Identifying further learning needs and implementing with a high level of independence</p>	<p>working with others project management personal development planning reflection on practice and own development career awareness planning</p>

In the above mentioned chart the terms: Knowledge, Skill and Competence are originated from the EQF, which are understood in the following ways:

- "**Knowledge** means the outcome of the assimilation of information through learning. Knowledge is the body of facts, principles, theories and practices related to a field of work or study. In the context of the European Qualifications Framework, knowledge is described as theoretical and/or factual." (Grün et al., 2009:3).
- "**Skills** means the ability to apply knowledge and use know-how to complete tasks and solve problems. In the context of the European Qualifications Framework, skills are described as cognitive or practical skills." (Grün et al., 2009:3).
- "**Competence** means the proven ability to use knowledge, skills and personal, social and methodological abilities in work or study situations and in professional and/or personal

development. In the context of the European Qualifications Framework, competence is described in terms of responsibility and autonomy." (Grün et al., 2009:3).

Moreover, The EQT and NQF are linked to the revised version of Bloom's taxonomy chart. It was revised by group of cognitive psychologist in 2001. In this version we meet verbs and gerunds to label the categories and subcategories, whereas in the original version there were nouns. The following "action verbs" describe the cognitive processes by which thinkers encounter and work with knowledge (Anderson et al: 2001)

- **Remember**
  - Recognizing
  - Recalling
- **Understand**
  - Interpreting
  - Exemplifying
  - Classifying
  - Summarizing
  - Inferring
  - Comparing
  - Explaining
- **Apply**
  - Executing
  - Implementing
- **Analyze**
  - Differentiating
  - Organizing
  - Attributing
- **Evaluate**
  - Checking
  - Critiquing
- **Create**
  - Generating
  - Planning
  - Producing

Above mentioned is well demonstrated in the below graph:

## Bloom's Taxonomy





Foreseeing the learning courses at Batumi State Maritime Academy, namely, the subjects: Maritime English MN 2 of the 3<sup>rd</sup> course (V semester) and Quality Assurance and Marine Risk Management onboard ships (QA&RM) 4<sup>th</sup> course (VII semester) of the Bachelor program **Bachelor Educational Program “Maritime Navigation”** are based on the level 6 of European Qualification Framework.

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The learning outcomes of the program are presented in the following table (Plymouth, 2015:18-21):

Learning Outcomes	Examples	Command Verbs	Knowledge and understanding	Skill	Responsibility and Autonomy
Knowledge and understanding	rote memorization, recognition, or recall of facts;  understanding what the facts mean	List Name Identify Show Define Recognize Recall State Visualize Summarize Explain Interpret Describe Compare Paraphrase Differentiate Demonstrate Classify	<b>Demonstrate</b> knowledge and understanding of calculations and methodologies required for marine position determination prediction; <b>Identify</b> decision support methodologies appropriate to the marine environment, including passage planning, collision avoidance; <b>Recognize and explain</b> the principles and theories relevant to engineering and stability; <b>Identify</b> the planning, safety and commercial considerations relating to cargo and service ship operation.	<b>Analyse</b> their own capabilities set against the national Occupational Standards and related documentation; <b>Apply</b> appropriate navigational methodology to a variety of problems and scenarios; <b>Apply</b> appropriate problem-solving techniques to complex situation; <b>Analyse</b> the legal concepts applicable to shipping industry <b>Acquire</b> and use weather information; <b>Performs</b> a supporting role in the management of situations where problem solving is a key requirement Effectively <b>communicate</b> information, arguments and analysis in a variety of forms, including oral. <b>Determine</b> risk of collision and take appropriate action. <b>Appraise</b> the factors affecting trim, stability and stress for variety of vessel types. <b>Determine</b> vessel's stability in both normal operations and extreme circumstances	<b>Independently</b> organize information and develop their own personal development plan; Critically <b>evaluate</b> marine navigation techniques and shipboard practice; <b>Solve</b> problems based on critical safety related scenario; <b>Determine</b> appropriate methodologies for solving complex problems; <b>Appraise</b> the effectiveness of methods employed; <b>Recognize</b> the benefits if undertaking further training and development, both in respect of learned and new skills; <b>Undertake</b> further training, develop existing skills and acquire new competences that will enable them to assume significant responsibilities within organization; <b>Evaluate</b> qualities and transferable skills necessary for employment requiring the exercise of personal responsibility and decision making <b>Optimise</b> their performance across a range of activities, including self-directed learning, research and
Skill	correct use of the facts, rules, or ideas;  breaking down information into component parts	Analyze Organize Deduce Contrast Compare Distinguish Discuss Plan Devise Solve Illustrate Calculate Use Interpret Relate Manipulate Apply Modify	<b>Demonstrate</b> the development of an appreciation of a range positioning instrumentation, and analysis of the derived data. <b>Problem-solving</b> methodologies appropriate to the marine environment, including project management, team management. <b>Recognize</b> the legal framework relating to the practice of vessel management and the carriage of goods and passengers by sea	<b>Determine</b> the vessels position and appraise the limitations of the method employed <b>Appraise</b> the factors affecting the loading, carriage and discharge of cargo	<b>Evaluate</b> qualities and transferable skills necessary for employment requiring the exercise of personal responsibility and decision making <b>Optimise</b> their performance across a range of activities, including self-directed learning, research and
Responsibility and Autonomy	combination of facts, ideas, or information to make a new whole;  judging or forming an opinion about the information or situation	Design Hypothesize Support Schematize Write Report Justify Evaluate Choose Estimate Judge Defend			

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		Criticize		<p>Work effectively in a team, at any level;</p> <p><b>Communicate</b> information to the intended audience, including research output. Make use of appropriate ICT, including standard business applications, the Internet and specialist software;</p> <p><b>Communicate</b> effectively in written, oral and visual format</p>	<p>project management;</p> <p>Take a lead in the management situations where problem-solving is a key requirements</p> <p>The ability to act appropriately within the legal frameworks relevant to the shipping industry</p>
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Moreover, the syllabi of MN2 and QA&RM are in accordance with the level 6 of EQT demonstrating the following learning outcomes. Both learning courses are the specialty subjects and MN2 is the prerequisite of QA&RM.

Learning outcomes of Syllabus MN2 and QA&RM (Plymouth, 2015:18-21):

<b>Learning course /Learning outcomes</b>	<b>Knowledge and understanding</b>	<b>Skill</b>	<b>Responsibility and Autonomy</b>
Maritime English MN 2	<p><b>-Demonstrate</b> broad concept of the English language, including critical thinking of information applying it.</p> <p><b>-Recognize and explain</b> International Maritime Organization Standard Marine Communication Phrases (IMO SMCP), marine terminology and abbreviations.</p>	<p><b>- Integrate</b> course knowledge into everyday life</p> <p><b>- Use</b> charts and other nautical publications, to understand information and messages concerning ship's safety and operation.</p> <p><b>- Explain, collect, analyze and judge</b> separated data and/or situations.</p> <p><b>- Apply</b> appropriate knowledge to understand, analyze, evaluate and make judgment on the operational principles of the deck department.</p> <p><b>- Implement</b> everyday communication applying course foreseen glossary (correctly understands English speaking</p>	<p><b>-Independently organize</b> information, <b>estimate</b> their own responsibilities for activities oriented on professional growth in learning environment;</p> <p>Follow up the principles of communication ethics;</p> <p><b>- Appraise</b> the effectiveness of methods and plans and updates the knowledge.</p>

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		<p>conversation and is able to provide appropriate answers), is able fluently to speak on everyday activities, to express own ideas and opinions, is also able to use course foreseen grammar constructions for oral and written communication.</p> <p>- <b>Demonstrate</b> performance of the officer’s duties is able to perform oral and written communication applying the course foreseen International Maritime Organization (IMO) Standard Marine Communication Phrases (IMO SMCP);</p> <p>- <b>Communicate</b> with other ships, coast stations and VTS centres.</p>	
<p>Quality Assurance and Marine Risk Management onboard ships</p>	<p>-<b>Describe</b> significance of international norms, standards and regulation requirements, best practice of integrated management system,</p> <p>-<b>Explain</b> Terms and Definitions of standards, principals of internal and external audit;</p>	<p>-<b>Apply</b> requirements of norms and regulations, evaluate performed activity, assess effective control, monitoring and self-assessment methods;</p> <p>-<b>Analyze</b> importance of compliance of rules, regulations and instructions;</p> <p>-<b>Determine</b> timeframe for activity, communication methods and processes effectiveness;</p> <p>-<b>Acquire</b> information, assess risks, make evidence-based conclusions, and develop risk management strategy;</p> <p>-<b>Apply</b> team work principles, explain impact s of personal and team members activities on company’s quality assurance system and implementation of</p>	<p>-<b>Evaluate</b> the proper communication with colleagues, keep the principles of subordination, respect colleagues independency, communicate with people despite differences in social, cultural, religious and ethnics.</p> <p>- Take responsibility on <b>upgrade</b> professional knowledge and skills</p> <p>- <b>Undertake</b> further training, aware of the necessity of continuous renewal of knowledge of professional activities</p> <p>- <b>Appraise</b> the effectiveness of method</p>

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		<p>policy;</p> <ul style="list-style-type: none"> <li>- <b>Use</b> health, safety environment system requirement;</li> <li>- <b>Appraise</b> integrated management system implementation benefits;</li> <li>- <b>Demonstrate</b> clear, effective, efficient communication methods with team members;</li> <li>- <b>Compare</b> /Differ hazard and risk, explain risk assessment necessities on workplace, analyze the most severe hazards;</li> <li>- <b>Performs</b> risk mitigation procedures on the workplace, describes importance of quality assurance, personal health, safety trainings and record keepings;</li> <li>- <b>Discuss</b> importance of good industry practice, integrated management system maintenance;</li> <li>- <b>Interpret</b> certification and audit process;</li> <li>- <b>Demonstrate</b> benefits of systematic approach</li> <li>- <b>Effectively</b> communicate different information sources, collect proper information in the shortest timeframe, classify the collected material, proper plan , process, analyze, make decision and report in written and orally.</li> </ul>	<p>employed, take responsibility on perform activity</p>
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The above-mentioned syllabi are not only in accordance with the learning outcome of Level 6 of EQT but with level of 6 of National Qualification Framework as well. In the NQF is clear the

following characteristics of level 6 in regards to Knowledge and Understanding, Skill and Responsibility and Autonomy.

## Conclusion

To summarize all the above mentioned, while analysing the syllabi MN2 and QA&RM could be concluded that they are in accordance with the qualification level 6 of EQT and NQF and these last two frames are based on the revised Bloom's taxonomy' where, EQT's and NQF's Knowledge and Understanding are equal to "remember and understand", Skill = apply and analyse; Responsibility and Autonomy=evaluate and create.

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## The Emergence of Powerships: A Revelatory Case Study

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### Abstract

The existence of energy improves the countries by both economically and socially. The increasing energy demand forces the countries to establish different types of power plants according to their various conditions. Establishing power plants are tough for some regions such as Middle Eastern, African and Asian countries. The emergences of powerships are born by considering these countries suffering from energy deficiency and have difficulty of building land power plants. In this study, the emergences of powerships and the successful launch strategies are investigated in a single revelatory case study concept. In this context, together with the intensive literature review, semi-structured interview questions are prepared to be asked to a number of company officials and former employees and detailed evaluations are described in the powerships operation process. Obtained results are then discussed to understand how the company launched its innovative product to the energy market successfully.

**Keywords:** Powership, Single Revelatory Case Study, Innovation, Energy Demand

### Introduction

The increasing energy demand causes a great challenge in Middle Eastern, Asian and African countries. The high implementation costs of local power plants and renewable power stations create reluctance on governments or investors (Mitsubishi Heavy Industries, 2017). The time required to build land-based power stations also poses a barrier against urgent power demands. Besides, considering the so-called regions, the size of the population that is going to be served (Spectra, 2017) and safety issues may hinder the long-term energy production investments for specific regions.

The rural areas like island countries also suffer from the energy shortage. Transferring the energy from the mainland via subsea cables is a complex and costly operation to be invested (Spectra, 2017). Mainland grid lines are most likely to be separated from the island

grids. In this case, local power plants should be built on the island, or renewable energy resources should be used, which are mostly not viable because of the investment costs, reliability issues, energy efficiency concerns and limited accommodation areas (Lin, Xia, He, Harley and Habetler, 2013).

Energy supply company carried the floating power plant industry one step further by producing the first floating energy fleet in the world in 2009, which are patented as "Powerships" by the same company (Karadeniz Energy (a), 2017). Unlike the traditional floating power plants, these innovative powerships can be propelled with their own propulsion systems. Preparation of the plants can be completed within a couple of months after the contract agreement. When the contract is over, towing is not required to navigate through where the next customer is located. Compared to land-based power plants, the same amount of power can be obtained in a much smaller area with powerships. High capital costs for the project financing are also eliminated with all-in-one solutions given by the company (Karpowership (a), 2017).

In this study, the successful launch strategies during the innovation process of powerships are discussed. According to the key findings in the literature, semi-structured questions are prepared to be asked to a number of Powership officials and former employees. Finally, the results are discussed in the next section to understand how the company launched its innovative product to the energy market successfully.

### **Literature review**

The academic literature gives very little information about powerships. Researchers might have hesitated from the subject because of the data collection difficulties and the patent issue of powership concept. Ataergin (2015) discussed the identity of powerships according to IMO (International Maritime Organization) regulations in his work. Powerships were described as floatable power structures which have been transformed from a ship. It is introduced that only Annexes IV, V and VI of IMO's MARPOL convention is fully applicable to powerships. Although powerships are treated as ships within the ship industry's approach, some definitions need to be regulated as the rest of the annexes show the only relation to the navigability of the vessels.

Intensely made literature review about the powerships mostly relies on journal articles, newspapers, industry associations' reports, press databases, educational websites, company websites and internal reports. The collected data were utilized to prepare semi-structured questions and harmonized in the previous chapters to understand the successful launch strategies of powership innovation.



## **Methodology**

### **Single case study structure**

The case study method allows researchers to examine the data closely in a specific context. In general, a case study method refers to a small field of study and a limited number of people. (Zainal,2017) In this approach, work design is flexible and data collection and analysis are largely determined by the subject and certain procedures are decided when the work is in progress (Fidel, 1984)

The researchers must decide whether to use single case or multiple case study before any data collection when performing case study designs. There are two types of single case studies. One of them is holistic case studies and the other is embedded case studies. Holistic case studies are examined under five headings and these are "Critical Case" "Extreme Case or a Unique Case", "Representative or Typical Case", "Revelatory Case" and "Longitudinal Case" (Yin, 2003).

The revelatory case is used when a researcher has the opportunity to observe and analyze a phenomenon that was previously unavailable for social science research (Yin, 2003).

### **Semi-structured interview questions for revelatory case of powership emergence**

We used the case study approach to get rich data and information about powerships technology. A detailed case study provided the powerships with an understanding of how to enter the energy generation market, how to provide more economical solutions, and how to create advantages in the regions where they are located. Qualitative evidence was obtained from both primary and secondary sources and covered different data types (Yin, 1984).

The most important advantage that case studies provide when compared to other approaches is that they allow different sources of evidence to be brought together. It is possible to distinguish about three sources of evidence:

1. Interviews
2. Documents and Archives
3. Observation

Also, there are three kinds of interviews which are unstructured, semi-structured and structured interview. We chose the semi-structured interview and prepare the appropriate questions. Because we've done a comprehensive review of the powerships. In addition to a limited number of articles written on the subject, we have benefited from many internet sites, domestic and foreign newspapers and official sources of countries using this technology. We even have interviews with people who are citizens of the countries in which the powerships has been operating and who have started to work in these facilities. Our aim is to prepare questions

based on this secondary data we gathered, to direct them to experts in the field, and to be able to provide important implications by blending the answers we receive with those we collect.

Based on the secondary-source data, we came up with 10 semi-structured interview questions and asked them to a number of Powership officials and former employees. The questions and the selected excerpts are shown in table 1 below.

Table 1. Selected excerpts from the answers to interview questions

<b>Interview Questions</b>	<b>Administrative Stuff</b>	<b>Technical Stuff</b>
<b>How did the "Powership" idea come up with?</b>	<p>"The idea is basically not new. There are small power plants installed on barges to be used on demand near the riverside regions."</p> <p>"Considering the chaotic order in Iraq/Basra region, energy demand was wanted to be covered by a mobile power plant."</p>	
<b>Why are the powerships being preferred?</b>	"Powerships maintain their presence according to geological difficulty and socio-economic underdevelopment factors of the countries."	"A floating and transitory power plant is more economical and more secure than land-based power plants."
<b>How economical are the powerships compared to other systems?</b>	<p>"Powerships can bring profit from time and money with the ability to transfer all the equipment at once."</p> <p>"The demanding countries may produce energy from solar power in a cleaner and more economical way. However, this situation is basically related to world's political vision."</p>	<p>"Powerships are more economical in the way that can provide more power in a limited area."</p> <p>"There is no need for cabling to rural areas because the ship arrives directly to the demanding location."</p>
<b>How are the fuel contracts made (by whom, what kind of fuel is used)?</b>	"The fuel demands of the projects have been met locally by this time. HFO is most likely to be used. These conditions depend on agreement."	"HFO and natural gas can be utilized. Fuel has generally been supplied by the contacted government."
<b>Do you have security problems (both staff and plant)?</b>	<p>"According to the specifically created security procedure for each project, a secure space is created with the help of the related unit of government."</p> <p>"It is natural to be the targets of rebel groups in chaotic regions,</p>	"Floating feature gives an advantage to powerships in the case of security compared to land-based power plants."

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	because the agreements are made with the governments. The security is provided with highly qualified security procedures."	
<b>Number of crew working on the ship and their sufficiencies?</b>	"The crew consists of operation and maintenance crew, life supportive staff, and the crew required for being a ship."	"There has Bangladeshi personnel to do the cleaning duties. Also, local people have been working as engineer and electrician according to the agreement with the government."

**Table 1. Selected excerpts from the answers to interview questions (Continued)**

<b>Have you experienced a problem with the safety of the staff and the environment?</b>		"I haven't experienced any environmental problem on the ship. MARPOL regulations are applied and necessary inspections are carried out by class society and port state."
<b>What other difficulties do you face (Operationally and socially)?</b>		"Some engines are stopped at nights because the energy need is reduced."  "Operation of the engines might be hindered in bad weather conditions, because of clogged seawater filters."
<b>Did you get a positive influence on your patent, how long does it last?</b>		
<b>How do you see the powerships future, what are your plans?</b>	"The powerships will stay on market as long as the fossil fuel based energy production continues in the world."	"The fleet will expand with the rising demand. Powerships are the fast-foods of the industry. The company gives the fastest option to provide energy. Who wouldn't want this?"

Table 2. Areas and details of the projects

<b>Iraq Project</b>	Energy supply company vessels operated with a total of 410 MW. In 2010, Iraq, the first country to send Energy ship, it also carries the title of the first country to order an extra energy ship and request extension to the contract.
<b>Lebanon Project</b>	In 2012, Powership signed a contract with the Lebanese Electricity Utility for 2 energy vessels with a total production capacity of 270 MW. In 2016, the capacity of Energy supply company ships has been increased. The capacity of Energy supply company vessels has started to operate in the country with production exceeding 370 MW and the contract period has been extended for another 2 years
<b>Pakistan Project</b>	Upon the agreement between Karpower Company and Pakistan, two powerships belonging to Energy supply company started producing energy and feeding Pakistan energy systems. However, the Pakistani government in the period did not fulfill the contractual obligations, did not provide the necessary fuel for the energy production, nor gave the agreed money for the service provided.
<b>Ghana Project</b>	In Ghana project, two powerships have been supplying 225 MW of energy operating at the Port of Tema with the Ghana Electricity Administration. The powership contract for the Ghana region was the first African country project to be signed, as well as a hub for the West African region. Ghana electricity purchase contract has been 5 plus 5 years, 10 years totally. Powerships have the advantage of dual fuel flexibility that can provide low fuel costs. Moreover, powership engines can both be operated by HFO (Heavy Fuel Oil) and natural gas. The first energy ship operated in December 2015 with a production capacity of 235 MW and the second with 470 MW capacity in 2017
<b>Zambia Project</b>	Zambia has agreed with Powership in order to support the defective power sector. Under this project, 100 MW of electricity has been supplied. The Turkish company supplies electricity with power ship called “Irem Sultan” to Zambia for a two-year period. Zambia is a non-coastal country. For this reason, the ship anchored in Nacala port in Mozambique. The electricity is supplied to Zambia via cross-border interconnection lines through Mozambique and Zimbabwe. The transfer of the economically critical electricity on this route is also the first cross-border electricity transfer in the world with a single energy ship.
<b>Indonesia Project</b>	Powerships are provided 120 MW energy for Indonesia with different vessels at 5 Islands

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**Table 1. Powership vessels properties**

Vessel Name	Location	Energy Output	Date	Operating Time
Powership Dogan Bey	West Africa/Sierra Leone/Freetown	126 mWh (30 MW Supply)	Since 2018	For 2 years
Powership Rauf Bey	Red Sea/Sudan	180 mWh	Since 2018	
Powership Kaya Bey	Red Sea/Sudan	216mWh	Since 2018	
Powership Mehmet Bey	East Africa/ Mozambique/ Nacala			
Powership Irem Sultan	East Africa/ Mozambique/ Nacala	48mWh	Since 2018	For 5 years.
Powership Koray Bey	Gambia	30 MW	Since 2018	For 2 years
Powership Osman Khan	Ghana	450 MW	Since 2015	For 20 years
Powership Metin Bey	Guinea-Bissau	17 MW/30 MW	Since 2019	For 1 year For 5 years
Powership Zeynep Sultan/ Gökhan Bey/ Yasin Bey/ Onur Sultan	Indonesia	120MW-960MW	Since 2016	For 5 years
Powership Fatmagül Sultan	Lebanon	270 MW-370MW	Since 2012 Since 2016	For 4 years For 2 years
Powership Dogan Bey	Iraq	410 MW	Since 2010 – 2016	For 6 years
Powership Irem Sultan	Zambia Via Mozambique	100 MW	2016	

## Evaluation of Powership Projects

The regions in need of energy, the powerships in these regions and the amount of energy provided are given in the below table in terms of operating time.

Table 2. Areas and details of the projects

## Results and discussion

According to our research about powerships and experts answers to our semi-instructed interview questions, there are many factors to the successful launch of powerships into the energy production and distribution sector. All of them are explained into six different headings below.

### Installation factor

The initial installation costs of the power plants are quite high. These costs can increase exponentially, especially considering geopolitical positions and infrastructure competencies in the regions where they are established. The following table shows how high these costs are, even for a developed country like the US, according to the power plant variety.

Table 3. Cost and performance characteristics of new central station electricity generating technologies (EIA, 2017)

Technology	First available year <sup>1</sup>	Size (MW)	Lead time (years)	Base overnight cost in 2016 (\$/kW)	Project Contingency Factor <sup>2</sup>	Technological Optimism Factor <sup>3</sup>	Total overnight cost in 2016 <sup>4,10</sup> (\$/kW)	Variable O&M <sup>5</sup> (2016 \$/MWh)	Fixed O&M (2016\$/kW/yr)	Heat rate <sup>6</sup> in 2016 (Btu/kWh)	nth-of-a-kind heat rate (Btu/kWh)
Coal with 30% carbon sequestration	2020	650	4	4,586	1.07	1.03	5,030	7.06	69.56	9,750	9,221
Coal with 90% carbon sequestration	2020	650	4	5,072	1.07	1.03	5,562	9.54	80.78	11,650	9,257
Conv Gas/Oil Comb Cycle	2019	702	3	923	1.05	1.00	969	3.48	10.93	6,600	6,350
Adv Gas/Oil Comb Cycle (CC)	2019	429	3	1,013	1.08	1.00	1,094	1.99	9.94	6,300	6,200
Adv CC with carbon sequestration	2019	340	3	1,917	1.08	1.04	2,153	7.08	33.21	7,525	7,493
Conv Comb Turbine <sup>7</sup>	2018	100	2	1,040	1.05	1.00	1,092	3.48	17.39	9,920	9,600
Adv Comb Turbine	2018	237	2	640	1.05	1.00	672	10.63	6.76	9,800	8,550
Fuel Cells	2019	10	3	6,252	1.05	1.10	7,221	44.91	0.00	9,500	6,960
Adv Nuclear	2022	2,234	6	5,091	1.10	1.05	5,880	2.29	99.65	10,459	10,459
Distributed Generation - Base	2019	2	3	1,463	1.05	1.00	1,536	8.10	18.23	8,981	8,900
Distributed Generation - Peak	2018	1	2	1,757	1.05	1.00	1,845	8.10	18.23	9,975	9,880
Biomass	2020	50	4	3,540	1.07	1.00	3,790	5.49	110.34	13,500	13,500
Geothermal <sup>8,9</sup>	2020	50	4	2,586	1.05	1.00	2,715	0.00	117.95	9,510	9,510
MSW - Landfill Gas	2019	50	3	8,059	1.07	1.00	8,623	9.14	410.32	18,000	18,000
Conventional Hydropower <sup>9</sup>	2020	500	4	2,220	1.10	1.00	2,442	2.66	14.93	9,510	9,510
Wind <sup>10</sup>	2019	100	3	1,576	1.07	1.00	1,686	0.00	46.71	9,510	9,510
Wind Offshore	2020	400	4	4,648	1.10	1.25	6,391	0.00	77.30	9,510	9,510
Solar Thermal <sup>8</sup>	2019	100	3	3,908	1.07	1.00	4,182	0.00	70.26	9,510	9,510
Photovoltaic <sup>8,10,11</sup>	2018	150	2	2,169	1.05	1.00	2,277	0.00	21.66	9,510	9,510

As can be seen from the table 3, for gas/fuel alternating power generation facilities providing a wide range of fuel usage flexibility, the recovery period is 4 years. When examined in this context, the investing company must have much longer contracts in order to be profitable. When the contract expires, a very small portion of the investment can be taken back. If you are planning to roll back, it is likely to encounter a cost of close to installation, sometimes even greater.

Energy supply company Chief Executive Orhan Karadeniz said that in the emergence of a powership, an investment of 1.5 Million Euros is needed for every MW (Firat, 2014). But once a ship is built, it can be used many times in different regions, following maintenance and transportation costs that may be relatively small.

### No need for free space

There are some difficulties in establishing a power plant for small island countries and large scattered islands, which do not have large land areas. Because the land is so precious in these countries, even creating the necessary space to build a power plant is causing very high costs. Although governments try to produce politics against it, they cannot be said to be very successful in this matter, as it is in Indonesia (Jullaga, 2015). However, the transfer of the generated energy between islands is also a separate problem. The cables that will be passed over the sea will increase the cost of installation, bring security problems and increase the cost of maintenance. Powerships can solve all these problems without having to occupy almost any

land component by sharing the necessary energy with the required number of ships and operating from different regions.

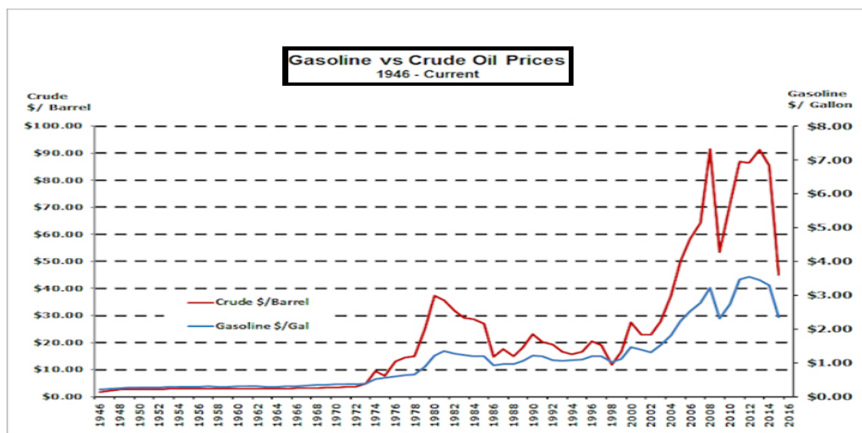
### Security factor

The security factor is one of the most important factors that distinguish the powerships from other energy production facilities. When security problems become uncontrollable, the ability to quickly move itself to a safer place can be enough alone to explain how the powerships has entered this energy supply sector so quickly and strongly. Particularly because the energy sector is the preferential target of terrorist organizations, it poses a risk even for regions that are considered to be relatively safe. Moreover, since agreements are made with governments, they are not welcomed by merchants and this risk is further increased in unstable management processes. It is not easy to dare to invest in such a foresight. However, a system that can accommodate fast-changing conditions and that can provide fast mobility.

### Fuel flexibility

The use of gaseous fuels is quite common in internal combustion engines with spark ignition however modern dual-fuel reciprocating internal-combustion diesel engines can provide high fuel efficiency with the use of liquid diesel fuels as well as gaseous fuels. The liquid fuels can range from light fuel oil (cleanest fossil fuel) to heavy fuel oil (cheapest fossil fuel), while bio-oils can also be used. Gas fuels may have different properties and calorific values, ranging from biogas to natural gas. In all cases, care should be taken that the engine is set to match the type of fuel used (Klimstra, 2016).

Figure 11. Gasoline versus crude oil price chart (McMahon, 2015)



Dual-fuel engines allow you to seamlessly and smoothly transition from gas fuel to liquid fuel processing (and vice versa), so you get full fuel flexibility. Powerships with dual fuel engines can work with gas, diesel, biofuel or heavy fuel oil (HFO). If it becomes difficult to obtain a fuel

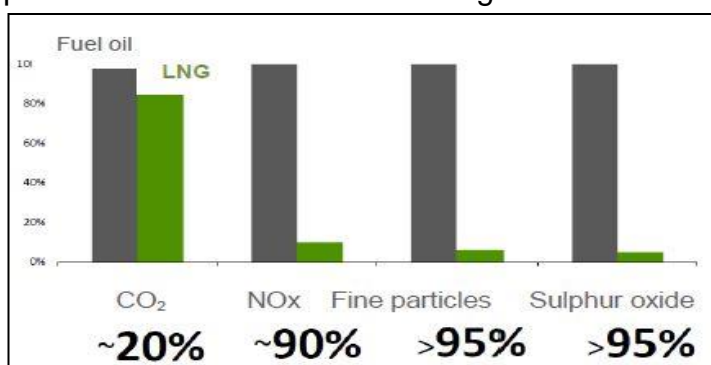
type, or if the prices become too high to be reached, our dual-fuel engines can simply be turned into another fuel source. This allows you to take advantage of gaseous fuels, even if gas supply is not certain (MAN, 2017).

The primary purpose of the powerships is to ensure that the countries that are inadequate to produce the energy they need are able to provide the energy in the desired amount in the most economical way. However, the emissions they produce must comply with the legal restrictions in the countries in which they operate. Natural gas, which is the most effective fuel for lowering emission values, is cheaper compared to diesel fuels. However, for natural gas, an alternative fuel requirement must be included so that energy production can continue uninterrupted when factors such as continuous availability and storability in suitable conditions are taken into account. The most effective solution in this context is dual fuel technology.

Rising fuel prices, regulations that are designed to prevent environmental pollution are getting more serious every day, put energy efficiency in a very important position on marine and power plants. A piston engine is still and in the near future the most efficient way to convert liquid or gaseous fuels into energy. The most effective way to convert liquid or gaseous fuels into energy is an internal combustion piston motor. However, there are differences in the efficiency achieved after using different fuels. Natural gas is the most efficient burning fossil fuel, and conversion of an existing liquid-fuelled engine to gasification has been tried many times, resulting in significant economic and environmental benefits (Wartsila, 2013). The use of gaseous fuel for energy production has several advantages. There is a serious price difference between natural gas and oil, which usually makes natural gas an attractive alternative. The exhaust emissions produced by gaseous fuels are considerably less than those produced by liquid fossil fuels. It is an effective alternative to both harmonize with the environmental laws that governments apply and to protect the health of the people living near the power generation facilities. For natural gas, different types of emissions reduction ratios are given in figure 12. With the burning of the cleanest natural gas of fossil fuels, almost no sulfur dioxide or ash or particulate matter is formed. Nitrogen oxide emissions, one of the most dangerous emissions for

nature, are also reduced by 90% compared to petroleum. In addition, natural gas produces 20% less carbon dioxide and 95% less sulfur oxide than petroleum.

**Figure 12.** Comparison of emissions from heavy fuel oil and LNG (Engie, 2015)





There is plenty of natural gas in the land. According to IEA estimates, today's natural gas reserves represent approximately 182 trillion cubic feet, which means that gas is available for about 60 years, based on current natural gas consumption. This estimate does not contain significant reserves of natural gas that are believed to exist but have not been explored yet (IEA, 2017).

### **Temporarily or Seasonal Energy Demand Factor**

The benefits provided by the company's technology are not limited to producing energy for undeveloped countries and providing energy to countries experiencing difficulties in producing energy. Energy supply company Chief Executive Orhan Karadeniz said: "Britain is among the target countries for 2016, amid concerns there that the closure of coal-fired plants could leave it without (enough) power," he said. "There could be a seasonal or periodic need for power ships in places ... like New York." (Reuters, 2013) In developed countries, this system is not intended to be a general energy deficit, but rather to solve the rising energy needs in the most cost-efficient and most practical way, and create a solution that will not draw on any workload or financial burden when the need arises. It may also be preferred as a transition system or as a system to cover periodic gaps, in countries, who intend to change the source of energy production and intend to direct cleaner renewable resources, like the British example given by Orhan Kardeniz.

### **External source problem**

In case of bad weather conditions in the area where the power ship was found, ship seawater filters are more polluted than normal and in this case, engines cannot operate properly. Moreover, in various natural disasters such as tsunami can affect power ships electrical production system. However, when compared with land electricity installations, these problems are described as very minor.

### **Conclusion**

In this study, we studied the emergence of powership innovation and the successful launch strategies that should be taken into account to take a place in the energy market. The successful launch of powership innovation is basically based on 6 factors as shown in the previous chapter. Powerships are essential for countries that suffer from energy shortage. These types of vessels are revealed with Turkey originated company, Energy supply company. Our findings show that the company provides more benefits compared to land-based power plants for energy needed countries. Many countries, shown in the projects, have already been enjoying the benefits of the fast energy supply provided by these powerships. So, they hinder

their electricity shortage in an efficient way. Moreover, local people can find work opportunities in these powership projects. The company also supports the smart students to enhance the infrastructure of these underdeveloped countries. Revelatory case analysis is used in this study. Powership and its technology are described. This study will be a good source for researchers whose studies are regarded with powerships as the literature shows very few studies about the subject.

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# Spatial Mapping of Piracy Prone Area Through Geographical Information System

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## Abstract

Piracy is the main threat to shipping security. Although some measures have been taken at global level in recent years, it has not been completely eliminated. It is seen that the attacks are concentrated in some regions. This paper presents a study of Geographic Information System (GIS) to the maritime security. Within this context, the aim of this study is to reveal the risk map of maritime areas in terms of piracy. To do this, initially the spatial analysis was performed using multiple spatial data from International Maritime Bureau (IMB) and Commercial Crime Services (CCS). The attack density map was created by MapInfo 16.2 software, and then the piracy prone areas were identified in accordance with the attack frequencies. As a result, a total of 239 (201 for 2018 and 38 for first quarter of 2019) illegal activities under 4 types of attack in 5 regions were considered and used in the analysis. It was concluded that African and Southeast Asian regions are still the riskiest areas in terms of piracy. However, as a result of the measures taken, it is observed that the attacks occurred especially in the regions such as Yemen, Aden and Somali have decreased considerably. Besides, it was found that the majority of actual attacks (71%) occurred on board. In further researches, it is recommended to create the map of piracy prone regions considering different analysis methods with in broader range of period.

**Keywords:** GIS, Piracy, Spatial Analysis, Risk Map.

## Introduction

Contrary to ancient piracy, contemporary maritime piracy has been recognized as a global threat in shipping as a result of the increased activity in the beginning of 21<sup>st</sup> century. Piracy activities, which have been on the upward trend since the 90s with the effect of globalization, targeted the Gulf of Aden, especially in Somalia and Yemen. This trend continued until patrol measures at the regional level increased with global cooperation. Following the

boom of Somali armed robbery attacks in 2009-2011, there has been a downward trend since 2012, with reaching its lowest value for the last 20 years in 2017 (Tumbarska, 2018). A total of 201 attacks in 2018 and 38 attacks in the first quarter of 2019 were reported to the International Maritime Bureau's (IMB) Piracy Reporting Centre (PRC). The increase in the number of illegal activities in 2018 compared to last two years (2016/191 and 2017/180) indicates that the downward trend starting from 2013 has been suspended (IMB ICC Report, 2013: 21-22).

Since piracy attacks have targeted ships, they have been concentrated geographically in some areas (Jeong, 2018). The latest reports show that the incidents have been concentrated in the Africa as in the previous years, but the piracy prone area changed due to increased security measures taken at global level (IMB ICC Report, 2013: 21-22). In recent years, the number of attacks, especially in Nigeria, has increased due to the measures taken in the Somali region. In addition, measures taken in the Indonesian region have also led to the shift of events to the Philippine. Within this context the piracy prone areas need to be redefined. Therefore, in this study, the updated piracy density map was created by GIS, and then the piracy prone areas were identified in accordance with the attack frequencies. Finally, we consider the theoretical and practical implications of the findings.

## **Literature review**

There are only few studies in the subject of tracking and the monitoring of the piracy attacks in the literature. Mackenzie (2019), in her study, focused on the GIS applications in tracking of maritime piracy. UNITAR (2014), in its global report, implemented a geospatial analysis of maritime piracy using the data between 1995 and 2013. Huang and Hu (2015), propose a GIS based method to estimate the probability using historical data International Maritime Bureau (IMB) and the United Nations Conference on Trade and Development (UNCTAD). Mercy et al. (2014) investigated the trends of international piracy using GIS software. Marchione and Johnson (2013) aimed to examine patterns in the timing and location of incidents of maritime piracy to see whether, like many urban crimes, attacks cluster in space and time. Watagawa et al. (2013) investigated spatial pattern of piracy activity using geographic information system (GIS) based-hazard map. Such GIS based studies in maritime literature have been largely focused on maritime piracy and oil spills (Giziakis et al., 2014; Ponnambalam et al., 2016).

## Materials and method

The aim of the study is to determine the piracy prone areas using Geographic Information System (GIS) considering illegal activities occurred in 2018 and the first quarter of 2019. The system consists of large-scale geographical data, density mapping, and interrogation accordingly a wide variety of image processing in order to solve social, economic and environmental problems on earth (Burrough et al., 2015; Goodchild, 1998).

In this study, the hot spot analysis which is spatial analysis and mapping methodology considering in the describing of clustering spatial data. These elements are defined as the spots in a map and refer to geographical position of activity. For this purpose, MapInfo 16.2 was used as desktop GIS software in order to draw density chart using hot spots. Hotspots are concentrations of activities within a specific location that appear over time. Piracy mapping is devoted to detecting such dense areas and are known as piracy hotspots.

## Data

In this study, a total of 239 incidents, 201 of them in 2018 and remaining in the first quarter of 2019 were taken into consideration. A total of 4 types of attacks in 5 regions were taken into account for the study. The data were obtained from periodic documents published annually and quarterly by ICC. The details of illegal activities are shown in Table 1.

**Table 1.** Actual and Attempted attacks by Location, 2018 and 2019 (first quarter)

Location		ACTUAL ATTACKS				ATTEMPTED ATTACKS			
		Boarded		Hijacked		Fired Upon		Attempted	
		2018	2019	2018	2019	2018	2019	2018	2019
<b>SE ASIA</b>	Indonesia	29	3					7	1
	Malaysia	8				1		2	
	Philippines	6	1			1		3	
	Singapore Straits	3							
<b>EAST ASIA</b>	China	1	3					2	
	Vietnam	4							
<b>INDIAN SUBCONT</b>	Bangladesh	10						2	
	India	5	1					1	
<b>SOUTH AMERICA</b>	Brazil	4	1						
	Colombia	1	1						

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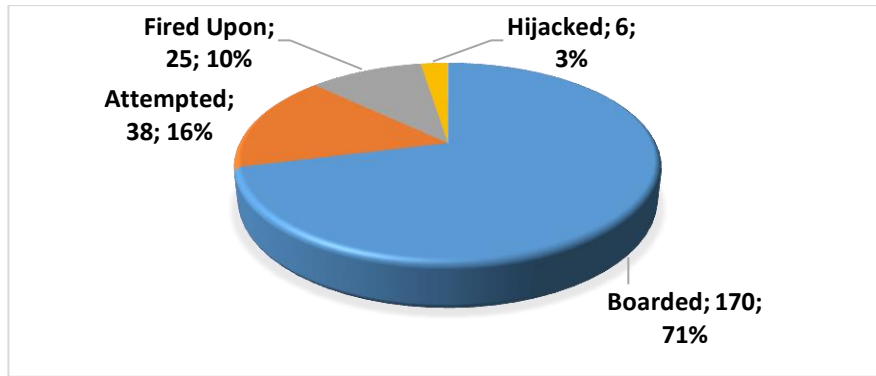
	Ecuador	1				3	
	Guyana	2					
	Haiti	3					
	Peru	4					1
	Venezuela	8	4			3	1
<b>AFRICA</b>	Benin	3	1	2			
	Cameroon	6	1				1
	Democratic Congo	1					
	Ghana	8	2	1			1
	Guinea	2					1
	Gulf of Aden					1	
	Ivory Coast	1	1				
	Mozambique	1					1
	Nigeria	29	7	1		12	6 8
	Somalia					2	
	The Congo	3		2		1	
	Togo		1				1
		143	27				
<b>Sub Total</b>		170		6	0	18	34 11
<b>TOTAL</b>		239					

According to the latest reports, insecure activities targeting marine transportation especially in West Africa increased in 2018. The ICC recorded 201 incidents of maritime piracy and armed robbery in 2018, up from 180 in 2017. As seen in the table only 2 incidents were reported to the IMB in 2018 and no incidents were reported in the first quarter of 2019. The international navies patrolling these waters play an important role in reducing the number of attacks.

However, the measures taken cause the pirates move more insecure areas such as Nigeria and Indonesia. Besides, the Gulf of Guinea is still dangerous for shipping. In addition, increased patrols by the Indonesian government caused the number of incidents drop for the third successive year.



**Figure 1.** Comparison of the types of attacks

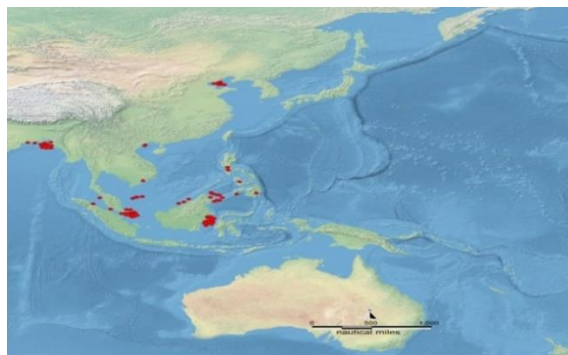


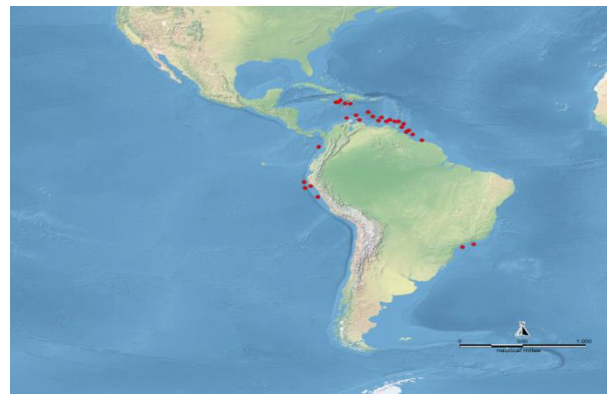
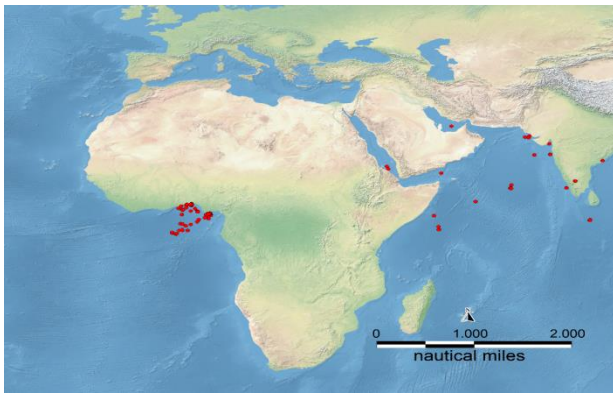
As seen in Figure 1, it is observed that pirates mostly carried out illegal activities such as stealing and kidnapping on board. It is seen that hijacking rates are quite low due to additional measures taken by the ship.

### Findings and Results

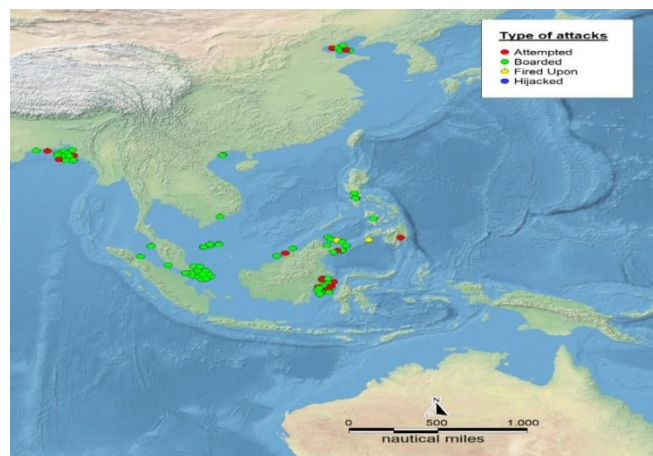
In this study, the incidents of piracy occurred between 2018 and first quarter of 2019 were taken into consideration. In this context, it has been observed that a total of 239 ship accidents under 4 types of attacks such as fired upon, boarded, attempted and hijacking reported in 6 regions. The detailed descriptive information which covers data between 2018 and first quarter of 2019 were obtained from IMB database. The data were analyzed through the Map Info Version 16.2 as GIS software. The positional analysis of incidents was carried out by "Point Density Analysis" method in MapInfo software. Figure 2 shows the regional distribution of the incidents obtained from the database.

**Figure 2.** Geographical distribution of piracy and armed robbery against ships

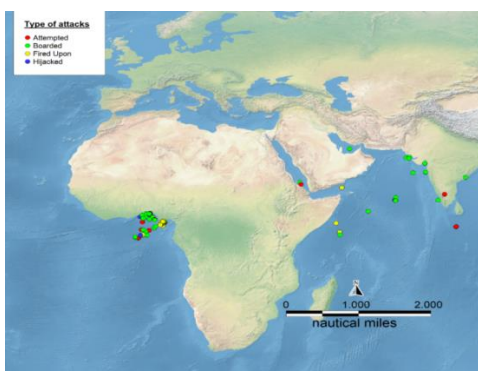




It is noteworthy that the classic piracy map has not changed, but there are positional shifts at the micro scale. West Africa is still the most risky area in terms of piracy attacks. Pirate attacks intensify in the territorial waters of less developed countries where security gaps are high. In particular, the strategic routes are still in danger of attacks against ships. In Figure 3, the distribution of illegal activities regarding the types of attacks is shown.



**Figure 3.** Geographical distribution of piracy and armed robbery regarding the types of attacks



It is clearly seen in the figure that all types of illegal activities are only observed in Africa and Asia region. Incidents of hijackings are frequently experienced especially in West Africa region and in Strait of Malacca. On the other hand, in the south US region, only boarded attacks resulted in theft, hostage and assault were noted. As a result of the security measures taken in the Gulf of Aden, it is seen that the activities are shifted to other regions.

## **Conclusion and Recommendations**

In this research, the piracy attacks all over the world between 2018 and first quarter of 2019 were examined and spatial analysis were carried out with MapInfo 16.2 software as an instrument of GIS.

It has been found that increased security measures have only caused a change in the micro scale piracy map but there is no remarkable change in the number of piracy attacks. In this manner, regional risk assessments should be carried out by security cooperation and additional navy patrols should be deployed. In addition to the increased security measures of ships navigating in areas where pirate attacks are intense, training and drills to increase security awareness are recommended. As can be seen from the findings, most illegal activities occurred on board. In order to prevent this, it is recommended to support the superstructure elements with new technologies specially to prevent the pirates from embarking on board. It is strongly advised to reduce the risk levels by establishing an effective communication network between the responders and ship under attack. To do this, new satellite communication system might be established in addition to existing system. In addition, real time reporting system should be maintained by the real time reports of any suspected, attempted and actual attacks provided by ship-owners and masters. Finally, to have wide and increased solution in the combat of piracy attacks in the region, countries should enhance global cooperation to construct a legal corridor, legislation structure and organize patrols to share knowledge and experience on issues that exist different point of views. For further researches, other instruments of GIS can be used and wider range of period should be considered. Besides, the spatial mapping can be drawn by taking into account of other parameters such as type of ship, flag, crew nationality, and types of arms used during attacks.

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## How to spell figures in maritime voice communication

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### Abstract

This paper addresses discrepancies between different ITU and IMO regulations and recommendations on how to spell figures in maritime voice communication and existing practices. What bears particular relevance for IMLA is the ambiguity of IMO Model Courses 1.25 (General Operator's Certificate for GMDSS) and 1.26 (Restricted Radio Operator's Certificate for GMDSS) that dictate the training of GMDSS operators and should therefore be, by nature, unambiguous. As a result, this paper will summarise different ITU (for instance, Radio Regulations, and the Manual for Use by the Maritime Mobile and Maritime Mobile-Satellite Services) and IMO (for instance, International Code of Signals, model courses, and Standard Marine Communication Phrases) documents and regulations, and compare these against each other and against existing maritime communication practices. In the concluding section suggestions for a necessary simplification of this seemingly clear subsection of maritime communication are given.

### Introduction

The dilemma of how to spell figures in maritime communication is not new. Twenty years ago, after the experience gained through approximately 15 GMDSS training courses, during a course debrief the involved instructors started a discussion on how they thought figures should be spelt in maritime communication. The result was a paper presented at the IMLA/WOME conference held in Rijeka, Croatia, in 1999 where the authors addressed a dilemma pertaining to the teaching of GMDSS: should we follow international regulations and IMO model course suggestions or simply use standard general English? Since then, the situation has not significantly changed. The present paper is based on the premises of the paper mentioned above (Suban et al., 1999), the main finding of which was that in terms of time the spelling of figures using the Figure Code is more than three times longer compared to the spelling of

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figures as is now suggested by the Standard Marine Communication Phrases (SMCP; IMO, 2001).

An examination of maritime VHF conversations during ships approaches to Northern Adriatic ports and discussions with active navigational officers revealed that in practice hardly anybody uses the Figure Code nor SMCP specifics (fower, niner). Therefore, where does the difference between the Figure Code, the SMCP, and the spelling of figures in practice originate from?

Officially, there is no dilemma of how to spell figures – it should follow international regulations. The regulatory bodies in charge of this field are the International Telecommunication Union (ITU) and the International Maritime Organization (IMO). Both dictate the use of the “International Phonetic Alphabet and Figure Code” (IPAFC; ITU, 1967). However, in practice almost everybody digresses from these rules. In the authors' opinion, using the prescribed form of spelling figures can lead to many difficulties in all messages but particularly so in distress communications, which may lead to disastrous consequences. In the role of lecturers, we have to follow official instructions but is this beneficial to future watchkeeping officers? In the following sections the ITU and IMO regulations will be presented.

## Regulations and recommendations

### International phonetic alphabet and figure code (ipafc)

The ITU Radio Regulations (ITU, 2016c), Appendix 14, as well as the International Code of Signals (ICS), Chapter 1, Section 10, Page 19, and Chapter 4, Table 1, dictate the spelling of figures with the IPAFC (ITU, 1967). In both documents the same content is used: item 1 presents the letter spelling table, **item 2 defines how to spell figures or marks** (see Table 1), and item 3 defines the use of other forms of spelling within the same country.

**Table 1:** Extract from the International Phonetic Alphabet and Figure Code (ITU, 1967)

0	Nadazero	NAH-DAH-ZAY-ROH
1	Unaone	OO-NAH-WUN
2	Bissotwo	BEES-SOH-TWO
3	Terathree	TAY-RAH-TREE
4	Kartefour	KAR-TAY-FOWER
5	Pantafive	PAN-TAH-FIVE
6	Soxisix	SOK-SEE-SIX
7	Setteseven	SAY-TAY-SEVEN
8	Oktoeight	OK-TOH-AIT
9	Novenine	NO-VAY-NINER

## ITU

### Radio regulations

The ITU regulates the spelling of figures in their RR (ITU, 2016c), Chapter VII “Distress and Safety Communications”, Article 32 “Operational Procedures for Distress

Communications in the Global Maritime Distress and Safety System (GMDSS)", Chapter IX "Maritime Services", Article 57 "General Radiotelephone Procedure in the Maritime Mobile Service", and in Appendix 14. The same regulations can also be found in the Manual for Use by the Maritime Mobile and Maritime Mobile-Satellite Services, Volume 2 (ITU, 2016a).

Below the RR paragraphs relevant to the spelling of figures are quoted:

Regulation 32.7. states: *"The phonetic alphabet and figure code in Appendix 14 and the abbreviations and signals in accordance with the most recent version of Recommendation ITU-R M.1172 should be used where applicable;"*

while 32.7.1. adds: *"The use of the Standard Marine Communication Phrases (SMCP) and, where language difficulties exist, the International Code of Signals (ICS), both published by the International Maritime Organization (IMO), is also recommended."*

In these points the existing maritime practice hardly ever follows the regulations. In fact, in daily maritime communications everybody uses the standard general English language spelling. According to the RR, the radio operator should use the Figure Code or the SMCP forms of spelling.

A comparison with the regulations valid 20 years ago reveals that for abbreviations and signals a reference to the most recent version of Recommendation ITU-R M.1172 was added. This is quite unusual and possibly not very useful. The abbreviations mentioned in this Recommendation are not more widely used due to the abandonment of the service of terrestrial (especially HF) coastal stations with a commercial telex service. In addition, the importance of the Q code is decreasing. In the last 20 years we did not notice any instances of VHF use of the Q code, a view corroborated by active navigational officers.

Article 57 "General Radiotelephone Procedure in the Maritime Mobile Service" includes Regulation 57.7. that states:

*"When it is necessary to spell out certain expressions, difficult words, service abbreviations, figures, etc., the phonetic spelling tables in Appendix 14 shall be used."*

### **Manual for use by the maritime mobile and maritime mobile-satellite services**

The ITU Manual for Use by the Maritime Mobile and Maritime Mobile-Satellite Services, Volume 1 (ITU Manual; ITU, 2016a), provides practical instructions for daily work with GMDSS equipment. Here Chapter 5 "Radio Procedures" and Subchapter 5.1. "Radiotelephony Practical

Information" instruct us how to perform radio communications. At the end of the chapter, a suggestion is given:

*"For clarity, the phonetic alphabet and figure code may be used (see Chapter 10) following the proword I SPELL."*

Later on, Chapter 10 "Other Administrative and Operational Procedures" includes Subchapter 10.7. "Phonetic Alphabet and Figure Code" that states:

*"When it is necessary to spell out figures or marks, the spelling table given in Appendix 14 is not widely used and it is preferable to use the table given in the IMO Standard Marine Communication Phrases."*

### **International code of signals (ICS)**

The International Code of Signals (IMO, 1969/2003), Chapter 1, Section 4 "General Instructions" determines how to signal numbers. Paragraph 5 states:

*"(a) Numbers are to be signalled as follows:*

*(i) Flag signalling: by the numeral pennants of the Code.*

*(ii) Flashing light or sound signalling: usually by the numerals in the Morse Code; they may also be spelled out.*

*(iii) Radiotelephony or loud hailer: by the Code words of the **Figure Spelling Table** in Chapter 1, Section 10, Page 19.*

*(b) Figures which form part of the basic signification of a signal are to be sent together with the basic group.*

*(c) A decimal point between numerals is to be signalled as follows:*

*(i) Flag signalling: by inserting the answering pennant where it is desired to express the decimal point.*

*(ii) Flashing light and sound signalling: by "decimal point" signal "AAA".*

*(iii) Voice: by use of the word "DECIMAL" as indicated in the **Figure Spelling Table**.*

*(d) Wherever the text allows depths, etc., to be signalled in feet or in meters, the figures should be followed by "F" to indicate feet or by "M" to indicate meters."*

Another important section is Section 8 "Radiotelephony" that states:



*"When using the International Code of Signals in cases of language difficulties, the principles of the Radio Regulations of the International Telecommunication Union then in force have to be observed. Letters and figures are to be spelled in accordance with the phonetic spelling tables in Chapter 1, Section 10, Pages 18 through 20."*

### **Standard marine communication phrases**

The IMO SMCP were adopted in November, 2001, as resolution A.918(22) IMO Standard Marine Communication Phrases. The SMCP replaced the Standard Marine Navigational Vocabulary (SMNV) adopted by IMO in 1977.

The SMCP give another approach to spelling figures in the General chapter, Paragraph 2.2. "Spelling of Digits and Numbers". Here it is highlighted that **a few digits and numbers have a modified pronunciation compared to general English** (see Table 2).

Table 2: Extract from the Standard Marine Communication Phrases (IMO, 2001)

	Spelling	Pronunciation
0	Zero	ZEERO
1	One	WUN
2	Two	TOO
3	Three	TREE
4	Four	FOWER
5	Five	FIFE
6	Six	SIX
7	Seven	SEVEN
8	Eight	AIT
9	Nine	<b>NINER</b>
1000	Thousand	TOUSAND

However, also in this case, in our opinion and as corroborated by active navigational officers, only few radio operators follow these recommended forms of pronunciation. Most, probably

close to 99%, use standard general English pronunciation. Therefore, we would like to suggest further research into the forms of spelling used by active seafarers and, if this is corroborated by research findings, **revising this chapter to recommend spelling according to the norms of standard general English.**

### **International aeronautical and maritime search and rescue manual**

The International Aeronautical and Maritime Search and Rescue Manual (IAMSAR Manual; IMO/ICAO, 2012a, 2012b, 2012c) is a guideline for a common aviation and maritime approach to organising and providing SAR services. It consists of 3 volumes, each is briefly presented in the following sections.

#### **IAMSAR MANUAL VOLUME I: organization and management**

Volume I (IMO/ICAO; 2012a) discusses the global SAR system concept, establishment and improvement of national and regional SAR systems and co-operation with neighbouring states to provide effective and economical SAR services. This volume does not directly state how to spell figures. However, Chapter 4 “Communications”, Segment 4.2. “Basic Functions and Requirements” contains an indirect reference to the spelling of figures:

“4.2.3 Publications which can be used to alleviate language barriers between vessels, aircraft, survivors, and SAR personnel include: the International Code of Signals, the Standard Marine Communication Phrases (SMCP) and Appendix I – SITREPs and Codes, of IAMSAR Manual, volume II. These documents should be included in RCC libraries and be understood by the staff who should be able to recognize coded messages based on these references. Ships should carry these documents and SRUs should carry the Code.

4.2.4 While tools like the International Code of Signals and SMCP are readily available and can be genuinely useful, they should not be thought of as total solutions for the challenges of communicating effectively across language barriers. Because of the range of topics and behaviours requiring common understanding, effective transfer of information in situations of operational emergency is dependent upon a very comprehensive command of language. Thus, no form of standardized phraseology or code can address the extent of need. A high level of proficiency in common (or plain) language is necessary.”

## **IAMSAR MANUAL VOLUME II: mission co-ordination**

The main objective of Volume II (IMO/ICAO, 2012b) is to assist personnel who plan and co-ordinate SAR operations and exercises. In this volume the spelling of figures is dealt with in Chapter 2 "Communications", segment 2.20. "Phonetic Alphabet and Figure Code":

"2.21.1. An example of phonetic alphabet and figure code which may be used when speaking or spelling out call signs, names, search area designations, abbreviations, etc., is found in the International Code of Signals. There are other versions of the phonetic alphabet which may be used just as effectively."

and in segment 2.24. "Codes, Signals, and Standard Phrases":

"2.25.1. Publications which can be used to overcome language barriers and circumstances among vessels, aircraft, survivors, and SAR personnel include IMO's International Code of Signals\*, International Regulations for Preventing Collisions at Sea, and Standard Marine Navigational Vocabulary. These documents should be included in RCC libraries, and they should be familiar to the staff, which should be able to recognize coded messages based on these references. Ships should carry these documents, and SRUs and aircraft should carry the International Code of Signals.

2.25.2. These references are all available from IMO and certain speciality bookstores world-wide. Only a few provisions of the references are duplicated in this Manual.

2.25.3. Most ship masters, aircraft pilots, air traffic controllers, SAR personnel, etc., have a working knowledge of the English language. However, they must sometimes communicate with those who cannot speak or understand English, or when voice communications are not possible under the circumstances. In these situations, the Code and the IMO SMCP can be essential."

## **IAMSAR MANUAL VOLUME III: mobile facilities**

Volume III (IMO/ICAO, 2012c) is intended to be carried aboard rescue units, aircraft, and vessels to help with the performance of a search, rescue, or on-scene co-ordinator function and with SAR aspects that pertain to their own emergencies.

In this volume, Section 3 "On-Scene Co-ordination", "Co-ordination of Search and Rescue Operations", header "Phonetic Alphabet and Figure Code" the following statement can be found: "The phonetic alphabet and figure code is sometimes necessary to use when speaking or spelling out call signs, names, search area designations, abbreviations, etc.

A complete listing of the phonetic alphabet, figure code, and Morse signals, is found in the International Code of Signals (INTERCO)."

### **Training requirements**

The level of knowledge of radio operators at different levels is prescribed by numerous international and national regulations. Here, too, we can find discrepancies between different international regulations related to the spelling of figures.

### **ITU**

The ITU regulates the spelling of figures in Article 47 "Operator's Certificates" and in the Annex to Resolution 343 (REV.WRC-12). Article 47 describes types of certificates and the ways to obtain them. Table 47-1 defines the requirements for radio electronic and operator's certificates. This table contains the requirements for professional operators sailing on GMDSS compulsory ships while Annex to Resolution 343 provides an examination syllabus for radio operator's certificates appropriate to vessels using GMDSS frequencies and techniques on a non-compulsory basis (ITU, 2016d).

Table 47-1 only contains general suggestions concerning language matters. What is required for general, first, and second class operators is: "*Sufficient knowledge of one of the working languages of the Union. Candidates should be able to express themselves satisfactorily in that language, both orally and in writing.*" while for a restricted operator what is necessary only is: "*an elementary knowledge of one of the working languages of the Union.*"

**Therefore, according to ITU regulations, the knowledge of the English language is not obligatory for general operators whereas for general operators the use of English in written and spoken form is clearly demanded by the STCW Convention.**

This is quite unusual, especially because in the same issue of the RR we can find the Annex to Resolution 343 that concerns operators on non-SOLAS ships (Short and Long Range Certificates). Requirement D4 in Section D "Operational Procedures and Regulations for Radiotelephone Communications" says that the examination should consist of theoretical and practical tests and include at least: "*Use of the international phonetic alphabet and, where appropriate, parts of the IMO Standard Marine Communication Phrases.*"

## **Electronic communications committee (ECC) within the European conference of postal and telecommunications administrations (CEPT)**

In Europe, also Georgia, communications (including maritime communications) are regulated by the Electronic Communications Committee (ECC) or European Radiocommunications Committee (ERC), part of ECC. The knowledge required for non-SOLAS vessel radio operators is regulated in CEPT/ERC/Recommendation 31-04 for the short-range certificate and ECC Recommendation (10)03 for the long-range certificate. Chapter D "Radiotelephony Procedures" of both regulations describes the required knowledge:

*"1.4 Awareness of the existence and use of the IMO Standard Marine Communication Phrases Vocabulary - English phrases*

*1.5 Phonetic alphabet"*

Here it is necessary to emphasise that ECC is not a competent regulatory body for radio operators on SOLAS vessels.

## **IMO**

IMO is the main body that regulates navigation at sea. Their responsibility includes the regulation of the required knowledge for watchkeeping officers, which is done through the STCW Convention (IMO, 2016). Mandatory minimum requirements for the certification of GMDSS radio personnel are described in Chapter IV, in particular in Table A-IV/2. The column "Knowledge, Understanding and Proficiency" clearly states:

*"1.5 use of the International Code of Signals and the Standard Marine Navigational Vocabulary as replaced by the Standard Marine Communication Phrases"*

*"1.6 the English language both written and spoken for the communication of information relevant to safety of life at sea"*

In terms of spelling figures in maritime communication, this regulation can be quite confusing: should an operator use ICS or SMCP when examined? Of course, they must know both ways but which one would be more appropriate to use in a distress scenario?

## **IMO MODEL COURSES 1.25 AND 1.26**

The purpose of IMO model courses is to assist maritime training institutions and their teaching staff in organising training courses or in enhancing, updating or supplementing existing training

material where the quality and effectiveness of the training courses may thereby be improved. (IMO, 2015a)

For maritime education and training, model courses provide excellent guidelines on which topics to teach and how. For radio operators are relevant IMO Model Course 1.25 "General Operator's Certificate for the Global Maritime Distress and Safety System" (IMO, 2015a) and IMO Model Course 1.26 "Restricted Operator's Certificate for the Global Maritime Distress and Safety System" (IMO, 2015b).

Let us first examine the spelling of figures as presented by IMO Model Course 1.25. Chapter 9 "Miscellaneous Skills and Operational Procedures for General Communications", Subchapter 9.1. is self-explanatory: "*Use of English in written and oral form for safety communications*". The text here states that it is recommended to use the English language to ensure that distress, urgency and safety traffic be conducted so that everybody involved in receiving information can understand it correctly.

Subchapter 9.1. is further divided into 4 subchapters as follows:

*9.1.1. Use of the IMO Standard Marine Communication Phrases*

*The IMO has published in its "Standard Marine Communication Phrases" special phrases for different events to ensure that crew members involved understand the meaning of such phrases how they are really meant.*

*9.1.2. Use of the International Code of Signals*

*If there is the risk that the standard communication phrases are not correctly understood the IMO International Code of Signals (INTERCO) can be consulted to bridge those difficulties. In case of phrases the code of signal uses codes consisting of one or more code groups of one or more letters followed by a figure describing a special situation. The use of the code of signals has to be announced by the word INTERCO.*

*9.1.3. Recognition of standard abbreviations and commonly used service codes (Q-Code)."*

and

*"9.1.4. Use of the International Phonetic Alphabet*

*In radio telephony difficult words, proper names and code and figure groups have to be spelled in accordance with the International Phonetic Alphabet, which is defined in the RRs and can be found in appendix 5 of this compendium."*

An examination of these subdivisions reveals that they do not uniformly state how to spell figures. It therefore seems that the trainees must know all the different ways how to spell figures

when giving their MMSI, position, telephone number, or figures within any form of maritime communication, including highest priority distress messages.

### IMO MODEL COURSE 3.13

IMO Model Course 3.13 (IMO, 2014a) "SAR Administration (IAMSAR Manual Volume I)" provides guidelines on the education and training of state administration employees in accordance with the IAMSAR Manual, Volume I.

In this Model Course we can only find several direct and indirect references to the spelling of figures in Appendix 5, under the heading "A Common Standard of Training for Maritime SAR Unit Coxswains, Mechanics and Crew Members". There the minimum standard for coxswains is described as follows:

*"IV.2.12 The minimum standard is to be an adequate knowledge of the English language enabling the coxswain to communicate with other ships or rescue coordination centres and have the ability to understand and use the IMO Standard Marine Communication Phrases publication."*

On the other hand, a radio operator on a SAR unit shall meet the following requirements:

*"VI.2.2 Search and rescue radio communications, including procedures in the IAMSAR Manual Volume III;*

*VI.2.6 Use of the International Code of Signals and the Standard Marine Communication Phrases."*

### IMO MODEL COURSE 3.14

IMO Draft Model Course 3.14 (IMO, 2019) concerning SAR Mission Coordinators recommends how to teach the personnel that plan and co-ordinate SAR operations and exercises. This Draft Model Course strictly follows the numbering of chapters, segments, and headings from the IAMSAR Manual, Volume II. It contains the following recommendations:

#### "2.21 Phonetic alphabet and figure code

The phonetic alphabet and figure code is used when speaking or spelling out call signs, names, search areas, abbreviations, etc. Trainees need to be aware that these can be found in the International Code of Signals, available in the IMO publications.

#### 2.25 Codes, signals and standard phrases

SAR operations can be affected by language barriers and communication difficulties between vessel and aircraft crews, survivors, and SAR personnel. The trainee needs to be aware of the publications which can assist in overcoming these language barriers:

- International Code of Signals; NCSR 6/17/1/Add.1 Annex, page 58 I:\NCSR\06\NCSR 6-17-1-Add.1.docx
- IMO Standard Marine Communication Phrases (SCMP); and
- Other codes which do not require verbal communications

Most ship masters, aircraft pilots, air traffic controllers, SAR personnel, etc., have a working knowledge of the English language but language difficulties are a common problem.

All SRUs should carry a copy of the International Code of Signals and the IMO Standard Marine Communication Phrases (SCMP), SOLAS ships carry these publications and the RCC library should also have them ready for quick use.

The instructor can refer to Volume II, Appendix A, and also review parts of the International Code of Signals and the IMO Standard Marine Communication Phrases (SMCP)."

### IMO MODEL COURSE 3.15

The purpose of Model Course 3.15 (IMO, 2014b) is to provide recommendations for the training of SAR On-Scene Co-ordinators, a special SAR unit or any vessel in the vicinity of a distress situation.

In this Model Course only one indirect reference to the spelling of figures can be found: "*The trainees should preferably be: able to understand and use the Standard Marine Communication Phrases (SMCP).*"

### **Existing practice in maritime communication**

A question that derives from the documents presented in the previous chapters concerns the existing practice among active seafarers in terms of the spelling of figures. All maritime radio operators make good use of the IPAFC, except in the case of the spelling of figures. These are usually simply spelt using standard general English spelling. As already mentioned, according to our estimation hardly any maritime radio operator spells figures according to the Figure Code while very few use the SMCP recommended spelling of figures.



Considering all these facts, what might be the reason why maritime radio operators intentionally infringe international rules? Is something wrong with the rules or with the maritime radio operators?

In the quest for the reasons for these infringements, we were able to find two core answers: if the figures are spelt according to IPAFC rules, the pronunciation is unclear and it takes longer (Suban et al., 1999). In our opinion, the greatest problem is the time that the utterance takes if the Figure Code is used, as was found already 20 years ago.

### **How to educate and train maritime radio operators?**

A question stemming from the presented issues is how maritime education and training institutions should educate and train maritime radio operators. In our opinion, we have to teach students according to international rules but they must also be aware that the existing practice in maritime radiocommunication can be considerably different. Unfortunately, we do not yet have many established contacts with lecturers of maritime communication worldwide. **We would therefore appreciate an exchange of opinions on this matter, and we hope that the present paper will encourage a fruitful discussion.**

The system of maritime education and training must be standardised all around the world. This IMLA conference can significantly contribute to this goal. Hence, we propose the establishment of a working group within IMLA or simply a group of colleagues that would closely examine this problem in coordination with ITU and IMO experts, and that would prepare a unified set of instructions for lecturers and maritime radio operators worldwide.

### **Conclusions**

The analysis of the requirements and recommendations revealed significant discrepancies especially between the SMCP, RR/ICS Figure Code, and existing practice. Our aim is to further investigate this problem. However, analysing voice communications only in one part of the world will not yield an accurate picture of what is going on globally. Therefore, we look forward to finding colleagues from different corners of the world, possibly within IMLA/IMEC coverage, that would engage in a joint research study or project in which we would listen to thousands of maritime conversations and conduct a survey among active seafarers. This would enable us to collect solid quantitative and qualitative data, and based on these, propose useful and data-driven solutions to the problems presented in this paper.

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## **The Concept of the Integrity of Auditorium Activity, Affecting Factors and Measures Ensuring the Sustainability**

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### **Abstract**

The paper deals with the structure of student groups, their elements, that often significantly differ from each other, which make the integrity of these groups conditional. The article analyzes the problems, arising during the lectures or workshops, that have a different nature from the viewpoint of origin. They directly affect the process of transfer-assimilation of knowledge as a unified phenomenon. These problems are presented in the paper as expanded classifications - internal and external.

Among the measures to ensure the integrity of auditorium activity, the article discusses and examines the following issues: the creation of a marketing structural unit of University and its role in establishing-creating the integrity of auditorium activity; conducting the educational process at faculties by teachers with appropriate qualifications; primary staffing/balancing of student groups, taking into account their initial academic performance; focusing on the forms and methods, based on the principle of integrity, in the lecturers' auditorium activity; weekly results management, based on the principle of integrity; the integrity of the planning of educational process and its operational management, etc.

**Keywords:** Auditorium integrity, Micro- and Macro-integrity, Group, Students group, Faculty Management Body, Marketing structural unit, University top management.

### **Introduction**

The auditorium work occupies the main place in the activities of the entire university. It is the basis of the creation and existence of the university itself, and it consists of two completely different parts - a group of young people, who want to receive a higher education, and a person, who provides them with such an education. (At the moment, the author refrains from using appropriate concepts).

A group of people, wishing to pursue a higher education, and a person, who provides with a higher education, form a coherent integrity on the basis of the relations built in the process of

conducting activities (in practice, only if this is really achieved). One of the criteria for the effectiveness of auditorium activity is precisely its integrity, and the quality of the desire to achieve the integrity.

Such an understanding of the integrity of auditorium activity is more traditional. Its modern understanding requires the obligatory addition of one of the most important components - the level (not partial) of technical and technological equipment of auditorium activity.<sup>9</sup> Therefore, the present paper examines three components necessary to achieve the integrity of auditorium activity: a group of people who want to get a higher education; a person who provides with a higher education, and a technique-technology used in the process of auditorium activity.

The present article is an attempt to effectively combine the above mentioned three completely different elements, what in practice is often very difficult to achieve because of the differences between these elements.

## **Main Text**

In what case the integrity of auditorium activity can be achieved? The initial answer is simple – it is possible when throughout the semester there is an ideal understanding between a group of people who want to get a higher education and a person who provides with an education - the first one, as an integrity, receives from the second one (also as an integrity) the knowledge provided by the syllabus [using the necessary equipment (laboratory equipment) and electronic services], and after a certain time, the first one convinces the second one in mastering this knowledge and the ability to use the acquired skills in practice (with the active use of the same technique-technology).

In what case can a perfect understanding be achieved between a group of people who want to get a higher education and a person who provides such an education? The answer is obvious - when each of them represents a whole, and at the same time, both of them actively use the classroom technique and technology (the level of knowledge about such use) during the educational process. A prerequisite for the achievement of auditorium activity is the integrity of its constituent parts. Without the integrity of these parts it is useless to talk about the effectiveness of auditorium activity.

What is meant by the integrity of a group of people, who want to get a higher education? - More or less equal and high level of basic knowledge of each member of the group at the time of enrollment; the readiness of the group members to understand and master the knowledge

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<sup>9</sup> The presence of this element in the process of classroom activity, the technical support of its work is directly related to the top management of a university, as well as to the issue of priorities for managing its financial resources.

gained at the lectures, and the group members' common goal in relation to each subject, in the perspective of study in general.

What does the integrity of a person, providing with a higher education, mean? - it is the ability to possess the knowledge (all lecture topics of educational material) at a correspondingly high level, to transmit it during the semester to the groups of students, who want to pursue higher education, and to examine them (using various methods to determine the level of knowledge, acquired by students in practical classes), as well as to convey the knowledge to a target group (students) at an appropriate level; the integrity of the emotional, psychological and pedagogical skills of this person; the ability to adequately use a variety of forms and methods of lectures and workshops; the deep knowledge of techniques and technologies used in the process of auditorium activity.

What signifies the integrity of the techniques and technologies, involved in auditorium activity? This is such an integrity of techniques and electronic technologies, used in the process of lectures or workshops, that facilitates the effective transfer of weekly knowledge to a listener (a student) and the effective identification and assessment of the acquired knowledge (the possibility of a weekly test of knowledge and understanding of all important issues on the topic of all group members).

It is in this way that the presented micro-integrity creates macro-integrity, which we called the integrity of auditorium activity from the very beginning. And the effectiveness of this activity, surely, is difficult to imagine without the above micro-integrity.

How is it possible to achieve the above mentioned micro-integrity between a group of people, who want to get a higher education, on the one hand, and a person, who provides with such an education, on the other hand? I would refrain from more detailed consideration of the issue of equipment and technologies, since this issue is technical in nature and is related to the lack of financial resources of a university, the cost of its acquisition and installation and proper functioning (operation).

Achieving micro-integrity for either a group of people, who want to get a higher education, as well as for a person, who provides with the education, is not an easy task.

Let's consider the creation of a group of people who want to get a higher education. For this, along with the concepts already used, it is necessary to mention another important concept, without which it will be difficult to understand the processes presented here. This is the concept of "flow of people who want to get a higher education".

The "flow of people who want to get higher education" can be identified with the concept of "flow of newly enrolled people", which represents the total number of students, enrolled in a particular university each year, and grouped after enrollment by deans of the relevant faculties. The aforementioned "flow of newly enrolled people" can be of two types: a) whose inflow / outflow is not controlled by a university and (b) whose inflow / outflow a university seeks to control.

In the first case, we are dealing with a situation when a university does not recognize (or partially recognizes) the fact that it is in the educational market. In this case, a university responds to the total number of applicants (across the country) or its regional part before conducting national exams through advertising in mass media. This is the current reality of Georgian universities [1. p.15.].

The second case is completely different from the first one, and today it represents the Georgian reality, but due to logic it should appear in the future. In this case, a university fully recognizes the existence in the educational market, what is reflected in the fact that it has a structural marketing unit (as well as strategic marketing), which actively communicates with public schools, their leaders, the best students and their parents during the year [1. p.19.]. The purpose of the above mentioned structural unit is to find the best students and to convince them to make their choice at a given university. This means that the advertising monologue is replaced by an advertising dialogue, which efficiency is much greater. During the dialogue, a university puts emphasis on its own values and competitive advantages not only for students of any academic progress studying at any public school, but also for those who are really interested in receiving higher education. In the first case, a university invites young people of all academic levels to pursue higher education through monologue advertising. Therefore, the majority of students, who have just been enrolled in the university, are ultimately interested in obtaining a diploma, and not a higher education. In the second case, this is the likely scenario of events that, due to logic, during the transition to a market economy (more than 30 years or more) among the subjects with transitional economy, first of all, should have been undertaken by universities and which they will have to undertake in the future.

In the case of newly enrolled students taken from the external environment, uncontrolled by a university, the role of the Faculty Management Body and its structural units in creating study groups is great. In the second case, this role will actually be of a technical nature.

Now let's consider the concepts of "group" and "student group." In the present work, a "group" is an integrity of young people with a certain (formal and informal) affiliation, purpose, interest, enrolled in a particular university. It should be emphasized that each member of a

"group" may have a goal that is completely different from the goal of other members, that is, each member of this "group" can be formally enrolled.

What goals can newly enrolled members of different "groups" have? These may be: a) the acquisition of the chosen specialty based on knowledge; b) getting a diploma. Members of this group may also have intermediate goals, for example, obtaining student status, so that they can get a job and get a certain salary, after which their official membership becomes formal. Such group members mostly do not attend lectures and seminars, they come maximum to take exams. There also should be mentioned the system of benefits for students with student status. A university itself is also comfortable with having such "groups" and its members (as they pay for tuition), and it provides assistance in certain matters. Thus, the "group" is a formal union of young people with different goals and interests, which ultimately is more beneficial for the university than for the "group" itself and its members (unconsciousness), as well as for the whole society.

The term "group of students" radically differs from the term "group". However, it no longer exists today and universities should strive for it. It implies such an integrity of people who want to get a higher education, and who have student goals, that are constantly associated with the entire period of study (teaching-learning); in contrast to the "group", they are students in the literal sense of the word, that is, they refuse to look for work during their studies, what means that they have no intermediate goals; their main objective is getting a higher education, not just a formal diploma.

As already mentioned, an important role in the creation of "group" belongs to the Faculty Management Body, their functional units, mainly regardless of the desire of newly enrolled students. However, sometimes young people voluntarily move from an already formed group to another one, which is obviously a manifestation of their will. Anyway, such transitions do not affect the final "picture", which is the following: it is assumed that all newly enrolled students have the same (educational) goals, the same initial academic level and in order to ensure the conduct of the normal educational process, it is sufficient to group (into a certain number) the newly enrolled students according to physical characteristics.

Unlike the "group", the university marketing unit, as mentioned above, should play an important role in shaping the "student group," while the Faculty Management Body and its functional structures would play a technical role in this case.

An ideal "student group" represents an integrity of students, who want to get higher education; it pursues not only student goals (teaching-learning, classroom work), but also employment (certified specialist) and subsequently goals related to the future well-being of



graduates. "Student group" is a group in which each participant realizes the possibility of achieving the above goals, based on the knowledge gained and weekly relationships with lecturers-teachers. It is clear that such goals of the "student group" (unlike the "group") are strategic ones [1. p.13], when they are distributed into groups according to physical characteristics. It should also be noted that this problem goes beyond the general recruitment of groups according to physical characteristics at a particular department of a particular university and it is largely related to the randomness of the choice of applicants for the enrollment of a higher educational institution.

If a "group of students" realizes the significance of the above objectives and acts in accordance with them in the process of learning, then it appears as a whole and creates one of the prerequisites for gaining the integrity of auditorium activity.

It has been said above that the integrity of groups is difficult to achieve. The difficulty lies in the fact that all applicants, enrolled in the university, vary considerably in their initial academic performance and personal values. It should also be added that only a small number of newly enrolled young people understand what is called student strategicity as a phenomenon. We can say that they do not have a real, clear vision of their future. Therefore, when creating a group of applicants, entering a university with such convictions, by simple selection, according to physical characteristics, it is easy to imagine, what a person, who provides with a higher education, can get in the process of auditorium activity.

What problems need to be understood by a "student group" and its members in order to achieve micro-integrity? First of all, the requirements of the practical field of employment, which they take into account when choosing the university; achieving compliance with these requirements through group lectures and workshops; secondly, a student should be aware that he is a strategic phenomenon by nature, who, on the basis of knowledge gained at the university, can provide real support to the organization in which he will work; he should be able to initiate transformations for the employer (company) or to facilitate such initiation, to lead the actual reform processes or to actively participate in them; to provide with new, progressive ideas at the level of society or to propose-implement such practical projects that will be successful in the long term; to create a material foundation for his own new life, strengthening this foundation and ensuring long-term personal well-being.

What level of integrity can be achieved in the "group" and what one - in the "student group"?

It is well known that the formation of "groups" occurs with the flow of newly enrolled students (groups "a", "b", "c", etc.), although sometimes the numerical value of this stream may

coincide with the one of the "group" and, therefore, the need for a governing body to form a group is eliminated. This happens when a university specialty does not need more than one group. What are the goals and objectives of the Management Body and its structural units, if there is a need to create more than one group of newly enrolled students?

In this case, we are talking about such an option to achieve micro-integrity, when the Management Body of the relevant faculty of university begins to form groups from the flow, which the same university receives from its independent external environment.

- a) First of all, it is necessary to analyze the flow of enrolled students according to at least three levels of their knowledge - strong, medium and weak. Also, prior to the formation of groups, it is necessary to interview all participants of the flow according to a well-developed and known scheme, in order to gather as much information about the group members as possible, as it will help clarify the intellectual and other resources (skills) of the students being surveyed and facilitate their grouping at the appropriate level of academic performance (strong / weak students), which in turn, will facilitate the achievement of micro-integrity of the groups at the initial stage.

The Faculty Management Body should be allowed to restructure groups, conduct interviews and persuade students to move from group to group, what should meet the interest in raising the student's academic level and further increase the micro-integrity level of each group.

- b) The Management Body, its structural units should have a clear idea about each newly formed, concrete group at the beginning of the first year of the first semester, in order to develop a strategy for the further development and strengthening of the groups, to help the group members overcome a different academic barrier and raise the overall level of the group in collaboration with with a person, providing with higher education. These processes require constant management and control.

In the process of creating groups of newcomers, large groups (30 or more) are often created, what represents a serious obstacle to achieving micro-integrity. Micro-integrity cannot be achieved in a group with any number of students, especially at practical lessons.

From the above, we can conclude that if a university enrolls a contingent of students to create study "groups" from independent external environment, then it can turn to one of the possible ways of creating "groups", when students with strong, medium and low academic performance are reallocated in equal numbers in different groups, and the close cooperation with the lecturers-teachers promotes their subsequent, every semester growth of the level of performance. A university may also consider other possible ways of forming "groups".

Creating-forming "student groups" is fundamentally different from the process of creating "groups". In the first case, a university appears to be one of the direct players in an outdoor, competitive environment, that supervises and controls a certain segment of the higher education market through the structural unit of marketing (strategic marketing).

It was said above that after the formation of a "group", the Faculty Management Body, in close cooperation with the lecturers, should play a significant role in the issue of micro-integrity. In which case will the "group", created in this way, be strengthened? We suppose, this implies the following set of measures:

- (a) textbooks of the appropriate (standard) volume, written in an accessible and understandable language, recognized internationally and prepared by university professors, in which each topic is presented in such a way as to facilitate the study of a specific subject as a single, whole material;
- (b) academic personnel, who do not violate the principle of academic freedom, but whose collective (team) behavior, acting according to a common plan and principles, creates a teaching-learning environment in which there is no room for weak groups;
- (c) the university management, the relevant Faculty Management Body, during the educational process focus primarily not on the student's marks (points scored) [2. p. 98], but on the level of knowledge for each individual topic, as an integral part of all educational material;
- (d) the university management tries not to disturb the conduct of classes during the participation of students in various events, both individually and in groups;
- (e) the university management, together with the Faculty Management Body and other relevant departments, strictly controls the process of restoring the classes missed for any reason, both at the level of "groups" and their individual members;
- (f) The university management directly controls the activity of the examination center and tries to prevent any "disadvantages" in the process of achieving final results. Every member of the weakest "group" at the initial stage should know that the only way to graduate from a university and get a diploma is to gain knowledge.

What is the problem with the second micro-integrity - a person who provides with higher education in the process of auditorium activity? Who is he and what requirements must he meet in order to make the auditorium activity a single whole process? Moreover, in what conditions should he act in order not to violate the micro-integrity?

A person, who provides with a higher education, is a hired staff (Assistant, Assistant Professor, Associate and Full Professor), employed by a university according to certain "rules of

competition) and endowed with certain rights, who performs his duties under a contract concluded with this university for a certain period of time. The competition commission is a temporary unification of experts of a certain field, invited by high-ranking managers from other universities or public organizations in accordance with the rules established by the regulations in force at the university.

The weaknesses of this approach, initiated by a university, is that it entrusts its own existence and future image to those who are less interested in the fate of this institution; the unification of this type, by its very nature, cannot guarantee the objectivity of processes, and its behavior in the course of a matter quickly acquires a superficial character; a person, elected by such a commission, does not have and will not be able to have features of academic integrity and he will not be able to achieve the integrity of the auditorium activity.

Why? As has already been said, the commission of the aforementioned unification type, along with others, operates within the framework of the university-created election commission, which focuses on only one passive part of the data on candidates: for example, a certain work experience (3 years for Associate Professors and 6 years for Full Professors); the total number of publications of candidates and various types of textbooks for a certain period (for the last 5 or 10 years). However, such questions as how much the candidates own the educational material that they will have to teach in case of their election, whether they know about the variety of forms and methods of lectures and practical exercises, what other types of skills they use in the actual classroom process, as well as in the organization and management of this process - all this in fact does not interest the commission at all.

The lecturers-teachers, employed by a university in this way, correspond to the "groups" (with smaller number of students, as it has already been discussed above) by their values. Thus, we can conclude, that the groups created by a university from those ones, enrolled to transfer knowledge-education from the external environment, uncontrolled (non-competitive) by a university, are people elected only formally. All the above mentioned indicates that there are zero chances to achieve the integrity of auditorial activity. It is clear that in addition to this, it is also necessary to take into account the situation in which all this occurs, and the administrative and managerial manifestations, which we discussed above on the example of hiring these people by a university.

The case described excludes any possibility of achieving learning outcomes formally announced by a university (mission, strategic development plan, etc.). Here we get the following results: a) a person, providing with a higher education, cannot adequately explain the lecture topic given by the syllabus; he cannot interest students with a specific question or the whole

topic, what causes one part of the group (most capable!) to unconsciously learn by heart only the initial part (from 3 up to 5 pages) of a multipage theme and ignore the rest (physical impotence); b) the part of the "group" with average skills is forced to talk about any issue of a certain topic, directly using the given topic (often peeping into the material); c) students with weak skills are forced to ignore the learning process and remain in the hope of gaining a passing grade (51 points) in intermediate or final exams to advance to the next semester (frequently retaking exams).

What should be the terms of lecturer employment? What are university requirements for recruitment? To get real answers to these questions, it is necessary to take into account such circumstance as the difference between private and public universities and the Soviet mentality. This mentality is most pronounced in public universities: such a university depends on government structures both directly (formal autonomy status, direct appointment of the head, government funding, etc.) and indirectly (assistance in various issues), which leads to constant pressure on its side: a) frequent hiring of university lecturers, recommended by themselves, who do not have any connection with auditorium activity; the academic personnel of former Soviet universities was to some extent "staffed" in this way; b) offering undeserved benefits (including final grades) on various issues only for one part of students.

What kind of situation is in this regard in private universities? In one part of such universities, the situation is the same as in the state institutions, although to a lesser extent. It is also worth noting, that some private universities in Georgia are more focused on making own profits than on actual achievement of the final learning outcomes, therefore, in their case it is generally inappropriate to talk about the integrity of auditorium activity.

Most of the Georgian private universities still do not realize the fact that they work in a marketing economy, what is proved by the fact that they do not have a marketing (as well as strategic marketing) structural unit, with which they could determine the requirements of labor market for graduates, and therefore, the desirable flow of students, who would like to enter the university. Today, they do not feel the competition! Most private universities are concentrated in the capital, what means that we have a much higher level and number of intellectual resources than in the regions of the country.

All of the above means that we are dealing with a systemic crisis that is not recognized either by the state or by the universities themselves. Consequently, in the case of reforming the system, the starting point is an auditorium and the activity conducted there (its integrity).

What steps should a university take to ensure the integrity of auditorium activity regarding to the part that we called the integrity of a person, providing with a higher education?

- a) A university should not only announce its own requirements for potential applicants for a particular academic position in competitive elections, but such requirements should be known to the whole society through relevant information posted on the university website;
- b) A university should give preference to theoretical candidates compared to practitioners, and strive to maintain some balance in this matter;
- c) A university should reject general competitive elections (considering work experience of candidates, number of scientific works published, etc.) in favor of specific elections [perfect knowledge of the relevant training course (or courses) (15 topics according to the syllabus) prepared by a candidate of the competition];
- d) Knowledge of the variety of forms and methods of conducting lectures and seminars and skills of their practical application [3. p. 90.];
- e) Sufficient knowledge of modern IT technologies to illustrate the lecture material and to provide a weekly assessment of all group members at workshops.

The above requirements apply not only to candidates from outside. They are common to all - those who are currently working at this university and those successful young people, who have grown up at this university and are eager to link their future with teaching.

The above requirements for applicants for academic positions at the university create the necessary prerequisites for achieving the micro-integrity of potential candidates as an organizing force for auditorium activity. After that, each university must constantly maintain and develop the academic level of its employees, including through retraining. The same approach should be adopted by the university in relation to the invited teachers.

## **Conclusion**

Thus, the integrity of the university's auditorium activity implies the micro-integrity of its three constituent elements (separately) and their effective interrelation (macro-integrity) to achieve the goals previously established by the same university. These elements are: a) a group of young people entering a university to get a higher education, their overall basic academic level; b) academic personnel, affiliated with the University, the level of knowledge of each educational material that they provide; the ability to adequately apply various forms and teaching methods in practical and lecture classes; c) technique and technology used in the process of auditorium activity, their diversity and quality of improvement. The recognition of the educational market by a university and the creation of a structured marketing unit (strategic marketing) an important step towards achieving the above integrity of auditorium activity.

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## **Some Key Aspects of an Organizational Ideology and the Importance of its implementation at the Universities**

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### **Abstract**

The article describes how does the organization ideology work and in proper use how successful it might be. That's why we tried to find an interrelation between organization and universities and implement an ideological education in high education institutions. In various countries, this attitude toward ideology is well used and that's why they succeed. Besides in the article is described scientists works, researches, observation and results.

At the black sea region, in the common regional location, we have almost equal and the same opportunities to develop, but comparison our students to others we have a huge difference between Turkish or Bulgarian students. They were well organized, motivated and proud of their universities. This pride is the outcome of the proper and strategic ideological studies and a high level of education – the result reflects on the economic environment and civic society.

**Keywords:** Education; Organization and University ideology; Civic society.

### **Introduction**

The purpose of the article is to deliberate the quality of high education and its tendency in Georgia. To create a competitive and economically sustainable and successful state depends on the level of education. Devoid of ideology and traditions the education system has led us to the point where community involvement and consensus on common principles remains vital for the development of the education system. Although the Ministry of Education of Georgia is working hard to improve the quality, unfortunately, the majority of lecturers still we have not been able to escape the influence of the Soviet system of education.[1]

In our opinion, the progress in education of Georgia depends on proper strategic missions, goals and objectives. In this term, the ideology will emphasize the preparation of future workers for a competitive local and global free market. An American economist William



Easterly's opinion "The ideology of development is about having the experts design a comprehensive, technical plan to solve all the problems of the poor. These experts see poverty as a purely technological problem, to be solved by engineering and the natural sciences, ignoring messy social sciences such as economics, politics, and sociology." [2] We agree with the above-mentioned idea and think, that it's not only the technical or technological problem but lack of proper ideological education.

### **Main Text**

An ideology is a collection of ideas, a comprehensive vision, a way of looking at things, or a worldview that embodies the way a person or a group of people believes the world should be organized and function. Proponents of each ideology attempt to convert other people to their viewpoint as they assert that their educational perspective is the only proper, natural, and acceptable way of viewing the field. [3] One of the strongest ideological foundations of education in Georgia, rooted in national liberation discourse, is related to religious and academic discourse. Rationalism becomes more closely related to other ideological trends. On the other hand, in the 21st century, approaches to self-actualization and social reconstruction have also been significantly strengthened in our country.

In order don't to confuse an ideological issue with the nationalism, we'd like to compare with the Western model of education, where mass mandatory learning is funded by the state and serve the needs of the nation.

Consequently, education systems serve the nation-state by creating a shared experience as students; developing a sense of nationhood and a common culture through teaching a national history and literature; instilling emotional loyalty to the nation-state through patriotic exercises, flag salutes, and nationalistic rhetoric and song; and educating a citizenry that accepts the legitimacy of the government and their own political role within the system. Also, the nation-state is built on a particular economic system which requires high educational institutions to teach a commitment to maintaining that economic arrangement and training to fit into the economic infrastructure. Thus, the nation-state uses education to prepare a disciplined citizen and worker. [4.pg.3]

In 2019 the USA professors Ryan T. Knowles (Utah State University) and Antonio J. Castro (Missouri University) analysed the implication of teachers' civic education ideology, also explored an ideological typology across conservative, liberal or critical civic perspectives, and suggested civic education ideologies relations to views of citizenship behaviour.

According to their research, they have long considered the role of education in reproducing, or challenging dominant ideologies that maintain social structures within society. The study addressed to explore how a teacher's support or reject of the status-quo relates to her/his ideological dispositions to civic education and in turn how ideology relates to the perception of civic behaviour that educational institutions should emphasize. Alternatively, teachers likely employ a range of ideological positions which manifest depending on course content, students population, and university climate.[5.pg9] In our view, the above-mentioned approaches can improve economic sustainable development in Georgia.

This information is provided under the general civic attitude toward education and its developments but could be significant to talk about the organizational ideology as well, because the organizations, in this case, (High Educational Institutions) HEIs should create ideology and main executions should provide teachers and academic staff. This way we thing the opinion provided by MIT professor Henry Mintzberg's about the Organizational Model will be best suitable for the article.

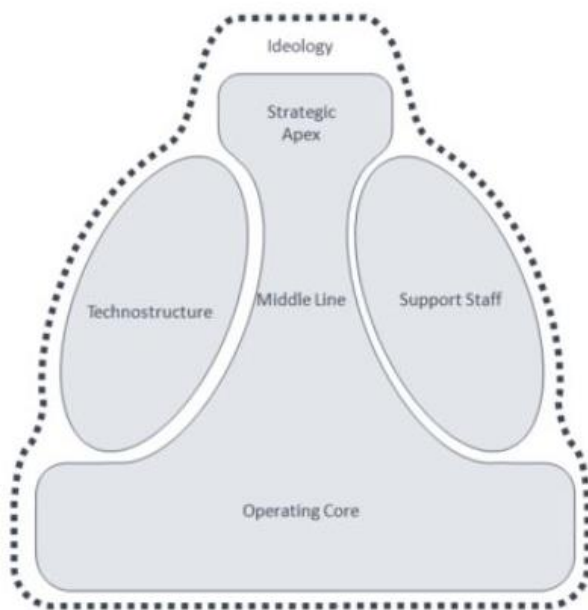
Organizational ideology consists of the beliefs concerning organization that make it distinct from other organizations in opinion of Henry Mintzberg, organizational ideology develops in three stages:

1. **The ideology is created from sense of mission;**
2. **It develops as traditions and stories, sagas are created;**
3. **The new members of organization are affected by the ideology.**[6.pg151-162]

Mintzberg's Organizational Model sometimes referred to as Mintzberg's Model of Five Parts of the Organization, divides the organization into the following basic parts where the ideology became the key factor:

- **Ideology** - shared values, vision and culture;
- **Strategic Apex** - top management setting strategy and objectives;
- **Middle Line** - middle management ensuring communication up and down,
- **Technostructure** - professionals responsible for the development and innovation, production, marketing;
- **Support Staff** - professionals responsible for human resources, finance, knowledge, assets;
- **Operating Core** - provides production and operation.[7]

**Fig.1. Mintzberg's Organizational Model**



Henry Mintzberg mainly describes an ideological attitude toward to organizational level, but if we'll convert to HEI ideological level this model will be well suited for education too. Figure 1 describes Organizational Models, in different literature the ideology refers somewhere in the middle or at the end of organizational structure. But we think that the ideology, traditions and sense of mission should be the main factor of success at HEIs.

**Source:** <https://managementmania.com/en/mintzbergs-organizational-model>

The Research Assistant at the Centre for College Affordability and Productivity and a student at Davidson College Matthew LeBar interestingly stated his view at Forbes journal about the importance of diversity of ideology. In his opinion - It is common knowledge that professors tend to have fairly leftist, interventionist views of politics. A couple of common answers carry some obvious weight. We should be concerned that leftist professors are indoctrinating students to become similarly leftist and thus are stifling the free exchange of ideas. However, data do not bear out this claim – interacting with faculty makes students more moderate, regardless of their starting ideology. There is diversity on other issues or between Democrats and other left-leaning members of the academe; this is still a concerningly large consensus on issues that are far from settled by almost any account. If we want academia to act as an engine for truth and intellectual progress, we must try and increase the diversity of ideologies and perspectives within it.[8]

## Conclusion

In the article, we try to expend an organizational ideology into the universities. Without an ideological approach, no noble organization can exist and succeed. This is a reason why we correlated an organization development to the HEIs.

The modification of the higher education system in Georgia and the use of traditional methods in most results tend to be ineffective. The government and ministry of education try to boost the education level, but the result is insufficient.

We think, if the education system will be changed from traditional to the modern ideological approach, then the result will positively influence on an unemployment level too, on the other hand - we'll develop the civic society.

In our opinion if we'll implement Henry Mintzberg's organizational model, where the ideology bounds personal and organization units, then we'll reach success in education too. To reach above-mentioned results, we also think the HEIs should be totally autonomous in their decision and election process of the university rector and top management shouldn't be held by the government or some political establishment. Thus the universities can state independent strategic mission, goals and objectives and to fit sovereign decisions within the framework of their ideology.

Thus, the ideologically well prepared civic society can build better state institutions and economic wealth.

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## **The role of simulators in the preparation of nearest future operators for managing unmanned vessels**

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### **Abstract**

Unmanned Vessels is it reality or phantasy? What do we know about the unmanned vessel, how expensive they are, how is reliable communication between vessel and shore base station, will the human's factor influent on accident rate or mechanical fails will prevail?

What kind of skills of unmanned vessel operator should have? Are seafarers today ready to manage and navigate unmanned vessels? Are Marine Academies ready to teach seafarers to manage and navigate unmanned vessels?

New generation seafarers' education should be maximally conducted with the aid of simulators in the teaching process, which could simulate navigation or managing group of MASS vessels as well as VTS interaction, pre-arrival cargo/ballast operation, and shore services. Such exercises could be conducted online and simultaneously by one team as well as a group of teams of international students from different maritime universities of the world. Actually, these activities are the examples of virtual managing of unmanned vessels, and such skills could be easily migrated to the real world when the stable and reliable ship-shore communication appears.

Now we are on the next stage of merchant fleet development and we must be ready for this challenge.

**Keywords:** maritime, autonomous, surface ship, unmanned, simulator, training;

### **The role of simulators in the preparation of nearest future operators for managing unmanned vessels**

MARITIME SAFETY COMMITTEE 98th session Agenda item 20 MSC 98/20/2 27 February 2017 First mentioned and provides the definition of MARITIME AUTONOMOUS SURFACE SHIPS (MASS).

The International Maritime Organization (IMO) defined a MARITIME AUTONOMOUS SURFACE SHIPS (MASS) as a ship which, to a varying degree, can operate independently of human interaction. IMO has established the following four degrees of autonomy:

Degree one: Ship with automated support;

Degree two: Remotely controlled ship with seafarers on board;

Degree three: Remotely controlled ship without seafarers on board;

Degree four: Fully autonomous ship: The operating system of the ship is able to make decisions and determine actions by itself.

This article deals with unmanned ships– either remotely controlled or fully autonomous, i.e. degree three and degree four.



Currently, there is skepticism in the maritime industry about the technical and economic feasibility of unmanned ships in shipping. But it is impossible not to admit that technological advances have reached such a level that no one doubts that various types of MARITIME AUTONOMOUS SURFACE SHIPS (MASS) will be commissioned in the near future. The number of MASS will only increase over time, so some classification societies have already recognized this trend and published criteria for MASS.

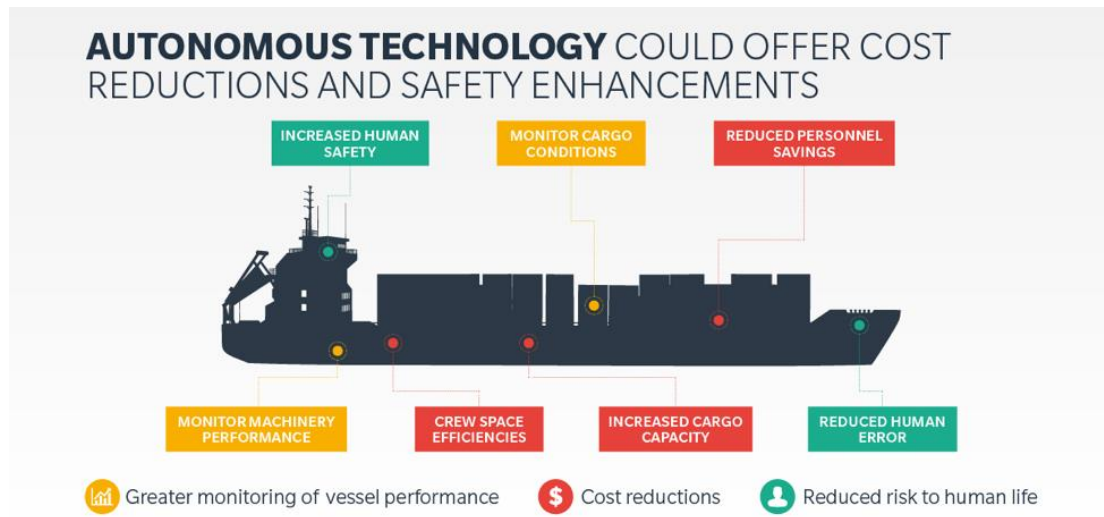
Lloyd’s Register’s definition of autonomy levels is based on differences between the techniques used as well as the operator’s role. ([1] 6)

(Table 1 below)

Autonomy level	Operator’s role
<b>M: Manual navigation with automated processes and decision support</b>	The operator (master) is on board controlling the ship which is manned as per current manning standards. Subject to sufficient technical support options and warning systems, the bridge may at times be unmanned with an officer on standby ready to take control and assume the navigational watch.
<b>R: Remote-controlled vessel with crew on board</b>	The vessel is controlled and operated from shore or from another vessel, but a person trained for navigational watch and manoeuvring of the ship will be on board on standby ready to receive control and assume the navigational watch, in which case the autonomy level shifts to level M.
<b>RU: Remote-controlled vessel without crew on board</b>	The vessel is controlled from shore or from another vessel and does not have any crew on board.
<b>A: Autonomous vessel</b>	The operating system of the vessel calculates consequences and risks. The system is able to make decisions and determine actions by itself. The operator on shore is only involved in decisions, if the system fails or prompts for human intervention, in which case the autonomy level will shift to level R or RU, depending on whether there is crew on board or not.

With the increase in automation, a number of tasks performed by people today onboard the vessel soon will be performed by artificial intelligence. Millions of seafarers are employed today on ordinary vessels degree one “M”(Manual Navigation). According to a study few vessels will be entirely autonomous in the next decade or two. The number of ‘crew’ onshore (shore base MASS operators) in supporting functions will increase significantly. This will change the meaning of the seaman to the operator of remote control of the ship and ship mechanisms, as well as other cargo systems. So that means that there will be new training needs because in the future the type of work available onboard may differ from that which they do today.





IMO issued Report of a survey on what maritime professionals think about autonomous shipping

*“Nearly 84% consider automation a threat to seafaring jobs” ([2] 5)*

*“Automation is the future, you can’t stop the future. Try to be a part of that future. Current jobs will be lost but new ones will emerge, focus on that. Don’t linger in the past, adapt and be part of this new development.” ([2] 5)*

*“97% of maritime professionals believe the first autonomous ships will be introduced within the next 10 years” ([2] 6)*

*“83% said that technology has the potential to improve the quality of work at sea... such as fatigue, excessive paperwork and boredom.” ([2] 7)*

*“Training for the future?”*

*A lot of respondents emphasized the need for adequate training to ensure that they are well equipped to work with automated systems – and 80% of the survey participants said radical changes in training and certification are required in response to the rapid advance of new technologies and new ways of working.” ([2] 12)*

*“3.5.8 it must be presumed that remote operators will, as a minimum, be required to have completed ordinary education and training as a navigating officer and to meet the relevant requirements under the STCW Convention.*

*To this should be added other competences necessary to steer an autonomous ship, i.e. especially education, training and qualifications within operational technology ("OT") and other relevant technology of importance to the steering of autonomous ships.*

*It is our recommendation to draw up an Annex to the STCW Convention regulating the special conditions that will apply in relation to qualification, education, training, certification and watchkeeping schemes and watchkeeping principles for remote operators of ships at autonomy levels R, RU and A so as to acquire international standards. The regulation should be based on an equivalence approach. A special issue to take account of is how to replace practical navigational experience with virtual simulator experience.*

*Remote operators will presumably become specialised as either operators with navigation tasks or operators with engineer officer tasks. In the longer term, the operator role will presumably include elements from the work functions of both the navigating officer and the engineer. In this connection, the Danish approach to education and training in the form of the "dual officer" training programme will presumably become more widespread." ([1] 34 )*

Based on above mentioned, we can conclude, that in nearest future Shore-based operators responsible for participating in the management or control of the ship should be STCW certified at the management level for each class of ship.

The focus will be driven on navigation. But no less important is the engineering department servicing the main engines, auxiliary machinery, and systems for fuel supply, lubrication, and cooling system, which should work for long periods of time without the possibility of maintenance by the onboard crew during sea passage. At the same time, there are a number of auxiliary tasks related to cargo operations that must be carried out at sea before arriving at the port in order to save time.

"Comments and proposals for interim guidelines for MASS trials

4 MASS should be compliant with regulations and conventions applied to existing ships. However, new technology adopted for MASS may introduce new risk factors that need to be identified and discussed with the aim of reduction.

5 For instance, to ensure safe navigation during remote control testing, officers ashore must be able to access the same information as officers on board MASS. In addition, control should be transferrable in a timely manner. Upon emergency, officers on board should be able to gain

control immediately, while the authorities need to be able to take appropriate measures by identifying where the control lies in." ([3] 2)

Same risk factors are also related to Cargo Operation and should be taken into consideration during the training of the remote operator.

All simulators which are used today were designed for modern ships where the decision and operation are made by the crew member who is onboard. The simulators simulating a bridge or engine room have very few opportunities to create a scenario for remote control operation. They simulate real equipment that is designed for local control, start-up of equipment, and set up the data directly from local control or from control rooms onboard the ship.

Definitely it is clear that the developers of the next generation of simulators will have to add the functions of remote control of equipment and control mechanisms to fully train the operators of MARITIME AUTONOMOUS SURFACE SHIPS (MASS).

However, at the same time, there are such simulators as, for instance: Liquid Cargo Simulator, which already at this stage allows you to create tasks and develop a case study for remote operator regarding cargo operations, tank washing and preparing tanks for loading, cargo care during the transit. It is clear that the cargo operations in the port, for a long time, will be directly under local control of professionals, as loading and unloading is high-risk operation, but at the same time there are number of tasks that should be and can be performed on R and RU and A type of ships during sea passage.

At this stage, with the already existed simulators, there are opportunities to simulate scenarios of cargo operations at sea that can be controlled from shore without involving crew directly in the local process, using only the remote control of this equipment including predetermined fails and ways to solve problems and find a way to resolve the problem and malfunction of equipment. In students' training course, along with theory, we propose to introduce the opportunity to process practical skills in Cargo Liquid Simulator using the training method described in the 6.10 model. For instance we can practice some types of tasks such as remote control of the atmosphere in tanks, cargo heating, tank-inerting before loading, tank washing in an inert atmosphere, ventilation and gas-free tanks, as well as the reception of heavy weather ballast, can be created at different levels of complexity using different ship models such as chemical tanker, LCC tanker, product tanker, LNG and LPG. For instance, this is a sample of tasks that can be performed on the simulator today:

**Sample of Product and LCC Tanker exercise**

LCCHS-5000	Model Product Tanker	Model LCC TANKER
	Exercise 1	Exercise2
Learning Objective	Vessel At Sea, Underway, Heated Cargo OB	Vessel At Sea, Underway, Inerting CT
	Candidate to arrange heating of cargo according heating instruction	Candidate to plan and execute cargo tanks inerting prior to arrival in port area
Time Allocate	45 minutes	60 minutes
	Grade : PALM STEARIN OIL in COT 2W; 6W	
	Density : 0.9250 @ 15C (heat instruction attached)	
Instruction to Candidate	1. Line Up Steam line	1. Activate and start IG System remotely
	2. Line Up Cargo line for recirculation via cargo heaters	2. To line up IG Line used remote valves
	3. Arrange FRAMO deep well cargo system	3. To monitor IG Oxy % content in IG flew gas
	4. Commence recirculation and heating of cargo	4. Line up IG system and start inerting CT
	5. Monitoring Cargo Temperature and atmosphere pressure in CT, follow Cargo heating Instruction, and rise temperature gradually	5. Perform inerting by "Displacement" method, continuously monitoring of pressure & temperature in CT and flew gas system, stop inerting upon reach 7.8% Oxy content in all CT

Using the training method described in the 6.10-course model, the student is provided with a theory that includes Specific Cargo Property, meaning, and importance of Heating instruction and cargo care during sea passage, Cargo Heating Methods, and systems, etc. The theory, that was accumulated by many years' experience of successful manual control of the vessel, mechanisms and cargo systems, should be gradually transformed into the new training of the

operator for MARITIME AUTONOMOUS SURFACE SHIPS (MASS).

Thereafter, when the task is presented on a simulator in which there are all the necessary conditions for the successful achievement of the goal, the student must also have the choice to use additional, secondary and duplicate systems that are created to have a flexible scheme for achieving the task by the remote control operator in our case, maintaining the required temperature as prescribes the Heating instruction received from shipper. When instructor introducing the fails, the student must present ability to react in proper time, choose the best way to solve the problem and, must find non-standard solution paths for completing the task in order to enhance skills to use vessels systems as the remote operator from shore base.

The following example of the task includes the theory and importance of Inert Gas System IG, preparation of IG line sequence, main distinctions of inerting methods "Cascade", "Dilution" "displacement" etc. In this case the task on the simulator the specific task is worked out under the appropriate conditions, which is most suitable for the given situation. Which can be used and remotely controlled by the operator from the shore?

On simulators the students must work out systems falls as well as malfunction of equipment and emergency situation in order to enhance operator skills of troubleshooting action and decision making in extraordinary situation, and different methods to resolve problems remotely, ability to react properly for alarms, use bypass systems and secondary equipment in order to fulfill and complete the task.

In conclusion, we can say that as technology goes ahead and we must be ready for challenges. Such learning method practically will provide the student to get operator skills using the existing simulator today. In the future, these skills will be easily migrated to real MASS training which will also include training on adapted navigation and engineering simulators.

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## **Problems with recruitment of seafarers in Georgia and possible measures for a solution**

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### **Abstract**

Shipping today is formed as an international industry, which involves different trends. The manning of the world fleet is one of the major and important components of the whole maritime industry and nevertheless automation and new technologies replaces and changes a lot of jobs, seafarers' jobs are still irreplaceable on board vessels. The overall growth of the world fleet stimulates the demand for seafarers, but at the same time causes a global gap between supply and demand, particularly for ship's officers (Glen, 2005; "officer shortfall," 2015). Due to this situation, it is hopeful for Georgia that if appropriate measures are implemented, the recruitment process can be improved and solved positively. Georgia strives to develop maritime industry, among which seafaring plays highly important role for the wealth and prosperity of our population leading to prosperity of the whole region as well. Nevertheless seafaring in Georgia has an old history today it still faces employment problems.

For this purpose, in this article preventive factors of problems existing in the manning process in Georgia will be defined and analyzed. Firstly, the established standards in the world manning sector, the number and nationality of world seafarers and demand and supply on the crewing market will be overviewed. The second part presents the recruitment process in Georgia and the existing situation in this field, further problems involved in this process, its reasons and possible measures for the solution the problems will be discussed and identified, followed by the conclusion with general review of the significant points.

**Keywords:** seafarers' recruitment; crewing; manning sector

### **Introduction**

Seventy per cent of the Earth's surface is covered by oceans, seas, lakes or rivers. Human evolution has always been tightly connected with its economic activities at the sea. These activities created and gradually developed one of the most important phenomena in the world, namely seafaring, which historically involved specific skills and knowledge needed for travelling or making a living from the sea. In the different parts of the Earth arose specific and various kinds of seafaring, among which seafaring in the Mediterranean is one of the oldest (Anderson, Barrett & Boyle, 2010, pp. 3,19, 81). Since ancient ages, Georgia thanks to its

geopolitical situation, as one of the Black sea region countries, was actively involved in trade through shipping with Mediterranean people (Phiphia, 2013, p. 34). This fact highlights that Georgia has an old maritime history and a great potential to develop a strong maritime industry, which is essential for the country's economy.

Getting its independence in 1991, Georgia has faced significant challenges. For example, it was necessary to create and develop a democratic government from the existing totalitarian system, including all the economic and industrial sectors. To fulfill this task was not easy and during the reforms some of the industries could not survive; unfortunately, among them was the maritime industry. Seafarers in the Soviet period were employed only on the national fleet, but after changing the system, they needed to find jobs in the international foreign fleets. Lack of experience caused great problems in the recruitment process of Georgians, which has lasted even to the present time. Therefore, it is vital to identify and study root causes of the problems in order to find an effective way to solve them.

## **Main Text**

### **Overview of Global seafaring market**

Recently, economic development transformed and created the shipping industry as the world industry, which automatically lead to the establishment of the global labor market for seafarers. National seafarers' markets gradually narrowed and global seafarers markets have progressively been established as the main source for the world merchant fleet. A global seafarer can be defined as a person employed by foreign shipping companies and working onboard vessels of 1000 GT or more in international waters. The global labor market gives the possibility to ship owners or ship operators to choose and employ themselves suitable and competent seafarers worldwide. Noticeable is the fact that seafarers' main supplier countries were steadily changed from advanced states to Eastern Europe and developing countries, such as the Asia Pacific region (Wu & Sampson, 2005).

Establishment of the new style of seafaring, which moved away from the scope of the applicable national legislation, caused the necessity to adopt and implement new measures and regulations for uniform standard of protection of seafarers at the international level. Too many common issues relating to treatment of seafarers, such as seafarer abandonment, poor treatment, no employment rights and non-payment of wages were not covered by existing conventions.

On 23 February 2006 at the International Labor Conference, the Maritime Labor Convention 2006 (MLC 2006) was adopted, which entered into force 20 August 2013. It became



one of the key instruments for the International Maritime Organization (IMO) involving all aspects to protect and control seafarers’ right and working processes onboard vessels. A seafarer is defined by MLC 2006 as any person who is employed or engaged or works in any capacity on board a ship (MLC 2006, Article 2). Article 5 of the MLC 2006 defines the liability and sets up the control measures for flag states, coastal states and labor supplying countries, which should control all placement and recruitment services and conduct certification of private placement and recruitment services (“International Labour Standards,” n.d.). In addition, in 2014 two proposals for amendments were submitted to the International Labor Organization (ILO), particularly, to bind the responsibility of ship owners regarding compensation for claims for death and personal injury, and with the abandonment of seafarers. Today more than 80 per cent of the world’s gross tonnage of shipping is regulated by MLC 2006, which means that over one million seafarers can be protected by labour standards of this Convention (Drewry, 2014).

The seafarers’ global labour market is divided by the following regional categories: advanced countries (western Europe countries, Japan, the United States, Canada), transition countries (eastern Europe), Asia, the Middle East and others. The proportion in supplying the work force by regional categories for national and global markets is presented in Table 1.

Table 1. Composition of regional seafarers by national and global categories

Region	National (%)	Global (%)	Total (%)
Advanced	76.0	24.0	100
Transitional	32.0	68.0	100
Asia	13.7	86.3	100
Mid-east	73.5	26.5	100
Other	32.2	67.8	100
Total	31.6	68.4	100

Source: Wu, B. & Sampson, E. (2005). *Seafarers International Research Centre*. Cardiff University, Cardiff. United Kingdom

As can be seen from Table 1, from the total number 68.4 per cent is represented by global seafarers and only 31.6 per cent are national seafarers. In the leading global market position are Asia and transitional countries, whereas for national seafarers the main suppliers are advanced countries and the Middle East. There is also a significant difference in the rank supplied on the global maritime labour market by different regions. Senior officers and junior officers are supplied from transitional and advanced countries and Asia, as well as the leading position in supplying ratings is Asia. When choosing an appropriate labour market, ship owners

based their choice on quantitative aspects, on age profile and qualifications of the existing seafarer population (Glen, 2005; Wu & Sampson, 2005). In addition, the main reason that the major sources of seafarers are from developing countries is the low price of labour. Furthermore, some features which are characteristic of seafarers from developing countries are acceptable and suitable for employers. These features are: a high consideration to their duty, discipline and responsibility in work and the employer's confidence (Galić, Lušić, & Pušić, 2012).

Sustainable development of the world economy is impossible without maritime shipping. Seafarers in this chain play an important role because they are considered as the main locomotive force for correct and successful working of the marine industry.

In his opening address at the Human-Element Sub-committee in 2015, the IMO Secretary General highlighted the fact that the increasing seaborne trade needs the appropriate increase in the manning sector in order to cover the gap of shortage in supplying seafarers. To keep the current situation, it is necessary to add 10 000 new officers every year. However, if the growth of shipping is expanded by 70 per cent in the nearest decade, it will be required that 40 000 new officers are trained every year.

The existing number of seafarers in the world is shown in Figure 1. The total amount for 2018 was approximately 1 536480 seafarers, from which 630400 are officers.

Number of world seafarers from 2000-2018



Figure 1.

Source: Drewry, 2018/2019

Figure 2 shows the world seafarers' supply by nationalities in 2018. Here are represented the top 10 countries which supply seafarers in the world market. The Philippines is in the leading position representing 14.1 per cent from the total number, followed by China with 10.8 percent and India with 7.50 per cent. As it is clear from Figure 2, the Asian region is in the first place supplying seafarers.

**The supply of seafarers by country in 2018 (numbers)**

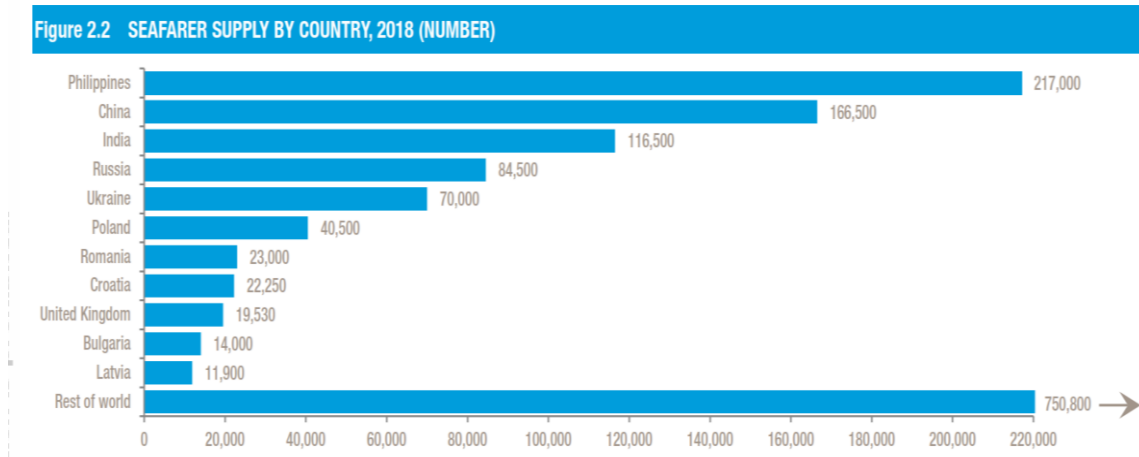


Figure 2

Source: Drewry, 2018

Interesting changes can be witnessed in the supply of seafarers from 2009. As it is shown in Figure 3, seafarers' supply from Eastern Europe countries such as Poland, Bulgaria, Romania and Russia increased drastically during the period 2009 to 2018; however, in some Eastern Europe countries, such as Croatia and Ukraine is noted decline. There is a sharp decline also in the developed countries. The reason for this decrease could be the fact that in developed countries the seafaring profession has lost its popularity.

**Changes in the supply of seafarers in 2009 - 2018 (Percentage)**

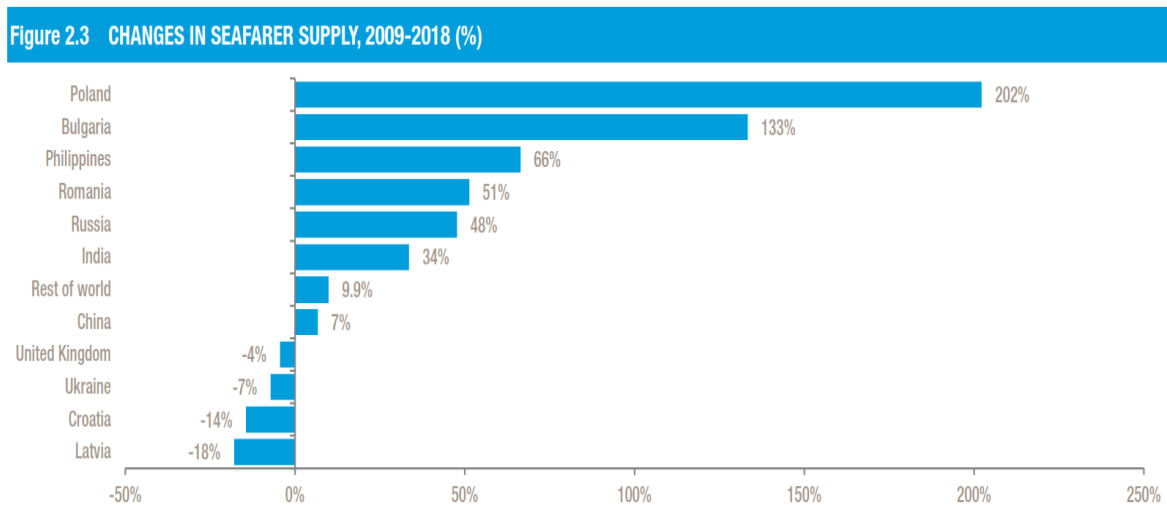


Figure 3

Source: Drewry 2018/2019

The requested number of seafarers is defined by the volume of the world fleet. Increased transportation, changes in crew number onboard vessels and changes in employment period caused increased demand for seafarers in the past years.

Table 2 presents the changes in the fleet with regard to cargo in the period of 2008-2018. As can be seen from Table 2, in this period all types of vessels grew insignificantly and the total number of ships climbed just to 1 percent, the capacity of carrying cargo was increased only for 4.9 percent. Demand in manpower is defined by the number of ships and it is not in line with the ship’s capacity. After analyzing the balance between supply and demand, it is forecasted that nevertheless slowest fleet growth shipping will need to find an additional officers and the shortage will continue for the next 5 years

Table 2. Changes in the main cargo carrying fleet 2008-2018

Sector		2008			2018			CAGR % 08-18		
		No.	Capacity	Avg. Vessel Size	No.	Capacity	Avg. Vessel Size	No.	Capacity	Avg. Vessel Size
Chemicals	<i>Dwt</i>	3,482	70.6	68,963	4,386	106.4	26,873	2.3%	4.2%	-9.0%
Containers	<i>Teu</i>	4,357	10.7	2,653	5,160	20.7	4,029	1.7%	6.8%	4.3%
Dry Bulk <sup>(2)</sup>	<i>dwt</i>	6,767	394.8	58,344	11,116	817.5	73,595	5.1%	7.5%	2.3%
LNG	<i>Cbm</i>	252	32.3	35,681	450	69.4	154,577	6.0%	8.0%	15.8%
LPG	<i>Cbm</i>	1,012	16.3	17,810	1,397	32.7	23,535	3.3%	7.2%	2.8%
Oil Tankers <sup>(2)</sup>	<i>Dwt</i>	2,866	336.0	117,248	3,470	470.5	135,182	1.9%	3.4%	1.4%
Others <sup>(3)</sup>	<i>Dwt</i>	34,587	145.1		32,900	104.0		-0.5%	-3.3%	
<b>Total</b>		<b>53,323</b>	<b>1005.9</b>		<b>58,879</b>	<b>1,621.2</b>		<b>1.0%</b>	<b>4.9%</b>	

(1) Fleet as of 1 January

(2) Only ships in excess of 10,000 dwt;

(3) Include: Other tankers, Combis, MPV, General cargo, RO-RO, Car carriers, Reefer, Cruise ships, Offshore (AHTS & PSV)

Source: Drewry Maritime Research

Source: Drewry, 2018/2019

As Drewry projects more than 17 308 officer will be required in 2023 then at the start of 2018. . Particularly, ship operators face difficulties to find officers with appropriate training and sea experience for special types of ships, such as LNG, LPG, IGF Code subjected vessels (Drewry, 2018/2019). Figure 4 shows the relation between demand and supply in officers since 2012 and estimated forecast for 2023. Figure 4 clearly presents the gap in supply during whole period, and it has a continually increasing tendency in the future.

Evolution of World officer demand/ supply , 2012-2023

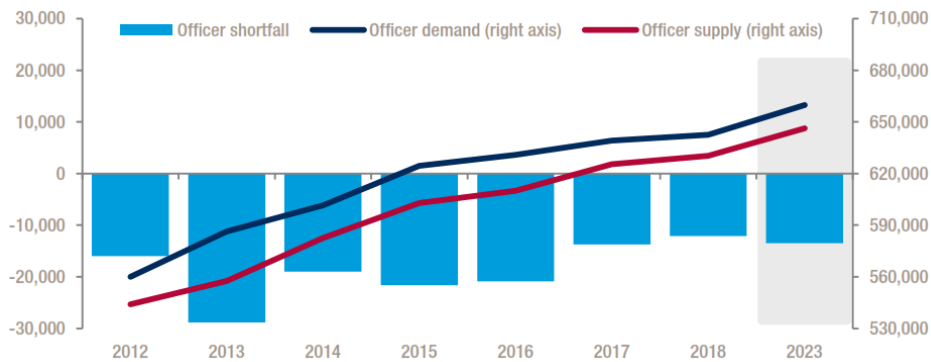


Figure 4.

Source: Drewry, 2018/2019

It should be noticed that inevitable implementation of technologies and automation continuously changes the current shipping industry that consequently affects seafarers' demand. Automation differently effects the jobs of transport workers. As it can be seen by World Maritime University's report automation will create more high risk to low-skilled or medium skilled workers (Transport 2040, 2019) .

Automation potential for job profiles in transport

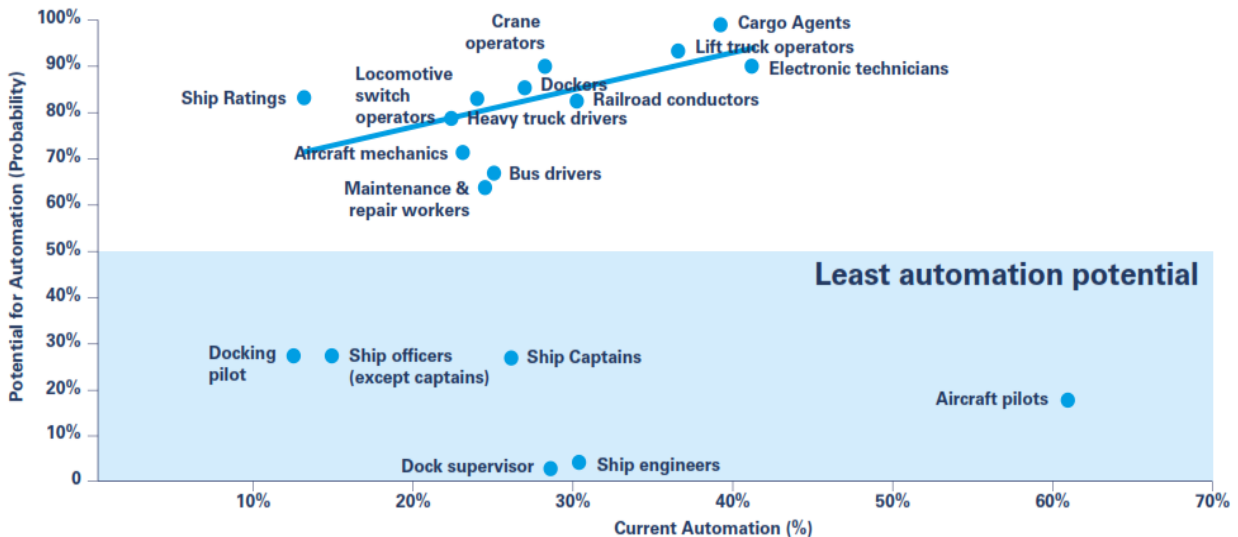


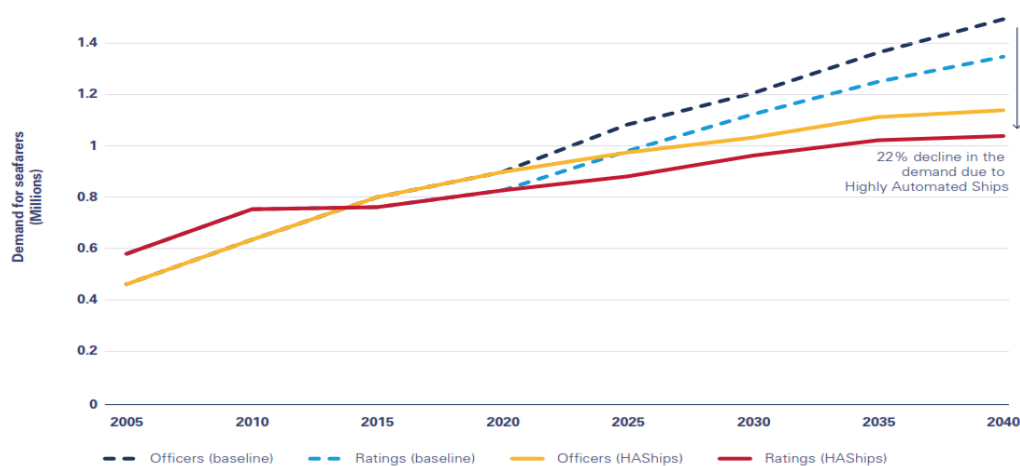
Figure 5.

Source: Transport 2040: Automation, Technology, Employment - The Future of Work, World Maritime University

In the report of World Maritime University “Transport 2040” for study the maritime labour force has been considered two scenarios of simulations. One - historic patterns of seafarers’ demand and the second –expected trade growth. After analyzing the results was outlined the following facts: seafarers’ demand growth rate is expected to decrease due to implementation automation, however obsolete number of seafarers will have increasing tendency for 2040 that could be caused by enlarging of seaborne trade. Increase of trade will mitigate impact of automation on demand of seafarers by 36 percent. It is foreseen to have significantly higher demand than its current level, in some scenarios the number is almost double of current number, that is approx.1.6 million seafarers ( Transport 2040, 2019).

This analysis are illustrated on the figure 6 and 7

### Simulation for the Demand for Seafarers

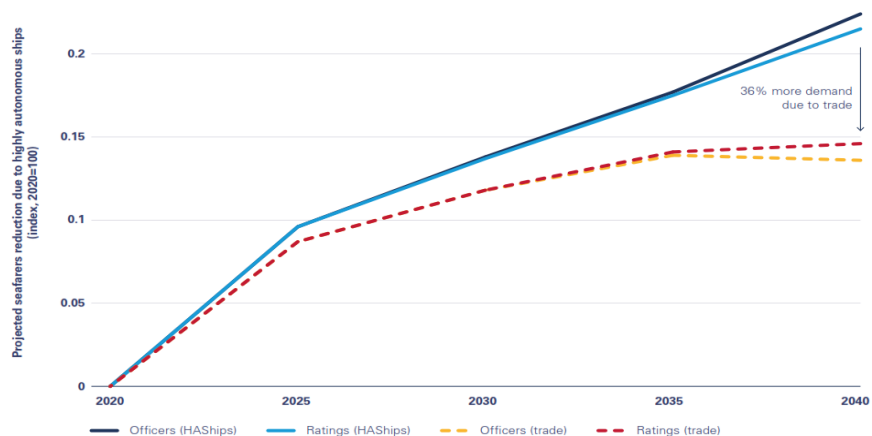


Sources: Historical data from ICS/BIMCO (2016); forecast used data from the start-up curves of Chapter 1 and UNCTAD maritime data; WMU forecast.  
Notes: HASHips stands for Highly Automated Ships taking international voyages (average tonnage, average trade). The predictions are subject to a high level of uncertainty, quantified between -6 percentage points and +18 percentage points within a 95 per cent confidence interval. The crew reduction approximately follows an exponential process and by 2040 the crewing levels are assumed to be reduced between 16 and 24 per cent.

Figure 6

Source: Transport 2040: Automation, Technology, Employment - The Future of Work, World Maritime University

Projected reduction on the labour demand for seafarers. **Figure 7.**



Sources: historical data from ICS/BIMCO (2016); forecast used data from the start-up curves of Chapter 1 and UNCTAD maritime data.  
Note: The graph displays a reduction in the demand for seafarers in comparison with the baseline (conventional ships, that is, no Highly Automated Ships, HASHips). A decrease in the graph corresponds to an increase in the demand for seafarers.

Source: Transport 2040: Automation, Technology, Employment - The Future of Work, World Maritime University

### Overview seafaring of Georgia

Located at the crossroads of Europe and Central Asia, on the eastern side of the Black Sea, Georgia is a bridge connecting several important economic regions with a total of 827 million people, including the EU (495 million), former Soviet Republics (243 million), Turkey (73 million) and the Caucasus Region (16 million). It is a key link in the shortest transit route between Western Europe and Central Asia for transportation of oil and gas as well as dry cargo. Georgia's oil and gas pipelines, Black Sea ports, well-developed railway system, together with its airports, are playing an increasingly important role in linking East and West. At the same time, Georgia functions as the vertical North-South transportation link between Russia and Turkey and, via Armenia, to Iran ([www.traceca-org.org](http://www.traceca-org.org)).

Georgia as a maritime industrial country started to develop in the early 20th century. A shipping company, a maritime institution, a shipyard factory and several sea ports were established and developed. However, the system was constructed in such manner that after the Soviet Union was destroyed, it was difficult to change it as a new independent country's industry. The first problem in the recruitment process occurred in 1992, when the shipping company was terminated with 55 vessels and operating 10 million tons of cargo per year. At that time it was the only source of employment for Georgian seafarers. The company was established in 1967 and stopped functioning in 1992 and left 90 per cent of the seafarers without a job (Takidze, 2014).

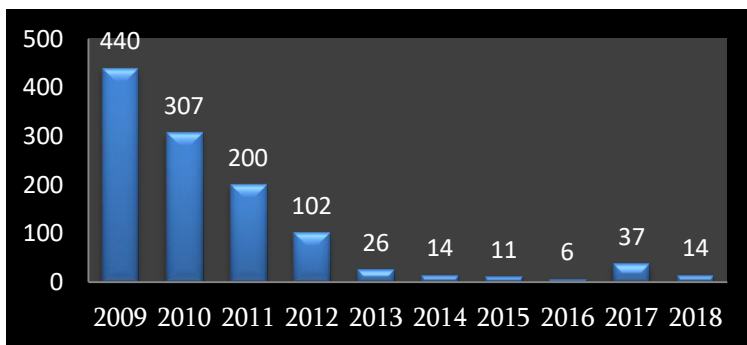
To change Georgian seafarers from national into global seafarers required specific knowledge and measures. The challenges were big because at that time the country did not even exist in the international maritime community. Georgia became an IMO member state in 1993 and soon in the same year ratified the Convention on Standards on Training and Certification on Watchkeeping (STCW 1978/95) ([www.imo.org](http://www.imo.org)). This was the first and necessary step to give opportunity to Georgian seafarers to find jobs in the global maritime markets. However, to adjust a new recruitment style needed time because it was necessary to establish new crewing and shipping companies in Georgia. Until the 1990th there were about 5000 seafarers employed and in 1999 only 2800 seafarers could be employed, even though the popularity of the seafarers’ profession increased during this period (D. Sharadze, personal communication, August 19, 2015).

Today, in Georgia’s seafarers database 12,500 seafarers are registered with valid certificates, from which 8,250 are ratings, 2050 operational level seafarers and 2250 hold certificates of competencies (CoC) at the management level (Maritime Transport Agency of Georgia, personal communication, August,2019). Presently, about 30 crewing agencies conduct their activities in Georgia. Only 13 crewing agencies are recognized by Maritime Transport Agency. Recruitment statistics through these recognized agencies from 2016 are given in Table3.

**Table 3.** Employed seafarers by the level of competency

	2016	2017	2018
Officers	1265	1198	1788
Ratings	937	1078	1346
cadets	125	148	179
total	2327	2424	3313

**Source:** Maritime Transport Agency of Georgia, August , 2019



**Figure 8.** Georgian forged Certificates in 2009 - 2019.

**Source:** Maritime Transport Agency of Georgia, Personal communication, August, 2019



As can be seen from Table 3, the total number of officially employed seafarers is quite small comparing to total number. However, it has an increasing tendency;

Particularly, is small employment rate of ratings. It could be suggested that a remained part of Georgian seafarers are unemployed or they are employed through personal contacts from which the most majority are employed unofficially on substandard vessels.

Recruitment of seafarers on substandard vessels is one of the most vulnerable issues for the whole country. Having no choice and the necessity to earn money for family reasons, seafarers are forced to agree to work on substandard vessels, where they face low wages, in most cases even unpaid salaries, poor living conditions, high risk of danger, no social guaranties and insurance. Particularly, the Black Sea is known as an obstacle and a sea of shame. About 2400 vessels ply in this region, operated by 8 000 seafarers, in which Georgia is on the forth place (Hazar& Yildirim, 2014). As a result there are abandoned, injured or unpaid seafarers. Fifteen seafarers lost their lives at sea during the period 2010-2015 (P& I Club of Georgia, personal communication, August 21, 2015). Fifteen Georgian seafarers were captured by Somali pirates in the Gulf of Aden in 2010 and were taken hostage for 16 months. They were abandoned by the ship owner, who refused to pay ransom for the crew ("Georgian seafarers," 2012).

Another problem, which influenced negatively the recruitment process of seafarers in Georgia was corruption in the system. High numbers of false certificates of competencies were the reason for the European Commission to withdraw recognition of Georgian certificates in November 2010. This act caused loss of jobs on European flag vessels for Georgian seafarers. Fortunately, after appropriate measures in October 2013, recognition was returned (European Commission, 2013). However, to return the honest reputation and job places, which were lost during these three years, time and effective work are need.

Figure 8 presents statistics of fraudulent certificates during the period 2009 to 2018. As can be seen from Figure 8 from 2009 to 2013 the number of forged certificates drastically declined. Should be also noted that since 2013 all discovered froud certificates were issued untill 2013. This result was achieved after effective measures that were conducted by the Maritime Transport Agency of Georgia. Particularely, was implemented online verification system, documents are printed on highly protected marks and printing proces is conducted in Service Development Centres under ministry of Justice.

The main criteria in selecting seafarers in the labour market for ship owners is to select a country which can provide sufficient quantity and high qualified seafarers. Appropriate qualification of seafarers was the main and most critical problem in Georgia. This problem is

directly linked with the maritime education and training system. Sustainable shipping development requires accordingly development of the educational system. Nevertheless, Georgia has a rather long experience and history in maritime education it could not be developed in a proper way. The problem was that the system was behind the modern standards and it was based on old study methods. Different activities have been conducted in order to address the problems of Maritime education by attempt of Maritime Transport Agency and ministry of education. Maritime education became a regulated profession that means that program accreditation and authorization processes are recognized and monitored jointly by Maritime Transport Agency and ministry of education.

Difficulties of maritime education are arising also due to deficiency of professors and trainers. It is very difficult to attract active seafarers and train them as teachers and instructors.

According to the STCW Convention, onboard training is an essential part in comprehensive maritime education. Difficulties in arrangement of proper cadetship program is one of the biggest barriers in further employment process because as the STCW Convention requires to become an officer on watch, 12 months onboard training should be replaced by 36 months sea service experience.

High maritime and vocational education in Georgia is conducted in one state and three private institutions. Short maritime courses are conducted in four maritime training centers.

Table 4. Alumni of Georgian maritime institutions

	2016	2017	2018
<b>High education</b>			
Navigation	173	198	209
Engineer	83	65	66
Electro-Engineer	15	39	22
<b>Vocational education</b>			
Navigation rating	278	395	419
Engineer rating	242	331	337

Source: Batumi state maritime academy, Batumi teaching maritime university, maritime institution Anri. Personal communication, August 21, 2019

Table 4 presents the number of students graduating from maritime institutions by specialization and education degree during the period 2016-2018. The data clearly shows that the interest in high maritime education retains its actuality for navigation specialization; engineer specializations have a decreasing tendency.

### **Suggested Recommendations for problems solution**

After identifying the problems involved in the recruitment process in Georgia the following measures for their solutions could be suggested.

First of all, as in the global market there is shortfall in officers, focus should be on preparing qualified marine officers for different type of vessels. Georgian seafarers mostly are employed on oil and chemical tanker fleet. It is necessary to train them for LNG, LPG, passenger vessels, as well as for off-shore industry and other types of vessels.

The marine industry is a quickly changing area, which is tightly connected with functions of sufficient maritime education and training (MET). The goal of a new MET concept should be to encompass such kind of teaching methods, which would give students ability to acquire useful knowledge and skills in a developing environment (Prylipko, 2013, p. 40). Moreover, should be taken into consideration current trends in shipping concerning automation and technology, that will require new and different knowledge and skills from seafarers. Internationalization of maritime education, close partnership to foreign institutes and maritime organizations would be an effective way to respond these challenges. .

Maritime education is a combination of theoretical knowledge and practical skills which can be developed by proper education and training. However, according to Bloom (1956) objectives of educational system should be achieved by 3 main domains: cognitive, psychomotor and affective (Manuel, 2005, p 6). Cognitive and psychomotor corresponds to knowledge and skills, affective domain is attitude, values, culture that became the most important issue for safe shipping. An affective domain that could be developed by informal education should be the main objective of maritime institutions.

Create the mechanism to attract and train experienced seafarers as teachers and instructors. To become familiar with the experience of other maritime administrations could also be useful.

To own a national fleet is a rather far perspectives for Georgia as it is connected with huge financial resources. Georgian seafarers are oriented for the global maritime market. For this reason, to attract ship owners and ship operators and to promote activities of crewing agencies are also important measures to decrease unemployment.

To interest more shipowners is significant to increase the quantity of seafarers. Attraction female students for study on marine specializations would help to increase seafarers' number and also keep gender equality balance.

Ratification of the MLC 2006 Convention is crucial to mitigate poor conditions for seafarers employed on substandard vessels. The maritime administration should carry out appropriate steps to enhance the understanding regarding the rights of seafarers.

A strong maritime industry is the fundament for the strong economy of the country. Seafaring in shipping is and always will be the most important issue. It is one chain in the whole system, without which it is impossible to obtain sustainable development of the industry. Therefore, Georgia should solve the problems and improve the current situation in the recruitment process, and thus also creating social and economic welfare. The existing shortfall in the global market gives the prediction that there are perspectives to develop seafaring in Georgia.

Relevant government decisions and effective steps should be carried out in line with international standards and requirements. This will bring positive results and Georgia will be able to supply good, qualified seafarers on the world maritime market.

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## **The prospects of application of bladed wind turbine on ships**

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### **Abstract**

The paper deals with laboratory samples of wind power plants, developed at Batumi State Maritime Academy. The paper also presents their structural composition and its main propulsive element – multibladed rotor, which contains arched shape blades placed eccentrically towards the rotation axis. Mathematical relations of power-kinematic particulars of multibladed turbine, resulted from analytical research, are also presented in the paper.

In conclusion, in order to make use of wind power plant attractive for marine transport, it must be equipped with effective turbines of simple shape. Thus, portability of poly bladed turbines determines the prospects of their application onboard the ships.

**Keywords:** wind power plant, turbine, research

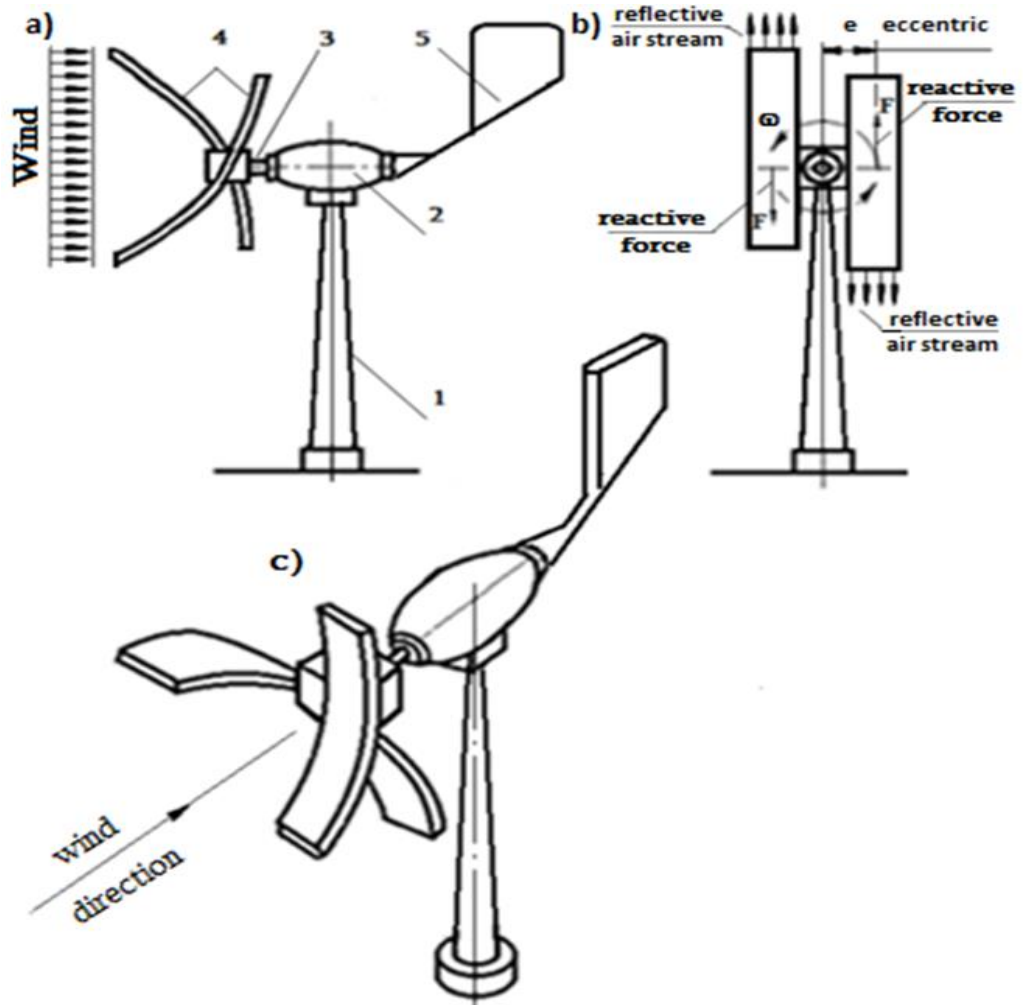
Shipping industry, serving people and cargoes carriage requires consumption of the natural sources of energy. Increasing use of natural power sources cause their rapid decrease and, at the same time, causes ecological problems [1]. Taking all noted into consideration, it becomes necessary to preserve natural resources and improve ecological situation through application of existed natural renewable energy sources [4]. Use of ecologically clean wind energy became the mainstream of researches in highly developed countries. In order to make wing energy attractive for marine industry, it must be provided with simple and highly effective turbines.

Nowadays, wind plants are mainly provided with propeller applied (currently having no alternative) plants, where propellers transform wind kinetic energy into mechanical one. It also shall be mentioned that the main working body of turbine plant is presented by aerodynamic shape longitudinal body and measuring of its exact sizes is related with expensive technological processes, also taking into consideration that during rotating, the blades are impacted by resistance of the air, decreasing its effectiveness [3].

In order to simplify and to increase turbine construction - the main working body of wind power plant, General Engineering Department of Batumi State Maritime Academy developed a model of wind right linear motion turbine, blades of which are simple shaped, thin and distorted (picture 1), the blades during rotation are almost not impacted resistance of air, increasing quality of wind energy.

The following construction components are included into the presented model: riser (1), on the upper part of which power block (2) is installed around a vertical axis, the main shaft (3), installed into power block, the blades (4) are placed eccentrically on the extending part, vane (5) provides blades' frontal placement towards wind. The main shaft transfers movement via multiplier to the power block or to other boy, performing the same function.

The sequence of following steps provide efficiency of the noted plant: air stream or wind firstly meets the surface of the blades, surround them and reflexing in changed direction (picture 1<sup>a</sup>). Air stream



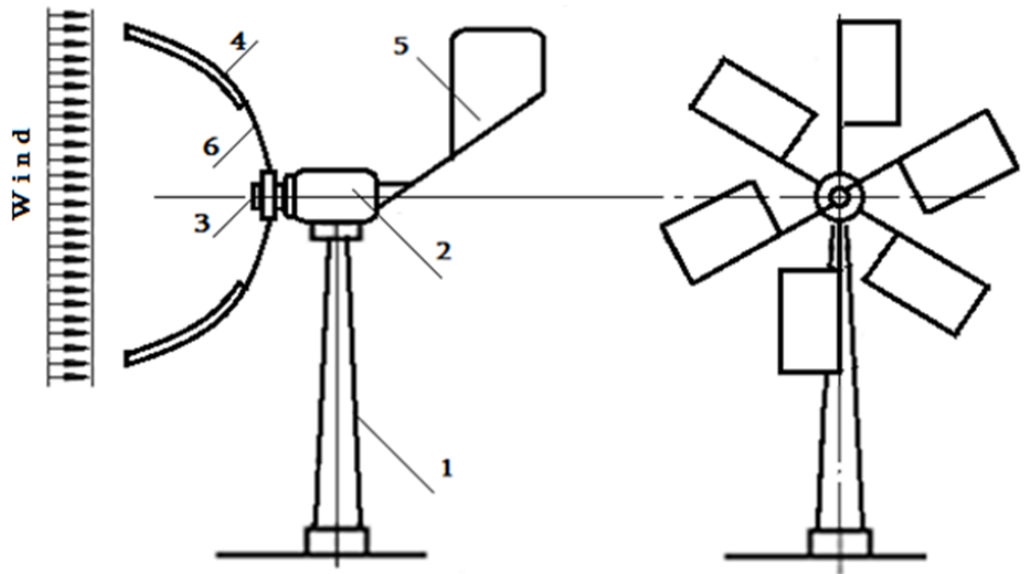
**Drawing 1.**

**1 - riser; 2 - power block; 3 - main shaft; 4 - blades; 5 - vane.**

reflexing the blades drives reactive forces, which create rotating moment for the shaft, such work of the turbine results in provision of the purpose of wind turbine.

In order to determine the main energy, kinematic and power particulars of the presented plant, let us offer its calculation particulars in working scheme (picture 1<sup>a</sup>).

As we noted above, the purpose of wind turbine is to perform the appropriate work, based on interrelation of air stream and blades of the turbine. The air stream firstly strikes the blade surface and creates the force acting on turbine axis.



**Drawing 2**  
**Poly bladed wind power plant**

1 - riser; 2 - power block; 3 - main shaft; 4 - blade; 5 - vane; 6 - coupling connector.

After striking with the blades, air stream surrounds the surface and in the same volume and speed reflexing from blade surface with changed direction and creates reactive forces impacting the blades. These reactive forces, which eccentrically impact towards rotation axis, drive moment of rotation, which in its turn, drives the main shaft.

Reactive force, caused by wind, which impacts the surface of the blades, is equal to [2]

$$F = \frac{\rho \cdot A \cdot V^2}{2} \dots\dots\dots (1)$$

$\rho$  - Air density, average  $\rho=1,25 \text{ kg/m}^3$

$V$  - wind speed , m/s.

$A$  – impacted area of one blade,  $\text{m}^2$  ;

In order to determine angle speed of the main shaft and the general efficiency of the turbine we apply dynamic law for rotating bodies

$$J \cdot \omega^2 = F \cdot e \dots\dots\dots (2)$$

Here -  $J$  - moment of inertia of one blade towards axis of rotation,  $\text{kg} \cdot \text{m}^2$ ;

$\omega$  – angle speed of the main shaft, 1/s;

$e$  - eccentricity, m.

According to (1) and (2) equations, the angle speed of the main shaft is

$$\omega = V \cdot \sqrt{\frac{\rho \cdot A \cdot \ell}{2 \cdot J}} \dots\dots\dots (3)$$

Then we may determine the main power particular of wind turbine – its efficiency

- For one blade turbine



$$P = T \cdot \omega = F \cdot e \cdot \omega = \frac{\rho \cdot A \cdot V^3}{2} \cdot e \cdot \sqrt{\frac{\rho \cdot A \cdot \ell}{2 \cdot J}} \dots\dots\dots (4)$$

T is moment rolling on the shaft, N · M;

- For poly blade turbine

$$P = Z \cdot \frac{\rho \cdot A \cdot V^3}{2} \cdot e \cdot \sqrt{\frac{\rho \cdot A \cdot \ell}{2 \cdot J}} \dots\dots\dots (5)$$

where Z – is a number of blades.

Rotor – the body, driving the turbine will be with one or two blades (picture 1) or poly bladed (picture 2) working in accordance with described above principle. They differ only with sizes. The number of the blades determines their sizes. In order to make use of wind power plant attractive for marine transport, it may be equipped with effective turbines of simple shape. Thus, portability of poly bladed turbines determines the prospects of their application on board the ships.

Finally, taking real factors into consideration, efficiency of presented wind turbine is determined by the following formula:

$$P = Z \cdot \frac{\rho \cdot A \cdot V^3}{2} \cdot e \cdot \sqrt{\frac{\rho \cdot A \cdot \ell}{2 \cdot J}} \cdot \eta \dots\dots\dots (6)$$

η here is a total coefficient of performance of kinematic pairs entering into wind turbine.

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## **The Importance of Extrinsic and Intrinsic Motivation Balance in Maritime Education and Training**

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### **Abstract**

The array of competence to be provided to the cadets of Maritime programs needs not only different approaches of language teaching but also analysis and simultaneous support of the learning process. Therefore, delivery of fruitful, result-aimed interrelated teaching and learning of Maritime English needs provision of various interrelated methods aimed at the development of above-stated competence.

Accordingly, the aim of the paper is to present the result of research, aimed to detect the importance of motivation correlation with MET purposes, to offer advantages of structured interviews and to propose the ways of identification and further consideration of intrinsic and extrinsic motivation of students.

**Keywords:** Maritime English, motivation, intrinsic, extrinsic, structured interview

### **Introduction**

The English language proficiency is increasingly becoming a compulsory obligation for seafarers. The conventions, established by the International Maritime Organization (IMO), strictly necessitate the request of English use in all scopes of shipboard operations. The International Safety Management Code stipulates the requirement for crew to interconnect using a conjoint language. (2) According to the convention, ensuring Safety of Life at Sea, on all vessels, to ensure effective safety matters, a sole working language shall be applied and provided in the ships' log-books. (3) At the same time, the convention demands that on vessels involved in shipping, the English language shall be ensured on the navigation bridge to deliver appropriate communication in on-board communication, the interrelation between the vessels and communication between the ship and shore-based stations. (3) The Convention on Standards of Training, Certification and Watchkeeping for Seafarers presents the whole range of the English language skills requiring the officers in charge of navigational watch (the OOWs)

to use printed and electronic nautical charts as well as a wide range of necessary nautical publications, including meteorological data and the information related with vessels' safety, security and operation, including contact with other vessels, shore-based services and to implement other obligations of the OOW including application of the IMO Standard Marine Communication Phrases (the IMO SMCP). (4) Accordingly, crewing companies consider English as a compulsory working language.

Teaching and learning process within the frames of Maritime Education and Training (MET) is a real challenge for a teacher and a learner due to its specific purposes and its unfamiliarity for the learner.

Thus, the goal of our researcher was to identify provision of a successful educational strategy.

Being backed by the results of our previously implemented researches of teaching methods inclusion of digital resources, case studies-based teaching material, etc.), more or less effectively serving MET goals, being interested in not only teaching but especially in provision of effective learning process we researched psychological factors determining students' motivation for learning language.

The sense of motivation is typically presented by integrative, instrumental, intrinsic and extrinsic ones. The effectiveness of intrinsic or extrinsic motivation is nowadays the subject of scientific interest of modern psychologists and teachers.

Therefore, having analyzed the modern psycholinguistic trends related with effectiveness of learning processes we implemented the research, aimed at identification of importance of intrinsic and extrinsic motivation within Maritime Education and Training.

### **The Importance of Motivation Correlation with MET Purposes**

The frames of traditional approach to Maritime English teaching offers a number of language teaching methods and techniques, traditionally applied within the system of Maritime Education and Training. But taking into consideration existed and constantly growing goals and aims of Maritime English, we need to find out the most effective ones. As we noted above, learning and teaching of Maritime English is a real challenge to a learner and teacher, due to its aims, purpose, expected results and initial unfamiliarity for the learner (e.g. crew sleep not in room, but in cabins, ship does not have walls, but bulkheads; instead of left or right, port or starboard sides are used; ships make headway, sternway, or leeway when they move forward, backward, or sideways through the water; ship has feminine grammatical gender for seafarers (mariner always call a ship she), etc.)

Motivation, commonly drives a person to success, is generally related with reward, goal, supportive peers, encouragement, friendly environment, determination, challenge, and opportunity.

But motivation from a psycholinguistic point of view was and is the subject of discussion.

In 1985 psychologist Howard Gardner defined integrative and instrumental motivation. According to Gardner's theory:

"Motivation construct has often been understood as the interplay of two components, integrative and instrumental motivations. The former is associated with a positive disposition toward the L2 group and the desire to interact with and even become similar to valued members of that community. The latter is related to the potential pragmatic gains of L2 proficiency, such as getting a better job or a higher salary". ([1], 274)

Later in 2000 Richard M. Ryan and Edward L. Deci added the new concept of motivation – Intrinsic and Extrinsic Motivation. All things we do in our lives are somehow motivated. Thus, generally psychologists define extrinsic and intrinsic motivations as following:

"Intrinsic motivation refers to behavior that is driven by internal rewards. In other words, the motivation to engage in a behavior arises from within the individual because it is naturally satisfying to you". ([2] 1)

"Extrinsic motivation refers to behavior that is driven by external rewards such as money, fame, grades, and praise. This type of motivation arises from outside the individual, as opposed to intrinsic motivation, which originates inside of the individual."([3] 1)

Therefore, aimed at improvement of performance of BSMA students' competence in Maritime English, we decided to focus our research on motivation, impacting the learning process – so called "the Dark Side" of the teaching one.

### **Research analysis: motivation impact upon learning process**

**The aim of the research:** within the frames of the offered research we tried to identify the impact of intrinsic motivation and extrinsic motivation upon the respondents.

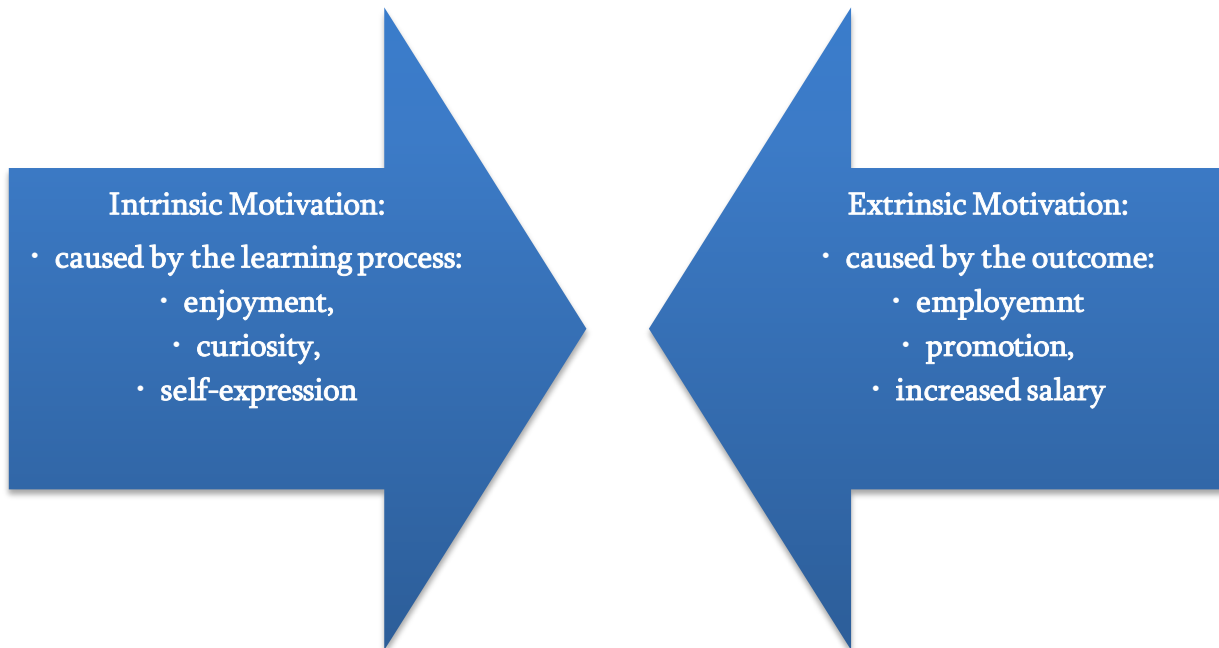
### **Research step 1: the research participants' selection**

The students of BSMA Bachelor educational programmes:

- 30 students of Marine Navigation (10 first, 10 second and 10 third years of studies)

Ten acting seafarers, passing additional English languages courses.

## Step 2: Determination of the respondents' intrinsic and extrinsic motivation models

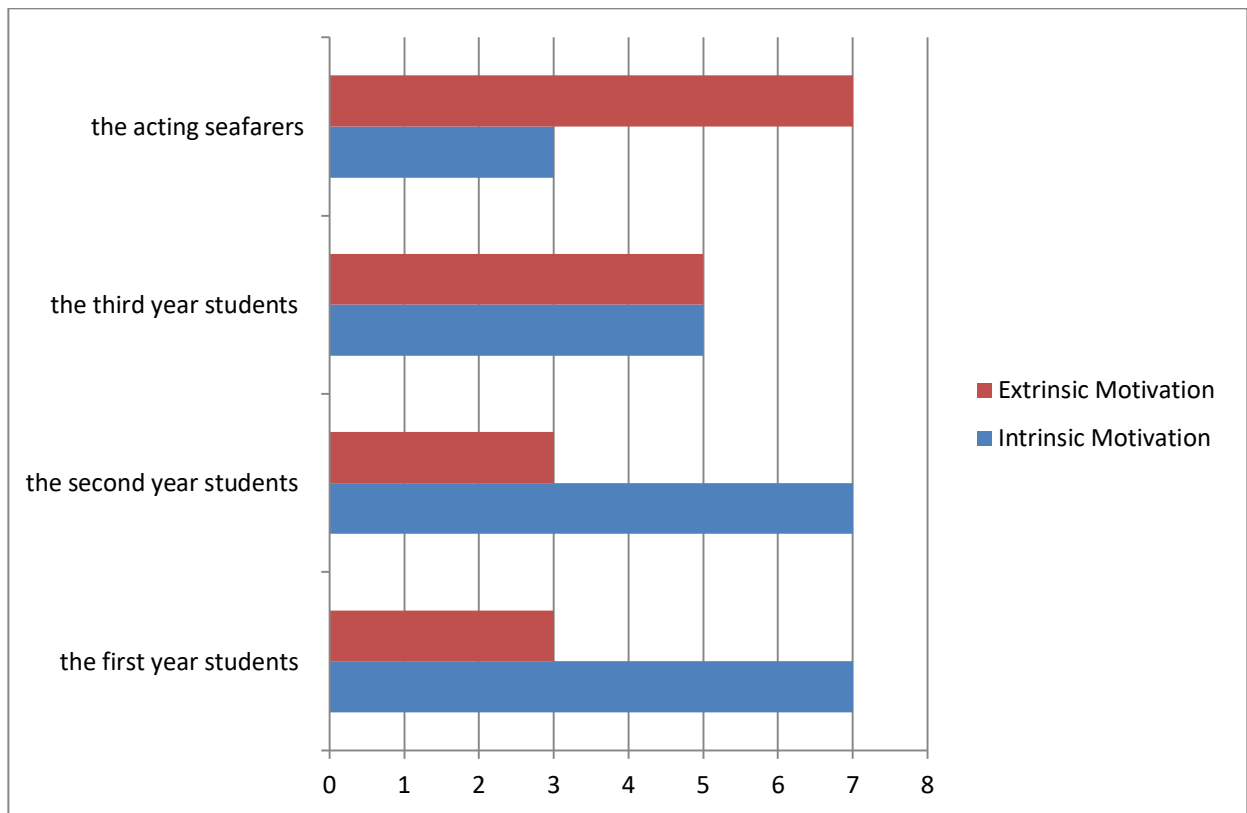


**Step 3: research method - application of "structured interview" to determine the type of respondents' motivation.**

### Step 3.1 - structured motivation questionnaire:

1. What are the current activities that make you feel satisfied with your English level?
2. What is the one step you can take immediately to be closer to chosen English level?
3. If you fail to achieve your English level, what will be the results?
4. If you successfully achieved your English level, what will your life be like?
5. What is the obstacle that is blocking you from reaching your English level?
6. Who do you want to be in the next 4 years?
7. What is the one aim that if you achieve it, everything else will be unnecessary?
8. What is the good advice that the 40 years old you will tell the 20 years old you?
9. If you could turn back time, knowing what you now know, what will you do differently?
10. What will people say about you when you graduate from BSMA?

#### Step 4: Results of structured interview analysis:



**Step 4.1 – research results description:** the diagram presented above shows that the students of the first and second year of studies are mostly motivated intrinsically.

The first year students of BSMA are taught non-Maritime English course, that's why the level of intrinsic motivation is dominating here.

The second year students are delivered Maritime English course, and yet they have not realized the role of the English Language for their future carrier.

The third year students have actually equal results, because they clearly understand their future responsibilities, they know that their promotion and safety greatly depend on their level of Maritime English. That is why at this level students are motivated intrinsically and extrinsically. Naturally, the results of the acting seafarers show that extrinsic motivation plays the most important role for them. Their professional responsibility before the crew, company and environment raises their extrinsic motivation more than intrinsic one.

#### Conclusion

It goes without saying that new technologies and aids of education must be widely used in classes. Lessons must be provided with involving textbooks, video and audio data, computers, projectors, posters, experienced seafarers shall be invited to provide co-teaching.

At the same time, application of psycholinguistic approach of the learning process makes it possible to research (and finally to improve) not only teaching process but learning one too.

The results of structured interview-based analysis give the teacher possibility not only blindly to use existed methods, but also to find out psychological factors and reasons for learning the language and effectively to apply necessary ones. At the same time, the application of structured interview method gives the teachers the possibility to determine the students' instrumental motivation and choose appropriate teaching and learning strategy.

The structured interview results, encourage teachers to give student's confidence and project the belief that they will achieve their goal. The teachers have the possibility to track the learners' progress as well as to clarify uncertainties by giving examples, teach students communication strategies, as well as strategies for information processing and problem-solving. The lessons become provided with materials, recordings, and visual aids appropriate to the needs of the learners. The method also promotes the learner's autonomy, minimizes external pressure, rises responsibility of the students in time management, involves them to prepare own activities and promote peer-teaching.

Therefore, backed by properly managed teaching aids, the teacher easily can manipulate with student's intrinsic motivation extrinsically, via tasks, lessons, presentations, tests, exams, etc. Thus, based on students inner wish and expectation, merging their wishes with extrinsic tasks, the teachers improve and develop the students' proficiency.

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## **Cognisance of the Maritime Lingual Training within the structure and framework of National Maritime Education and Training Policy in Kenya**

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### **Abstract**

The value of standard and effective lingua franca within the confines of the maritime industry and especially on-board cannot be understated. Effective communication is a prerequisite to holistic realisation of maritime safety. Therefore, the foundation of raising the level of comprehension and proficiency in English with particular interest of maritime English in MET is essential. It is therefore imperative that while the STCW convention and code gives a berth for conformity to national values and policies in MET, the cognisance of the Maritime English cannot be over looked. The paper looks at the formative and structural inclusion of Maritime English in the syllabi and curricula in the current Kenyan MET framework, and then presents a proposal for inclusion of a Maritime English Module Unit in the formative presentation in accordance with required modular requirements and structure in Kenya.

**Keywords:** MET, Maritime English, SMCP, Communication, Safety, Pedagogy, English for specific purpose.

### **Introduction**

The maritime industry by large has been a global village attracting different players within one environment especially on-board ships although distinct in culture, religion, race in addition to other affiliations but united by a common goal and celebrating a common achievement. This therefore calls for effective and enhanced levels of communication intra and intergroup. This largely presents a challenge in the lingua franca used, which is primarily English. It is noted that although communication as intended is void of ambiguity, there arise other affecting factors ranging from level of comprehension and proficiency in the English language and the specific lingua franca within the maritime domain. While this is attempted to be reconciled with the SMCP, maritime English serves as a fundamental compliment and foundation upon which communication is built.

Kenya is among the countries who have signed and ratified the International Convention on Standards of Training, Certification and Watch-keeping for seafarers (STCW). From its readmission to the whitelist, it has achieved tremendous progress within the last five years in compliance with the STCW Convention and Code. It is worthwhile to note that now not only is the training of officers of the watch at diploma level but also at the degree level. Significantly, Kenya has a number of MET programmes among them the diplomas in training officers of the watch and others to conform to other non-officer trainings including craft certificate in both nautical science and marine engineering with recent addition the inclusion of coxswain courses from grades III to I.

## **National education and training policy**

### **Conformity of MET programmes at the Technical Level**

All educative programme and training in Kenya are guided by national policies, which were geared in its revision to achieve the national vision 2030. These policies include:

- (i). Foster nationalism, patriotism and promote national unity through non-discrimination on grounds of race, colour, gender, religion, national or social origin, political or other opinions, economic status and inclusivity with particular reference to people with disability, human dignity, equity, equality, respect for cultural and social diversity and protection of marginalized societies.
- (ii). Promote the social, economic, technological and industrial development through entrepreneurship culture and partnerships with relevant stakeholders
- (iii). Meet economic needs through access to equitable resources with an enabling environment and opportunities to produce skilled, knowledgeable and expert citizens
- (iv). Equip Technological and Industrial Needs
- (v). Promote individual development and self-fulfilment through mechanisms to provide opportunities to those seeking to pursue quality technical training at all levels together with complimentary training and on-the-job training
- (vi). Promote sound moral and religious values

Education should enhance acquisition of sound moral values and help youth to grow into self-disciplined, self-reliant and integrated citizens.

- a) Promote social equality and responsibility
- b) Promote respect for and development of Kenya's rich and varied cultures

- c) Promote international consciousness and foster positive attitudes towards other nations
- d) Promote positive attitudes towards good health and environmental protection

Assessing the different goals in reality of the training, we find that the diplomas are placed under Technical and Vocational Training (TVET) while the training at the degree level is expected to conform to the rules, regulations and policies of the Commission of University Education (CUE).

### **TVET guidelines**

The diploma follows technical training and as such, it is imperative to a mention of the national aims of the technical training programmes [6].

- i. Provide training opportunities for the increasing number of school leavers to enable them to be self-supporting*
- ii. Develop practical skills and attitudes, which will lead to income generating activities in the urban and rural areas through self-employment*
- iii. Provide practical education and training skills, which are responsive and relevant to Kenya's agricultural, industrial, commercial and economic needs*
- iv. Provide the technical knowledge and vocational skills necessary to enhance the pace of this nation's development*
- v. Encourage self-employment while at the same time producing skilled artisans, technicians and technologists for both formal and informal sectors at the ratio of one technologist to five technicians to 30 craftsmen/artisans (1:5:30)*

### **University guidelines**

While the CUE has general guidelines, universities are also at liberty to develop their own policies in addition to the standardised guidelines. Among the policies is the approval of common units, which is implemented at both the national and university level. For MET programmes to be structured as degree level it is important that such should be realised to conform to the degree awarding levels. Among the common units is Communication Skills and for engineering programmes communication skills for engineers. This by breadth and depth do affect MET programmes, especially Nautical Science and Marine Engineering. Assessment of the unit communication skills in the degree programme and the diplomas does not yield any difference. The unit at both levels are identical in content although with the degree it is covered in one semester while with the diploma it is a modular unit to be covered ideally in one trimester for Technical Training Institutes.

## **Training and certification regulations in Kenya**

The STCW Convention and Code has been adopted (domesticated) to Kenyan regulations through Merchant Shipping (Training and Certification) Regulations and the clear qualifications set out in the Kenya Maritime Code of Qualification (COQ). Addressing the challenges posed by the national policies, it is therefore important that there is a redress to the manner and structure of maritime English and communication lingua within the framework of the national academic/vocational competency requirements, a view that is also shared by Capt. Ergun Demirel and Capt. Romesh Mehta [2]. However, much of the regulations are defined with the individual syllabi for the level of training, for example, the syllabus and regulations for each of the artisan course for seafarers, the crafts and diplomas in both nautical science and marine engineering.

## **Principle of effective communication in avoiding precipice of disasters**

Trends in the maritime industry have led to the expectation that a shipboard officer is not only fluent in general English but has a solid command of maritime English. Boris Pritchard [11] has also echoed this. It is important to note that while IMO has repeatedly emphasized on safety culture [5]. It is verifiable that the linguistic aspect in communication plays a great role in miscommunication. Through an analysis of a research based questionnaire, it has been proven that indeed the sum total of SMCP, writing, listening, speaking, pronunciation, grammar, technical/nautical vocabulary, vocabulary while at the same time excluding reading skills, were major factors in play for problems caused from time to time during communication with officers [7]. The need to communicate effectively using maritime English is also emphasised by the report to the Maritime Safety Committee of the 41st Session in 2010 by the IMO, Sub-committee on Standards of Training and Watchkeeping [3].

## **Requirements as advised by the IMO Model Course 3.17**

It is important to note that model course for Maritime English is arranged in two sections, which each contains a syllabus on its own. The two sections are section 1 and section 2 [4]. The sections as arranged clearly indicate the separation of the levels of apprehension of English into elementary and intermediate. However, this should be also of concern to native English countries where common terminologies and understanding might affect the interpretation of the intended message. While other English testing methods are used such as TOEFL it is also

important to take cognisance of the intended focus especially emphasis on skills rather than grammar [11].

## **Imperative approach to cognisance of maritime English**

### **Analysis of content in syllabus 2008 and 2015**

The Kenyan education system is English based with English language as the principal lingua of instruction. This therefore enhances the ease of implementation of the MC 3.17. Of interest is the maritime technical terms, which are primarily in English although some other words have been borrowed examples being 'securite', 'mayday' etc. with other equivalents in other languages [1]. The 2008 syllabus was thence revised in line with the amendments of the Manila 2010 amendments to the STCW which among other introductions obligated MTIs to '*revisit their strategies for teaching, learning and assessment as there will not only be new content.....*' [10]. The importance of the need to realise linguistic importance is also one of the recommendation of the IMO to national authorities ensuring effective communication by officers hence the stress on Maritime English [3]. Communications have never the less been the most critical component of human element in marine casualties and accidents and is there important that the emphasis is realised as "*Maritime Test of English Language*' and not and '*English Test of Maritime Knowledge*" [11]

Looking at the contents for the Unit Maritime Communication, which presuppose the infusion of maritime English, the unit primarily conforms to guidelines of the TVET Authority and the CUE. The conformity is clear in the 2015 syllabus [6] [12] [13] [14] [15], which clearly titles the unit to its guided content by both authorities in post-secondary training as Communication Skills. While in Kenya the core unit 'communication skills' [6] [12] [13] [14] [15] seems adequate for emphasis of communication efficiency, it should be noted that effectively for the maritime setting some of the related overtures present a direct challenge. This much exhibited by the forms of non-verbal communication which although are simply understood within a common and familiar environment to same and related cultures its might necessarily be the same projection beamed by a different culture. This includes body language and eye contact, which with multinational crews poses a challenge and creates a fertile environment for misunderstanding [9]. This therefore places more emphasis not only on SMCP but also on the underlying foundation of maritime English.

Upon scrutiny with the MC 3.17 [4], we find that while the unit communication skills complimented by the Kenyan educational system, which dictates English as the educational language; we find the irrelevance of the section 1 of the model course.

### **Programme Unit Design Philosophy**

Since the education system in Kenya uses English primarily as the *linguae Franca*, it is then only necessary that the section 2 of the model course be adopted at the Diploma Level, however the Section 1 need to be adopted for both Artisan Seafarer and Craft Certificate course. Therefore, basing the adoption on the guidelines for TIVET, the awareness of the general and specific objectives to be met within the syllabus is core to the unit design philosophy. The development should also take into considerations the environment and a reflection of the professional work of the seafarer [9]. Smorochynska [9] further advocates for thematic approach, which in the Kenyan context is a viable unidirectional flow of the purpose. However, with the expected level of English proficiency post-secondary and as reflected in the common unit ‘communication skills’ thematic areas primarily concerned with building general language proficiency shall be excluded.

### **Proposed Unit Structure**

#### **Maritime English I**

While in recognition of the TIVET formative presentation of units, the following proposes an approach to introduce maritime English in the syllabi for Artisan Seafarer and Craft Certificate courses.

Unit name	Maritime English I
Introduction	
	This module unit is intended to equip the trainee with knowledge, skills and attitudes to enable him/her, acquire adequate knowledge of the English language as a Maritime <i>Lingua Franca</i> enabling the officer work and communicate in the intended technical environment.
General Objectives	
	By the end of the module unit, the trainee should be able to:
	a) Describe crew roles and routines
	b) Name types of vessels; describe parts of a vessel

c)	Describe the location and purpose of safety equipment
d)	Name positions on board; ask for and give directions on board and ashore
e)	Describe routine operations on board; understand standard engine orders

Sub-Module Unit 01 - Enhances the student's English Language Knowledge: (a) Grammar: use parts of speech correctly; identify the constituents and the functions of the noun phrase; construct different types of simple sentences; identify the constituents and the functions of the verb phrase; construct correct compound and complex sentences. (b) Linguistic competence by writing sentences in a variety of ways; use language structures creatively and competently; use knowledge of grammar to interpret information from various sources. (c) Reading and Writing of maritime related texts and other important texts

Sub-Module Unit 02-The Maritime Industry and Environment: Vocabularies of use, tenses and communication skills in phonology, speaking, listening, reading and writing

Sub-Module Unit 03-Elementary Marine Communication Procedures: The student Asking for and gives personal data. The trainee is taught to understand key questions in listening; he/ she exchanges and notes personal during marine communications, give and receive simple communication procedures:

Sub-Module Unit 04-Describing crew roles and routines: Crew Roles Deck Department, Crew Roles Engineering Department, Crew Roles Galley, Other Crew Role Passenger and Roro-Pax Vessels.

Sub-Module Unit 05 - Ship Knowledge: Naming types of vessels; describe parts of a vessel: identifying ships with relevant pronouns, tenses and relevant identification markers. Describe the ship in oral conversation. Describe the ship types in report format.

Sub-Module Unit 06-Directions on-board a vessel relative to the ship and shore: Name positions on board; ask for and give directions on board and ashore.

Sub-Module Unit 07 General Meteorological and Marine Environmental Conditions: Vocabularies of use, tenses and communication skills in phonology, speaking, listening, reading and writing.

Sub-Module Unit 08 General On-board Operations: Vocabularies of use, tenses and communication skills in phonology, speaking, listening and reading

Sub-Module Unit 09 on-board safety equipment: Vocabularies of use, tenses and communication skills in phonology, speaking, listening, reading and writing

Sub-Module Unit 10 Routine Operations on board: Vocabularies of use, tenses and communication skills in phonology, speaking, listening and reading

Sub-Module Unit 11 Standard Engine orders: Vocabularies of use, tenses and communication skills in phonology, speaking, listening, and reading

Sub-Module Unit 12-Emergencies on board: Vocabularies of use, tenses and communication skills in phonology, speaking, listening, and reading

Sub-Module Unit 13-Introduction to SMCP: introductory knowledge to SMCP

Sub-Module Unit 14 - Emerging Issues and Trends: discussing emerging trends, Identifying the challenges and effective coping mechanisms.

The unit shall be taught in Module II in Artisan Course, Module I in Craft Certificate course and module I in diploma courses. The arrangement is specific because of the nature of transition of the student from artisan to diploma. The transition follows that the student shall complete Module I and II in artisan then a direct entry to Module II craft certificate and lastly Module II in Diploma.

Where: (aa) is the unit number in the Module, (b) signifying the module followed by sequential numbering of submodule unit. Thereby in the case of the syllabus 2015, the submodule units shall be coded as 21.2.0 hence 21.2.1 to 21.1.14 in Artisan Seafarer Course, 22.2.0 hence 22.2.1 to 22.2.14 and 23.2.0 hence 23.2.1 to 23.2.14 in Craft Marine Engineering



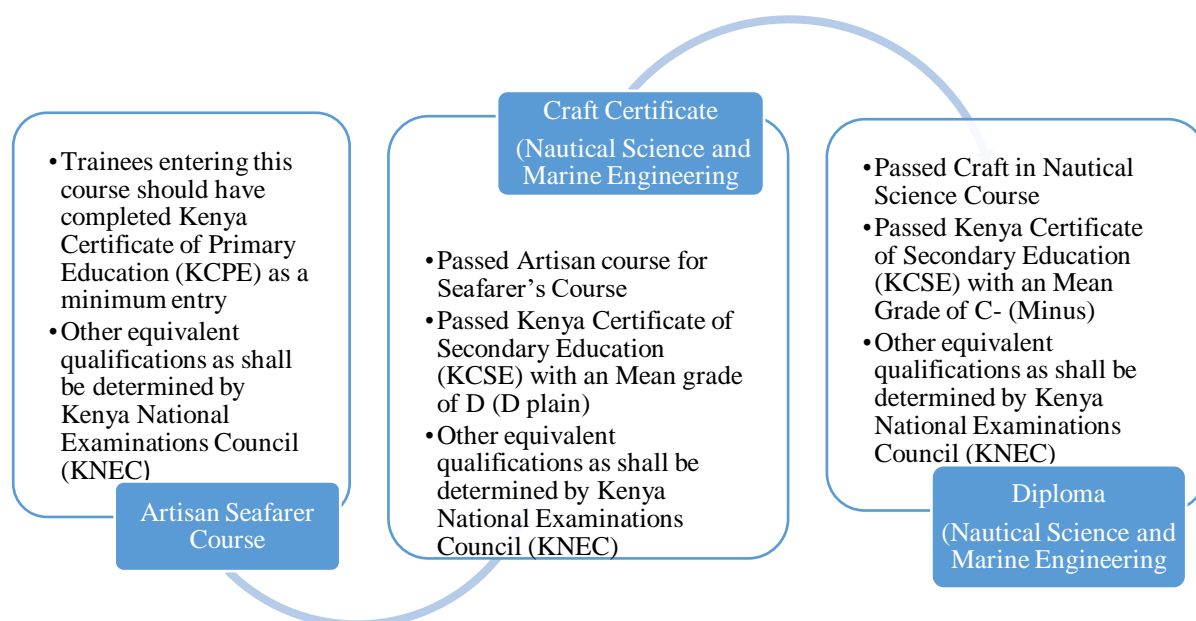


Figure 14: Training progression from artisan seafarer course to diploma

Therefore, in the event that it is placed in Module II craft and Module II diploma it shall create unnecessary repetition and irrelevant redundancy.

### Maritime English II

While in recognition of the TIVET formative presentation of units, the following proposes an approach to introduce maritime English in the syllabi for diploma courses.

Unit Name	Maritime English II
Introduction	
	This module unit is intended to equip the trainee with knowledge, skills and attitudes to enable him/her, acquire adequate knowledge of the English language as a Maritime Lingua Franca enabling the officer work and communicate in the intended technical environment.
General Objectives	
	By the end of the module unit, the trainee should be able to:
	a) comprehend the lingua franca in order to use charts and other nautical publications, to understand meteorological information and messages concerning ship’s safety and operation
	b) Use the lingua franca in expressing himself clearly in his

	communications with other ships or coast stations. c) understand and use the IMO Standard Marine Communication Phrases (The SMCP)
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Sub-Module Unit 01-Understanding the SMCP: understanding the SMCP vocabularies and use with appropriate verbs, pronouns and tenses

Sub-Module Unit 02-the Linguae Franca in using charts and other nautical publications: Defining key vocabularies: Grammar, Communication skills: reading skills, listening and speaking skills for effective communication

Sub-Module Unit 03- Meteorological information and messages concerning ship's safety and operation: Defining key vocabularies and adjectives, correct Grammar, appropriate communication skills and message markers

Sub-Module Unit 04-Communications within the ship: Key vocabularies: grammar in reading and writing, Communication skills: listening and speaking using the correct terminologies

Sub-Module Unit 05-Communications Bridge to Engine Room: Key Vocabularies in the Engine Room communication; Grammar in reading and writing, Communication skills; listening and speaking using the correct terminologies

Sub-Module Unit 06-Communications with other ships or coast stations: Key Vocabularies: Grammar in reading and writing, Communication skills: listening and speaking using the correct terminologies

Sub-Module Unit 07-safety Instructions on board a ship instructions on board ship; the trainees should have the ability to recognize the safety symbols and signage on board; introduce the life-saving and fire-fighting appliances to passengers; role-play giving appropriate instructions to passengers in emergency situations.

Sub-Module Unit 08-Appropriate language and terminologies in addressing Human Behaviour and Crisis Management: (a) Key Vocabularies and Grammar: terminology in English to inform the passengers about the emergencies, to direct the passengers and other personnel to their muster stations; and will reassure passengers in panic. (b) Communication skills to deliver clear

and concise decisions in an emergency using the English language (c) how to communicate information to passengers and other personnel and how to give clear reassuring orders.

Sub-Module Unit 09 - Emerging Issues and Trends: discussing emerging trends, Identifying the challenges and effective coping mechanisms

Where: (aa) is the unit number in the Module, (b) signifying the module followed by sequential numbering of submodule unit. This Units shall preferably be taught in Module II Diploma in Nautical Science to enable the student to realise ample time for the trade project done in module III. Thereby in the case of the syllabus 2015, the submodule units shall be coded as 23.2.0 hence 23.2.1 to 23.2.9

## Conclusions

It is then incumbent upon the Kenya Maritime Authority to provide or approve a National Reference Standard for Maritime English in line with the recommendation of the MC 3.17, as the STCW Compliance is not about an institution but rather a country. While referring to maritime English, it should be taken into account the need to train language trainers, instructors and literary lecturers in this domain, which appears as a distinct field in language and communications within the running curriculum at the post-secondary level. This enhances a conversion for maritime English as an ESP (English for Special Purposes), hence inclusion in the reference standards for broader maritime courses.

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## **Efficacy of the Maritime Academy of Asia and the Pacific Learning Management System as a Learning Delivery Method**

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**BSMT Class 2022, Maritime Academy of Asia and the Pacific**

### **Abstract**

This quasi-experimental research was conceptualised to test the efficacy of the Academy's Learning Management System as a learning delivery instrument in place of traditional teaching methodologies. Participants were selected using non-probability sampling, based on grouped average academic standings of MAAP BSMT Class 2022 as of the 1<sup>st</sup> Semester School Year 2018-2019, as well as from the pre-test results, administered to potential participants. Two groups were selected and were assigned as the Control and Experimental group. The Control group underwent four consecutive weeks of traditional teaching methodologies, while the Experimental group underwent four consecutive weeks of controlled administration of the Learning Management System, wherein, access to the system was scheduled on prescribed intervals. The experimental group classroom strategy was strictly self-directed learning; wherein the instructor's intervention was limited to technical or system administrative support. Results gathered from the Pre-test and Post-test of the control and experimental group were compared. The teacher factor was eliminated by employing a single Instructor to facilitate the classroom instruction to both Control and Experimental groups. The Instructor administered the same course and course content during the research period. Electronic devices utilized during the conduct of the research were provided by the participants.

**Keywords:** Academic Intervention, Diagnostic Test, E-learning, Self-directed learning, Teaching Methodology

### **Introduction**

The Maritime Academy of Asia and the Pacific (MAAP), envisions itself as the leading institution of excellence in Maritime Education and Training by providing students quality education and training curricula to produce competent graduates. Thus, in its program offerings, it incorporated a new system to deliver educational courses and training programs, academic reporting, documentation, and student tracking. This system is primarily used by other education and training institutions that cater to distant learners (Evans et al., 2008). As part of the Academy's

development projects, the Learning Management System (LMS), was tested for its efficacy on a group of first-year midshipmen/women. Significant improvement of the academic performance of the experimental group will provide an essential background for the continuous development and full implementation of the system in the Academy.

The need for such a system stemmed out from the concept of having a repository of uniform educational media. The Academy has a vast number of academic materials, but access to such entails several procedures. Through LMS, these academic materials are made accessible through a single software, and within the confines of the classroom, via intranet. Furthermore, this system will incorporate self-directed learning (SDL), a progressive educational approach that focuses on individualistic learning and achieving competence (Knowles, 1975; Hammond & Collins, 1991), limited to the duration of the research.

The research made use of an independent variable - dependent variable paradigm as a framework. The independent variable in this study was the use of MAAP LMS as an academic intervention while the dependent variable was the performance of students after the intervention.

This study determined if the MAAP Learning Management System (LMS) would be a useful learning delivery medium for the midshipmen/women of the Maritime Academy of Asia and the Pacific.

Specifically, the researchers addressed the following questions:

1. What is the level of performance of MAAP students (controlled group and experimental group) during pre-test?
2. What is the level of performance of MAAP students (controlled group and experimental group) in the post-test?
3. Is there a significant difference between the two groups of MAAP students in terms of the level of performance during the post-test?

The study shows whether the MAAP LMS provides improved academic performance of the Midshipmen/women compared to traditional teaching methodology.

## **Methods**

The design of the study was quasi-experimental using groups administered with a fifty-item diagnostic pre-test, academic intervention, and post-test. The researchers utilised two groups generated from non-probability sampling- one control group and one experimental group. The participants of the study were from the first batch of students who met the K-12 admission pre-requisite in the Academy. They were from different regions of the country, and

were subjected to standardised diagnostic tests prepared by the researchers in conjunction with the Academy's Centre for Competence and Assessment, an independent department dedicated for the sole purpose of evaluating the competencies of midshipmen/women and trainees . The questionnaire was validated by various Subject Matter Experts and Function Heads, from the Academic Supervisor's Office. The diagnostic tool was pilot tested to a set of twenty students not included in the study. The reliability was measured using the Cronbach alpha through SPSS. Based on the results of the reliability test, the alpha coefficient for the questionnaire was .706 interpreted as having acceptable internal consistency. The results of the pre-tests served as a gauge that the group of participants were homogenous and the results of the post-tests served as an indication of the overall efficacy of the intervention. This arrangement ensured robust internal validity. The figures gathered from the pre-test and post-test were compared and evaluated through critical analysis and computations to determine if there was a significant difference between the results using T-test.

## Results

Table 1 presents a summary of the descriptive statistics of the pre-test results. The data shown include the measures of central tendencies and variabilities.

It can be recognised in Table 1 that the experimental and control groups have an equal number of 18 students. The average score of the experimental group in the pre-test is 9.72 while the control is slightly higher at 10.94. The middle score is indicated by the median at which the experimental group is 9.00 while the control is 11.00. The most occurring score in the experimental group is 8.00 while 11.00 for the control group. The lowest and the highest score in the experimental group are 3.00 and 18.00, respectively while 7.00 and 16.00 points in the control group. The scores in the experimental are more dispersed than the control group as indicated by the standard deviations of 3.58 and 2.44 respectively.

**Table 1**

Pre-test Results of the Diagnostic Test

<b>Respondents</b>	<b>N</b>	<b>Mean</b>	<b>Median</b>	<b>Mode</b>	<b>SD</b>	<b>Lowest Score</b>	<b>Highest Score</b>
<b>Experimental Group</b>	18	9.72	9.00	9.00	3.58	3.00	18.00
<b>Control Group</b>	18	10.94	11.00	11.00	2.44	7.00	16.00

To compare the pre-test results of the two groups, the data were subjected to a normality test using SPSS. The Sig. values of the Shapiro-Wilk Test were more significant than 0.05. Hence, the data were normally distributed. The use of parametric test was necessary.

The comparison of pre-test scores between the experimental and control groups was carried out using the independent sample t-test using the SPSS. The summary is shown in Table 2.

**Table 2 - T-test Results Comparing Pre-test Scores in the Diagnostic Test**

<b>Respondents</b>	<b>N</b>	<b>t</b>	<b>df</b>	<b>Sig.</b>
<b>Experimental</b>	18			
<b>Control</b>	18	-1.198	34	.239

As can be observed in Table 2, the completion of the t-test comparing the pre-test scores of the experimental and control groups with the p-value (Sig. value) associated with the  $t = 1.198$  is .239 which is higher than .05 ( $p < .05$ ) indicating that they are not statistically different. Accordingly, no significant differences were found between the experimental and the control groups before the application of the treatment. The groups may then be said to be equivalent at the beginning of the study.

Table 3 presents a summary of the descriptive statistics of the post-test results. The data shown include the measures of central tendencies and variabilities.

**Table 3 - Post-test Results of the Diagnostic Test**

<b>Respondents</b>	<b>N</b>	<b>Mean</b>	<b>Median</b>	<b>Mode</b>	<b>SD</b>	<b>Lowest Score</b>	<b>Highest Score</b>
<b>Experimental Group</b>	18	25.22	25.00	21.00	4.97	15.00	34.00
<b>Control Group</b>	18	25.00	27.50	28.00	6.24	13.00	35.00

The results show that the mean scores of the experimental and control groups in the post-test are almost equivalent at 25.22 and 25.00 respectively. The median score of the control group is higher at 27.50 than the experimental group at 25.00. The most occurring score in the experimental group is only 21.00 while the control group is much higher at 28.00. The lowest



and highest scores in the experimental group are 15.00 and 34.00 respectively while 13.00 and 35.00 in the control group. The scores in the control group are more dispersed than the experimental group as indicated in the standard deviations of 6.24 and 4.97 respectively.

Referring to Tables 1 and 2, it can be noticed that the scores of both groups increased. To test whether the increase was significant, the data were subjected to a normality test to decide which statistical treatment is necessary — based on the results of the normality test using the SPSS, the Sig. Values of the Shapiro-Wilk Test were more significant than .05. Hence, the data were typically distributed. The use of parametric test was necessary.

To test whether the increase in scores was vital, paired samples test was used using SPSS. The report of the results is shown in Table 4.

As can be seen in the table, the t-test for both the experimental and control groups is significant as the p-values (Sig. values) are both less than .05. It means that there was a significant increase in the scores of the experimental group from pre-test (mean = 9.72) to post-test (mean = 25.22),  $t(17) = 15.85$ ,  $p < .05$ , and the increase was sizeable based on Cohen's formula ( $d = 3.73$ ). Likewise, for the control group there was a significant increase in the scores from pre-test (mean = 10.94) to post-test (mean = 25.00),  $t(17) = 11.12$ ,  $p < .05$ , and the increase was considerable based on Cohen's formula ( $d = 2.62$ ).

**Table 4**

Paired Samples t-test Results Comparing Pre-test and Post-test Scores

<b>Group</b>	<b>T</b>	<b>df</b>	<b>Sig. (2-tailed)</b>	<b>Cohen's Effect size (d)</b>
<b>Experimental</b>	15.85	17	.000	3.73
<b>Control</b>	11.12	17	.000	2.62

To compare the performance in the post-test scores, the data were subjected to a normality test and based on the results of the normality test using the SPSS, the Sig. Values of the Shapiro-Wilk Test were higher than .05. Hence, the data were typically distributed. The use of parametric test was necessary.

The comparison in the performance of the two groups in the post-test was carried out using the independent samples t-test using the SPSS. The results are shown in Table 5.

Table 5

*T-test Results Comparing Post-test Scores of the Two Groups*

<b>Respondents</b>	<b>N</b>	<b>t</b>	<b>Df</b>	<b>Sig.</b>
<b>Experimental</b>	18			
<b>Control</b>	18	.118	34	.907

As can be seen in Table 5, the completion of the t-test comparing the post-test scores of the experimental and control groups the p-value (Sig. value) associated with the  $t = .118$  is .907 which is higher than .05 ( $p < .05$ ) indicating that they are not statistically different. Accordingly, no significant differences were found between the experimental and the control groups after the application of the treatment. The groups may then be said to be equal at the end of the study.

**Discussion**

A Learning Management System (LMS) is a software application or web-based technology used to plan, implement, and assess a specific learning process. Typically, a learning management system provides a lecturer with a means to create and deliver content, monitor student participation, and assess student performance. Means et al.(2011), in a primary meta-analysis of research on blended and online learning for the U.S. Department of Education, reported that: "In new experimental and quasi-experimental studies contrasting blends of digital and face-to-face instruction with conventional face-to-face classes, blended education has been more effective, providing a rationale for the effort required to design and implement blended approaches. When used by itself, digital learning appears to be as effective as conventional classroom instruction, but not more so." The same authors attributed the slightly better performance of blended learning to students spending more time on task, wherein, classroom instructions are free-reigned, without time constraint and self-directed. Additionally, Jaschik and Letterman (2014), regarding attitudes towards digitally delivered courses, noted that appreciation of quality and efficiency of digital learning media is based on a user's exposure and mastery of such systems. Gallup, an American management consulting company, reported significant skepticism among faculty members about the quality of digital learning as opposed to traditional pedagogy, wherein digital learning is perceived to be of lower quality than in-person courses on several key measures. However, according to Sarma (2013), no evidence-based study had ever supported the claim that traditional methodologies are superior. Favor towards

digital media is primarily based on learner's ability to attend a physical school, as Bates (2005), reiterates: "online learning is used only when circumstances prevent the use of face-to-face teachings, such as when students cannot get to the campus, or when classes are so large that interaction with students is at a minimum." Fortunately, a generous number of research and best practices that guides implementation of digital learning is available (Anderson, 2008; Picciano et al., 2013; Halverson et al., 2013; Zawacki-Richter & Anderson, 2014).

### **Conclusions and Recommendations**

Data shows that both group academic performance significantly increased after the academic intervention. However, no significant difference between the academic performance attributed to the use of LMS, or from traditional methodology, can be established by the data collected. Thus, data confirms that the academic performance of learners is not dependent on the medium of instruction. Likewise, according to the data, the students were able to improve their academic performance through LMS and Self-directed Learning. It is accordingly recommended that further studies on self-directed learning as well as the student adaptive capability to such a learning module be conducted. Furthermore, a comprehensive and continuous evaluation of the MAAP LMS, including but not limited to its base software, physical facilities, and infrastructure; course and course contents should be regularly administered.

Finally, the Academy should devise an implementing guideline regarding the use of LMS as a learning medium should it decide to fully integrate the system, with all its potential applications in the Academic scheme. This guideline should include and guarantee that all involved: Administrators, Assessors, Developers, Evaluators, Facilitators, Learners, and Moderators are well versed with the system through training and continuous exposure and should be regularly verified by the Quality Assurance Department of the Academy.

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## **Creating effective navigation rules of the road e-learning content to promote competency for collision avoidance**

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### **Abstract**

Despite time-tested collision avoidance regulations, sophisticated navigation systems, STCW amendments to update training requirements, marine accidents, although sporadic, continue to occur, sometimes with catastrophic consequences. Often preventable, these accidents sometimes result in loss of lives, millions of dollars in damages, environmental pollution, tougher regulations, escalating insurance premiums, costly delays, and more.

Since our global economy relies on water transportation for cost-effective shipping of over 90% of goods [1], ramifications of marine accidents ultimately affect everyone, to some extent. Considering the relatively high cost of marine accidents, employing every possible measure to reduce the odds of occurrence is in the best interest of all stakeholders.

To some degree, human error, contributes to many marine accidents. Moreover, navigation rules of the road violations are the leading causes of most collisions. This paper explores the problem, and probable e-learning solution to promote navigation rules of the road competency for collision avoidance.

### **Introduction**

Despite time-tested collision avoidance regulations, sophisticated navigation systems, and STCW amendments to update training requirements, marine accidents, although sporadic, continue to occur, sometimes with catastrophic consequences. Often preventable, these accidents sometimes result in loss of lives, millions of dollars in damages, environmental pollution, tougher regulations, escalating insurance premiums, costly delays, and more.

Since our global economy relies on water transportation for cost-effective shipping of over 90% of goods [1], ramifications of marine accidents ultimately affect everyone, to some extent. Considering the relatively high cost of marine accidents, employing every possible measure to reduce the odds of occurrence is in the best interest of all stakeholders.

A study of *Safer Seas Digest*, a compendium of lessons learned from marine accident reports

issued or adopted by the National Transportation Safety Board (NTSB), shows some form of human error(s) as "probable cause" in 80.9% of 141 marine accidents investigated between 2013 and 2017. These accidents comprise of collision, allision, flooding, capsizing, grounding/stranding, and hull/machinery/equipment damage involving an extensive variety of vessel types [2].

Marine accident reports from investigation agencies around the world, reveal similar percentages of human error related accidents. The American Bureau of Shipping (ABS) reviewed 150 accident reports from Australian Transportation Safety Bureau (ATSB), 100 from the Canadian Transportation Safety Board (TSB Canada), and 100 from the United Kingdom Marine Accident Investigation Board (MAIB), for a technical paper on the role of the human element in accident causation and consequence mitigation. Human error transpired in 85% of ATSB accidents, 84% of TSB Canada cases and 82% of MIAB accidents [3].

Human error is simply defined as "a person's mistake rather than on the failure of a machine [or equipment] [4]." James E. Hall, former chairman of NTSB, expanded human errors to encompass flaws in: "perception; judgment and decision making; breakdowns in communication and coordination; distractions and diverted attention; inadequate training, skills and experience; inadequate supervision at the primary and higher management levels; and physical impairment, fatigue and other environmental stressors [5]."

People, often referred to as "human element," are the heart of operations in every segment of the maritime industry (vessel traffic services, shipping companies, regulatory and enforcement agencies, to name a few). Moreover, human error(s) originating in any of these entities can also inadvertently contribute to marine accidents. However, this paper focuses on reducing human errors committed by bridge teams, as a last line of defense against vessel collisions.

The International Maritime Organization (IMO) consistently amends STCW requirements and institutes other measures to "promote safety of life and property at sea and protection of the marine environment [6]." For instance, Safety Management System (SMS), training in Leadership & Managerial Skills (LMS), Bridge Resource Management (BRM), ECDIS, ship and port security. These measures can potentially prevent marine accidents. Unfortunately, marine accidents prevail.

Scrutinizing marine accident reports overwhelmingly shows that accidents are seldom caused by a single action, but ultimately result from a chain of human error. In collision cases, the final mistake in the error chain is often one or multiple violations of the navigation rules of the road. A prime example occurred during the early morning on June 17, 2017, near the Izu Peninsula, Japan.



The sky was dark with scattered clouds, moon was relatively bright, seas, two to four feet, and visibility unrestricted. The USS *Fitzgerald*, a naval destroyer, on a course of 190° T at 20 knots, was in a crossing situation with three eastbound container ships (one of which was the *ACX Crystal*) on her starboard side, near the Mikomoto Shima Traffic Separation Scheme (TSS).

The *ACX Crystal* collided with the USS *Fitzgerald*, resulting in the untimely death of seven sailors and at least three injuries aboard the destroyer. The *ACX Crystal* was damaged in the collision, but had no fatalities. The collision was "avoidable," according to the U.S. Navy accident investigation report for the USS *Fitzgerald* [7]. The report highlighted a host of human errors, some of which were multiple violations of the navigation rules of the road [8].

#### Rule 5 - Look-out

Risk of collision existed on the starboard side of the ship. However, watch standers assigned look-out duties were stationed only on the port side of the ship.

#### Rule 6 - Safe Speed

A speed of 20 knots, during darkness, in an area with other vessels cannot be considered safe.

#### Rule 7 - Risk of Collision

The Automated Identification System (AIS) was not used, even though the USS *Fitzgerald* was operating in an area with many commercial ships. No attempt was made to contact the other vessel(s) by VHF radio, sound or light signals. Additionally, radars were not adequately tuned to present accurate depiction of other vessels. Hence, "all available means" were not utilized to assess risk of collision.

#### Rule 10 - Traffic Separation Schemes

The USS *Fitzgerald* was not using the traffic separation scheme, and should have avoided it by as wide a margin as is practicable, as stipulated in Rule 10 (h). However, the bridge team was not aware of the traffic separation scheme.

#### Rule 16 - Action by Give-way Vessel

The USS *Fitzgerald*, being the give-way vessel in a crossing situation (Rule 15), did not keep out of the way of vessels on her own starboard side, as directed by Rule 16.

The report concluded that USS *Fitzgerald* "officers possessed an unsatisfactory level of knowledge of the International Rules of the Nautical Road." Since no official accident investigation report was obtained for the *ACX Crystal*, one can logically conclude that, regardless of fatigue, ignorance, complacency, distraction, or any other unacceptable excuse, her bridge team also neglected their duty to ensure safe navigation. Rule 17 (a)(ii) directs the

Stand-on vessel (*ACX Crystal*) to maneuver for collision avoidance if the Give-way vessel (*USS Fitzgerald*) is "not taking appropriate action in compliance with [navigation rules]." Hence, this collision could have been avoided by the *ACX Crystal* bridge team actions alone.

This poignant case, like many other collision cases, emphasizes the fact that navigation rules of the road can help prevent collision, if adhered to. However, bridge teams on the *USS Fitzgerald* and *ACX Crystal*, as well as those on many other vessels involved in collision, either lacked acceptable knowledge of navigation rules of the road; and/or, failed to apply these rules to avoid collision. Therefore, a probable solution (goal) is to enhance understanding of navigation rules of the road, and motivate mariners to apply them to avoid collision.

Effective e-learning contents can be customized to efficiently deliver the required navigation rules of the road competency training. "Effective," being the operative word, is an absolute necessity for any training content to successfully achieve its learning objectives. According to Badrul H. Khan, Ph.D., a world-renowned authority on modern e-learning, a successful "e-learning system should be meaningful not only to learners, but also to all stakeholder groups... [9]" .

The International Maritime Organization (IMO) released STCW circular entitled "Issues to be considered when integrating computer-based technologies into the training and assessment of seafarers," on 29 May 2002. The circular contained results from the Nautical Institute research and debate regarding the "role of computer-based technologies in the training and assessing of seafarers with a wide cross section of the [maritime] industry [10]." STCW 2010 Manila amendments introduced guidelines for seafarers training by distance learning and e-learning [11]. Basically, these guidelines are to ensure distance learning and e-learning contents are of an acceptable standard. In other words, simply producing a PowerPoint video with computer generated voice may not be acceptable.

These developments opened a realm of possibilities to produce highly effective e-learning contents. The "Eight dimensional e-learning framework [12]," developed by Khan, provides a comprehensive itemized checklist for organizing and evaluating e-learning contents. All items in these e-learning guidelines may not apply to every project. Hence, the e-learning content(s) developer must decide, based on requirements for the success of the course goal, which guidelines are relevant.

As a seasoned, professional mariner and maritime instructor for many years, I have always been concerned about the difficulty some learners have deciphering navigation rules of the road. However, I needed quantitative data to validate my concern. I requested exam results data from the U.S. Coast Guard merchant marine exams database. The data showed that

17.1% of the 7,463 navigation rules of the road exam participants, between 2014 and 2018, failed on the first attempt [13].

Additionally, I administered an anonymous survey, consisting of five short questions, to a group of 75 merchant marine deck office candidates who had taken a formal rules of the road course. One of the questions asked candidates to indicate which of five navigation rules of the road items (Legal verbiage, Required lights, Day shapes, Sound signals, and Right of way) was considered most confusing. Information from 39 responses received indicated the following: Required lights (41%); Legal verbiage (23%); Sound signals (23%); Right of way (10%); and, Day shapes (3%).

Navigation rules of the road competency problem also plagues the U.S. recreational boating industry. According to the *2017 Recreational Boating Statistics*, released by the U.S. Coast Guard, collision with recreational vessel, and collision with fixed object, ranked #1 and #2 respectively, in the top five primary accident types. Both resulted in a total of 1,615 accidents, 112 fatalities and 1,048 injuries [14].

In order to help learners better understand navigation rules of the road, I incorporated relevant videos, pictures, and illustrations into classroom lectures. These visual aids proved beneficial. However, I found it necessary to maximize learners' involvement in the process to achieve a more effective learning outcome. Exponential expansion in the e-learning era had opened a new dimension of training possibilities. Thus, I developed a fully interactive e-learning solution consisting of comprehensive video lectures, case studies, gamified exercises for lights and sound signals, and, various assessments including practice quizzes. Effective e-learning content creation is daunting, but the building process can be divided into manageable sections, and is similar for most projects: determine course goal to identify possible problems; brainstorm solutions; and, implement probable learning activities to engage learners. The underlying goal of every e-learning project is to keep the learners engaged, by all means necessary. Retrieval practice, spacing and interleaving, and any other learning strategy can all be successfully used in e-learning contents. To illustrate, for the e-learning content goal to enhance understanding of navigation rules of the road, and motivate mariners to apply them to avoid collision, the following examples were some of those used in the content creation:

### **Problem: Legal verbiage**

Mariners and vessel operators have varying educational backgrounds. Thus, legal style wordings used in some navigation rules of the road may be confusing. For example, "Nothing in these Rules shall exonerate any vessel, or the owner, master or crew thereof, from the

consequences of any neglect to comply with these Rules or of the neglect of any precaution which may be required by the ordinary practice of seamen, or by the special circumstances of the case."

- Rule 2(a)

**Solution:** Two professional voiceover talents were employed throughout the course:

one to read the navigation rules of the road verbatim, paragraph by paragraph; and, the other to elaborate as needed. Furthermore, having more than one voiceover talent may help break the monotony throughout the course. Computer generated voices, although usually free, can sometime be difficult to follow.

### Problem: Lighting configurations

Required lights may confuse some learners.

- Vessel lighting configuration changes, depending on navigation status.
- Lighting requirements may differ for international and inland navigation rules.
- A power-driven vessel, 50 meters or more in length, is required to have two masthead lights. However, a trawler, 50 meters or more in length, is required to have only one masthead light.
- A power-driven vessel less than 50 meters in length, is not required to have a second masthead light, but may opt to do so.
- Some vessels are required to show sidelights and sternlight when underway, even when not making way. Other vessels show sidelights and sternlight only when making way through the water (fishing vessels).

**Solution:** Vessel lighting configurations explained with the aid of 3D generated environment (Figure1).



Lighting examples are shown in high resolution "real world" videos or images.

In order to further engage learners, two interactive exercises were included: one requires learners to place the correct lights on vessels, and the other allows learners to rotate the

vessel 360° to see the lighting configuration from different aspects (gamification). The latter was developed to help learners correctly identify vessels from any aspect, based on lighting configuration (Figure 2).

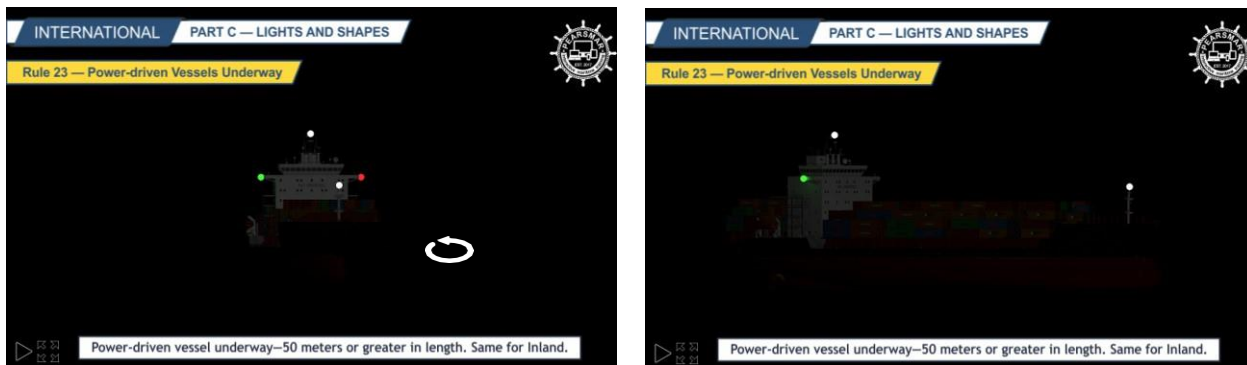


Figure 2

### Problem: Sound signals

Different vessels use different sound signals to communicate their presence, identity and navigation status, in restricted visibility. These signals also include an optional warning signal for vessels at anchor. Moreover, sound signals are also used to communicate maneuvers, or intention to maneuver.

**Solution:** In addition to detailed explanation of sound signals with examples, interactive exercises were included for learners to match the correct sound signal to different vessels.

### Problem: Right of way

Vessel priority status does not only depend on relative positions of vessels (Figure 3), but also on navigation status, and vessel type.



Figure 3

**Solution:** 3D generated graphics were used to illustrate right of way, from different perspectives (Figure3).

## Problem: Visualization aids

Some situations may be difficult to visualize. For example, learners not familiar with mine clearance process may not fully appreciate the danger of approaching within 1000 meters of a vessel engaged in mine clearance operations.



Figure 4

**Solution:** Detailed explanation of mine clearance process was supplemented with 3D generated graphics to help learners visualize the underwater operation (Figure 4).

## Problem: E-learning accessibility

Some learners onboard ships may not have a laptop, only a tablet or smartphone. There may be limited or no internet access.

**Solution:** The e-learning modules were built on HTML5 technology. They are responsive contents to automatically adaptation to screen resolution of different digital devices. And, they do not require internet access to run.

## Problem: Vicious circle of avoidable accidents

If the human error chain is not broken, it may result in a marine accident. Similarly, if lessons are not learned from marine accidents, continued unsafe navigational practices may contribute to a vicious circle of avoidable accidents. For example, on October 29, 2012, the *Bounty*, a tall wooden ship, sank off the coast of North Carolina, USA, during transit through the forecasted path of a hurricane. Three of 16 persons on board were seriously injured, plus two fatalities. The NTSB determined that the probable cause of the accident was "the captain's reckless decision to sail the vessel into the well-forecasted path of Hurricane Sandy... [15]"

On October 1, 2015, a little more than three years, the *El Faro* sank in the Atlantic Ocean, Northeast of Acklins and Crooked Island, Bahamas. All 33 persons on board were lost. The NTSB probable cause included "...the captain's insufficient action to avoid Hurricane Joaquin, his failure to use the most current weather information, and his late decision to muster the crew

[16]." Obviously, lessons could have been learned from the *Bounty*.

**Solution:** Case studies were used constructively throughout the course to illustrate specific unsafe practices and navigation rules of the road violation(s). Furthermore, these cases can serve as a somber reminder that accidents can happen to anyone, anytime, if adequate actions to avoid them are not taken in a timely manner. Hence, these case studies may motivate mariners to be more vigilant and act accordingly.

### Problem: Knowledge reinforcement

There is a possibility that some learners may forget parts of a section completed. **Solution:** Various assessments, including practice quizzes, are included in the e-learning modules to reinforce covered information. For example, practice questions provide feedback for each selected option (Figure 5). This helps learners understand why a particular option is incorrect. However, the final assessment only gives feedback at the completion of the course.



Figure 5

### Conclusion

High risk industries, like shipping, require competent crew for safe operation. Incorporating effective e-learning contents into seafarers' training is a win-win situation for all stakeholders. E-learning has proven to provide efficient and cost-saving solutions to competency problems in many industries. Moreover, navigation rules of the road competency will not only help prevent collision, but other maritime accidents (allision and groundings, for example).

The next step for this navigation e-learning content is to make it widely accessible to recreational boaters, deck officers, and able bodied seamen (AB) or other mariners serving as Ratings Forming Part of a Navigation Watch (RFPNW). The more knowledgeable a bridge team is, the safer.

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## **From the student idea into the cooperation with industry**

### **Collaboration between "Academia" and "Industry" for development of relevant skills**

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## **Abstract**

As part of the university studies and the subsequent thesis, students regularly develop very interesting ideas and approaches in the maritime context. Often, however, these ideas lack database to pursue these approaches. Best practice describes how to create an almost ideal collaboration between science and industry. It discusses the forms of cooperation and outlines the benefits of the facility.

## **Introduction and motivation**

Automatic Identification System data has become an essential data basis for a large number of disciplines. By the use of this data, it was possible to observe world shipping and draw a variety of conclusions. Exemplary applications in the academic environment and in research are:

- Real data for simulation exercises
- Data basis for statistical investigations
- The source of data for maritime accident analyzes
- Research on marine pollution
- Input data for work to improve the supply chain

Due to the wide range of use cases, students are also regularly in contact with this data. Likewise, there is a need and there is a desire to procure it.

## **Student request for ais data**

FleetMon (herein forth abbreviated as FM) operates one of the world's largest networks with its ten thousand terrestrial AIS receiving units. Besides, there are contracts with the three largest AIS satellite providers as well as several AIS research satellite constellations. Every day, 480,000,000 million messages are processed, with position updates per day for an average of 225,000 ships. This position in the market means that there is intensive cooperation with industry, public authorities and academic institutions.

Due to this market penetration, FM is always mentioned in the first places of the results when using search engines and in the question of providing AIS data. It is also in this way that students become aware of FM and ask for data for their student projects. Essentially, there are three variants of student data which are presented below.

## **The Research Institute as an AIS Partner**

FM AIS Partner [AISP 2019] are institutions, companies, or individuals who have an AIS antenna installed in a suitable location and send the received data to the corporate servers. In most cases, there is a long-term partnership and thus a foundation for sustainable trust.

The partners are provided with the hardware including all necessary cables and fastening elements. Likewise, the costs for the dispatch are taken over. In return, in addition to their received terrestrial data, these partners will also receive Accounts / Subscriptions to view the worldwide reception of AIS shore-based data.

As a cooperative partnership, requests from these research organizations are treated with the highest priority. This means that inquiries of this kind have, with almost 100%, without a doubt the highest chances of success from the point of view of the institution or the student. The main reason is that FM knows the participating institutions and very often the chair holders or the institute management personally. The goal is to create a win-win situation to make the partnership sustainable over many years.

### **B. Establishing contact on the base of existing relationship**

A regularly used option is direct contact based on existing research activity. FM is involved in a large number of research projects as coordinator and collaborative partner (example [EMS 2018]). In addition, there are a dozen ongoing projects in which FM is involved as a subcontractor or associated partner. As a result, there are direct relationships with over two

dozen institutions in Europe. The chairs involved in these facilities inform the students about the availability of the data and refer to us.

If the company participates in research activities, there is usually also an interest in the results. Now, if a student asks from these chairs, the probability that the subject is of tangential interest is high.

#### C. Contact establishment via the Form

Another way is to contact via the FM AIS Data Request Form [HAISD 2019]. This most frequently used way is probably the one with the lowest chance of success. In this way, FM receives more than 20 requests per week, which are by no means all answered. There is a pronounced pre-qualifying. The effort and the benefits for the company are evaluated. There are, of course, several dozens of examples showing that this path can be successful too.

When submitting the form, the student must recognize several aspects that should be mentioned. The following things should always be formulated:

- Name and contact details of your supervisor
- The university and the course
- The content of the project
- Your official e-mail address from your institution
- The exact data you are looking for (a request for all positions from the last 3 years for all cargo vessels is unlikely to be successfully fulfilled)

#### **Available data**

For projects, a variety of data fields can be made available [HAISD 2019]. These are on the one hand the pure AIS fields but also processed and evaluated data. The fields included in the AIS can be examined under [Raymond 2016].

#### A. Basis Output (AIS Dynamik Data)

- Timestamp (UNIX Timestamp)
- MMSI (Maritime Mobile Service Identity)
- Position (Lat/ Long)
- Speed (kn | knots over ground)
- Course (0-359° over ground)
- Navigation status

#### B. Advanced Output (AIS static and voyage related data)

- IMO (International Maritime Organization Number)
- Vessel name (AIS based)
- Callsign (AIS based)
- Draft (in meter)
- Heading (0-359° over ground)
- Rate of Turn
- ETA by vessel (sting - AIS based)
- Destination by vessel (sting - AIS based)
- Vessel type (0-99 | AIS based)
- Length (in meter | AIS based)
- Width (in meter | AIS based)
- Source (satellite or terrestrial)
- C. Individual Output/ Analyses (Example)
  - Last port (With LoCode and verbose name)
  - Destination by FleetMon (Based on AIS)
  - Distance to destination by FleetMon
  - ETA by FleetMon
  - Actual next port and distance
  - Verbose location
  - AIS class
- D. Portcalls (By Port or Vessel)
  - Port name with LoCode
  - Vessel Name, MMSI and IMO
  - Vessel dimensions
  - Vessel type
  - Time of arrival
  - Time of departure
- E. Individual FleetMon Database extract
  - Vessel type
  - Dead weight and Gross tonnage
  - Container and Person capacity
  - Height

- Year built
  - Builder, Manager and Owner
  - Flag and Classification society
  - Vessel images
- F. Area, Zone and Terminal Events
- Vessel type and name
  - Area/Zone/Terminal type
  - Area/Zone/Terminal name
  - Time and draft at entry
- 
- Time and draft at exit

### **Data supply**

The usual form of data delivery is the provision in the form of a .csv (character-separated values). The file is then sent by e-mail or offered for download on an sftp (secure file transfer protocol). In the case of download, the access authorization has a TTL (time to live) of four weeks after sending the access data by e-mail.

Alternatively, a data stream can also be provided. This is common for long-term projects in which a traffic area is observed. There are also scenarios in which an API (Application Programming Interface) is provided with a corresponding API key for a certain time. In principle, all APIs that the company makes available are also consumable by students [APIs 2019]. Depending on the needs, the number of API calls per month will be limited.

### **Agreement in written form**

Before any data delivery for a (student) project, a contractual agreement is required. It details what data is provided and how it is delivered. In addition, the value of the data is quantified in order to sensitize the student. The following four aspects are always agreed:

- The data is provided for free by FleetMon, for the purpose of assisting the student project. The student, his supervisor and all other persons directly involved in the student project may access and use the AIS data as required for the student project
- The signatory contractors confirm that this project has no commercial element and that the supplied data will not be used for any commercial purpose

- The signatory contractors agree to cite FleetMon data sources in any publications resulting from the student project.
- The signatory contractors agree to provide FleetMon with digital copies of publications which cite FleetMon data (including, but not limited to, students' theses).

### **Examples for cooperation**

From a variety of student work, several projects were selected and presented here. These examples show how the request was made and what output was generated:

#### **A. China, Dalian University of Technology**

This facility [Dailan UoT 2019] has been an AIS partner for many years. For work on the duration of stay of container ships in Chinese ports, port calls were requested. Furthermore, there was a need for AIS data from the immediate vicinity to analyze the reed duration. In 11-2018, for the period 01-2017 to 06-2018, the AIS data is provided within a radius of 40 NM and the port calls of the following ports:

- Tianjin (Xingang)
- Ningbo-Zhoushan
- Shanghai (Yangshan)
- Huizhou
- Rotterdam

#### **B. Germany, Leibniz-Institut für Wirtschaftsforschung**

A doctoral student of this very important business institute [ifo 2019] approached FM via the request form. There was a need for a long-term survey on container line traffic. In January 2019, two position signals were provided for the period 01-2014 to 12-2018 for all container ships in the world over. After a successful master thesis, the student is currently working on his doctorate at [IfW 2019] and still has access to FM AIS data.

#### **C. Iran | Islamic Azad University (Theran)**

The student from Tehran [IAZ 2019] with his supervisor (Faculty of Computer Science) had the goal to determine how many tankers are driving on the Strait of Hormoz. The contact in October 2016 was made via the Data Request Form. The main purpose of the work was to investigate questions about anomaly detection with the Markov Model using the sample file in the Strait of Hormoz.

Data of all ships from 10.09.2016 to 16.09.2016 from the Persian Gulf were provided. Out of this project developed an excellent master thesis with the subsequent publication [Toloue 2018] at an international conference. The student is currently working on his doctorate, with FM continuing to support him.

D. Indonesia | Sepuluh Nopember Institute of Technology

With the Sepuluh Nopember Institute of Technology [ITS 2019] in Surabaya, there is a long-term AIS partnership and joint work in research projects. The goal of the student work was to develop approaches for improved logistics between the islands. For this purpose, data from two Indonesian cargo ships of the year 2018 were provided. A delegation from the ITS visited FM 04-2018. A return visit took place 06-2018 to intensify the cooperation.

E. South Africa | Nelson Mandela University

A communication project in the field of telecommunications in Port Elizabeth [Mandela 2019] aimed to investigate the spread of AIS news in different weather conditions. The student contacted FM based on existing relationships. The special climatic situation in South Africa leads to a very changeable AIS reception quality. For this

purpose, all data received from 01-2015 to 12-2015 were provided by a bounding box. From this data supply an AIS partnership arose which was supported by an ERASMUS + project with the seafaring division in Rostock Warnemünde.

F. Spain | Universidad de Alicante

The contact made at a conference has addressed FM 2018. There was a need for vessel position data to measure the impact of shipping on marine pollution in the Alicante region [UDA 2019]. All AIS data for the year 2017 has been made available for the region. From the master thesis, a paper [Rivera 2018] was published in the area of Marine Pollution.

G. Georgia | Batumi State Maritime Accademy

Through several visits of the [BSMA 2019] within the work of the SMALOG project, a partnership relationship developed. This is countersigned by mutual visits. From the built trust an AIS partnership has developed, which will also be very sustainable in the future.

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