IAMU 2001 Proceedings

The Second General Assembly

INTERNATIONAL ASSOCIATION OF MARITIME UNIVERSITIES

2-5 October 2001
Awaji Yumebutai (Awaji Dream Stage)
International Conference Center
Kobe, JAPAN

iamu
international association of maritime universities

Proceedings of

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Sponsored by The Nippon Foundation

Supported by Ministry of Education, Culture, Sports, Science and Technology

Kobe University of Mercantile Marine

Kobe, JAPAN

Welcome to Awaji Island, Hyogo

I am very pleased and honored to host the second general assembly of International Association of Maritime Universities (IAMU) 2001 at Awaji Island, Hyogo, Japan.
The inaugural general assembly of IAMU was held in Istanbul in June, 2000. IAMU is trying to promote research and studies with the three common goals ;

1. What the next generation seaman education should be
2. What the future education for safety management at sea and its qualification should be
3. What the worldwide standard should be

In an increasingly global business climate with progress of the Internet, maritime transportation and the training of personnel, who could make contribution to it, play more important role than ever. Such circumstances would add to the significance of the role in the second general assembly.
I except a lot of people get engaged in the heated discussion over the various matters.

Awaji Island, the place of scenic beauty, is close to the international harbor city Kobe. The island is linked with the main island by the Akashi Kaikyo (strait) Bridge, which is the longest suspension bridge in the world.
We are to hold the assembly at Awaji Yumebutai International Conference Center in Akashi Kaikyo National Government Park. The complex is truly deserved to be called "the stage of dreams" with its magnificent harmony of the flowers, green hills and blue sea and has state-of-the-art facilities.

Kiyoshi Hara

Professor Dr. Kiyoshi Hara
Chair, Local Organizing Committee of IAMU2001
President, Kobe University of Mercantile Marine

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OUTLINE OF WORKING GROUPS

Working Group 1 - Maritime Education and Training System
Head : Gamal Eldin Ahmed Mokhtar, AASTMT (Egypt)

WG-1 aims at the contribution of individual seafarers to the safety and the environmental protection. To achieve this purpose, WG-1 carries out the academic discussions regarding with the improvement of the methods and the contents of maritime education and training, and the international cooperation.

Topics on WG-1

1) The analysis and assessment of the current reality and the future needs of the maritime education and training system.
2) The design through the scientific and academic approach higher level of education system than minimum requirement in STCW'95.
3) The design of curricula, examinations, assessment and evaluation methods.
4) The design of educational techniques, including the use of simulators.
5) The new framework to be introduced, including the utilization of flexible learning techniques such as multimedia technologies, satellite and Internet.

Working Group 2 - Maritime Safety Management System
Head : Neil Otway, AMC (Australia)

WG-2 aims at the establishment of the safety management system from shore side in the international maritime society. To achieve this purpose, WG-2 carries out the academic discussions regarding with the improvement of the methods and the contents of education and training of maritime safety management system, and the international cooperation.

Topics on WG-2

1) Quantification of performance measures associated with a Maritime Safety Management System and development of a process for monitoring these measures and taking action as necessary to achieve continual improvement.
2) Identification of shore-based activities associated with a Maritime Safety Management System that are not covered by the ISM.
3) Inculcating a culture of “safety” and “environmental awareness” amongst shore-based managers and operators.
4) Benchmarks for the technical side of shore-based ship management activities.

5) Potential problems and solutions for implementing international and national regulations and rules to comply with the objectives of a Maritime Safety Management System.
6) The common elements of Port State Control, Flag State Control and the Regulator's.
7) Identification of internationally-accepted environmental management and quality assurance standards that should be incorporated into a Maritime Safety Management System.
8) The appropriate allocation of responsibilities between shore-based and shipboard personnel for a Maritime Safety Management System.
9) Best-practice standards of training and qualifications required by port authorities worldwide.
10) Identification of the common aspects of Port State Control courses offered in various PSC regimes and determination of best practice in course content and delivery.
11) Conduct a study into the causes of incidents and accidents that have occurred whilst ships have been at their berth.

Working Group 3 - Promoting Global Maritime Excellence
Head : Malek Pourzanjani, Southampton Institute (UK)

WG-3 aims at the establishment of the global standardization of the maritime education system and the safety management system. To achieve this purpose, WG-3 carries out the academic discussions regarding with the improvement of the existing certification system and the initiation of the newly developed international certification system.

Topics on WG-3

1) The analysis and assessment of the current reality and the future needs of the certification system in the international maritime society.
2) The improvement of the existing certification system for competency of seafarers for the graduates of the high level maritime universities/faculties.
3) The initiation of the new global standard of the international certification system for competency of seafarers, including common examination and evaluation standards and methods.
4) The initiation of the new global standard of the international certification system for qualified experts in the field of maritime safety management, including common examination and evaluation standards and methods.

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CONTENTS

Session VI – Working Group 1
3 (Wed.) October, 15:30-17:00
Chairperson : Licheng Sun, Dalian Maritime University (China)

Session VII – Working Group 3
4 (Thu.) October, 13:30-15:00
Chairperson : Vladimir A. Loginovsky, Admiral Makarov State Maritime Academy (Russia)

Session VIII – Working Group 1
4 (Thu.) October, 15:30-17:00
Chairperson : Sue Lewey, Southampton Institute (UK)

Presenting Papers

2 (Tue.) October

[Session I, II]

Meeting the requirement and development of Maritime Education and Training

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ABSTRACT

Maritime Education and Training (MET) evolves along with the fast development of maritime industry. It faces with many new requirements in the progress of such an evolvement, such as the requirement on further enhancement of seafarers' practical skills and ability under the new STCW'95, the requirement on the introduction of new training items such as Electronic Chart Displaying Information System (ECDIS) and Bridge Resource Management (BRM), and other requirements and demands from maritime industry.

The process of meeting those requirements can be seen as new development of MET. Various difficulties and problems are encountered in such a process. The essay analyses in depth some of them that MET is now facing with, focuses on: 1) How to meet the requirement of STCW'95 on the increasing of seafarers' practical ability? 2) How to keep pace with new maritime development in terms of maritime technology and maritime management science applicable onboard ship by adjusting their curricula and educating systems? 3) How to enhance the capability of fast responding to various needs of the maritime industry?

The essay comes up with some constructive solutions based on the above analysis in the light of successful experience in STCW implementation and MET management. In its final summarization, it stresses on the application of a comprehensive way for a satisfactory solution to all the above-mentioned questions and problems.

Key words: MET, CBT, Curricula, Training, Teaching, Maritime, Education, Management

1. Introduction

MET is facing with many new requirements, and those can be seen as new MET development: 1) MET should make effort to enhance further the seafarers' practical ability and skills as required by STCW'95. 2) MET institutions have to involve newly-emerged training subjects and items in both maritime technology and maritime management science aspects into their curriculum systems, such as ECDIS, BRM, multifunctional VTS. 3) For those countries interested in crew-manning supply, the quality of their MET is one of the main factors affecting the competitiveness of their seafarers in crew-manning market. So the additional requirement for those institutions is that they should place special importance on the capability and rapidity of response-making so as to react fast and correctly to different demands from the manning market.

For those pursuing higher education and training quality and more competitiveness, more subjects and items have to be included into their curriculum system.

To sum up, the development of MET in future encompasses on the following aspects (but not limited hereto) while taking constructing a more effective and efficient MET as a whole goal.

1. To keep theoretical education and practical training simultaneously, while the latter to be paid with more attention.
2. To keep maritime education and training the same pace with the development of maritime industry, which includes both the development in the respect of maritime technology and maritime management science, and to make sure those achievements to be fully and correctly applied onboard by equipping students/trainees with above achievements.
3. To build up and reinforce the response-making capability of educating and curriculum systems in order to suit various needs

It should be pointed out that the essay looks at only those problems having been met with in the above-mentioned MET development. Meanwhile, all the discussions and analysis in this essay are based on understandings and practices in a context of MET institution management, not training centers engaging in short course training, intensive training, etc,.

2. Problems being put forward and analysis

However, after a few years of STCW implementation and pursuing the above, i.e., future development of MET, quite some problems have been identified, including but not limited to the following:

a. Difficulties and problems exist in full fulfillment of STCW'95 requirements on the enhancement of seafarers' practical skills.
b. There is a lack of capability within the MET institutions in the respect of new subject designing and deployment, and a lack of capacity of curriculum adjustment, while maritime technology and management science keep evolving.
c. There is a shortage of capability, where MET institutions are working in market scheme, of fast response-making to the demands from crew-manning market, also owing to the lack of capability of new subject designing and deployment, the very limited capacity of curriculum adjustment, etc.

So to summarize, the key problems are: 1) how to enhance the seafarers' practical skills? 2) how to enhance the capability of response-making and the flexibility of an educating and curriculum system?

2.1 Problems encountered in meeting STCW'95 requirements on the enhancement of seafarers' practical skills

The usual way of implementing such STCW'95 requirements can be illustrated by the figure 2-1. Theoretical education goes first, then practical skill training, which can be done by simulator training, CBT and onboard training. The final stage is assessment and examination.

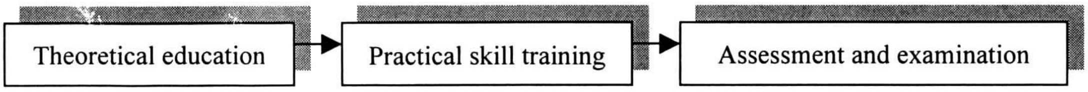

Figure2-1

The problems arisen in the above process are: 1) new demand on the training facilities due to more practical training as required, causing possibly funding problem. 2) with the joining of or more practical training, the workload for the whole process increases and the hours required for education and training expand as well. These cause consequently problems to teaching staff and training infrastructures. On the other hand, if the whole workload and hours have to be controlled, then other problems may be caused such as complaints from teaching staff and the imbalance between theoretical education and practical skill training.

As to the problem regarding the new demand on training facilities, for MET institutions in major shipping countries, the average cost contributed to each trainee is quite high due to small number of trainees since a procurement of new equipment or building of new facilities usually requires large investment. So the necessity of such a procurement or building has to be detailedly taken into account. For crew-manning supply countries, the problem is the shortage of funding, although the trainee group is usually large enough. Anyway, the funding problem does exist in many cases.

Simply adding practical training to the theoretical education is not realistic. For most of MET institutions, it is regulated by education authority that the whole education and training hours cannot be exceeded excessively. Consequently, each subject or training item should be done in given hours.

Both theoretical education and practical training are required in many subjects or training items. To give prominence to the practical training as required by the convention, the practical training is now occupying more percentage of hours given to a certain subject or training item. The theoretical education hours therefore has to be shortened to a certain extent. This causes problems: Quite a number of instructors complain nowadays insufficient hours for theoretical teaching. Apparently, insufficient theoretical teaching can affects disadvantageously the practical training.

So the final question is how to secure the effective fulfillment of both theoretical teaching and practical training, while not adding new education and training hours?

2.2 Problems encountered in meeting the development of new maritime technology and management science

New subjects and items are emerging, such as ECDIS, AIS. Meanwhile, a new trend can be seen in maritime industry in recent years, that is, maritime management is attracting more and more attention. Many newly-emerged management subjects or subjects of that nature, such as BRM, FSA, onboard management, are understood as an effective way leading to more effective and efficient maritime operations. They are also understood as a promising and significant way of eliminating maritime accidents, especially human errors. More and more shipowners stress on the necessity of their employees onboard to be equipped with enough management knowledge and skills. All these should be introduced into MET institutions' curricula.

However, it is not easy to introduce a new subject or training item into educating and curriculum system.

Problems exist in: 1) new demand of training facilities and the expanding of education and training hours, which have been discussed in section 2.2. 2) slow responses that educating and management system make towards the emergence of new subjects and training items. Further analysis reveals more detailed reasons:

a) the introduction of a new subject or training item under Quality Management Scheme needs to go though many formalities and takes time. The procedure for an introduction is generally divided into two stages, i.e., the curriculum designing and incorporation of the curriculum into educating system. (figure 2-2).

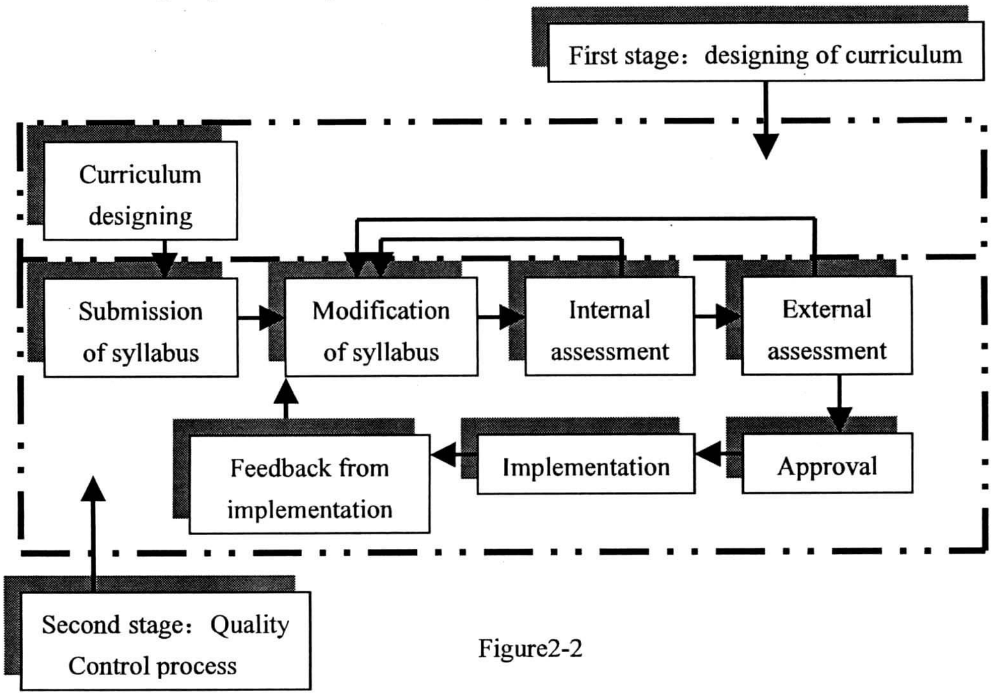

Figure2-2

b) possible inconsistence between different departments and sections, delay of funding, shortage of human resources and other various resources, etc,.

3) once failed to perform the above procedure, the problem becomes the difficulty to adjust curriculum by the educating and curriculum system itself to deal with the new emergence.

So the question is how to work out reasonable and exercisable curriculum, then incorporate it into educating and curriculum system, or, to adjust the system so as to absorb the new emergence.

2.3 Problems encountered in fast responding to crew-manning market

For countries interested in crew-manning supply, their MET institutions should have good capability to respond various needs from the manning market. The needs and their changes from the manning market mainly are: 1) high quality seafarers. Those who master in both navigation and sea transportation management may bring more safety and profits to shipowners. 2) seafarers with designated quality. 3) the number of seafarers available 4) the quality, knowledge and skills of seafarers available 5) time for obtaining available seafarers, etc,.

The demands from the manning market can be variable, and may impose upon the MET institutions abruptly. Possibly one day a large shipowner or crew-manning agency drops in unexpectedly, listing out various requirements for his prospective employees (seafarers). Again, when the oil tanker market booms, the market may require enough competent seafarers to be supplied in short period. Thus for institutions, first of all they should have a fast-responding scheme in place, and then have good capability of response making. However, this is exactly what many MET institutions are short of, since most of them work according to pre-planned schedule and rigid curriculum. Even though there is a modification for that schedule and curriculum, it takes time. MET institutions therefore stay in a passive position. That is the question.

3. Measures for problem solving

3.1 Measures to be taken for problems in section 2.1

There are two alternatives: 1) cutting away or compress the content of theoretical education, making it simple. 2) enhancing the efficiency of education and training.

There might be some difficulties when putting the first method into practice. How much importance should MET place on theoretical knowledge is always in discussion. Additionally, maritime instructors complain about the reduction of theoretical teaching hours.

So the necessity of seeking for advanced and high efficient methods does exist. The second consideration is much preferable, and can be achieved currently in the following ways: 1) the use of multimedia education and training facilities 2) the use of CBT software 3) the use of simulators. Particularly the CBT, which enjoys concurrently the advantages of cost-effectiveness and efficiency, is able to solve the problem of funding and the expanding of education and training hour as well.

3.2 Measures to be taken for problems in section 2.2

To fast respond to the emergence of new subjects and training items,

1) adoption of concise and quick curriculum designing procedure

This is purposed to shorten the time spent in the first stage (see Figure 2-2). By comparing with other types of curriculum designing models, the procedure enjoys the advantages: "... Given the pressures that teachers and curriculum developers work under, a rational model provides a straightforward, time-efficient approach to meeting the curriculum task." (Murray Print, 1993). The procedure is shown as follows (Figure 3-1).

Step 1: diagnosis of needs
Step 2: formulation of objectives
Step 3: selection of content
Step 4: organisation of content
Step 5: selection of learning experiences
Step 6: organisation of learning experiences
Step 7: determination of what to evaluate and ways and means of doing it

Figure 3-1 *Source:* After Taba, 1962

2) adoption of Project Management (PM)

Project management is proved to be a powerful tool. "Project Management is a way of fulfilling different tasks within a prescribed time period, the budget and quality objectives by combining various systems, methods and human resources. An efficient PM means planning, distributing and controlling for all organizational resources in a time period prescribed for the realization of substantial indexes and objectives." (U.S Project Management Institution, *Guidance to Project Management*)

The use of project management in a new emergence introduction possesses the following advantages:

a) enhancing by and large the capability of adjustment for an educating system towards the emergence of new subjects or training items

b) harmonizing the cooperation between departments and sections, and utilizing efficiently human resources, funding and other resources

c) improving the quality of subject to be introduced, etc,.

3) flexible styles for course delivery

When failed to introduce new subject into educating and curriculum system, those styles can be applied: a) short courses. b) symposium. c) intensive training. d) others

3.3 Measures to be taken for problems in section 2.3

A scheme of fast response making should be established first of all. Section 3.2 covers that. Then the capability of response making should be built up.

A designing of dynamic and flexible education system should be considered, where fixed and flexible modules co-exist to a reasonable proportion. Those modules can be organized in different ways in order to suit different needs. Meanwhile, in such a system, the whole hours should be divided fixed and flexible hours to a certain proportion. The figure 3-2 tells the basic idea of such a system.

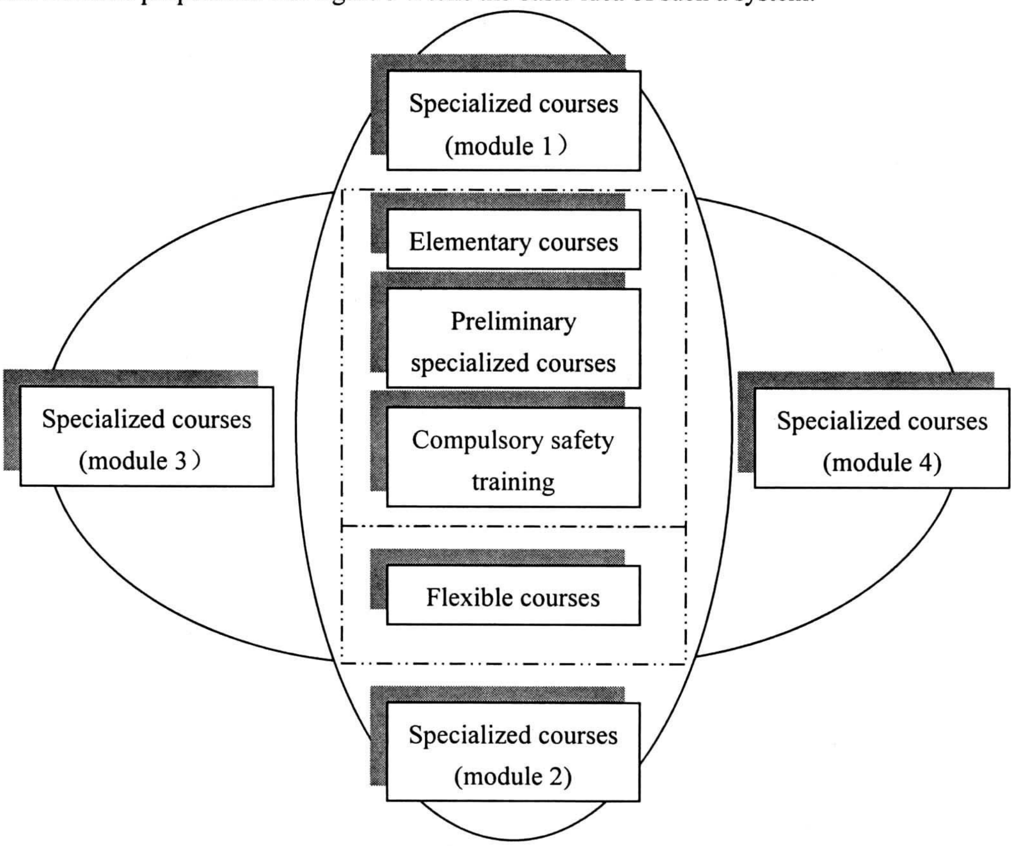

Figure 3-2

4. Summarization

MET evolves fast. Challenges and opportunities co-exist. The above is only a part of discussion and analysis. For a better solution, and also for the purpose of meeting fully the changes and development of MET, it should be pointed out that the following should be applied comprehensively.

1) The latest teaching pedagogic and training tools, including the application of computer technology
2) The application of various management sciences, such as information management, project management, and human resource management.
3) The application of systematic engineering science
4) The comprehensive application of the miscellaneous methods

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M.E.T Program in Mokpo Maritime University

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ABSTRACT

According to the growing economics and changes of social environments, seafaring as a job is not so attractive that young generation does not want to join MET program and young officer regards shipboard service as temporal career. On the other hand sophisticated environment of ship operation requires well-trained, high standards of seafarer. Thus it has been the common topic of MET institutions how to attract good applicants. To cope with this problem, many maritime universities have developed advanced educational programs. Mokpo Maritime University also developed new program, so called dual major system, which provides subjects for navigational watch officer according to STCW convention, and subjects for professional mobility between shipboard service and shore-side professionals. In this paper, the outline of dual major scheme of MMU is briefly introduced with current educational activities.

1. Introduction

In recent years, ship operation has rapidly achieved big change in such technological fields as energy saving, labor saving and high reliability. This trend is along with economical conditions and the developments in new technology. Highly sophisticated equipment has greatly contributed to the complexity of ship operation. In the light of this advanced technology, the education and training of ship's officer need more efficient MET program, new applicants in higher admission standards and also the convention of STCW is one of the countermeasures to meet safe operation of the ships in changing maritime environment

On the other hand, seafaring as a job has been loosing its attraction as economic and living standards growing. Thus more or less it is the common problem for the maritime universities to attract good applicants to the institution.

In these days, the topics of MET institutions are

- to establish new educational program with highly efficient teaching tools according to the requirements of maritime industry and international standards.
- to show applicants visions in MET with career developing program which gives professional mobility based on advanced high technologies of ship.

Many maritime universities developed advanced MET program to cope with this problem and Mokpo Maritime University is also operating dual major system. In this respect, I would like to introduce MET program in MMU for deepening mutual understanding through the exchanging of educational information.

2. Environment of MET in Korea

Modern shipping industry in Korea started after 2^{nd} world war and it was very poor in scale and quality at that time. But within a half century it shows surprising developments and marks one of the major countries in world shipping market. It is agreed fact that the motive of this rapid development is based on abundant well-educated seafarers supported by Korean government.

At present there are two maritime universities with 400 cadets per year in each deck and engine departments, and 1 institution for retraining and additional certificate course.

Supports of government to maritime university have continued for several decades and it can be categorized into two groups, finance and military service.

- Financial support to university: educational facilities including training ship, student dormitory
  Student: subsidy to tuition, free uniform, free foods and dormitory
- Exemption of military service: Korean young man must finish military service for 2 years but graduate of maritime university can be exempted if he works on board for 3 years.

These kinds of supports have worked very effectively to induce good applicants joining to MET program but in these days they seem to be less attractive than early years as per the economic growth and change of social environments.

3. Introduction of Maritime Transportation System faculty in MMU

3.1 Educational goal

The faculty of Maritime Transportation System provides academic instruction and practical training programs for professionals in shipping industry. A principal objective of the faculty is to aid students in advancing their skills and knowledge to comply with internationally accepted standard of training for masters and navigational officers according to STCW convention

But also it is commonly agreed today that MET has to serve several purposes. Undoubtedly the qualification for ship services stands in the first place, but close after this it comes the requirement to provide a profound basis for shore based careers within the shipping industry.

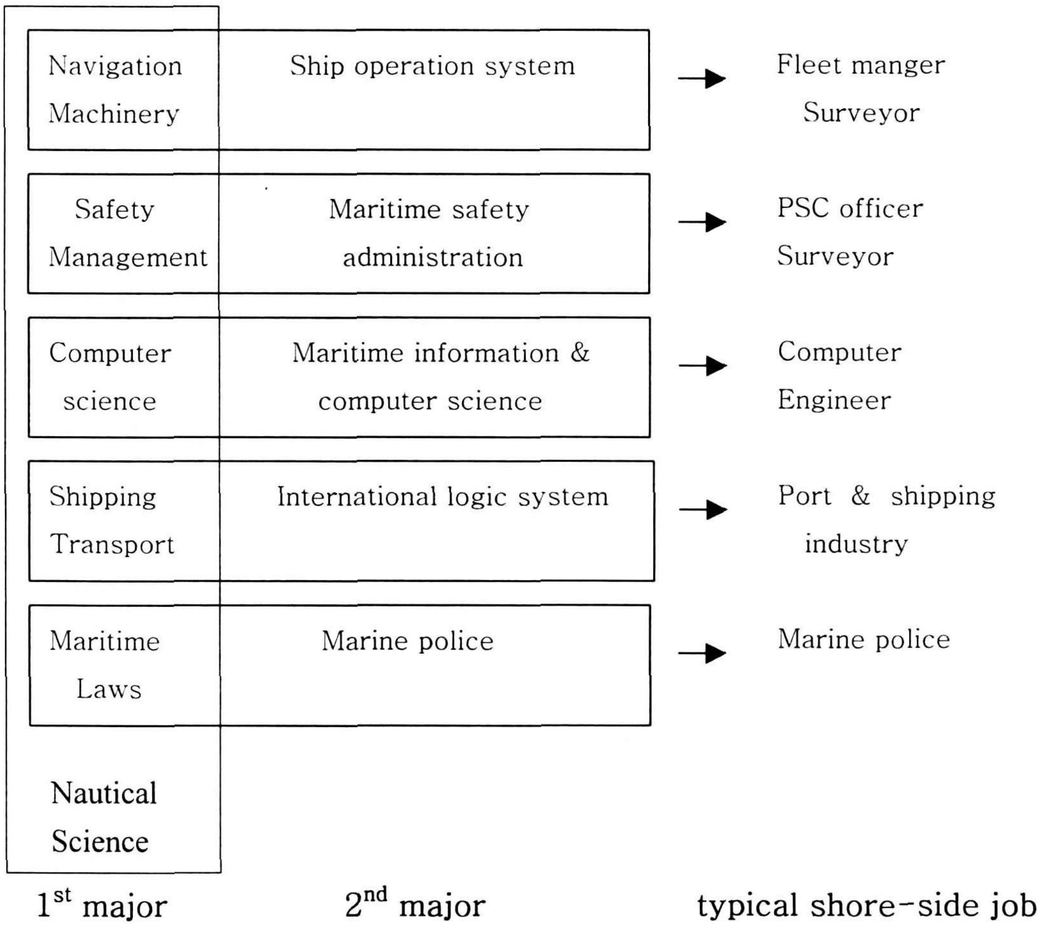
Thus this faculty aims to provide education and training for deck officer and master, and also to expose cadets for a long-term rewarding career by paying greater attention to the development of scientific orientation and maritime industry.

3.2 Outlines of 5 departments

Knowledge and skills for deck officer consist of shipboard operations, information and computer technology, logistics including shipping business, marine safety and environment protection, which could be extended to shore based jobs in marine industry.

The faculty offers dual major system, which consists of one mandatory core course of department of nautical science and additional five selective courses. 5 selective educational schemes is derived from nautical science and they intend to give cadets professional mobility and flexibility in career development and to lower the barrier between the professionals in sea service and shore.

The outlines of educational scheme in each department are shown as <fig.1>



<Fig.1 The structure of dual major system>

The outlines of educational schemes in each major are as followings;

1) Principal course of Nautical Science

Students entering the faculty of Maritime Transportation System must enroll in the course of nautical science. The objective of the course is to aid students in advancing their skills and knowledge to comply with STCW convention to be competent deck officer.

It provides instructions and training in the fields of navigation, cargo handling & stowage, the operation of the ship and radio communication etc..

2) Department of Ship Operation System

The objective of this department is to provide expert knowledge for dual-purpose officer with alternative certificate but dual-purpose officer is not accepted in Korean shipping industry. Education and training program is extensive to engineering and ship's machinery.

It aims to develop capability for the fleet manager, surveyor, and supervisor in shipping industry after sea-service.

3). Department of Maritime Safety Administration

This department provides extensive knowledge concerning the management of marine safety. The core of curriculum is knowledge in international maritime laws, marine pollution control, protection of marine environment and safe ship operation etc.

It aims to develop capability for PSC officer, surveyor and safety manger etc. after sea-service.

4). Dept. of Maritime information & Computer Science

This department provides extensive knowledge concerning computer science. The core of curriculum is knowledge in computer system, programming, information technologies etc..

It aims to develop capability for information manager in transportation industry after sea-service.

5). Department of International Logistics System

In these days, combined transportation is the most popular type of international cargo flows and the importance of logistics is recognized.

This department is to instruct students in the subject of shipping business, combined transport system, insurance, port management and logistics systems. It aims to develop capability for manager in shipping and international transport industry after sea-service.

6). Department of Marine police

This department provides extensive knowledge concerning activity of marine police. The core of curriculum is domestic and international laws focused in marine police and it aims to develop capability for marine police after sea-service.

4. Curriculum and facilities of the faculty of Maritime Transportation System

4.1 Educational scheme

The educational scheme is programmed to develop general knowledge of navigation prior to onboard training. Onboard training is carried out during 3rd year and in 4th year, extensive subjects in nautical science and 2nd major are concentrated.

<Table 1 > educational scheme of faculty

School year	Semester	Subject	Remark
First year	Spring Semester	Arts, Mathematics, Physics, Introduction to nautical science	
	Fall Semester	Nautical science based on STCW	
Second year	Spring Semester	Nautical science based on STCW	
	Fall Semester	Nautical science based on STCW	
Third year	Spring Semester	On-board training Ⅰ (Training ship or shipping co.)	To be confirmed by training record book
	Fall Semester	On-board training Ⅱ (Shipping co. or training ship)	To be confirmed by training record book
Fourth year	Spring Semester	Nautical science Selective 2nd major	
	Fall Semester	Selective 2nd major	

4.2 Structure of educational scheme and credits

As mentioned above, the faculty is composed of 5 departments and students must enroll in the course of nautical science and one another additional department selectively, so called dual major system.

Credits of each scheme are as followings;

<Table 2 > credits of educational scheme

	Common science	1st major (Nautical science)	Onboard training	2nd major (selective)
Compulsory	12	57	(30)	18
Optional	16	14		25
Total	38	71	(30)	43

* 1 credit is a unit for 15 hours of lecture.
* Students must get more than 150 credits before graduation.
* Subjects in nautical science to be completed before onboard training.

5. Onboard Training

Traditionally in the MET program, the emphasis is laid on the practical onboard training to prepare them for the job and to fit them to the shipboard life. Though MET have been carried out in various ways according to each country's tradition and educational system, generally it is done by combination of school education and onboard training which is also mandatory for certification as ship's officer in STCW convention. Onboard training is to develop practical competence as ship's officer but the type of training is various as per each tradition and educational system.

One of these, onboard training can be divided into several parts, which are spread over total MET program. In this case, each part of training can be designed for the given goal like pre-sea training etc. and this is the traditional type in most of European countries.

Another type of these, onboard training continues for one full year with intensive programs, which is adopted in Korea and some other countries.

Onboard training in MMU is carried out at 3rd school year, for six months on training ship and another 6 months on ship of shipping company, alternately.

Training ship accommodates cadets, who are trained under supervision of lectures for six months. For another six months, cadets are sent to shipping company as apprentice officer. Ship's staffs supervise the training according to the training program and training record book. We believe this combined training system could compensate the week points in each training period.

The time needed to understand ship's operation and to be capable of navigational watch properly was surveyed by questionnaire for 109 cadets and shown as below.

<Table 3 > time needed to be capable of navigational watch

Time	4 month	6 month	8 month	10 month	No answer
Ratio(%)	46.8	37.6	5.5	4.6	5.5

This result shows that the most of cadets need about 6months of sea experience to be capable of navigational watch and the rest of the time is used for repeating practices.

6. Educational Facilities

Typical facilities of education in MMU is as follows;

- Training ship :
  - T/S Yudal : G/T 3,600 160 cadets
  - T/S Saeyudal : G/T 3600 152 cadets
- Full Mission Ship Handling Simulator with 4 own ships
- Liquid Cargo Simulator with 5 terminals
- GMDSS Simulator with 60 terminals

7. Refreshment program of maritime lectures

As per the advancing technology, Lecturers also needs some time for refreshment to follow up the change of ship's operational environments and new technologies. Thus with the cooperation of shipping company, MMU is offering re-freshening program for lectures joining to merchant ship in short-term voyage.

8. Conclusion

In these days, sophisticated environment of ship operation requires well-trained, high standard of seafarer, but seafaring as a job is not so attractive that young officer regards shipboard service as temporal career.

In this regards, to attract good applicants to MET, it is essential that educational programs provide subjects which can give professional mobility from ship to shore.

To cope with high technology of ship and professional mobility, syllabi of MET contain subject as economics, management and computer science in addition to navigation, which are not only useful for shipboard application but also for working in the shore-based maritime industry. Thus MMU established dual major system, one for shipboard career based on STCW, another for shore-side career based on shore side requirements and so far it seems quite successful. There can be an argument that if syllabi of MET provides professional mobility so effectively, then it would encourage young officers to leave the ship.

But to keep competent seafarer in shipping industry, this kind of trial seems unavoidable.

There can be another arguments that if syllabi are not concentrated to shipboard skill and knowledge, then it will downgrade the competence of seafarer. But I believe that it can be solved by rationalization of MET program, modernized training facilities like simulators, well- trained lectures.

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A Comparative Study of Training Methods for Training and Education of Marine Engineering Students of IAMU Universities

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ABSTRACT

The major role of the marine engineering department of IAMU member universities/faculties is to provide their undergraduate students with effective and highly leveled education and training to be a highly competent marine engineer.

Standing at this point of view, the authors have considered the effective training method in compliance with STCW'95 convention and the Codes. Without doubt, the traditional methods, using ships in service and/or training ships, to provide practical experience have long been recognized as the effective training method by marine engineering institutions. On the other hand, engine room simulators have recently begun to attract notice as a new training method because of the several advantages over the traditional methods.

In the first part of this paper, a comparative study among the training methods utilizing a ship in service, a training ship and an engine room simulator is carried out, by taking account of the merits and demerits of each training method in view of reality, repeatability and types of training concepts. Consequently, the way to organize the most effective training method for IAMU member universities/faculties are proposed in the first part of the paper.

In addition to this, the authors also considered additional training programs which aims higher competencies for maritime institute graduates than the minimum requirement for the competences shown in the tables A-III/1 and A-III/2 in the Code of STCW'95. In the second part of the paper, the authors also discuss what an additional competence should be needed for the graduates from advanced maritime universities and propose a competence for managing the risk in machinery space on board ship as the additional competence for students of IAMU member institutions.

1. Introduction

Importance of the safety at sea and preserving the sea environment has been increased in the operations of the ships during last decades. To achieve a safe navigation and preserve the environment, ships are equipped according to the IMO regulations and standards.

On the other hand, sea personnel are the people who fulfill these tasks by using the equipment. Therefore, the training of the seafarers for updated information and for better skills also became a very crucial issue. Even though there are new regulations and guidelines, this still does not reduce the accidents which 80% of still caused by human mistakes. The tasks expected from the sea personnel to provide a safe navigation are:

- ✧ To perform their duties without risking the safety of the ship,
- ✧ To be able to take action fastly and reliably when any unexpected event occur.

Success of acheving these tasks are based on the level of the personnel's knowledge and skills. The lack of these causes the personnel not being able to use the equipments appropriately and effectively that also increases the risk in an abnormal situation resulting more harm at the incident.

In this paper, two main targets are focused regarding to the improvement of the training and education of marine engineering students of IAMU universities. These are:

(i) to propose a useful method to organize the most effective training method for the students of the Marine Engineering departments of IAMU institutions.

(ii) to make it clear what the difference between the minimum requirement for the marine engineers' copetences in accordance with STCW Code A and the requirement to be a qualified marine engineer in view of IAMU objectives.

2. Competency Levels and Training Methods According to STCW95

Competency Levels of Engineer Officers for ocean going vessels are basically classified into two categories in STCW Code A-III as follows [1]:

- ✧ Operational Level
- ✧ Management Level

For Operational Level, Table A-III/1 defines the specification of minimum standard of competence for officers in charge of an engine watch in a manned engine room or designated duty engineers in a periodically unmanned engine room. For Management Level, Table A-III-2 defines the specification of minimum standard of competence for chief engineer officers and second engineer officers on ships powered by main propulsion machinery of 3,000 kW propulsion power or more.

To demonstrate the competencies for both operational and management levels, different types of training methods recommended in STCW95. These training methods based on STCW95 could be listed as the following:

i. Classrooms/Workshops/Laboratories
ii. Ships In Service (Merchant Ship)
iii. Training Ship
iv. Engine Room Simulator (ERS)

As suggested in STCW'95, labs and workshops could be used to demonstrate some of the competencies. In this paper, this method is considered as the base level and the fundamental teaching methodology for maritime institutions. Therefore, the workshop and lab training or teachings are not considered as an alternative method to the other three.

For the purpose of this paper, the following assumptions are made regarding to the types of training methods under study:

- ✧ Ship in-Service is an ordinary merchant ship that comply with IMO regulations and standards [1],
- ✧ Training ship has both the navigation personnel and training instructors
- ✧ Simulator is a Full Mission Type [2].

In view of these assumptions, summary of merits and demerits of three training methods – Ship in Service, Training Ship and Engine Room Simulator- are considered and listed in the following sections.

2.1 Ships in Service (M. Ship)

- o Classical method that is still preferred by many institutions
- o "Actual working place" after school
- o Training record book is provided with guidelines
- o Having the first priority of the M.Ship is commercial, no active responsibility may be given to trainees
- o Difficulty of training some subjects
- o Difficulty of finding an approprite commercial ship
- o Unscheduled events and learning
- o Difficulty of evaluation
- o Dependence on teaching skills of Chief or Second Engineers - difficulty of standardization.

2.2 Training Ship (T. Ship)

- o Navigation is based on the training curricula,
- o A "good training program" may easily be achieved.
- o Actual working place after training is similar
- o Having training personnel, possibility of standardization.
- o Still some malfunctions cannot be implemented and some certain responsibilities cannot be given to the students
- o too costly

2.3 Engine Room Simulator (ERS) Training

- o The operations of the machinery are simulated as close as possible to their actual conditions,
- o Training for both normal and abnormal condition "repeatedly"
- o Cost-effective
- o Time effective
- o Flexible and controlled schedule of the training curricula,
- o Controlled evaluation of the students.
- o Possibility of setting standards for globalization
- o Even though ERS simulates the real engine room environment and systems, still "ERS is not the actual working place of trainees"

3. EVALUATION AND COMPARISON OF TRAINING METHODS BASED ON STCW95

Having the suggested training methods in STCW95, the authors' intention is to compare these methods based on some criteria as well as in view of the merits and demerits of these methods explained in the previous section. In this section, to perform a detail study and evaluation, each of the following four criteria are considered for comparison of the training methods against each other:

- ◊ Reality,
- ◊ Repeatability,
- ◊ Type A,
- ◊ Type B.

The first two criteria, Reality and Repeatability, are basic expectations from a training method to have to train marine engineering candidates. While the ERS training has so many advantages over T.Ship and M.Ship training, it is authors' interest to find out how ERS training is good when reality issue is considered. Also, authors' another interest is to compare ERS training with M.Ship and T.Ship that have actual ship environment but provide limited as well as unrepeatable training subjects.

The first competence required for a marine engineer is to keep all of the machines and systems under the normal condition. This is valid for both operational and management levels. In order to achieve this competence, marine engineers have to know what normal condition is and to be able to forecast the malfunctions when an abnormal condition is monitored. To achieve this, the purpose of the training is to keep all of the machinery under the normal condition. This type of training criteria will be defined and called ~~as~~ "Type A Training" throughout this paper.

The second type of competence is to recover the abnormal condition to normal condition based on the knowledge and experience. For this competence, marine engineers have to know the difference between the normal and abnormal condition, the process to recover and should not fall into the panic condition when an abnormal condition occurs. In view of the skills and experience needed to recover the abnormal condition to the normal one, set of repeated training with abnormal condition is needed. This type of training criteria will be defined and called as "Type B training" throughout this paper.

Since one of the purposes of this paper is to propose a way to organize the most effective training method, the procedure of comparison for management level will only be shown as an example with some explanation in the following section. The detail procedure for both operational and management levels are referred to described in another paper presented by the authors [3].

3.1 Comparison of Methods for Demonstrating Competence (Management Level)

Based on the four criteria explained before -reality, repeatability, Type A, and Type B training-, each competence under column 1 of Table A-III/2 of STCW'95 is evaluated, and grading letters A, B and C are assigned based on the merits and demerits of each training methods. The meanings of these grades are:

A – Better: mostly preferred type of training

B – Good: sometimes preferred type of training

C – Average: rarely preferred type of training

The results of this evaluation for Management Level are inserted into a similar table as in Table 1 and the summary of the justification for the evaluation is described below.

When reality is considered, M.Ship is the better training method comparing to T.Ship or to ERS training methods because that is the actual environment where the trainees will perform their duties under full responsibility. T.Ship is also very close in covering most of the competencies. ERS is considered that its environment reflects the reality less comparing to M.Ship or T.Ship and "C" or "B" letters are given for the competencies. This is because no matter how the simulator is well designed to make the environment close to real, it is still the simulator and it is very difficult to create the same training based on reality. Only some competencies, such as operating control systems, might be implemented close to reality in ERS training.

Table 1. Comparison Table of Methods for Demonstrating Competence (Management Level)

	Reality			Repeatability			A-Training			B-Training		
Competence	**M.S.**	**T.S.**	**ERS**	**M.S.**	**T.S.**	**ERS**	**M.S.**	**T.S.**	**ERS**	**M.S.**	**T.S.**	**ERS**
Marine Engineering												
Plan and schedule operations	A	A	B	C	B	A	A	A	A	C	B	A
Start up and shut down main propulsion and auxiliary machinery including associated systems	A	A	B	B	B	A	B	A	A	C	B	A
Operate, monitor and evaluate engine performance and capacity	A	A	B	C	B	A	C	A	A	C	B	A
Maintain safety of engine equipment, systems and services	A	B	C	C	B	A	B	A	A	C	B	A
Manage fuel and ballast operations	A	B	C	B	A	A	B	A	A	C	B	A
Use internal communications systems	A	A	B	B	A	A	B	A	A	C	B	A
Electrical, Electronic and Control Engineering												
Operae electrical and electronic control equipment	A	A	B	C	B	A	B	A	A	C	B	A
Test, detect faults and maintain and restore electrical and electronic control equipment to operating condition	A	A	C	C	B	A	B	A	A	C	B	A
Maintenance and Repair												
Organize safe maintenance and repair procedures	A	B	N/A	B	A	N/A	B	A	N/A	C	B	N/A
Detect and identify the cause of machinery malfunctions and correct	A	A	C	C	B	A	C	B	A	C	B	A
Ensure safe working practices	A	B	N/A	C	A	N/A	A	A	N/A	C	B	N/A
Controlling the Operation of the Ship and Care for Persons on Board												
Control trim, stability and stress	A	A	C	B	A	B	B	A	A	C	B	A
Monitor and control compliance with legislative requirements and measures to ensure sfety of life at sea and protection of the marine environment	A	A	C	A	A	A	A	A	A	C	A	A

Regarding to repeatability, ERS training is better since it provides the possibility to implement almost all of the training topics for competencies repeatedly. T.Ship is also good for repeatability since the schedule of T.Ship is controlled according to the training program. In M.Ship, only some competencies such as normal watchkeeping operations repeatable because most of the schedule of engine room operations cannot be planned based on the training program. Also, repeating malfunctions is not possible in M.Ship. On the other hand, M.Ship is the most effective training method for maintaining a safe engine watch since a regular and systematic engine watch twice a day has to be maintained for a long time of navigation.

In view of Type A training, T.Ship and ERS training is found better since the reality is not under consideration and almost all competencies can be covered. In both ERS and T.Ship training, students are assigned with specific responsibilities and instructor makes sure that all competencies for operational level are satisfied. Whereas, students are most of the times assumed to be observant and active participation under an instructor cannot be given during the training in M.Ship, therefore "B" letter is assigned for all competencies for M.Ship.

Considering Type B training, the training program for creating malfunctions cannot be implemented in M.Ship training. T.Ship is still a real ship and it is not possible to create malfunctions and control the program for the training. On the other hand, ERS training is almost perfect for this type of training since there are no actual breakdowns when malfunctions are created and associated troubleshooting skills are developed. For example, handling the panic and stress can be trained only in ERS training. Therefore, letter "A" is assigned for almost all of the competencies under the ERS column of Table 1.

3.2 Results on the Comparison of Training Methods based on STCW95

In order to summarize the evaluation shown in Table 1, the grading letters in the table are converted into numeric values based on the following criteria:

$$A \geqq 2.5$$

$$1.5 \leqq B < 2.5$$

$$C \leqq 1.5$$

The resulting numerical values for each training method and competencies collected and averaged. Final numeric values are converted back to the grading letters based on the same criteria. After having letters that includes all criteria, namely, reality, repeatability, Type A, and Type B, a summary table is reconstructed as seen in Table 2.

Table 2. Summary of Comparison Table for Demonstrating Competence (Management Level).

Competence	T-Ship	M-Ship	ERS
Marine Engineering			
Plan and schedule operations	A	B	A
Start up and shut down main propulsion and auxiliary machinery including associated systems	A	B	A
Operate, monitor and evaluate engine performance and capacity	A	B	A
Maintain safety of engine equipment, systems and services	B	B	A
Manage fuel and ballast operations	A	B	A
Use internal communications systems	A	B	A
Electrical, Electronic and Control Engineering			
Operate electrical and electronic control equipment	A	B	A
Test, detect faults and maintain and restore electrical and electronic control equipment to operating condition	A	B	A
Maintenance and Repair			
Organize safe maintenance and repair procedures	A	B	N/A
Detect and identify the cause of machinery malfunctions and correct faults	B	B	A
Ensure safe working practices	A	B	N/A
Controlling the operation of the ship and care for persons on board at the management level			
Control trim, stability and stress	A	B	B
Monitor and control compliance with legislative requirements and measures to ensure safety of life at sea and protection of the marine environment	A	A	A

The resulting tables can help an institution to effectively organize the available training methods in the curricula. For example, at ITUMF, T.Ship is being used as the basic level for recognizing the parts, systems, and operations visually under the instruction. In general, these training methods could be used for the following purposes:

T.Ship: for recognizing parts, systems, and operations visually.

M. Ship: for practicing the engine room operations in the actual working environment.

ERS: to offer more advanced trainings such as to increase troubleshooting skills of the trainees.

4. Additional Competences for being a Qualified Engineer Officer

An article of IMO NEWS said, "One of the key differences between STCW'95 and the previous Convention is the emphasis on competence rather than knowledge"[4]. In the light of this sentence, it is reasonable to suppose that our proposal to organize the training method is based on the competence even for the management level. In other words, the proposed method is useful to organize the training program for engineer officers' licenses. Considering the role of IAMU member universities as leading the Maritime Education and Training (MET) in the world, it is just a minimum requirement to organize and implement the training program for officers' license even if the program is the most effective one.

In order to offer the additional competence mostly based on knowledge level for being a highly qualified engineer officer, it is worth considering the procedure to restore to the normal operational condition after facing a severe accident in the machinery space. In such a case, engineer officers first have to find out the cause and measure the level of the incident using their knowledge and experience, which are mainly covered as the competences shown in the table A-III/1 and 2 of STCW95.

In addition to these competencies, teamwork among the engineer officers and the leadership of the Chief Engineer officer as well as the risk management to predict and prepare for the accident are absolutely indispensable because the machinery system of a typical modern ship is very much complicated.

On the other hand, it is common understanding that facing to a severe accident easily creates 'Panic' that often leads the increase in the human mistakes in spite of the theoretically given competences. Furthermore, fatigue and stress, which sometimes are impossible to prevent perfectly because of the nature of the human being, increase the human errors additively. However, the training for having the knowledge and experience of what situations creates and leads to make human errors may create qualifications to control panic, stress, and fatigue and to focus on what to do correctly under these difficult circumstances.

Based on the above discussions, the authors propose the following additional competences for being a qualified engineer officer;

- ✧ Teamwork among engineer officers (how to be part of the team)
- ✧ Leadership (how to organize the team)
- ✧ Safety culture and management of the risk in the machinery space (how to predict and prepare for an accident)
- ✧ Aspect of the human error (the causes, behaviors and results etc.)
- ✧ Communication aspects (how to communicate in multicultural environment with better communication skills)

The authors would like to point out that education and training curriculum to demonstrate these additional competences have to be provided to the undergraduate students of IAMU member universities.

5. CONCLUSION

The purpose of the comparative study discussed in this paper is not to decide what training method is the best for all of the competencies needed to be a qualified marine engineer based on our results obtained herein. Rather, to have some comparative results for the training types so that some recommendations to Maritime Institutions can be made.

Maritime institutions around the world are using different types of training to comply the same competencies as explained in STCW'95 and the Code. Because of these differences, it was authors' special interest to find out the most efficient training method and take actions based on that. The results in this paper show that one institution can use the available training methods efficiently with guidance of such comparative tables.

Based on the results of the previous sections, it is concluded that ERS training could be used to give marine engineer candidates higher-level qualifications discussed and proposed in this paper. For example, the use of ERS for team-management and for communication skills could very efficiently be arranged because of the opportunity of preparing the scenarios based on the type of the training and education. Furthermore, by providing a scenario of simulated severe accidents in the machinery space, marine engineer candidates will be able to experience the situation without any damage to training equipments. Through this type of training, marine engineer candidates can easily learn the safety culture, how to manage the risk and the aspect of the human error. Simultaneously, the behaviors of the trainees during this type of training recorded on ERS will provide the academic staff of the department of marine engineering with opportunities to develop research topics in order to prevent mistakes by human errors. Therefore, authors' proposal is that IAMU institutions should introduce and extensively use the state-of-the ERSs in the undergraduate curricula for both students and academic staff at IAMU universities.

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Research in Maritime Institutes

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ABSTRACT

Increasingly maritime institutions are seeing the benefit of research programs that underpin their education and training programs. Research can be conducted for its own end, but is far more beneficial to an institution when it informs and supports the teaching.

Maritime research can take two main forms: subject based research into specific maritime issues, e.g. Ship safety, or, pedagogic research into the ways of delivering educational and training material, e.g. distance learning packages. As well as helping the teaching programme, research can be seen as a development activity, benefiting individual teaching staff.

Developing research strategies in existing maritime institutions can present economic and cultural problems. This paper will present various models for developing research programs in maritime institutions.

1. Introduction

In recent years there has been a dramatic change in the attitude and approach of Maritime Institutions towards "Research" and "Scholarship". For a variety of reasons Maritime Institutions are showing more interest in getting involved in these areas. For some, it is a matter of potential extra funds associated with these activities, and for some others it is from the viewpoint of prestige. In HE sector as a whole and in very general terms research and other scholarly activities are seen to firstly underpin and support the teaching programmes which takes place. Secondly to provide expertise to support the relevant industries, and finally to push forward the scientific barriers in different disciplines.

Academic staff have also been under pressure to pursue research and scholarly activities for different reasons. Some Institutions have made it very clear that "tenure" and "promotion" is directly linked with research output particularly publications in reputable journals, with conference presentation having lesser value.

Research and Scholarship are important and necessary elements of academic life, which need to be integrated and embedded into the daily work of all academics. The industry (MET) has progressed from those days that academics could lecture from their notes which at times were (possibly are) out of date and not relevant to the current practices. Academics must at least be familiar with latest development in their subject area, and ideally involved with the latest development both scientific and industrial.

To set the scene we distinguish between two types of Maritime Institution here at the outset. Firstly we identify a group of large Maritime Academies/Universities which are either wholly dedicated to maritime work, or a major part of their activities are maritime related. These Institutions mainly provide "long courses" such as BSc and MSc degrees, as well as other ancillary and related training programs supporting the STCW requirements. The second group is smaller and more focussed Maritime Training Centres, which specialise in one or more maritime related subject area and provide short courses in support of the shipping industry. There are of course other Institutions (like Southampton Institute in UK) which provide a mix of these and provide both long and short courses either as part of the same department or in a more structured manner under different departments.

Experience has shown that Maritime Universities have the capability of undertaking a much wider range of research programmes and topics. These include both subject (or discipline) related research, e.g. research into the next generation of navigation systems, or pedagogic research to establish new and more innovative means of student learning. The second category which are the smaller Training Centre are best suited to conduct "applied research", where involvement and co-operation from the industry is an important element.

2. Need for a Strategic and Co-ordinated Approach

Most Maritime Institutes either have a research programme or in the process of developing one. For these activities to be successful it is essential and necessary to be properly co-ordinated and part of the strategic plan of the Institution. To ensure success it is suggested that there are two closely related elements, which should be covered under the strategic plan for Research and Scholarship. Firstly is the role of "Leadership" in research, and secondly the "Human Resource" element

2.1 Leadership: This by far is the most important element and if not exercised properly, the activity will either fail or level of success will be disappointing. Leadership is seen here as all activities, which create the suitable atmosphere and environment, leading to successful achievement of goals and objectives. This must be at the highest level of the management where decisions regarding strategic direction of the Institute, policies, and staffing and other resources are made. There are of course different styles of leadership, and the most successful one that we have observed is the "open and consultative" approach, which will give the ownership of the activity to everyone involved.

2.2 Human Resource (or the people issue): The actual research and consultancy is usually undertaken by academic and research staff, and it is important to have a well planned "staff development" programme which will support the staff in having the required expertise in subject area. Staff workload should be considered and designed very carefully, giving academics enough time to be able to undertake the research and other scholarly work related to their subject area.

It is suggested here that the Maritime Institutes need to develop a "Research Strategy" if they already have not got one. This will involve the normal process of looking inwards to assess the capability and identify areas requiring enhancement, as well as looking externally to identify what else is happening which may have an impact on research (SWOT analysis).

Following are extracts from the Research and Scholarship strategy[1], which was developed at Southampton Institute about a year ago and took about 12 months to develop:

The Strategy

The development of the current research and scholarship strategy builds on the previous work of Research Committee. There has been consultation and debate, which has led to agreement on what, is meant by research and scholarship in this Institute, together with the principles, which form the basis of this strategy.

The development of the strategy has, therefore, taken account of:

- *Changes in the national environment*
- *the Institute-wide consultation for a new strategic plan*
- *faculty and service plans*
- *the current position and recent progress*
- *the survey of research activity, November 1998*
- *deliberations of the Research Committee*

Scholarship

The Institute's academic community espouses the notion of scholarship as the prime characteristic of its membership. Scholarship comprises all forms of academic achievement and includes any activity which results in the acquisition and advancement of knowledge, erudition and learning. This means, inter alia: the conduct of original research in subject areas related to the curriculum; the necessary learning required to present material representing the current state of the art; the pursuit of excellence in teaching and learning; and the analysis of material and reconstitution at various levels appropriate to taught courses. In short, the Institute has adopted a modified version of the Boyer [2] notions of the integration of the scholarships of discovery, integration, application, and teaching. This inclusive definition values all aspects of scholarship.

The role of subject research

The academic staff of the Institute are a reservoir of subject expertise. The Institute has a vocational academic mission and ergo needs its academic community to maintain a strong and appropriate subject research profile in *order to properly reflect the expectations of society. The expectations of a higher education institution are that it can provide up to date knowledge of a specialised nature, which will extend the intellectual capacity of its students and educate them in such techniques as will fit them for problem solving in the modern world.*

Subject research is pivotal in creating the necessary conditions and the Institute expects its academic community to acquire new knowledge through the conduct of research projects funded by public bodies both national and trans-national and by industrial sponsorship. Excellence in subject research is evidenced by the publication or production of: refereed journal papers; books; chapters in books or edited volumes; refereed conference papers; exhibitions; works of art; designs; patents; and other output. Outputs are appropriate to the disciplines of the Institute.

The role of pedagogic research

The prime purpose of the Institute is the provision of Higher Education. To ensure that teaching and learning are delivered effectively it is important that all staff involved in teaching are engaged in: reflection on; development of; and enquiry into the pedagogic process. This strategy envisages that research into the techniques and methods relating to teaching and learning shall be ubiquitous. Pedagogic research is synonymous with contributions to the academic professional knowledge corpus. The Institute expects that its academic staff will: draw on this corpus; be informed about national and international developments; and be active in pedagogy.

Key Aims and objectives

- *The Institute aims to provide opportunities for its staff to be involved in research and scholarship of national and international standing which leads to the enhancement of learning and teaching.*
- *The strategy is intended to enable the achievement of the Institute's aim of ensuring its future as an independent institution of high standing, and its objective of gaining powers to award both taught and research degrees.*
- *The research and scholarship strategy is central to achieving these aims. The issue of scholarship covers all aspects of academic competence. It includes research and the necessary subject and pedagogic excellence required to underpin and support postgraduate programmes and honours components of undergraduate programmes.*

The objectives that are designed to support the aims are:

- *To ensure that the Institute sustains a level of funding and a rigorous process which will maintain a research student population that is at least that required by the Quality Assurance Agency and of peer expectation.*
- *To ensure that staff contribute fully to the enhancement of student learning and specifically of research degree supervision. This contribution is to be based on sustained scholarship.*
- *To ensure that staff have an opportunity to enhance their knowledge through subject research and their reflective and presentational powers through research into pedagogy.*
- *To ensure that in the context of research, faculties and services work effectively together, having regard to equal opportunities and enabling research expertise to contribute, where possible, to the geographic region and the community of the City of Southampton.*

Implementation

The Institute will, through the work of its Research and Graduate Studies Committees, the ADS the Research Office of the Academic Quality Service and the Research Centres:

- *advise staff and students of the Institute's priorities for research and scholarship*
- *encourage research which is focused, selective and which builds upon the expertise within the faculties*
- *value and encourage discipline-based research and pedagogic research*
- *encourage collaborative research on an inter-faculty or inter-institutional basis*
- *recognise and promote significant achievements in research and scholarship*
- *seek to enhance the research environment and infrastructure*
- *promote the effective management of resources allocated to research and scholarship*
- *seek to enhance the external profile and reputation of its research and its researchers*

Faculty strategies will be consistent with Institute priorities for research and scholarship, and will build upon the particular strengths within the academic areas.

Faculties will:

- *develop their own strategy, consistent with the Institute's strategy, including the strategy to develop additional income streams, and demonstrating support of other faculty activities*
- *with the approval of the Faculty Board, submit their strategy for approval by the Research and Scholarship Committee*
- *produce an annual plan for approval by the Research and Scholarship Committee, detailing proposed spend against internally-funded projects, individuals and teams, together with anticipated outputs*
- *be responsible for the monitoring and review of all research and scholarship in the faculty, and especially that which has attracted funding, either internal or external*
- *produce and submit to Research and Scholarship Committee an annual report of research and scholarship in the faculty*

Consideration will be given to the research and scholarship undertaken within services, and the extent to which they will be expected to comply with the provisions of paragraph 28.

The Institute will:

- *make substantial investment to stimulate and encourage research and scholarship in the faculties, to enhance the environment and to support an appropriate infrastructure*
- *support Research Centres within faculties, to provide areas of focus for research and to promote excellence*
- *expect staff to be annually accountable for their use of research and scholarly activity' time*
- *provide additional support to encourage team research*
- *operate programmes of seminars, publish internal papers at faculty level*
- *further develop collaborative, jointly funded ventures with industry*
- *seek to protect Intellectual Property Rights arising from research and scholarship*
- *seek to exploit the commercial potential arising from research and scholarship*

3. Ethos and Rational

The purpose and rational for undertaking research must be clearly defined and agreed with close consultation with the academic staff. If the main reason for undertaking research is to underpin the teaching programme, then one must be able to link research programmes to different parts of curriculum.

It also suggested here that staff should be able to research into areas, which perhaps not directly related to curriculum, but have current interest from the industry. This will allow new teaching areas to be developed based on the research being undertaken.

If research is purely to support the industrial need then a close link with the industry is needed. This will enable the academics to have a good understanding of industry, and ideally to be able to predict their needs in terms training and consultancy ahead of the time.

4. Research Culture

Research Culture includes all issues relating to the research environment and staff attitude towards research and scholarly activities. Institutes intending to embark on this road may face the challenge of developing a "research culture" and suitable "research environment" which is conducive for academic research, and will encourage and reward those who are pro-active in research.

5. Research Topics and Ideas

One issue that most researchers and in particular the new blood is facing is how to start and what topics or subject area they should research into. This is a genuine and difficult issue to address. We believe that research area must be of interest to the "researcher", otherwise progress will be slow and difficult. We also believe that the subject must fit in with overall research direction and profile of the Institutions. External factors and availability of resources (e.g laboratory equipment, simulators etc) should be considered and present at the Institute and accessible to the researcher. When looking externally for subject areas, academic networks and technical journals can be used to identify areas with current interest, noting that some of the material published in technical journals may be up to 2 years old, and results of research which may be even older. This is perhaps one area that IAMU can play a big role by providing support for those who are starting up, as well as finding international partners for those already engaged in research programmes.

6. Role of Different layers of the Institution

In section 2 we gave a summary of a research strategy at Southampton Institute. Examining this in detail you will notice that there are responsibilities both at the Institutional level in terms of commitments from the Institute and faculties as well as on individuals in terms of contractual requirements for them to undertake research and participate in various activities.

Here we would like to reiterate what has been mentioned before that it is not just the researchers who are important but the leadership element of the Institution by providing support and guidelines.

7. Formation of a Centre or Unit

A great danger for research activity is low visibility due to ignorance of its role, importance, and potential and significance. Ironically, its wide scope can also lead to difficulties in recruitment of students and staff, fragmentation of effort with several ``isolated" groups working in parallel, possibly replicating results, using resources inefficiently, competing for such resources and presenting a confusing and unfocused picture to the outside world which, if it can detect activity at all, is likely to respond by taking its custom (research contracts etc.) elsewhere. Our experience show that formation of research clusters with the same subject-area interest will give higher visibility and more impetus to the research culture within an Institution. The purpose of such a Unit or Centre can be summarised as follows:

1) developing and increasing the visibility of a particular research area, such as Maritime Technology, as an academic teaching and research discipline involving ingredients of the related disciplines; (such as):
  a) Ship Manoeuvring Analysis
  b) Mathematical Modelling and Simulation of Marine Systems
  c) Vessel Traffic Control
  d) Marine Control Systems Design
2) providing impetus to research in the subject area and an ability to plan and co-ordinate effort and resources to the benefit of the discipline, the Institute's regional, national and international profile;
3) providing a focus for staff and students in the Institution to develop their expertise and contribute to the subject area;
4) to foster links with industry, research organisations, higher education institutions and the international R \& D community and to act as a highly visible focal point of contact for such bodies in their contact with the Institution on this subject area.
5) to seek common funding from such external sources for equipment, research assistants and students;
6) to provide a framework for the development of short term industrial contract work to be carried out following normal Institute procedures;
7) to consider the development of short post experience and training courses for the industry;
8) to encourage staff members and research students to develop innovative ideas particularly those with industrial interest across a wide spectrum of the subject area.

In the initial development period the Centre may concentrate on increasing the academic activity and infrastructure in the subject area and increasing the profile of the Institution both nationally and internationally by attracting research students and research contracts.

It is also advisable for the Centre to have a steering committee composed of both internal and external (industrial) members to provide guidance in the strategic direction of the centre.

The activities of the Centre may be clustered around the central objectives of:

Developing a skill base relating to the subject area,
Undertaking Research, pure and applied, in all related areas, based on the resources and expertise available within the Centre,

Consultancy work in the areas of expertise of the Centre to be encouraged for members of the Centre. It is also expected that the interdisciplinary nature of the area will provide a platform for other staff members to carry out this type work possibly in collaboration with Centre members.

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ROLE OF ISO 14001 IN MARPOL CONVENTION FOR THE ASSURANCE OF CONTINUAL ENVIRONMENTAL MANAGEMENT

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ABSTRACT

Ship Management Companies are responsible for the prevention of environmental pollution caused by their managed vessels. When they are initiating to implement all compulsory requirements that are defined in MARPOL, STCW Convention and separate Port State Control requirements, they are confronting some hesitations or confusions that could result an environmental deficiency. Misunderstanding or lack of environmental management philosophy directly causes the hesitations or confusions at Ship Management Companies. Taking into account, the requirements of ISO 14001 and the international marine pollution prevention rules, Management Cover Up Cycle Model is proposed in this study for internationally trading shipping companies.

Management Cover-Up Cycle Model is a backward and forward data-driven process. It means the actions will be taken step by step. The steps are to identify the environmental aspects, analyse the impacts, measure the significant impacts, and then tailor a solution that could be named as target. When the target is initiated to implement, its effectiveness is measured. If needed, the approach for reaching the target is adjusted for effectiveness. When success is achieved, the set of process actions is closed. Long term monitoring usually follows to ensure that the environmental hazardous occurrence does not arise again. As well as that this model enables to upgrade the management staff and the crew members know-how for ensuring an effective Environmental Management System.

KEY WORDS: Application of ISO 14001 for ships, Management Model, Marine Environmental Pollution

1. Introduction

A number of administrations and authorities have seen fit to introduce their own rules or legislations to cover pollution prevention caused by the ships, considered as PSC (Port State Control) requirements. The existing rules and regulations which are described in MARPOL (Marine Pollution) Convention states only the prevention for the occurence of oil spill or leakage, garbage disposal limits, handling of garbage and sludge to shore-based facilities, the specifications and the operational condition of sewage threatment units, ballasting and deballating operations etc. It is difficult in an international environment to refer to a single specific piece of rules as it may not apply to all shipping companies and multinational shipboard activities caused by different cultural management knowhow or the background.

The only defined management rule for preveting the shipboard pollution is directly coupled with ensuring safe operational conditions, called as ISM (International Safety Management) Code (Er and Sogut, 1999). Hence the ISM Code indicates some countermeasures for pollution prevetion, its main concept defines occupational health and safety conditions of vessel's equipment, cargo of ship and crew members. For this reason, the ISM Code was made mandatory under the new chapter IX of the SOLAS (Safety of Life at Sea) Convention (Traves 1997). Besides the ISM Code that is only compulsory international ship management standard in shipping business, defines what to do but does not make any clear explanations on how to do.

Taking into account the above mentioned considerations, Management Cover Up Cyle (MCUC) model is presented in this study by utilising ISO 14001 Environmental Management Standard, with in the parallel view of compulsory existing shipping rules that are established by IMO (International Maritime Organisation) to compensate the weak points of pollution prevention activities on board the ships.

2. Overview of Management Standards and Rules

2.1 ISM CODE

The International Management Code for the safe operation of ships and pollution prevention (ISM Code) was adopted by the IMO General Assembly with the resolution A.741(18) on its eighteenth session in November 1993 (IACS, 1996). The ISM Code aims at contributing to safer shipping and pollution prevetion by laying down requirements for a clear link between shore and sea staff of a company and for a designated person to strengthen that link. A key aspect of the ISM Code is that companies must have a verifiable SMS (Safety Management System) in place. For the system to be effectively implemented there must be commitment form the top, responsibilities assigned and measures in place to remedy the deficiencies. It has today become very split the management of a vessel into several distinct management departments. These may in certain circumstances, work independently of each other or even be separate companies. These can be narrowed down to: crew management, technical management, operational management, commercial management and insurance management. In relation to the Code, the relevant "management" is the one which has responsibility for the actual technical and operational management of the ships.

2.2 MARPOL CONVENTION

Marpol Convention covers all the technical aspects of pollution form ships, except the disposal of waste into the sea by dumping and applies to ships of all types, although it does not apply to pollution arising out of the exploration and exploitation of sea-bed mineral resources. The convention has two protocols dealing respectively with reports on incidents involving harmful substances and arbitration five annexes that contain regulations for the prevention of various forms of pollution as follows:

Annex I : Prevention of pollution by oil
Annex II : Control of pollution by noxious liquid substances
Annex III : Prevention of pollution by harmful substances carried in packaged form or in freight containers or portable tanks or road and rail tank wagons
Annex IV : Prevention of pollution by sewage
Annex V : Garbage management plan

and the protocol of 1997 (Annex VI on regulations for the prevention of air pollution form ships) (Wright, 1999).

2.3 STCW CONVENTION

The IMO Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW), 1978 was substantially revised in July 1995. The convention as amended has become known as STCW 95 (IMO, 1995). This will improve the standard of seamen's qualifications and it will help to save lives, ships and cargo and improve environmental protection. The main goals of STCW 95 are:

- To transfer all detailed technical requirements to an associated Code.
- To clarify the skills and competence required and to take account of modern training methods.
- To require Flag State Administrations to maintain direct control over the qualifications of those masters, officers that they authorise to serve on their ships by an endorsement procedure.
- To make parties to the Convention accountable to each other, through IMO, for their proper implementation of the Convention and the quality of their training and certification activities

The system to ensure a uniform standard of competence can be called the core of the revised STCW Convention. For the first time, the standards for seafarer competence are based not only on knowledge requirements but are directly linked to the seafarer's ability to perform their tasks safely and effectively.

In the process of qualification for a professional certificate the weight has shifted form examinations by the maritime school or Administration's examination board to the ability to demonstrate safe and efficient structured and controlled on board training and performance evaluation. This system is based on the following key concepts as functions, level of responsibility, seagoing service and specification of competence standards.

2.4 ISO 14001 STANDARD

ISO 14000 series of standards contains requirements and guidelines for establishing and maintaining an organisation's environmental management system. Environmental Management System is the structure of policies, procedures, documentation, etc and it has in place to control the impact of its products, services, and processes on the environment. The only standard that contains requirements and thus the only standard those organisations can actually be registered to be ISO 14001. ISO 14001 requires a documented system for controlling the environmental effects of the processes that the organisation uses to develop and produce products or services (ISO, 1996). The basic premise behind ISO 14001 is that there are certain elements every management system must have in place in order to ensure that organisation's negative effects on the environment are minimised.

4. THE INTERRELATIONSHIP BETWEEN THE ISM CODE, THE STCW CONVENTION, MARPOL CONVENTION AND ISO 14001 STANDARD

The ISM Code covers safety and prevention risks while the STCW Convention covers the competence of shipboard personnel, the ISO 14001 covers the specified requirements for an environmental management system, to enable an organization to formulate a policy and objectives tasking into account legislative requirements and information about significant environmental impacts (ISO, 1996).

There are many links between the ISM Code and ISO 14001 standard. Management Responsibility is defined in ISO 14001, as structures and responsibility (clause 4.4.1) and environmental management program (clause 4.3.4). The authors of the ISM Code found it more practical to define such responsibilities in separate sections like safety and environmental protection policy (clause 2), company responsibility and authority (clause 3), designated person(s) (clause 4), master's responsibility and authority (clause 5), resources and personnel (clause 6), verification review and evaluation (clause 12). Clause 7 of the ISM Code correspond the following clauses of ISO 14001 such as the whole requirements of planning (clause 4.3), training, awareness and competency (clause 4.4.2) and operational control (clause 4.4.6). Clause 8 of the ISM Code corresponds directly to emergency preparedness and response (clause 4.4.7) in ISO 14001. Clause 9 of the ISM Code, although it covers a wider field than ISO 14001, covers the non conformance, corrective and preventive action (clause 4.5.2) in ISO 14001. The concerns of clause 10 of the ISM Code are divided the following paragraphs as monitoring and measurement (clause 4.5.1) and operational control (clause 4.4.6). Similarly the concerns of clause 11 of the ISM Code are divided the following paragraphs as environmental management system documentation (clause 4.4.4), document control (clause 4.4.5) and records (clause 4.5.3) in ISO 14001. Clause 12 of the ISM Code correspond the following clauses of ISO 14001 such as the environmental management system audit (clause 4.5.4), management review (clause 4.6). More detail links between ISM Code, and ISO 14001 Standard is given in Table 1.

Similarly the comparison between ISM Code, STCW Convention, MARPOL Convention and ISO 14001 Standard is given in Table 2. Many of the direct company responsibilities in the STCW Convention are largely derived form the relevant provisions in the International Safety Management (ISM) Code. The difference however, is that whereas the ISM Code generally requires shipping companies to ensure that certain procedures related to personnel are established.

The STCW Convention stipulates in some detail that companies must be able to demonstrate that the relevant STCW provisions have been implemented, to ensure that the aims of the convention are met, i.e. that seafarers employed on board are competent qualified and can indeed perform their duties safely and effectively.

Shipboard activities that are mentioned in MARPOL Convention technically describe the main aspects of pollution prevention caused by ships, but the requirements of this convention are not directly linked to ISM Code accept defining and planning the operations in both clauses 7 and 8 of ISM Code. This results to explain what to do, but not clearly define how to do, how to manage or how to follow up. For this reason the cause of integration process of ISO 14001 is professionally needed into Ship Management Business.

Table 1 Links between ISM Code and ISO 14001 Standard

Active links between ISM Code & ISO 14001	1.General	2. S&EP Policy	3. Company Res. & Authority	4. Designated Person(s)	5. Master's Res. & Authority	6. Resources and Personnel	7. Dev. of Plans for Shpborad Opt.	8. Emergency Preparadness	9. Reports & Analy. of NC, Acc, H/O	10. Maint. Of ships & Equipment	11. Documentation	12. Company Ver. Review and Control	13. Cer. Ver. & Control
4.1 General requirements	■												
4.2 Environmental policy		■											
4.3 Planning							■						
4.3.1 Environmental aspect							■						
4.3.2 Legal & other requirements			■										
4.3.3 Objectives and targets	■						■						
4.3.4 Environmental Manag. programme							■						
4.4 Implementation and operation						■							
4.4.1 Structure & responsibility			■	■	■								
4.4.2 Training aware. & competence						■							
4.4.3 Communication						■							
4.4.4 Envir. Manag. Sys. documentation											■		
4.4.5 Document Control											■		
4.4.6 Operational Control							■			■			
4.4.7 Emergency prepard. & response								■					
4.5 Checking & corrective action									■	■			
4.5.1 Monitoring & measurement										■			
4.5.2 NC, CA and PA									■				
4.5.3 Records											■		
4.5.4 Envir. Manag. Sys. Audit												■	
4.6 Management Review												■	

5. MANAGEMENT COVER-UP CYCLE (MCUC) MODEL

The purpose of "Covering-Up Cycle model" is to make an adequate incorporation between all maritime related international requirements and the ISO 14001 Environmental Management Standard into Ship Management Business. Covering-Up Cycle Model can be recognized at two different milestones.

Table 2 Comparison of ISM Code, STCW Convention, MARPOL Convention and ISO 14001 Standard

	ISM Code	**STCW Convention**	**MARPOL Convention**	**ISO 14001 Standard**
Field of Application	Management of safety at sea and pollution prevention	Training, certification and wacthkeeping	Prevention of pollution from ships	Improvement of existing systems to reduce the level of pollution in environment
Applicable to	Ship Management	Administrations, training services, maritime training institutions, ship management companies and shipboard operations	Shipboard operations for all types of ships	All organisations that wishes to implement "Environmental Management System"
Purpose : Demonstrate compliance with	Managing safety and pollution prevention requirements	Training, certification and wacthkeeping requirements	Reducing the risk of pollution form ships	Self declaration of conformance regarding with environmental management
Means: Implementation of	Safety Management System	Training Management System	Pollution prevention regulations and rules	Environmental Management System
Scheme of certification	Shore based audit and shipboard audit	Organisation's Audit	Classification Society's survey program	Environmental System Audit
Validity	5 years subject to audit	5 years subject to assessment	5 years subject to surveys	3 years subject to audit
Compliance	Mandatory	Mandatory	Mandatory	Voluntary

The first milestone defines the individual relationships of each standard or legislation that could be managed in separate phases called as "Covering-Up". Then the aim of the second milestone is to make an efficient integration of each defined phase of first milestone is called as "Cyclic Build Up Process". When the two milestones are initiated to implement in actual shipping practices then the management process is called as Cover-Up Cycle Model.

The fundamental approach of the Cover-Up Cycle model enables a backward and forward data-driven process. It means the actions will be taken step by step. The steps are to identify the environmental aspects, analyse the impacts, measure the significant impacts, and then tailor a solution that could be named as target. When the target is initiated to implement, its effectiveness is measured. If needed, the approach for reaching the target is adjusted for effectiveness. When success is achieved, the set of process actions is closed. Long term monitoring usually follows to ensure that the non-compliances and deficiencies do not arise again.

The infrastructure of organisation in maritime industry that supports Management Cover Up Cycle Model (MCUCM) is very important. That infrastructure is set up so that shoe-based key personnel can identify aspects, department heads can select and review due to their priority, Management Representative(s) or Chief Executive Officer(s) can support relevant resources and the personnel who is responsible from process can able to implement routine operational procedures in an efficient manner.

Together, the process and the infrastructure have the potential to yield measurable differences to establish continual improvement. MCUCM simply constitutes three key ingredients:
1) Interest and support from executive management and operation management.
2) Enthusiasm among shore-based and shipboard personnel for identifying aspects and teaming up to solve them.
3) Technical support for teams using the MCUCM process.

Where these don't exist, momentum wanes and so does prevention of deficiencies. But where all three exist, MCUCM produces results to comply the requirements of Maritime Safety Management System.
Decisions on the performance parameters selection and its own characteristics should always one of the following:

- GO (proposal meets selection criteria and is a priority now)
- HOLD (meets the criteria, but not a priority)
- NO-GO (fails too many criteria)
- REFINE (certain criteria leave questions that must be resolved before a decision)
- REFER (not our function)

Go's are nominations that meet the performance parameter selection criteria and are a priority now. Each GO carries an implication and management thinks the problem is important enough for staff to re-structure their time.

Hold's are nominations that fit the selection criteria, but are not judged a priority at the time. HOLD's are rare since most proposals that fit the selection criteria are important. When a nomination becomes a HOLD, it is held until a later date for evaluation. In this respect the selection criteria might constitute followings:

- ✓ *Is the problem recurring?*
- ✓ *Is there a significant human health risk?*
- ✓ *Is it within Maritime Safety Management System's role?*
- ✓ *Is the problem large enough to matter but not too big to tackle?*
- ✓ *Can success be measured?*

No-go's are nominations that do not fit the selection criteria. Generally, NO-GO's are either not recurring, not Maritime Safety Management System's job. This is not to say that they are not important.

Refine's are nominations with un-answered questions on one or more selection criteria. Usually, the nominator is asked to research the problem then return for the next performance control.

Refer's are nominations about, "It's not our function."

In this respect consideration of the significance of environmental impacts should include, but is not limited to, the following criteria in ship management process:

- *scale of the impact*
- *severity of the impact*
- *probability of occurrence*
- *duration of impact*
- *potential regulatory and legal exposure*
- *difficulty of changing the impact*
- *cost of changing the impact*
- *effect of change on other activities and processes*
- *concerns of interested parties*

The sample format of environmental aspects, impacts, their criteria of significance and the related objectives are proposed in Table 3.

Table 3. Several examples of shipboard environmental aspects and impacts

No	Activities	Aspect	Impact	Criteria of Significance	Significant Impact	Objective	Target
1	Running engines cause leakage from pipes, joints, elbows etc. in engine room	Fuel and lube. oil leakages occur	Contamination of Bilge Water	Improper planned maintenance, Ineffectual precaution	Sea pollution caused by the contaminated bilge water	Reducing bilge water contamination caused by Fuel and Lube. Oil leakages	Improving planned maintenance system
2	General cleaning works on board the vessel	Usage of wasted oils (kerosene, gas oil etc.) during cleaning in the engine room	Contamination of Bilge Water	As a result of not using special trays or waste cotton for cleaning purpose during cleaning, wasted oil to be poured to the bilge.	Sea pollution caused by the contaminated bilge water	Reducing bilge water contamination caused by wasted oils during cleaning process	Using special trays or waste cotton for cleaning purpose
3	Filter cleaning	Spillage may occur during transportation of filters	Contamination of Bilge Water	Careless or incorrect transportation of filters	Sea pollution caused by the contaminated bilge water	Reducing bilge water contamination caused by careless transportation of filters	Filters should be cleaned in special trays and in the designated areas
4	Process in galley and pantry	Food Waste	Sea pollution	Throw away to the nearest land	Sea pollution caused by food waste	Categorisation of garbage	Establishing and implementing Garbage Management Plan
5	Cleaning process during maintenance	Solid carbon residues generated by purifiers or cleaning jobs	Sea pollution	Throw away into sea	Sea pollution caused by solid carbon residues	Categorisation of garbage	Establishing and implementing Garbage Management Plan
6	During ballasting, de-ballasting operations	Transfer of harmful aquatic organisms, and pathogens into coastal waters	Ecological equilibrium change (eco-system change)	Impact of marine species on the environment	Occurrence of non indigenous diseases in marine environment	Ballast Water exchange operation	Establishing and implementing Ballast Water Management Plan

4. Results and Discussions

This study is generally concentrating on the importance of ISO 14001 requirements implementation for Ship Management Companies. Although the identification of policy statement, responsibilities of shipboard personnel and emergency preparedness for each type of contingencies, internal audits, management review activities, calibration and testing procedures of relevant equipment are already established in accordance with the requirements of ISM Code and statutory certification of ships, the environmental planning approach and their targets with in the framework of defined objectives are not clearly known and practiced both by the shore-based management staff and crew members.

Appropriate implementation of ISO 14001 requirements with in the parallel view of Management Cover Up Cycle Model could enable the Ship Management Companies reduce their unforseen expenses and the rate of detentions or arrest during various port state controls.

Consequently this proposed model could be a supportive preventive action for reducing the marine pollution and the rectification of environmental management rules that are not clearly defined in MARPOL Convention. The advantage of Management Cover-Up Cycle Model can enable the shipboard environmental protection activities by controlling the process as a backward and forward data-driven process. It means the actions will be taken step by step. The steps will define the environmental aspects, analyse the impacts, measure the significant impacts, and then tailor a solution that could be named as target. When the target is initiated to implement, its effectiveness is measured. If needed, the approach for reaching the target is adjusted for effectiveness. The proposed method can especially enable the tanker and gas carrier operators to integrate their existing structures for the new international rules and regulations.

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Safety Management - Leading Space Information Conception (LSIC)

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This power to abstract is one of the outstanding characteristics of human beings as compared with other animals. And this power is used not only by mathematicians, but also by artists, musicians, poets, and all other "human" beings. Perhaps some day we shall measure a person's "human-ness" by his power to abstract rather than by the I.Q.

Lilian R. Leiber (D. Wells,(1997))

ABSTRACT

What are the common things between ship's voyage plan, ship's ladder, Wall street in New York, International Convention STCW 95, path through the woods, cook- book, fairway in restricted waters, Principle of Universal Gravitation and ... ISM Code check-list ? All of them are tactical or strategic algorithms following which the Man and the Nature reach the definite goals in their activity. These algorithms are constructed in different forms , but they fill every step of our life.

To develop the safe algorithms of activity in any area we have to use the experience accumulated by the Mankind during a lot of years and there is no other ways to do it. For instance, if the Mankind did not accept the negative results of it's industrial activity to the Nature, we hardly began to protect the environment.

Following the vast set of different regulations and principles the Man with the help of technique which is created by himself has learned how to reach safely the different goals and how to solve the very difficult tasks.

In every time and everywhere the unconscious using an *abstract information* helped the Man to find the right way to the goal.

The paper highlights and analysis the link between Shannon abstract information quantity and Safety Management. Our ideology is based only on the conception of minimum redundancy of measurements relatively the enveloping space.

1. Introduction

In every field of mankind activity the obtaining of knowledge is based on analysis of information which is got from the object of research. Measurements in any case are the origin and they carry all the information we can extract.

Measurements are made by a lot of special instruments, devices or sensory with the help of our organs. They may be direct or relative ,discrete or continuous ,but the quality and quantity of information extracted from them is the key to get the goal we want.

In spite of the powerful development of science and technique a lot of failures and accidents take place in all spheres of our life .Navigation is only one small part of Man's activity where the tendency of accidents and catastrophes is not going down.

The pulse for research of this fundamental problem has arisen from practice and applied science of marine navigation and in the origin it has gone from the sea going ships navigation accidents analysis .

Preliminary investigations made in optic and radio- physical redundant measurements applied for fixing position of ships discovered that navigational measurements carry very few of Shannon (abstract) information in them, Loginovsky (1997). It was surprising and has encouraged us to go ahead.

Detailed analysis showed the direct connection between the shortage of Shannon information and navigational accidents at sea.

This paper may be considered as an introduction into the problems which arise not only in navigation but in every field of mankind activity where measurement are applied ,but they are applied everywhere.

2. Shannon information and measurements.

We live in time of upward tendency of civilization and development of techniques ,but nevertheless the *Human Element* (HE) is the main factor of safety in any area. We are of the opinion that difficulties relating to formalization of HE do not permit to compensate the negative influence of it to the *level of safety* .

To compensate the HE is not to exclude the Man from the management of any system, but to make him follow the strict safe algorithms constructed by himself. Electronic aids should help to solve the problem but first of all we have to learn how to abstract a lot of things connected with safety to apply the modern technology .

In this paper we shall begin with information. There are two types of information that may be received by different sensors: concrete (real) information (color, temperature, sum of money, distance, bearing, thickness, time... volume...etc) and abstract information in binary digits (bits).

The main positive features of abstract information are the unification of different types of measurements and direct of it link with the characteristics of measurement errors which are existing everywhere in our life.

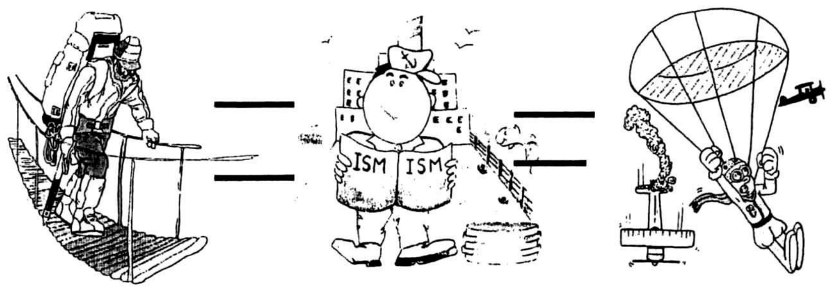

Figure 1. Safe algorithms

Suppose that we control some moving objects: ship at sea, airplane in the air, car on the road , etc. We are high quality specialists and we have a power to control the object ,but some measurement information is necessary to do it. Usually there is an information about the initial and running coordinates of the object .The coordinates of destination point have to be known as well. We begin to steer the ship ,to pilot a plane or to drive a car to the point of destination but make an accident or catastrophe occurs.

What are the main reasons of such things ? Let's try to find the most general , but come to agreement to exclude force- majeure situations from our discussion.

Grounding of the ship - what may be a reason of it ? It may be : not accurate navigational charts, poor visibility, HE (skill of a master, he is tired , etc.).

The ship was off the safe way because the navigator for example was not attentive due to some health troubles or his experience in that situation was not enough. But in any case the navigator did nothing to correct the situation. May be he did not identify the safe way ? May be, and it is very important.

Airplane catastrophe while landing- it's possible to find a lot of reasons but the most generalized one may be that the plane was just the same off the safe trajectory of landing.

The real and direct reason of every accident and catastrophe exists , but it's generalized as the bias of moving object from the safe way. One can say there was not enough reliable information to control the object along the safe way, that's why the control procedure was not effective. You may state that the information was reliable ,the information was enough ,but improper

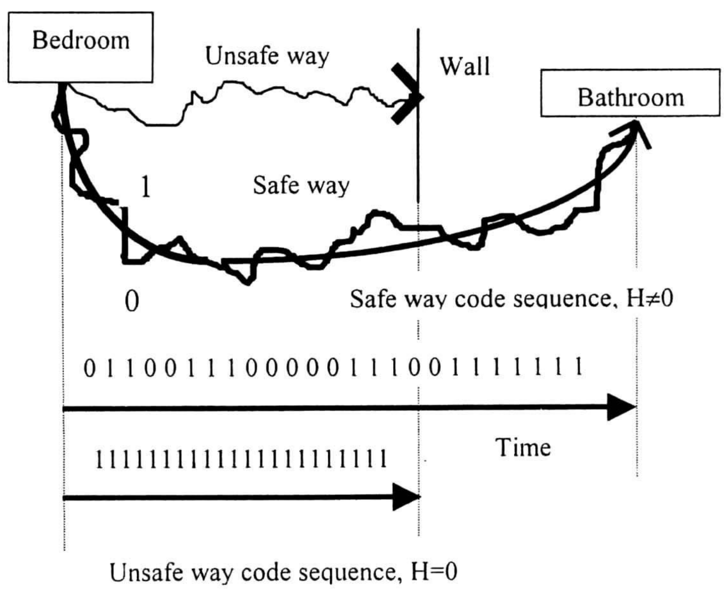

Figure 2. Safe way and Shannon information

interpretation of it may be the reason of an accident as well . It's just the same thing if the navigator did not recognize the safe or unsafe way.

It is very simple to understand that the systematic errors in measurements are the reason of bias in position and if this bias in position is unidentified it is the reason of different types of disasters not only in navigation .The navigator has to recognize such a situations and make corrections in control procedure to avoid danger. There are a lot of problems to discuss but the main is that the navigator compulsory needs to know if the moving object is on the safe way or not ?

We are sure to state a fact that there is clear resemblance and exact formal link between the information fields of such events as not correct proving of mathematical theorem ,not correct made diagnosis of man's illness or weather forecast ; grounding ,collision or capsizing of a ship or perishing of a space vehicle etc. In all events the control procedure was based on improper estimation of measurements and misunderstanding of the situation that has grown into uncontrollable state.

It's possible to say that the shortage of reliable information about position does not permit to predict the result although there is a power to control the object or some procedure. We observe such examples every day in our life. The information we use everywhere is a concrete information that is hardly able to be calculated. For instance we had an information about the coordinates of the ship before the grounding , but we did not know if this information was wrong or correct, reliable or not.

It is obviously to have a Hypothesis that there is a discrepancy between measurements and information they carry. We'd like to know what is a reliable information. Let's try to formalize the procedure of obtaining information and link the quantity of it with the of bias from the safe way.

Imagine that early in the morning you get up and go from the bed room into your bath room. You begin to navigate your body with the help the most modern integrated navigation system in the world that is located in your head. You know the safe way and use such your sensors as eyes to obtain the navigational information. The picture of your track is on fig.2.

Certainly it's possible to draw the safe way on the floor but it is in your head. You can't follow the way without any errors ,so your the track may be drawn as on fig. 2.

The safe way divides the space on the floor in two subspaces or it divides the plane of the floor in two arears. If you are in the left part we shall code such position as 1, and if your location is in the right side -it is 0. Let's take time interval to fix positions, for example ,in some seconds and make code sequence of your fluctuations near the safe way as a function of time. If you change the position from 1 to 0 or from 0 to 1 your track intersects the safe way in certain points , or in other words all these sectors include the points of the safe way. We shall call these points as information points or H-points. It is impossible to go strictly along the line and your fluctuations are random. The procedure is exactly the same as if you toss the coin to find the number of heads (p_0) or tails (p_1). So, you can calculate the information H about the safe way in bits (binary digits) . Ambiguity creates the information. You get it while traveling. This is so called Shannon (abstract) information and it's very easy to be analyzed by the following formula, Harmuth, (1989):

$$H= -l\,(p_0\log_2p_0+ p_1\log_2p_1),$$

where l - is the order (length) of binary code sequence , p_0,p_1- are the probabilities (frequencies) of *ones* and *zeros* in this sequence.

The maximum of H will be if your fluctuations are symmetrical relatively the safe way. But something had happened with your eyes ,you closed them and the real track had a bias into the 1-area. There were neither $0\rightarrow1$, nor $1\leftarrow0$ fluctuations and code sequence did not contain any information about the safe way. This was not good way and you I collided with the wall !

So, in this case you had the safe way in your head and got the concrete information about it by your eyes. The more such an information you have the closer to the safe way you go. But it's impossible to calculate the concrete information that you get by your eyes , so you have to calculate the abstract one relatively the safe way.

The reason of your early morning accident was the shortage of Shannon information about the safe way .You was off the way and did not identify the bias.

3. Shannon information on the leading line.

Imagine yourself on the navigation bridge and you ,as a navigator, control the ship's position on the leading line R, fig.3 .You observe the navigation leading lights and you know when your ship has a port side cross track error or a starboard side one . The plane in the vicinity of the leading line is just the same divided in 0-area and 1-area and it's possible to calculate H . So , in accordance with the above said ,$H \neq 0$ when the ship's track is on the leading line R and H=0 ,when the ship's track is off it. Now the safe way is indicated to navigator by leading lights or marks, but the situation is just the same it was before. How to link systematic and random errors of measurements with the quantity of abstract information ? Figure 3 shows us the quantity of Shannon information as the function of a systematic cross track error ε and random fluctuations with reference to the safe way . So the rule is : *the more intersections mean the more abstract information.* In this case it is mach more simple not to use formula for calculation of H but to estimate the number of information H-points, so on the track *a* H=8 and on the track *b* H=0. The corresponding graph is shown on figure 3.

The amplitude of fluctuations of the ship near the leading line depends on the accuracy of the line and the skill of the helmsman. The modern measurement systems are very precise (random errors are very small) But good precision (mean square error) is nothing if the system is not Shannon informative. Non-informative bias way (*b*) approaches the ship to the catastrophe.

When the ship is proceeding along the leading line there is one very serious feature (advantage) that helps the navigator to steer the ship: in every time the navigator can observe the error of ship's position relatively the leading line.

Do you know any other measurement system where the operator (*safety manager...*, why not ?) can do the same ? I guess it's not difficult to find an example.

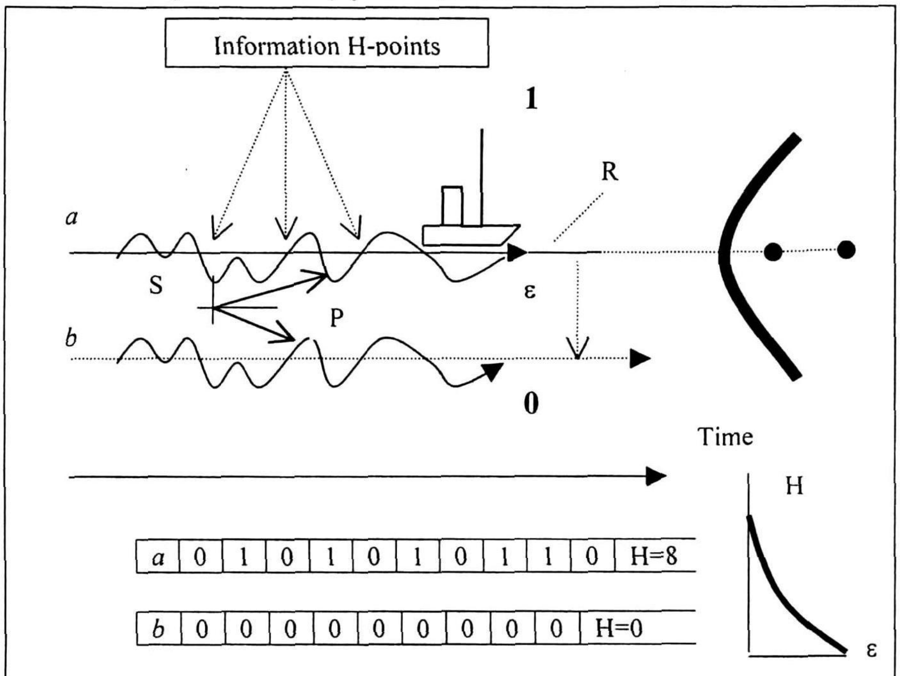

Figure 3. Information on the leading line

4. Generalization of approach

The human activity in any area is a movement. It means not only the physical movement of real object in a real space, but any movement of some point P (abstract moving object – vector P) in any abstract mathematical space S of any dimension. For example, in the case of cooking this space S might be multidimensional: S= $\{t, x_1, x_2, x_3, x_4 ... x_n\}$, where t is time, x_1 - quantity of food, x_2 - salt, x_3 - pepper, x_4 - water,...x_n– temperature of cooking and in the case of operations relating to Bridge Checklist B11 - Navigation in ice, ICS (1998) the space S may be formed by the following coordinates: S= $\{t, x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8\ x_9 ... x_n\}$,where t - time, x_1- latitude ,x_2- longitude ,x_3- time between observations ,x_4- speed ,x_5- depth ,x_7- time between soundings, x_8- time interval between soundings in bilges and tanks ,x_9- information of Master about the approaching to ice, x_n- ... etc.

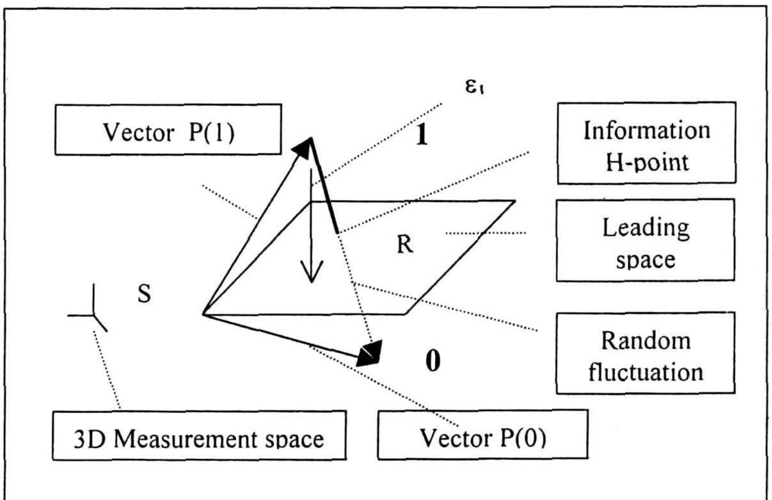

Figure 4. 2D leading space

The term *leading line* may be generalized on the space of any dimension. So in 3D space it is a *leading plane*, in 4D space it is a 3D *leading space (subspace)*, ... in nD space it is (n-1)D subspace. If the object P is off the leading space R it may be identified by the running deviation vector ε, fig.4.

In practice *leading space* R may be safe or unsafe, linear or non-linear, it may contains the information H-points or does not contain the abstract information about the running position of object P. It may serve as a thwart space, or guard space, but if it does not contain H-points this means that measurements are not informative relating to it and the track has a dangerous bias. In these case you are in the right to ask where we are ?

The very important note is that any deviation from R to S may be identified by vector ε, for example ,if we drive a car along the 1D central line on the highway we can see the deviation ε from this line into 2D plane of a highway. To attract the driver's attention they use the deviation ε of a car from 2D highway into 3D space ("lying policeman"). So, this is the same conception. It is remarkable that ,for example, some GPS receivers have highway mode of data presentation, it is LSIC mode, GPS 12, (1999) . There is preliminary plotted way on electronic charts and the OOW can observe by GPS track every time the deviation ε from the safe way. Problem is if the GPS track contains the information points . The development of DGPS mode shows that there are a lot of doubts about the quantity of information along this track fixed by standard GPS mode. Identification and elimination of systematic errors of measurements is primarily important.

So, if the navigation in S is impossible without measurements, there should be determined navigational marks, navigational parameters, navigational functions and if the number of measurements in nD space is n+1 we may use the LSIC to calculate H for *safety management* of object P.

In this case the linearization of navigational functions gives the local linear leading spaces (the space of solutions of linear system of equations) which may compose the whole non-linear leading space, for example if there is 3D S space and 2D R space, we have the following picture on fig.4, Strang (1976) . In this case measurement vector P is the abstract object that is to be controlled.

In principal any linear space S of Human activity may be constructed where the algorithm of progress is presented by some function F {t, x(1) x(2),x(3), x(4), x(5), x(6),x(7), x(8) x(9)... x(n) } or it's graph R.

From the above said it is possible to come to conclusion that the term *navigation* is ideologically applicable to any real or abstract mathematical space S and the expression *safety of navigation* has the general sense at all times and in all spaces.

One of the main task is to create the multidimensional electronic navigational chart for S space. On such a chart there should be the point of departure (the initial position to start the activity), the point of destination (the goal). To make a progress it leaves to plot the safe way and follow it. To follow this way we need to know where we are now relatively the safe way in order to control the progress.

In the context of the paper it should be defined some popular nowadays terms:

Safety Management is the set of procedures to bring the object (vector) P into the safe space R , using the information H. If the fluctuations of vector P are random the H-points are determined by themselves !

Danger level is the function of vector ε length and quantity of information H and it might be running and average one.

Safety Culture is an ability of a Man to keep vector P along the safe way R in S, and it is measured by average danger level during the time of progress in S.

Safety Culture as a form collective behavior may exists at different levels: IMO, IAMU, Administration, company, ship, Master, OOW,...ratings. At exact time we deal with the *Realization of Safety Culture*. It is the running danger level , that may be estimated if there is a safe way R in S.

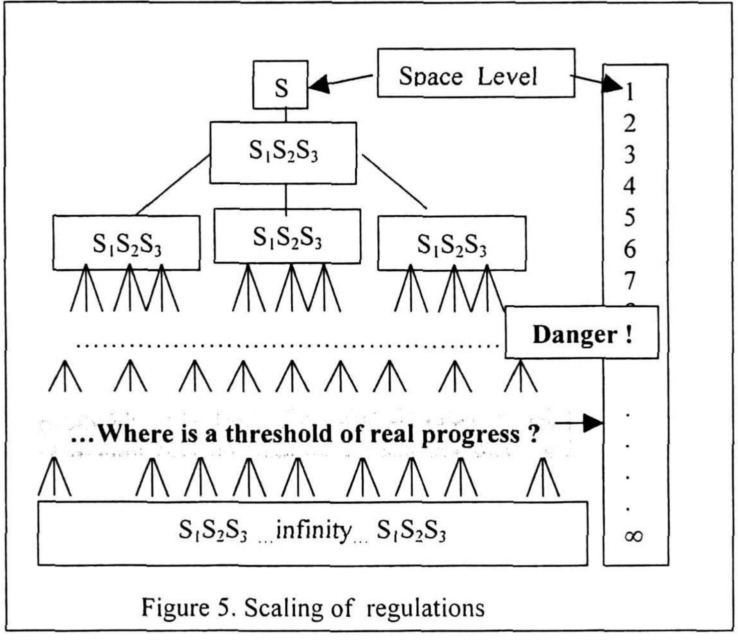

Figure 5. Scaling of regulations

5. Specification of safety procedures

Speaking about specification of procedures we are to take into consideration that every

area S of Human activity needs a lot of information H that should be obtained and developed.
To reach the goal in S let us divide it by 3 sub-spaces , Gludkin (1999) :

- S_1- is the sub-space of preparatory actions (planning)
- S_2 -is the sub-space of control procedures (realization)
- S_3- is the subspace of analysis and corrections

This algorithm is universal and applicable to any space S, but if we use the scaling to $S_{1,2,3}$ we discover that every space contains the same spaces $S_{1,2,3}$. Such structures are investigated in fractal geometry and are called as self-similar structures, Feder (1991), fig.4.The boom of algorithms (regulations) arises and the question is on what level the system effectively works if all the steps are to be documented. It is absolutely clear that the absence of regulations is dangerous, a lot of regulation is just the same dangerous, that is why the optimum for every S should be determined (Human or electronic aids capacity). It is may be the work of IMO Facilitation Committee, but it is obviously that the more higher level of education and training of seafarers the less number of regulations in S they need, so IAMU activity may give the tangible help. These problems are investigated by the information theory but the milestone problem is the quantity of abstract information to follow the safe way in S.

Figure 6. Do these papers contain H ?

We would like to highlight the documentation boom that is observed in international shipping nowadays. It reduces the *Safety* which is in the inverse proportion to danger level.

To develop regulations we have to take into consideration the qualification level of effecters.

So, the less the qualification of the specialist the more detailed algorithms of his activity should be prescribed, and that's why the main part of them must be carried out during the MET program. The STCW 95 Code may be as an example of such a minimum but comprehensive program that should be carried out in MET institutions. The high level of education and training should relieve the effecter from a lot of formal procedures in S.

The ISM Code procedures should be just the same of different levels of specification which depends on Safety culture level of company and seafarers: strategic- for high level, tactic - for middle level.

The STCW 78 Convention was not achieving its purpose . Instead , the Convention was gradually losing credibility as it acceptance widened. The main cause for this appeared to be the general lack of precision in its standards, the interpretation of which was left to the satisfaction of Administrations, IMO Workshop (1997). STCW 78 was too general and oriented on very high Safety Culture level of Parties . We are of the opinion that ISM Code has repeated the STCW 78 lack of precision, there are no tactic requirements for the middle and low level companies. These requirements should be developed to help the classification societies to rise the safety level of companies, taking into consideration Human or electronic aids capacity.

6. Approximation of tracks by H- points.

One of the problem to be learned is the measuring of safety. It may be done by estimation of abstract information H to follow the safe way with the prescribed accuracy.

Below on figure 7 we present some results on approximation of the unit segments of some graphs using LSIC approach, abstract space is presented on fig. 4 and real 2D –space is on fig 3. We used different proportions of measurement errors *k=systematic error/ random error* to obtain the definite sets of H-points applied for approximation of real curve segment by cubic splines. The real "safe track" is shown by bold line and spline numbers (N) are indicated in the boxes, H is the quantity of information as a number of H –points.

The following results were obtained:

- The maximum number of H-points on the curve or the quantity of H, as it is seen from table is obtained when *systematic errors are equal to zero*. It means that the errors of measurements are random and independent. The first spline is very close to the true curve.
- When the k=0.76, the approximated curve converts into a straight lines. So, the k or just the same H or number of H-points changes the shape and length of the curve segment and we may fix the minimum H when the approximated way might be considered as dangerous.
- When $k \le 0.7$, H=0 . In this case all measurements does not carry any abstract information H. All the measurements are dependent (systematic errors prevail – there is no $0 \rightarrow 1$ or $1 \leftarrow 0$ transfers). Strictly

speaking in the context of this paper we don't know the track at all and we can not approximate it by measurements, if there are a lot of them -they are fiction.

- Information H spreads not regularly along the curve: the maximum number of H-points is near the maximum curvature points.

7. Results and Discussion

- The lack of H about safe position of object P in any space of Human (or Nature) activity may be considered in general as the main reason of different types of accidents and catastrophes.
- LSIC gives the key to formalization of different spheres of Human activity including the HE.
- Using LSIC we may formally explain that information is born from redundancy and ambiguity. Observing the real areas of Human activity one can see the similar processes of obtaining information H for the progress to the goal. In this context (binary approach) ambiguity is the origin of progress ,by other words it is competition in industry , democracy in policy ,...redundancy in measurements ...etc. Redundancy and ambiguity (read *information* H) are the origin of progress in everywhere .
- Sometimes they say that redundancy and ambiguity is not need for the safety management because P_1 is much more closer to safety space R than P_0 , but theoretically no one object P is exactly in safe space and information H may be obtained if the competition exists. *One of the actions announced by LR, DNV and ABS is to align ISM with other safety management control measures by linking future issuance of SMC certificates to the classification of the vessels. The objective will be to phase out, over time, the split responsibility that now exists when one society classes the vessel while another judges compliance with the ISM Code* ,LSM :(April 2001) . May be it is the essential step nowadays. This is right if in binary situation one may prove the fact that $\varepsilon_1 << \varepsilon_0$., but the situation in shipping industry space is far from binary.

N	H	*k*
1	9	-
2	9	10
3	7	5
4	4	0.3
5	4	2.5
6	5	2
7	5	1.7
8	9	1.4
9	6	1.25
10	5	1.1
11	7	1
12	6	0.9
13	6	0.8
14	2	0.76
15	0	0.7

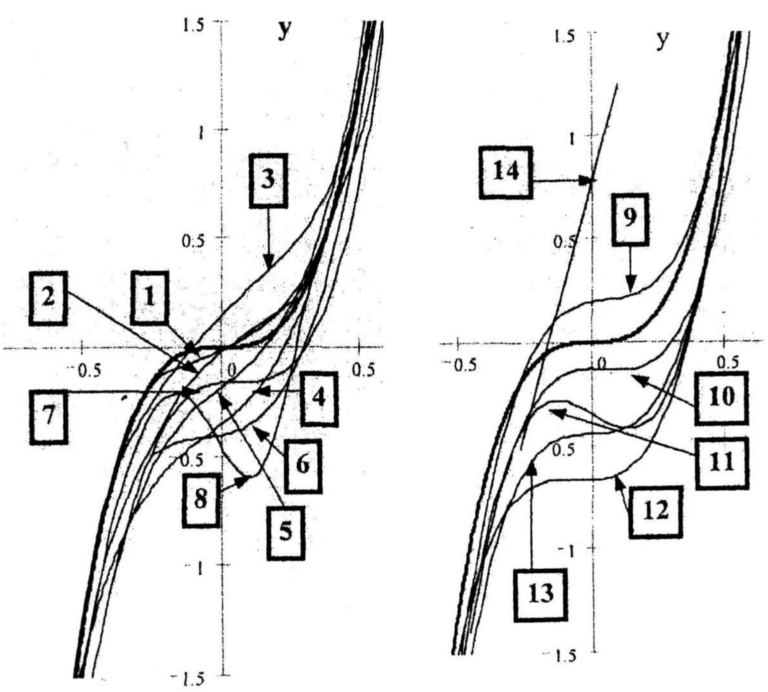

Figure 7. H-points and approximation of function $y=x^3$

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The importance of minimum standards in training of shore-based personnel on environmental protection

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ABSTRACT

The training of seafarers in environmental protection is an old and continuous developed subject. We can consider that present situation of the minimum standards are well stated and each crew member should be in the position to act properly in an emergency situation related to environment pollution.
However, that is not enough. When ships are under loading/unloading operations the risk of pollution is related to the shore-based personnel in the same time.
The paper presents the high risks of environmental pollution during the time when the ships are at their berths and the importance of minimum standards in training for shore-based personnel on this subject.
It is analysed the particular situation of the Port of Constantza and the possible impact of the lack of training in environmental protection. There are also presented the initiatives of the Constantza Maritime University in order to offer on a regular basis and in the local language appropriate training both for seamen and shore based personnel on environmental protection and anti-pollution procedures.

1. General framework

The environmental protection became one of the most actual issues in the last period, but unfortunately, not often the efforts in eliminating the risk of pollution are correlated with the training of the personnel. Nowadays we are discussing about very precise rules and standards related to prevention of pollution in regard to the ships and to the on board personnel training. The STCW Code requires that the on board personnel must prove the competence in prevention of pollution of the marine environment and anti-pollution procedures. After very short time the International Safety Management Code will become mandatory for all ships.
Under these circumstances, with the appropriate efforts to reach the standards and follow the procedures, the risk of pollution from ships is limited, but the question is: ***Is the risk of pollution in maritime transportation related only to the ships?*** Certainly not. The risks are also related to the loading/discharging operations. So, in the same time we consider that the port operators should have specific standards for pollution prevention and shore-based personnel should have standards for training in pollution prevention and anti-pollution procedures.
As will be presented in the following sections there are efforts in this field but they are not coordinated, most of them being in the stage of action plan steps. Having in view the risks associated with port operations in the environmental pollution, same importance must be given for the training of shore-based personnel as is for the on board personnel and to be sure that the goal is achieved, standards for training of shore-based personnel must developed.

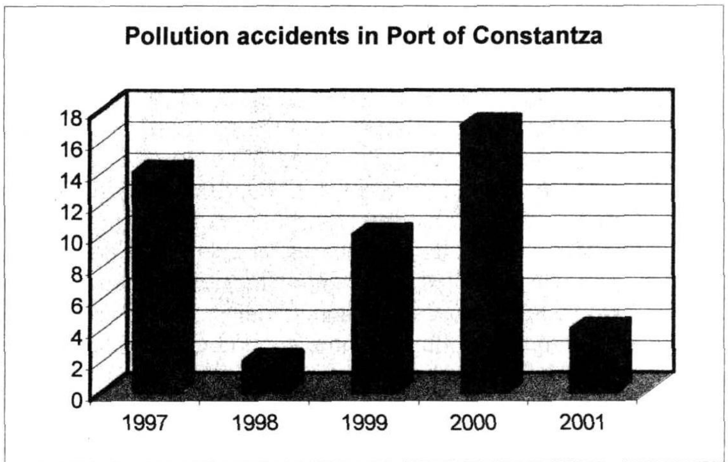
2. Regional and local issues

The European Sea Ports Organization highlighted in the *Environmental Code of Practice* issued in 1994 the importance of education and training on this subject. It is recognised that in spite of the high degree of automation and computerization in many ports it is still the human element which should be in control. This requires a level of knowledge and training which is sufficiently high to execute the various tasks professionally. Education and training programmes need to be developed which are geared up to the specific activities carried out in the port. An important result of high levels of training is that full knowledge of the tasks being carried out will also enhance motivation. This in itself has a positive effect on the quality of performance and the sense of responsibility. For example, improper handling can not only lead to loss of cargo, but will also create potentially harmful situations for the people involved and those in the vicinity.
All ESPO members are recommended to ensure that education and training receive high priority within their environmental management plan.
The project *ECO Information in European Ports* underlined the need of standards of training on environmental protection. The final report issued in November 1999 shows the necessity of the active training programmes to

bring the European environmental knowledge in ports on a joint higher level. The assessment developed under the Self Diagnosis Method (SDM) in more than 50 European ports concluded that the staff is at least partially aware of the environmental effects of their work activities. Between 16% and 40% of replies satisfied Environmental Management System requirements, and between 45% and 60% were found as making progress towards this goal.

Are all employees aware of the following	*% Answered*	*% Yes*	*% Partial*	*% No*
Potential environmental effects of their activities	100%	40%	50%	10%
Environmental benefits of improved performance	97%	19%	62%	19%
Consequences of non-compliance	97%	19%	45%	36%
Economic benefits of improved performances	97%	16%	48%	36%

Over 80% from the respondents did not had a full environmental training programme in place, but 60% of the respondents indicated that some training programmes are in use.
The Central European Initiative- environment and transport subgroup, where Romania is one of the members, included in the action plan steps related to the education and training.
The Black Sea, of which the six littoral states are members of the Council of Europe, with three applying to join the European Union, is assessed as 90% biologically dead, the Danube being source of 80% its pollution. We can mention here the cyanide spill occurred at Baia Mare, Romania on 30th January, 2000 with important consequences, or the accident occurred on 10 March 2000 in north-west Romania, when sludge with high concentrations of heavy metals (in particular lead and zinc) was discharged from the sedimentation pond of a non-operating mine in Baia Borse into the river Visheu, a tributary of the Danube.
In 2000 the Port of Constantza made high efforts in increasing the maritime safety and environmental protection. The investments were in amount of 33 million US dollars. The main part was spent for the Works of Reabilitation and Completion of the Breakwaters project which will be finished this year. The Vessel Traffic Management Information System was implemented. Another achievement, the Bilgewater Treatment Plant, part of the Constantza Port Waste Management project, was also inaugurated. Thus, it made one step ahead towards the increase of the port safety and environment protection in compliance with domestic and international regulation. Concerning the development, one of the most important priority and action is Port Waste Management Project financed from Romanian resources 3.3 million Euros, from European Investment Bank 5 million Euros, From European Union (through ISPA programme) 8.3 million Euros and the completion is expected by 2006.



In Constantza Port there are regularly small pollution accidents. As is presented in the diagram, only in 2000 occurred 17 such accidents, including pollution due to improper loading/discharging operations of bulk cargo or oil products. In first seven months of this year other 4 pollution accidents occurred.
In October 2000 was performed an environmental assessment based on SDM. From the first conclusions of the assessment we can observe:

- Existence of various authorities and entities involved in environmental protection actions, within the port area.
- Land inside the port belongs to several different entities, which reduces the Port Administration commitment, responsibilities and authority.
- Port Administration is not responsible for port operations.
- Zoning of port areas is important to control and reduce the adverse impact to the environment.
- Environmental issues are strategic topics, as they affect the competitiveness of the port
- Establishment of an Environmental Management System and its respective Action Program (Policy, procedures, reception facilities, control, assessment, etc), must be part of the Strategic Action Plan.

3. International initiatives on curricula standardization

The need of curricula standardisation for training of the port industry it is widely recognized. One of the most important events discussing the subject was the 16th International Port Training Conference held in Rotterdam on 27-30 May, 2001. The participants to the conference concluded:

- Port Authorities and cargo handling operators supervised by such authorities are neither governed by global standards on certification or by provisions ensuring, by means of inspection, that ports operate under best-recognised practices. On the other hand, the shipping industry operates under a set of international rules governing a) working and living conditions, b) standards for certification of crews and c) safety conditions on board ship. Compliance of these rules is inspected, among others, by regional Port State Control agreements.
- It is argued that ports may operate under national rules. This argument is debatable. Ships must conform to the national rules of the flag they fly. The lack of appropriate application and control of the rules in many countries of registry led to the adoption of international instruments to pursue acceptable operational practices in this industry. Increasingly, the safety of ships, crews and the environment is also dependent on port services and Port State Control inspections offered. Accordingly, ports operating in conformity with recognized international best practices could also serve the world shipping industry.
- Although in 1951 port work was internationally recognized as an occupation, no instruments, comparable to the STCW convention, are presently in force spelling out the minimum standards to which port personnel training must conform. This state of affairs is questionable. The economic benefits of standardization are not generally challenged by international organizations, which devote a substantial amount of money and resources to the drafting of standards.
- The existence of non-harmonized standards for similar technologies in different countries can contribute to the so-called "technical barriers to trade". Industries have long sensed the need to agree on world standards to help rationalize the international training process. This was, among others, the origin of the International Organization for Standardization (ISO) crated in 1947.
- Many port industries are presently pursuing certification for the quality of standards of the ISO. As part of the certification process the ISO stipulated that:
  "*The supplier shall establish and maintain documented procedures for identifying training needs and providing for the training of all personnel performing activities affecting quality. Personnel performing specific tasks shall be qualified on the basis of appropriate education, training and/or experience, as required. Appropriate records of training shall be maintained*".
  This development should strongly encourage international organizations and leading shipping and transport educational institutions to seek for minimum curricula standardization.
- the need for overcoming problems affecting the port industry throughout the world makes it also essential to consider standardization of teaching programs for port personnel at levels yet to be determined. This involves the opening of economies and trade liberalization, which in turn require a higher degree of port efficiency.
- Standardization on the basic content of job descriptions is an alternative that could be considered for port training. Such an approach would in turn lead to a degree of standardized training to adhere to the requirements established in the above job descriptions. Standardized job descriptions would also set global benchmarks for developing training programs for international use.
- Unlike the shipping industry, the port industry is a land-based industry with national practices and laws that have been developed for production industries. A number of countries have included the training and certification of portworkers in their national certification process. International instruments in force for Occupational Safety in Dockwork, Handling of Dangerous substances should be embodied in national certification standards covering safety, health and working practices.
  This would ensure the application, where appropriate, of minimum training standards in these areas, promote best practices in ports from a national perspective and permit qualifications for cross port sectoral employment conditions. Together with proper and modern management optimal performance is reached.
- The use of simulation techniques in educational programs for the port and shipping industries is rapidly becoming an essential tool for achieving optimal and rapid training results. Such techniques are developed on existing operational realities in these industries. To a large extent these realities are globally similar. Simulation techniques should be developed on such global realities for supporting standardization in practical training through simulation.
- Training of port personnel is currently within the action programs and agendas of several international organizations. Unfortunately, there is no apparent effective coordination between these organizations.

4. Constantza Maritime University initiatives

The training on environment protection for the shore based personnel in the Port of Constantza is sporadical and in most of the cases is developed just in English language under different international projects. That is way Constantza Maritime University decided to translate into Romanian language and deliver the TRAINMAR course *Environmental Management of Ports,* in order to offer training for a larger target population and on a regular basis on this subject. An other CMU initiative was to apply for an European project in order to develop a Masteral Course on Maritime Safety, where the environmental issues are also included. The project was approved to be financed under SOCRATES Programme and will be developed in cooperation with other European universities.

4. Conclusions

Having in view the above presented facts we may conclude that:

- the environmental pollution prevention is a general concern and there are efforts for developing a sustainable transport;
- there are developed and applied environmental standards related to ships and on board personnel;
- it is recognised the role of the training in prevention pollution and anti-pollution procedures but the training programmes for shore-based personnel are running just in few ports;
- environmental management systems are not implemented in all ports;
- there are not training standards for shore-based personnel and so it is difficult to assess the quality and the effectiveness of the training activities developed on this subject;
- the lack of training, or the lack of quality of training may increase the risks related to environmental pollution in ports.

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Potential problems and solutions for implementing international and national regulations and rules to comply with the objectives of a Maritime Safety Management System

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ABSTRACT

After an international convention coming into force, the most important thing that the contracting party is going to do is the implementation of the international conventions. Due to the various reasons, sometimes some international and national regulations could not be implemented properly, as a result, it is not possible to achieve the original objectives of the conventions. Therefore, how to implement the related conventions is the key issue in the maritime community. This paper is going to analysis the potential problems existing in the implementation of the international convention and national regulations, and points out the solutions.

The potential problems include the following aspects:

@ Inadequate financial support

@ Lack of public awareness

@ Insufficient enforcement by the Administration

@ Consideration the interests of the country

The solutions will focus on the following areas

@ The Flag State Responsibility

@ The Port State Responsibility

@ The Classification Society Responsibility

@ The Training Institutions Responsibility

This paper will also highlight the Port State Control(PSC) regime in the implementation of the conventions, which includes the positive and negative impacts of the PSC, the inter-relationship between Flag State Control and PSC, and the future development of the PSC in the implementation of the international and national regulations.

1. Introduction

Since the foundation of the International Maritime Organisation(IMO), there have been a number of international conventions and regulations being drafted and finally being ratified by sufficient contracting parties. However, the marine disasters have not decreased as expected. Obviously there are many reasons, one of the reasons is the improper implementation of the international conventions and national regulations. Therefore, it is quite necessary to find a way to overcome the problems for the implementation of the international and national regulations and rules.

2. problems for the implementation of the international and national regulations and rules.

2.1 *inadequate financial support*

inadequate financial support is the common problem for the implementation of the international and national regulations and rules in the world, particularly in the developing countries. Maritime industry needs quite large investment. If the economy of a country is slump, it is not possible to invest a lot of money in the maritime sector, as a result, the international and national regulations and rules unable to be implemented properly. For instance, the major problem of Annex II of MORPOL73/78 concerned reception facilities, the provisions of which was crucial to the effective implementation of the regulations. Reception facilities for chemicals are more expensive and complicated than those designed for the reception of oily wastes, since the wastes they are required to deal with are much more varied. There is also little opportunity for recycling them. As a result, governments and port authorities were reluctant to provide such facilities.

Another example is the lack of training facilities for marine officers. With the development of the technology of marine simulators, more and more training institutions are using the marine simulators to train the trainees in accordance with the requirements of the STCW78/95. Some marine colleges, particularly in developing countries, could not purchase such kinds of marine simulators due to short of money, therefore the STCW78/95 Convention is unable to be implemented properly.

2.2 Lack of public awareness

Sometimes the publicity did not pay close attention to the international and national regulations and rules due to lack of awareness, particularly to the marine environmental issue. in that case, it is not easy to fully implemented the regulations. This is another problem. So the fact that MARPOL measures have essentially been disaster-led is not necessarily a bad thing. The impact of the public outcry over oil slicks or tar balls on beaches has been to ensure that oil majors who transport crude oil around the world are willing to invest in safety and pollution prevention features-because an accident, apart from its costs in human life or physical terms-could cost them dearly in bad publicity.

2.3 Insufficient enforcement by the Maritime Administration

Some Administration did not take sufficient measures for the enforcement of the implementation of the international and national regulations and rules due to lack of inadequate infrastructure, as regards organisation and personnel for ensuring proper standards of maritime safety on board ships and prevention of pollution from ships. Sometimes the national legislation could not be updated.

2.4 Consideration the interests of the country

Due to the historical reasons, the average age of the national merchant fleet is very old, which makes some of their vessels very difficult to comply with the present international and national regulations and rules. However, the national government is unwilling to eradicate such kinds of substandard vessels for the consideration of the protection of its national maritime industry. Under such kind of circumstance, the international and national regulations and rules could not be implemented properly.

3. The solutions for the problems for the implementation of international and national regulations and rules

How to tackle the foresaid problems is the key issue for the improvement of the implementation of the international and national regulations and rules. The solutions will focus on the following areas:

3.1 Flag States Responsibility

The UN Convention on the Law of the Sea(UNCLOS)establishes the fundamental principles and thereby makes it clear that having a shipping register is not an unfettered right of a sovereign state but one which is qualified as a result of the obligations imposed on the state, especially with regard to ensuring compliance with international minimum safety , pollution prevention and social standards.

The duties and responsibilities of flag states are firmly established in international law and provisions are binding all states. All flag states should abide by their international obligations and take the necessary enforcement measures so as to secure the implementation of the international conventions by vessels flying their flag.

The efforts of Flag States are of primary importance in ensuring that ships conform to international safety standards such as the ISM Code. That is why the Maritime Safety Committee of IMO is currently looking into improving Flag State implementation of the main IMO safety conventions through its FSI Sub-Committee, as well as focusing on streaming the rights and obligations of port states.

The Flag State must be responsible for the following aspects in respect of the implementation of the international conventions and national regulations efficiently and sufficiently.

3.1.1 Establishing the necessary national legislation to guide proper implementation of the international conventions

it is the obligation of the Flag State to draft the national legislation for the implementation of the relevant international maritime conventions. No IMO Conventions pertaining to maritime safety or marine environment protection, except the International Regulations for Preventing Collisions at Sea, is capable of being properly implemented without detailed regulations or rules. From a mere legal point of view it may seem adequate if there is a piece of legislation declaring an IMO Convention as national law. A number of developing countries did in this way.

3.1.2 Establishing control mechanism to ensure the international conventions being properly implemented

a large number of Administration have delegated fully or in part their statutory work to Classification Societies. Even if an Administration decided to delegate their full work to the Classification Societies, the necessary legislation must be developed and adopted and some guidance must be given by the Administration to the Societies. The Administration must establish some control mechanism to be able to monitor the work being carried out on their behalf. Each Administration must be aware that the responsibility can never be delegated to other parties such as the Classification Societies. It is always the first responsibility of the Flag State to ensure ships flying its flag to implement the international conventions.

3.1.3 Taking measures for enforcement of the implementation of the international conventions

Flag States should also consider taking additional measures such as bringing proceedings against substandard vessels flying their flag, and imposing penalties of adequate severity to discourage such violations of international minimum rules and standards. The Flag State must be aware that Port State Control can never substitute the Flag State though sometimes the Port State can find the substandard vessels and force them to take appropriate corrective measures to meet the requirements of the relevant conventions.

3.1.4 invest in the maritime sector

due to the foresaid reasons, one of the problems in the implementation of the international and national regulations is the lack of money, so it is the Flag State's obligation to seek money for the investment in the maritime field in order to fully implement the relevant international and national regulations and rules.

3.2 Port State Responsibility

Port State Control(PSC) which means the inspection of foreign flag vessel visiting national ports has been defined as the last safety net in maritime safety. PSC is recognized as being a step in the right direction towards the eradication of substandard ships, when it is carried out in accordance with IMO Assembly resolutions and recommendations.

Port State Control is described as a secondary tier of enforcement, the first responsibility for compliance with international convention standards remains with the Flag State. Port States are not obligated to inspect foreign ships, but do so in the interests of safety and pollution prevention. While Flag States are responsible for the enforcement of IMO Convention, PSC is seen as fulfilling a caretaker role in terms of supervising the application of Conventions. Port State Control aims at eliminating the operation of substandard ships but it is not a substitute for the Flag State's responsibilities. The increasing failure on the part of some Flag States to effectively implement and enforce international standards for safety and pollution prevention has led to the increased strengthening of the role of the Port State as a policing mechanism for the shipping industry and a "safety net" for the Flag State.

In recent years, Port State Control has become a key element in singling out unscrupulous operators and eventually eliminating substandard vessels. It is now commonly acknowledged that Port State Control will play an important role in determining whether the implementation of the international conventions on board ship is as effective as desired. For instance, the Port State Control Officers (PSCO) will verify the Certificates of the ISM Code such as the Document of Compliance (DOC) and the Safety Management Certificate(SMC) on board the ships which have to comply. If the PSCO has clear grounds for believing that the master and crew are not familiar with essential shipboard safety procedures, the operational drills and demonstrations may be required. If the operational proficiency of the crew is not of an acceptable level, the ship may be detained. This decision will be based on the opinion of the PSCO.

3.3 Classification Societies Responsibility

the greatest contribution to improve maritime safety can only come from higher conformance by the world fleet to recognised IMO Conventions and international standards. As the author mentioned before, much of the work of the Administration have been delegated to the Classification Society. So the Classification Societies must do their work in accordance with the relevant international and national regulations. For instance, many Flag Administrations have delegated the International Association of Classification Society(IACS) to issue the Safety Management Certificate(SMC) for ships due to lack of resources, and some Flag Administrations also delegated the IACS societies to issue the Document of Compliance(DOC) for a shipping company. Therefore, the IACS must control the ISM Code certification delivery and ensure that the ISM Code certification services are under the responsibility and authority of the IACS member society and not of any of its subsidiary bodies or sub-contractors.

3.4 Training personnel

it is very important to improve the personnel awareness for the international and national regulations through training. Human factor is the one of the most important factors in the process of the implementation of the international and national regulations, particular for the seafarers. When reading reports on investigations into maritime casualties over the decades it becomes clear that most casualties have come about as a result of human failures. The statistical analyses suggest that around 80 per sent of all shipping accidents are caused by human error. The underlying truth is that the act or omission of human being plays some part in virtually every accident, including those where structural or equipment failure may be the immediate cause. It is the training institution's obligations to train the seafarers and let them better understanding the all relevant international and national regulations. For instance, the international convention on the Regulations for Preventing Collisions at Sea,1972 is the one of the most important conventions for the marine officers, firstly, they have to understand the exact meaning of each provision of the convention, then they could know why they should do so or why they should not do so during the navigation.

4. Conclusion

The Flag States, the Port States, the Classification Societies, Shipping Companies and Training Institutions shall work together for the fully implementation of the international and national regulations and rules. Of course, the first responsibility for the implementation of the conventions still remains in the Flag States.

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Presenting Papers

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PROFICIENCY DESIGNATION FOR THE SHORE-BASED MANAGEMENT OF SHIPPING COMPANIES

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ABSTRACT

The ISM Code has heralded a new era in shipping and shipping management. The Document of Compliance and the Safety Management Certificate of ISM are the only statutory trading certificates that take into account shore-based management strategies. The ISM Code is the first IMO instrument to combine both shore-based and shipboard standards in a coherent manner.

Although the STCW Convention clearly identifies proficiency standards and knowledge requirements for shipboard personnel, there are no such standards for shore-based staff. This is an issue as such staff can also affect the quality and the efficiency of the ship management process. STCW-95 addresses company responsibilities that were not defined in STCW-78. On the other hand, although Clause 4 of the ISM Code requires key shore-based person(s) to be nominated, it does not clearly indicate the qualifications of these staff while carrying out their ship management functions.

The assurance of safety and marine environmental protection can only be achieved by the efficient integration of shore-based and shipboard personnel qualifications for the different ship management functions. This paper provides definitions of proficiency and proposes interrelationships between shipboard and shore-based personnel which will reduce hazardous occurrences and other risk parameters.

This study proposes proficiency standards for staff involved in crewing, operation and the technical activities associated with the coordination of the fleet management process. In addition, the role of executive management and the interrelationship between the commercial and technical ship management processes are considered, whilst taking into account international legislation and regulations. Claims handling and supplying necessary resources to ships are covered under the operational management of fleet directors.

KEY WORDS: Proficiency designation, qualification requirements for shore-based staff, ship management

1. Introduction

The international rules and regulations that are established by the International Maritime Organisation (IMO) for the technical management of ships are mainly focussed on two crucial outcomes - safety and pollution prevention. These rules and regulations concentrate on the specifications of ship's structure, the machinery and equipment that should be provided and operated on board the vessel and the proficiency of crew members to name just a few. The ISM code is the only set of IMO rules and regulations, focussed on the assurance of safety and pollution prevention, that addresses shore-based requirements (Traves, 1997). The ISM Code provides a management methodology for implementing the rules and regulations described under SOLAS, MARPOL, COLREG, LOADLINE and the STCW Convention.

The ISM Code defines what has to be done, but does not make any clear explanations on how it should be done (Er and Sogut 1999). This produces a great deal of uncertainty for both external and internal auditors. In an international environment, it is difficult to always produce a single specific rule as it may not be applied easily to every shipping company. Moreover, a prescriptive regime may be difficult to implement for ships with a multinational crew and differing cultural approaches to ship management. The methods proposed in this study aim to define and properly implement the minimum requirements of shore based proficiency that are required to produce an effective ship management process (Er 2001). Ideally, this paper will provide a blueprint for ensuring the safety and effective environmental management of ships whilst at the same time ensuring the continual improvement of quality in shipping.

2. Why Do We Need to Define Proficiency Standards for Shore-Based Staff?

The analysis of 113 deficiencies on 68 ships relating to the ISM Code in the year 2000 indicates that they are mainly caused by the insufficient coordination and understanding of the international requirements of technical ship management by shore-based staff and the ship's crew (Equasis 2001). The majority of defects are caused by operations carried out by shore-based personnel who are inadequately trained or poorly supervised. The rest of the defects are mainly caused by the inadequate implementation of action plans defined in shipboard operating procedures.

The dominant causes of deficiencies in year 2000 are illustrated in Table 1 with 1999 statistics included for comparison.

Table.1 Dominant cause of ISM deficiencies in year 2000.

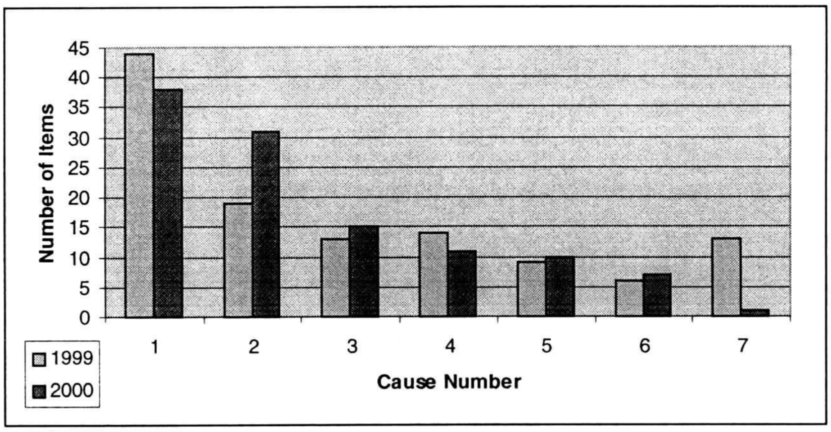
Cause No.	Leading Causes of ISM Deficiencies	No. of Items 2000	No. of Items 1999	% (Yr 2000)	No. of Detainable Deficiencies
1	Poor maintenance of ship and equipment	38	44	33.7	7
2	Insufficient familiarisation of crew and company staff with SMS	31	19	27.4	8
3	Failure to satisfactorily carry out emergency response drills	15	13	13.3	7
4	Improper documentation of SMS	11	14	9.7	3
5	Improper DOC or SMC	10	9	8.8	2
6	Other (relating to STCW regulations)	7	6	6.2	2
7	Inadequate language ability of crew members	1	13	0.9	1

In general, the total number of ISM deficiencies slightly decreased in year 2000 compared with the deficiencies that occurred in year 1999. In both years, the number of deficiencies caused by poor maintenance of ship and equipment (cause 1) was the greatest. Every Port State Control inspection addresses the maintenance aspects of ships from both the hardware and software viewpoint. Items related to the insufficient familiarization of crew and company staff (cause 2) and improper documentation of the Safety Management System (cause 4) have also increased from 1999 to 2000. Interestingly, the cause related to the inadequate language abilities of crewmembers (cause 7) showed a remarkable reduction between year 1999 and 2000.

Looking at specific causes, Cause 1 and 2 are consistently the most prevalent with the dramatic increase in unfamiliarity of crews with the Safety Management System (Cause 2) being a potential concern. However, this increase may reflect a greater focus on this matter by PSC surveyors and some care is required in interpreting the results, now and in the future.

The above seven dominant causes of defect can be classified into two groups (Redfern 1998); namely group "A", of conventional causes which have always been detected by PSC surveyors (causes1,3 and 6 above), even prior to the ISM Code came into force, and group "B" for post-ISM Code causes (causes 2,4,5 and 7).

The ratio of both groups and the comparison of deficiencies are illustrated in Fig.1. It can be seen that group A and B were almost equal in both years.



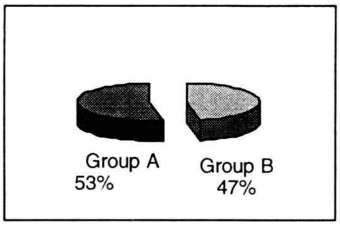


Fig.1 Number of ISM Code deficiencies classified by dominant causes and grouped dominant causes

Now, taking the same deficiencies in Table 1 for year 2000 and relating them to each of the relevant ISM Code clauses, we obtain Table 2.

Table 2. ISM Deficiencies classified in each clause of the ISM Code

Clause No.	Clause	No. of Deficiencies	Percentage
1	General	5	4.4
2	Safety and Environmental Protection Policy	0	0.0
3	Company Responsibilities and Authority	3	2.7
4	Designated Person(s)	3	2.7
5	Master's Responsibility and Authority	5	4.4
6	Resources and Personnel	11	9.7
7	Development of Plans for Shipboard Operations	7	6.2
8	Emergency Preparedness	17	15.0
9	Reports and Analysis of Nonconformities, Accidents and Hazardous Occurrence	7	6.2
10	Maintenance of Ship and Equipment	34	30.1
11	Documentation	7	6.2
12	Company Verification, Review and Evaluation	4	3.5
13	Certification, Verification and Control	10	8.8
	TOTAL	113	100%

We can see that Clauses 8 and 10 produced the most deficiencies in this year. These deficiencies have a close relationship with the Reports and Analysis of Non Conformities and Accidents and Hazardous Occurrence as stated in clause 9 of the ISM Code. In order to minimise the re-occurrence of the same non-compliances both in the company's office and on board the ships, the Designated Person Ashore (DPA) and the ship's master play a crucial role in the corrective and preventative actions (Hunter 1998).

The statistical distribution of deficiencies classified for each clause of the ISM Code depending on the type of ship is illustrated in Fig.2

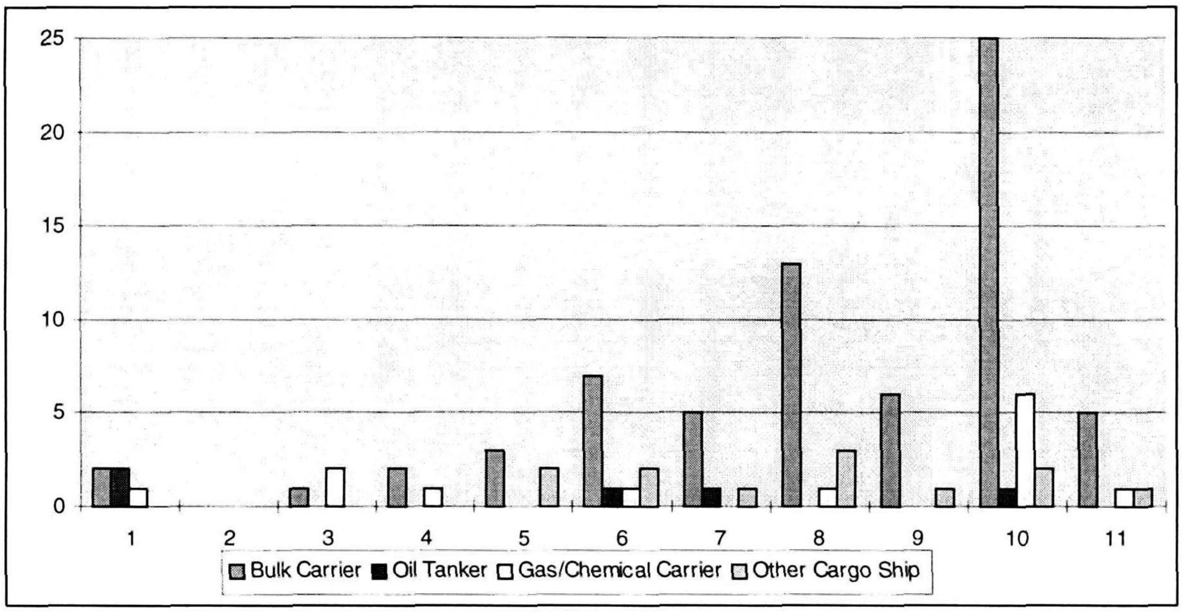


Fig.2: ISM Deficiencies classified in each clause of the ISM Code and type of ships

It can be seen that the number of ISM Code deficiencies on bulk carriers account for 60% of the total deficiencies for all types of ships. Deficiencies relating to Clauses 10,8 and 6 of the ISM Code are the most prevalent across all ship types with bulk carriers again dominating. With respect to clause 10 of the ISM Code (relating to the maintenance of a ship and its equipment), many bulk carriers and gas/chemical tankers show the same deficiencies. The role of vetting as part of the approval process for charterers for oil tankers and gas/chemical carriers has undoubtedly had a significant effect on the reduced incidence of deficiencies on these vessels, especially compared to bulk carriers.

3. Identification of Proficiency and the Expected Duties and Responsibilities for Shore-Based Staff

To ensure a satisfactory level of safety and environmental management, a ship management company needs to have key people undertake the following activities (Er 2001):

- *Coordination and Execution* : The person carrying out these activities is the Fleet Manager or the General Manager of the Marine Division. These people are responsible for the technical and commercial management of ships as their first priority and provide all the necessary resources on behalf of the senior management.
- *Operational*: The person carrying out these activities is usually the Operations Manager. This person is responsible for the pre-fixture and post-fixture of ships including the voyage and cargo plans, port operations, ship supplies, implementation of charter party requirements, the claims handling process, emergency preparedness both for the office and shipboard staff, and the work assignment of operations superintendents.
- *Technical*: The person carrying out these activities is termed the Technical Manager. He/she is responsible for the maintenance of the ship and its equipment, supplying fuel and lubrication oil, any necessary ship docking and repair works, the traceability of a ship's statutory certificates, and the work assignment of technical superintendents.
- *Crewing*: This person, called the Crewing Manager, is responsible for recruiting crew members, implementing pre-joining ship training procedures and the arrangement of crew.

The associated job descriptions for the people described above all have the following objectives:

- To pro-actively control and maintain the company's Safety Management System;
- To control non-conformance's and take corrective actions with the intention of preventing re-occurrences of quality and safety system deficiencies;
- To ensure that any implemented corrective actions are effective; and
- To undertake management reviews that identify system weaknesses and eliminate these weaknesses.

The qualification levels and the expected functions of each key activity in terms of responsibilities and authority of each designated position in a Ship Management Company's system that has particular influence on the quality of service and the effectiveness of the Safety Management System are defined in Tables 3 and 4 below.

Table 3. Expected Proficiency and Identification of Training Needs for Coordination and Execution Activities.

COORDINATION AND EXECUTION ACTIVITIES	
Required/Expected Proficiency	**Identification of Training Needs**
1.Efficient and economical running of the marine operations and transportation requirements of cargo, formulating budgets for management, monitoring, and maintenance of Quality and Safety Management Systems.	Course: Ship Management Output Skills: Integrated implementation of the Commercial and Technical Management of Ships including budget planning, running cost analysis, ship finance.
2. Effective implementation of the Quality and Safety Policies and providing the infrastructure required to enable the Company to meet its desired objectives and stated aims of providing a quality service to its customers.	Course: Business Administration Output Skills: Process management, failure mode analysis, scope of assessment techniques, decision-making, team work approach.
3. In liaison with the other Departmental Managers producing and developing projects, budgets and determining the training requirements both for office staff and shipboard personnel. Providing necessary resources (including personnel) and support for the departmental activities to carry out their functions for implementing the Quality and Safety Management Systems effectively.	Course: Human Resources Output Skills: Compulsory rules and regulations overview, organization theory and planning, performance evaluation, resource management
4. Planing and implementing the internal audits of the Safety Management System, performance evaluation and review to ensure the effectiveness of Quality and Safety Management Systems	Course: Assessment & Improvement techniques Output Skills: Audit and inspection techniques, review and strategy planning.
5. Enough knowledge and experience to ensure the safe operation of ships and to provide a link between the company and those on board.	Course: Conventional Requirements Output Skills: Analysis of IMO rules and regulations, PSC requirements, P&I and insurance requirements.
6. Control of Quality and Safety Management Manuals and related procedures and documents.	Course: Documentation Management Output Skills: Principles of documentation, records and checklist formation
7. Reporting and analysis of the non-conformities and deficiencies and verification of corrective action to remedy defects in the Quality and Safety Management System.	Course: Non-Compliance Management Output Skills: Management system failure analysis, critical functions overview, close out process investigation
8. Planing and executing the emergency preparedness process both for office and shipboard personnel	Course: Contingency Planning Output Skills: Accident/ Casualty Cover Up, Relations with 3rd parties, Minimising prospective defects

Similarly the Designated Person Ashore, defined in ISM Code clause 4, must have the same proficiency and knowledge for the defined activities illustrated in Table 3.

The proposed activities for the other shore-based key personnel (Er 2001) in Ship Management Companies and their proficiency level or background in terms of authorities, responsibilities and duties are illustrated in Table 4.

Table 4. Expected Proficiency for other key personnel of a Ship Management Company.

KEY PERSONNEL OF A SHIP MANAGEMENT COMPANY WHO HAVE A DIRECT EFFECT ON THE SAFETY MANAGEMENT SYSTEM		
OPERATION MANAGER	**TECHNICAL MANAGER**	**CREWING MANAGER**
Operational activities related to the Safety Management System are: 1-) Training of shore based staff relating to the Safety Management System. 2-) Planning and preparing training needs and training curriculum of shore based staff for the approval of the Designated Person Ashore. 3-) Control of procedures and other documents as defined by the Document Control Rules and related procedures. 4-) Operations and communication with ships defined by the Contingency Rules and related procedures. 5-) Planning and implementing company emergency drills. 6-) Responsibilities of the Operation Manager related to Safety Management System including: a-) Controlling all voyages and their connections. b-) Providing for the prevention and handling of marine casualties and giving information's to ships. c-) Examining the risks of handling dangerous and special cargoes, and reporting information to ships. d-) Maintaining health and safety conditions, and distributing necessary information to ships. e-) Maintaining necessary instructions for the prevention of marine and atmospheric pollution. f-) Providing information on a safe sea route and providing technical information's related to port facilities. g-) Operations pertaining to ship insurance, P&I insurance, and other ship-related insurance. h-) Providing necessary information to vessels about the conventions, regulations and rules. i-) Providing necessary information to vessels about marine technology. j-) Researching matters pertaining to ship management.	Technical activities related to the Safety Management System are: 1-) Operations and communication with ships defined by the Contingency Rules and related procedures. 2-) Responsibilities of the Technical Manager related to the Quality and Safety Management System including: a-) Providing necessary information's to vessels about the regulations pertaining to ship equipment b-) Procurement of ships' stores, spares, supplies, and lubricating oils c-) Checking and supervision of measures for prevention of machinery accidents d-) Analysis of causes of machinery accidents and failures, examination of measures to prevent recurrence, and execution of post-accident/post-failure handling operations e-) Providing necessary technical information to vessels f-) Planning and execution of hull and engine maintenance management, and evaluation of maintenance contractors g-) Planning and implementation of shipbuilding and ship modifications h-) Planning, arrangement, and implementation of dry-docking i-) Collection and study of information on machinery and equipment for prevention of environmental pollution j-) Research into safe machinery operation and into facilities, fuels, lubricating oils, and water quality as they pertain to machinery	Crewing activities related to the Safety Management System are: 1-) Operations defined by Contingency Rules and related procedures 2-) Responsibilities of the Crewing Manager related to Quality and Safety Management System including: a-) Planning and preparing training needs and training curricula of shore based staff for the approval of the Management Representative/ Designated Person Ashore. b-) Operations related to evaluation, promotion, discipline and payment of crew members. c-) Providing necessary information's to vessels about the national and international regulations, especially STCW 95. d-) Operations related to health, safety, and management of medical treatment. e-) Operations related to employment of crew members, labour management, service, and welfare. f-) Operations related to communication with crew members' families.

4. Administration of Safety and Environmental Management and Refresher Courses for Shore-Based Staff

The shore-based Staff Proficiency Designation during the ship management life cycle can be established by the initial certification of key management personnel taking into account the Administration of Safety and Environmental Management (AS&EM) needs that constitute all ship management activities both in the operation and management level. The details of the proposed Proficiency Designation process is illustrated in Fig. 3.

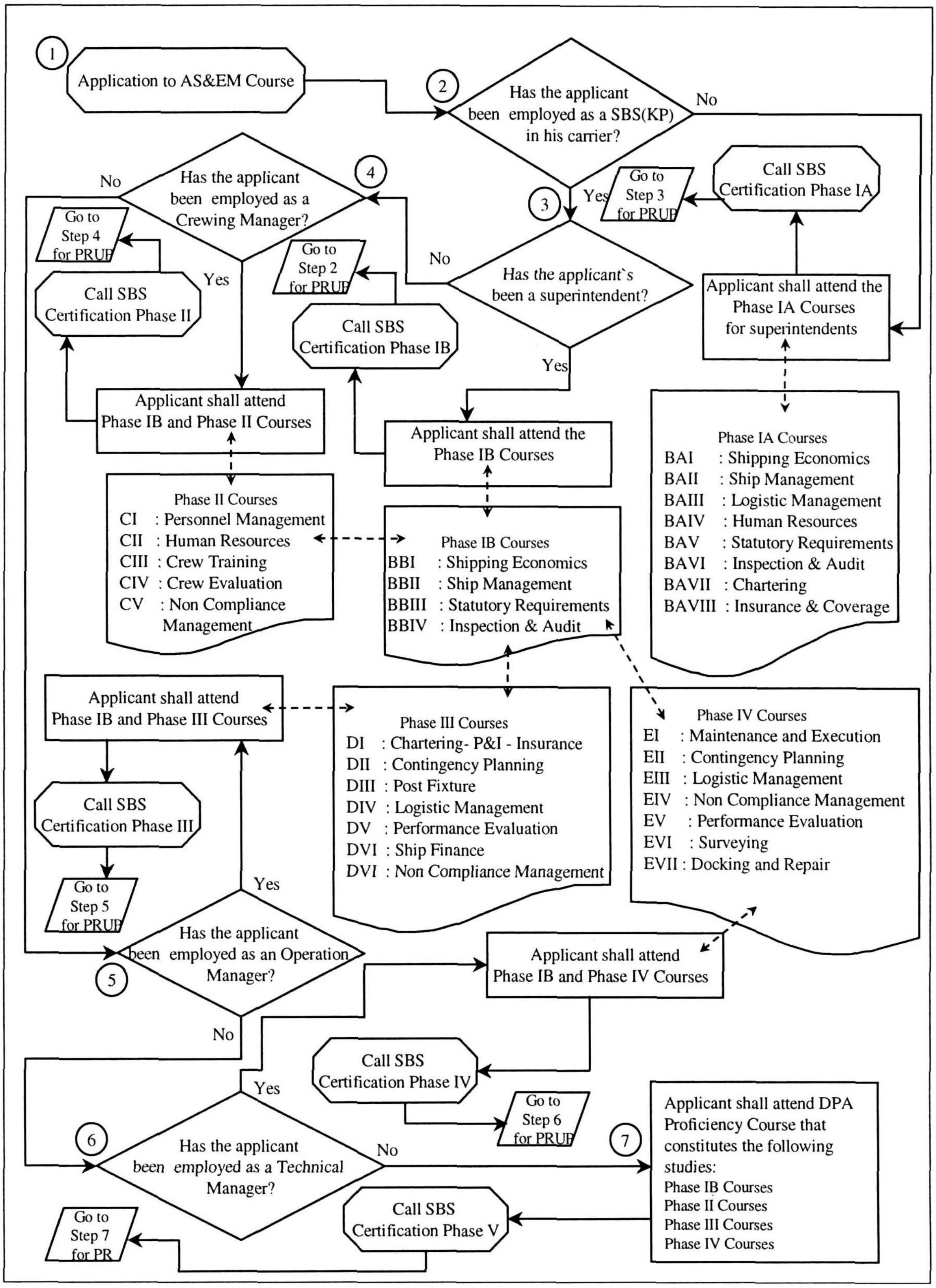


Fig.3 Proposed Loop Cycle for Shore-based Staff Proficiency Designation

The first decision-making process in the loop decides whether the applicant has been employed as a shore-based staff in terms of key management personnel (SBS-KP) prior to applying the Proficiency Designation process. Defining the five different access levels of qualifications for each major activity, shore-based staff can be certified for five different proficiencies. For each proficiency level, the minimum requirements can be considered as

- ❖ the Initial Certification,
- ❖ Proficiency Refreshment (PR) due to the effects of new regulations and technology change,
- ❖ Upgrading Proficiency Level (UP) for promotion starting from Marine Superintendent or Technical Superintendent to the Designated Person Ashore (DPA)

The duration of indicated Proficiency Designation courses for each qualification and the refresher course periods are illustrated in Table 5. To update existing knowledge, refresher courses should be held at least every three years.

Table 5. Proposed Course Schedules for Proficiency Designation

<table>
<tr><th>Qualifications and Certification</th><th>DPA</th><th>Operation Manager</th><th>Technical Manager</th><th>Crewing Manager</th><th>Superintendents</th><th></th></tr>
<tr><td>Initial Certification</td><td>79 hrs</td><td>24 hrs</td><td>20 hrs</td><td>15 hrs</td><td>30 hrs</td><td rowspan="2">Course Duration</td></tr>
<tr><td>Refreshment Cert.</td><td>27 hrs</td><td>15 hrs</td><td>12 hrs</td><td>10 hrs</td><td>20 hrs</td></tr>
</table>

5. Results and Discussions

The leading causes of deficiencies that frequently occur on board a ship are mainly sourced by insufficient coordination between the key office personnel and the master/chief engineer. This inadequate coordination mostly comes from three main aspects of the ship management process:

- ❖ the key office personnel cannot adequately describe what their expectations are for the efficient handling of shipboard operations;
- ❖ improperly certified crew members are employed in direct violation of the requirements of the Minimum Safe Manning Certificate; and
- ❖ the Masters and senior officers have not been delegated sufficient authority by the Company.

The second and third causes identified above could easily be avoided by redefining the training needs and properly notifying the ship's officers what is required of them. The first cause is more difficult to overcome because generally the key office staff are mostly experienced in shipboard operations for different types of ships and they are employed after a competitive selection process. The actual paucity of their knowledge is caused by the implementation of new international regulations and rules. This leads to the Ship Management Companies needing to strengthen their technical and commercial ship management capability through short-term and long-term planing/execution activities. This enables them to reduce expenses and provide a competitive ship operating capability.

This study offers an approach for defining the key shore-based personnel proficiency requirements in order to minimise the deficiencies, hazardous occurrences and accidents. Although the STCW Convention clearly identifies proficiency standards and knowledge for shipboard personnel, it does not mean that all the critical factors, relating to the human element, are included in ship operations. The proficiency requirements for shore-based staff, including the Designated Person Ashore must be identified as well. This study proposes Proficiency Designations for the superintendents, crew managers, technical managers, operation managers and DPAs, by defining their tasks and their expected knowledge. Proficiency level training needs are considered for each qualification. The duration of the proposed training for each qualification and the associated refreshment courses are also indicated in an implicit manner to overcome the re-occurrences of any type of casualties, deficiencies, nonconformities and unforseen expenses. In this way a better Safety and Environmental Management System is ensured.

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DEVELOPMENT AND ENHANCEMENT OF SUCCESS CRITERIA IN GLOBAL MARITIME EDUCATION AND TRAINING

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ABSTRACT

Accomplishment of continuous improvement can only be achieved by taking into account the minimization of prospective defects that could result due to management and operation level non-compliances in maritime education and training institution. Decision-making and implementation of principles should be continually reviewed to ensure the quality objectives are in process at training institutions. The major factors that are affecting the actual process of training institution's quality are mostly caused by impairment of teaching methods, not properly defined learning and understanding levels for students, and the inadequate administrative level course programs and curriculums.

These factors could activate educational effectiveness independently or simultaneously interrelated. Then this could lead to increase the number of corrective actions in a complex manner when the psychological factors begin to deal with the training process as well. A scientific approach shall be compulsory to resolve and prevent the training defects for achieving quality at Maritime Education and Training (MET) institutions.

It is also explained that academic staff potential backgrounds and their knowledge integrity with the application of maritime field of studies play a significant role to ensure the quality of graduates. In this study, the general terms of non-compliance management in training and education is proposed. In this respect, the importance of statistical techniques and evaluation methods are clearly emphasized. The outputs of this study are proposed to general discussion and review with the other Maritime Higher Education and Training Institutions on a worldwide basis.

Consequently it is also proposed to carry out similar studies for the other institutional member of IAMU, achieving the enrichment of sampling techniques and the combination of smooth and effective maritime training and education quality.

KEY WORDS: Maritime Education and Training, Statistical Technique, Academic Staff Proficiency

1. Introduction

For the assurance of maritime safety and environmental pollution protection objectives, STCW 95 Convention requires quality standards for all training institutions in accordance with regulation I/8 (IMO. 1995). The existing regulation requires that the effectiveness measurements should be carried out at all levels of the training institutions. In addition to that for the establishment quality management system standards in maritime training and education, it suggests to utilize recognized academic accreditations or quality standards body or Governmental agencies while defining the criteria of independent registration or certification body.

The main objective of the quality standard is to train and certify the crewmembers in an efficient continual improvement approach complying with the requirements of IMO Conventions such as SOLAS, MARPOL, STCW, COLREG, LOADLINE and ILO amendments etc.

It is obviously seen that, quality assurance of a MET institution becomes much more complicated when safety, environment and quality management criteria need to be integrated into the existing dynamic processes of a training institution while defining the knowledge, understanding, skills and competence. Assessment activities of all MET institution's Management and Operational Levels on a worldwide basis put other crucial constraint caused by different national backgrounds.

The quality management terminology needs to explained in terms of maritime education and training prior to define the requirements of STCW-95 A-I/8. In this consideration the relationship between supplier and customer additionally the product that is provided by the supplier should be indicated in order to define the assurance of quality in the general terms of quality management literature.

Actually the maritime student is not a product. The product is the education of the student. In the manufacture of this product, as with any other product, it is essential that the worker (student) be an active participant in the design and creation of the product. The student, who is the person who stays with the learning process longest, should learn to become the comanager of his or her education. This means, according to the tenets of quality management, that the student should be involved, consciously and with skill, in the continuous improvement of the processes that create the product. The customers for the education of the maritime student are several. They are, in order of importance,

1. The maritime student, who must live with the product for the rest of his or her life. The student must become the co-manager of the production of the education and, having such a personal stake, must be considered first when attempting to define what it means to have quality in education.

2. The maritime student's parents and immediate family who, in many instances, are paying for the product and might also live with the results for the rest of their lives.

3. Potential employers who will rely on the education of the student after graduation to achieve the purposes of their enterprises.

4. Society at large, which pays a substantial proportion of the cost of the education and requires the future participation of the student as a citizen in the operation of government, as a contributor to the general welfare of society, and as a taxpayer who will support the education of future generations of students.

2. Identification of 'Quality' Concept and Various Expectations from MET(s)

After defining the basic interrelationship between supplier and customer, it is needed to define special boundary conditions of MET. In shipping business the management of training and education can be considered as the technical and the commercial management of maritime activities. The new regulations or rules that will be established by IMO have to be taken into account as a research work and the requirements of new rules have to be amended in relevant department curriculum in an efficient manner. As well as the Port State Control parameters and the effects of these parameters in shipping environment cause rapidly positive change improvements of ship management. As a result lecturer's academic research has to point out port state control inspection results and the classification society's survey requirements that complies the statuary certification of vessels. From the Commercial side of ship management, the charterer's complaints and the condition of clauses in charter party directly affects the claim handling process. The marine casualties or cargo damages that have the direct significant impact in training needs must be considered.

The maritime education and training can be defined as a set of interdependent processes such as teaching, learning, researching and resources including human, material and information that function harmoniously to achieve specified educational objectives in the means of ensuring marine safety and the protection of environment.

In this aspect, the maritime student's role during his or her education plays a significant role, while obtaining the outputs of requirements that is mentioned in STCW-95 Convention A-I/8. The management of quality and the assurance of customer satisfaction could only be defined in a sufficient manner when all specifications and the boundary conditions of the product is clearly defined and well managed.

The training and education concept can be analysed in four categories for determining the general expectations and reaching to customer satisfaction philosophy.

a. Knowledge, which enables the people to understand what they learn in relation to what they already know (Bloom, 1996). Knowledge is both practical and theoretical. Theoretical knowledge provides the people with the ability to generalise from unique instances. With theoretical knowledge, people can accumulate long years of experience such as twenty years. Otherwise, with only practical knowledge, people will have only one year repeated twenty times.

b. Know-how, which enables people to do and how to act. Know-how takes people past merely understanding. Know-how enables people to put knowledge to work (Bloom, 1996). Know-how differs significantly from knowledge. Knowledge can be organised into intellectually tight compartments, and these compartments may be taught as a subject on to themselves. Know-how, on the other hand, requires the purposeful organisation of knowledge from many different areas of learning. As know-how is extended to higher and higher levels of accomplishment, it requires extension to more and more areas of knowledge. When teaching know-how, it is impossible to put bounds on the areas of knowledge, which will be encompassed.

c. Wisdom is the ability to distinguish what is important from what is not (Spanbauer. 1987). Wisdom enables people to set priorities on how to use resources of time, energy, and emotion.

d. Character, as Stephen Covey has said, is a combination of knowledge, know-how, and wisdom coupled with motivation (Bloom, 1996). People often recognise the development of character by certain character traits, among which might be listed as: honesty, initiative, curiosity, truthfulness, integrity, cooperativeness, ability to work alone, ability to work in groups, self-esteem. It is up each MET institution to identify what to include in each of these four categories. It appears that in maritime education and training, attention is given only to the first of the four categories, with the last two not even given lip service.

In maritime education the lecturers often believe, that at the university level their sole duty is to develop knowledge and pass it on to the next generation. The development of the student's character is none of their business.

The list of knowledge that students are expected to acquire is usually a composite of what is required for accreditation and what the MET institution decides itself. In general, the accrediting authorities should pay attention to the development of either wisdom or character in accordance with the goals for education in the new century like CAEB, ABET, CHEA etc. In this respect, the training and education system recognised the existence of a number of supplier, customer relations, as shown in Table 1.

Table 1. Customer - Supplier relations in Education and Training

Customer	Supplier	Services
Students	Teachers	System Management Curriculum Design Counselling Leadership Materials and Equipment
	Administrators	System development and analysis Materials and equipment
	Faculty Boards	Policy
Teachers	Administrators	Materials and equipment
Parents	Faculty system	Knowledge, wisdom, know-how and character of student
Industry	Faculty system	Knowledge, wisdom, know-how and character of graduates

3. Principals of Managing Quality in Training Environment

3.1 The difference between features and quality

In the application of quality principles, it is important to distinguish between the concepts of features and quality.

Features are what the lecturer put into the product to distinguish it from other products and to appeal to the people for whom the product is intended. The kinds of knowledge and know-how that are included in the curriculum represent the features of the educational program. A MET institution may boast, for example, the excellent laboratories and workshop facilities for student use or may tout its computer facilities and internship program with industry, these are features. Quality, on the other hand, has to do with the way the features are delivered. Laboratories may be unkempt, equipment may not always work, the instructions may be poor, the internship in industry may be just an excuse to send the students away for a time and allow them to earn some money while the institution consults.

3.2 The difference between teaching and learning

Teaching occurs when the lecturer show the student how he or she solve a problem. Learning occurs when the student figure out how to solve the problem. Quality management in education should be concerned with the improvement of processes, teaching and learning. Learning can never be separated from the motivation to learn. One of the most powerful principles of learning is this. Lecturers therefore should pay great attention to creating a healthy situation in which the students feel a need to know. A common mistake in teaching is to create a need to know through fear, for example announcing an important test to be given in the near future and emphasising that grades will be strongly dependent upon the results. This is the aspect of education that made Einstein says that it was only after his education that he could begin to learn (Gallagher and Mary, 1993). Edwards Deming is explicit on this point and says that fear is destructive of education. At best it produces conditioned reflexes. At worst, it generates cynicism and disgust with education (Gallagher and Mary, 1993).

3.3 The role of tests and examinations

Quality leaders in world commerce have eliminated the need for final inspection, so should the aim of academia be to eliminate the need for final examinations in education (Deming. 1986). Final inspection used to be the method whereby a manufacturer attempted to assure the company and its customers that the product was fit for use. It seemed like a reasonable approach, and, for most educators, the concept of a final examination seems rational. In industry it is found that reliance on final inspection increases cost, produces inferior products, and masks the in efficiencies of the process.

As one who has been an executive and has had to rely on the education of employees to produce better, more competitive products, what every engineering executive will tell that most of the employees do not know how to make use of the materials they studied in school. Most use only a very small fraction of what they have been taught. The efficiency of the teaching and learning process is low education, for most students, is getting past the next examination. For example when the teacher asks, "Are there any questions?" and the first question is always, "Is this material going to be on the test?" Many educators are beginning to understand the following principle with regard to examinations.

The only legitimate purpose of an examination is to enable the lecturer and learner to decide what to do next. What is implied in this principle is that the learning process should be a process of constant improvement in the acquisition of knowledge, know-how, wisdom, and character. The assessments should be designed to provide feedback to both the student and the lecturer as a means to improve the processes of teaching and learning. The student should use the feedback to improve the learning process. The lecturer can use the information to help the student improve the way the student learns. Since each student may have a different style, students should be encouraged to perform tests and to measure the results of different approaches.

The lecturer should use the feedback from all students to assess the effectiveness of the teaching process and to improve it. At the beginning of the semester, the lecturer should discuss with the entire class the list of competencies and the level of mastery expected for each competency. The students should participate in the discussion of each competency; how they, themselves, will know their level of competency; how they will demonstrate it; how the lecturer will assess it; and what the lecturer will do to help them achieve it.

4. Establishment of Quality Activities in MET Institutions

Quality activities are necessary because their successful implementation will enable MET institution to:

- react quickly to customer needs. By determining customer expectations and surveying satisfaction, MET

Institution can become more responsive to the needs of its customers.

- focus limited resources on activities that truly satisfy customer needs. With data and information regarding customer satisfaction areas MET institution can eliminate services that are not key drivers of customer satisfaction.
- make improvements in a systematic way. Engaging in the problem solving process will enable MET institution to analyse facts and base actions on facts and test results, thereby becoming more effective organisation.
- engage and use the creative abilities for all members. An effective quality implementation strategy in higher education will involve all community members in the continuous improvement and change process.

Focus on improving processes when results are unacceptable, MET institution can flowchart, troubleshoot, and modify the processes that deliver those results. In industry, a focus on the product is perhaps the most straightforward application of total quality because product characteristics are relatively easy to measure, monitor, and improve. Support services are slower to adopt quality management principles. In higher education, it is seen that progression in the opposite direction. The product of education is delivered in the curriculum. Curriculum is the domain of the MET institution who may resist change. Results can be difficult to measure.

As a result the supplier and the customer relationship and the customer expectations need to be investigated in more detailed approach. For this reason it is essential to define the customer of higher education and training institution. For this purpose the customers of higher education are illustrated in Fig. 1 in terms of internal and external environment.

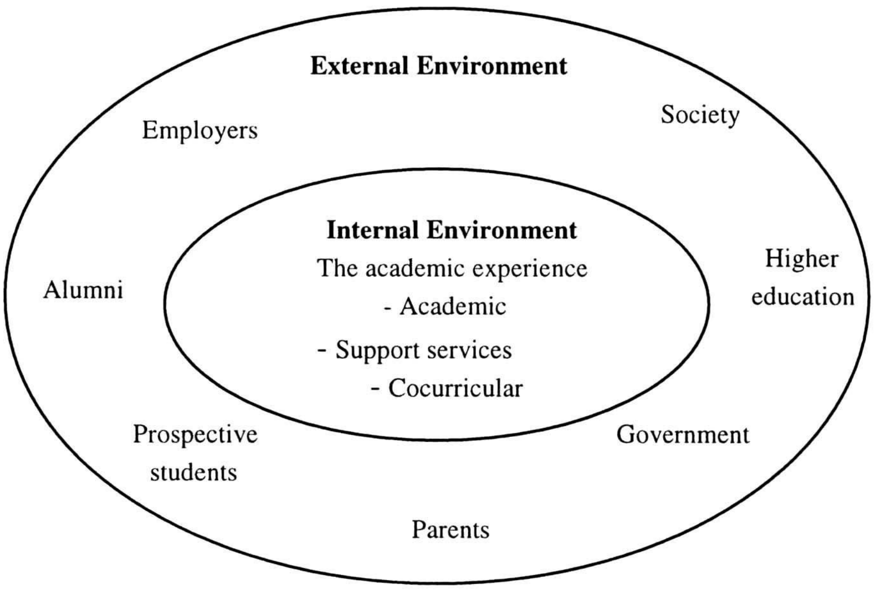

Fig. 1 Customers of higher education in terms of internal & external customer

As Fig.2 details, what is required is a twofold quality process, one that addresses not only basic offerings (curricula), but encompasses administrative processes as well. By understanding how MET institution can deliver enhanced service (by determining what MET institution's customers would like to see in the future). Eventually what was initially an enhanced service will become part of either the basic offering or support service in order to yield higher levels of customer satisfaction. This also will enable the institution to provide products or services that competitor institutions do not currently offer, which yields competitive advantage.

Adopting total quality necessitate will give up ownership of the curriculum by the MET institution. It will require consideration and accommodation of the needs of multiple customer groups. No longer can MET institution simply say the curriculum is the exclusive domain of the institute. MET institution will need to develop and modify curricula according to input, data, and information from customer segments, including students, employers, and parents. In addition, MET institution will need to be cognizant of the connection between the classroom and co-curricular student development opportunities.

Professional service providers must develop more effective strategies to engage the professionals in the adoption and implementation of total quality. The classic implementation strategy in industry is a top-down approach. With this strategy there is typically a full-scale, organization wide total quality launch. Training is conducted, teams are launched, and all employees are expected to be involved within a relatively short period of time.

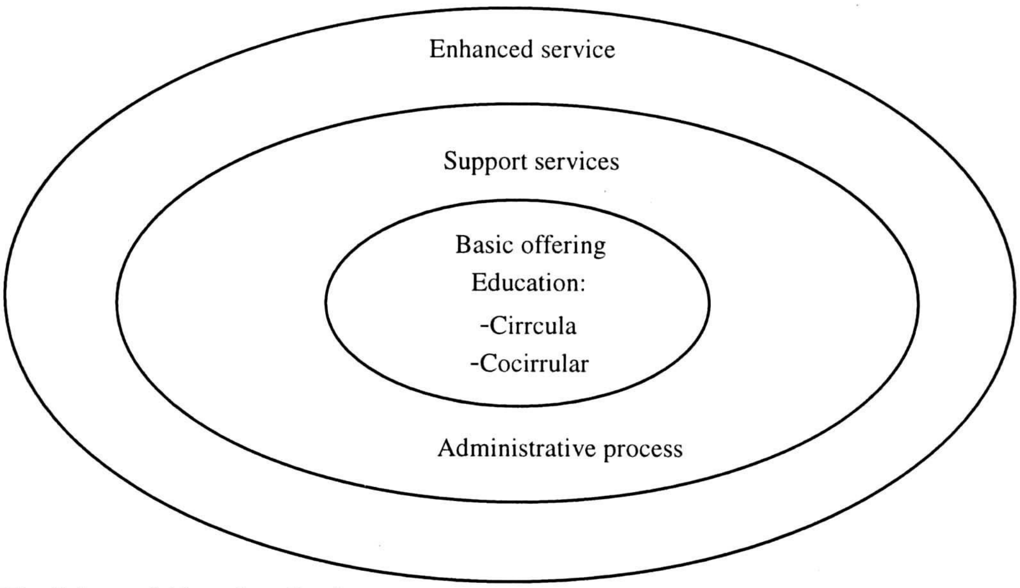

Fig. 2 A two-fold total quality focus

A main goal of the quality department in MET institution is the development of an organizational infrastructure to facilitate total quality implementation. The model, to be detailed for Maritime Education and Training, using the Shiba's approximation. Specific elements of each of the infrastructure areas are as follows.

1. Goal setting involves articulating what MET institution want to achieve with respect to total quality. This includes results as well as process related goals. This can be achieved through the incorporation of quality goals into the current evaluation system and preparation of a strategic plan for quality that includes specific goals for the next specified terms.

2. Organization setting involves deploying the necessary resources for implementation. This could involve setting up a department who reports to the highest level in the organization.

3. Training and education involve enabling people with tools and techniques. Decisions must be made regarding the content and length of training based upon the individual needs of the institution. A significant proportion of the training is dedicated to effective meeting skills, in order to enable a more disciplined and effective process for meetings.

4. Promotion involves, newsletters, and other written materials as well as visual displays and promotional events to pique interest and enthusiasm. MET institution can also submit information on quality initiative to the student and employee newsletters on a regular basis.

5. Diffusion of success process is a mechanism to learn from others and includes communication of specific means and results, the methodology applied by particular teams, and so forth.

6. Diagnosis and monitoring involves a plan-do-check-act (PDCA) cycle of the overall total quality initiative, which allows modification if necessary. As a result of initial PDCA, MET institution can start working more closely with the cabinet on inspecting the process and furthering team motivation. Additional training opportunities in response to employee needs can be developed.

QFD (Quality Function Deployment) is an approach to operationalising the concept of customer focus for an entire product or service line in an organization. The QFD process ensures that customers' needs, expressed in customers' own language, become the basis for definition of a product or service. These needs are translated into operationally defined characteristics, with target values and detailed plans for achieving those values. QFD's purpose is to ensure that quality, as demanded by the customer, is incorporated into each stage from definition to delivery of the product or service (Axland. 1991).

Introduced by Yoji Akao in the late 1960s, QFD was used in Japan in the early 1970s by Mitsubishi and Toyota to improve the quality of their products (Robinson et al. 1991). Because of its success in Japan, American companies recently have shown a growing interest in QFD.

At this point, MET institution has to decide to focus attention on one of the broadly defined customer demands, realizing the effort required to address each demand would be significant. Although it is important to eventually attempt to address all customer-identified demands, initially one or two priority demands should be targeted for immediate additional analysis. In setting priorities, it must be considered the relative importance of each demand to the customer, the degree to which the organization currently is succeeding in meeting the demands, and the interrelationships among demands. The goal is to focus first on the one or two customer demands that will result in the greatest perceived and actual improvement in service.

To assist in setting priorities, it is useful to consider relationships among the broad groups of demands identified. One way to understand these relationships is to construct an interrelationship digraph. Fig.3 displays the interrelationship digraph for broad demanded student characteristics.

Notifying the category "understanding of real-world issues" has four arrows pointing to other categories. This suggests that if changes could be made to improve this category, these changes would affect four other categories: "ability to analyse and synthesize," "ability to recognize and solve problems," "knowledge of competitive strategies," and "renaissance people." Thus, based on its relationships with other customer demands, "understanding of real-world issues" is assigned a high priority.

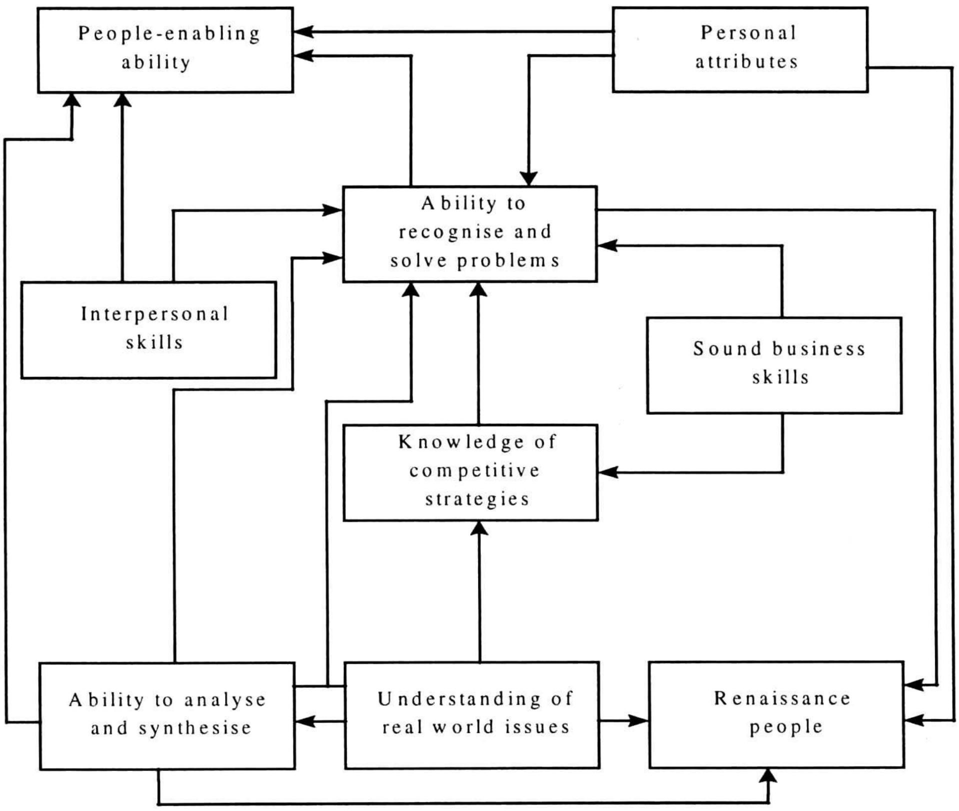

Fig. 3 Interrelationship digraph for broad demanded student characteristics.

5. Results and Discussions

As a result QFD is a process by which customer requirements are translated into design features, specifications, and operational targets. Customer-perceived value drives the process from beginning to end. In this study it is illustrated how to determine broad customer demands and how to use these broad demands as a basis to derive more detailed requirements. It is shown how to develop measurable characteristics that are correlated with the detailed demands and how to summarize the correlation's between the derived measurable values and the customer demands.

Finally, it is indicated how to summarize all this information in a manner that is useful for development of improvement plans. This is only the beginning of a process of continuous improvement. Each subsequent contact with the customer is another opportunity for the supplier to re-examine the product or service in light of customer requirements and to make changes as needed.

The strength of Quality Function Deployment comes from its ability to capture a customer's needs and to make them drivers of all processes, from design to delivery of a product or service. By its nature, QFD involves the MET institution seeking to bring about change, enabling individual members to discover ways to contribute to the improvement of a product or service. Customer needs and perceptions of quality change, requiring the supplier to inquire and listen, examine again and again.

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Do We Need The Official Ranking of Maritime Universities/Faculties Associated in IAMU?

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Abstract

This paper was prepared to provoke the international discussion on the subject: are we ready and do we need the official ranking of maritime universities/faculties? The Author presents the most objective from his own point of view the open criterions and their particular components which can help to establish such ranking. All presented criterions and assumptions are only samples and can be matter of dispute.

1. Introduction

The main object of the IAMU Working Group III is to promote the global maritime excellence. WG-III aims at the establishment of the global standardization of the maritime education system. To achieve this purpose, the academic discussions should be carried out regarding with the improvement of the existing education and certification system. To initiate the newly developed international system we should analyse and assess education system offered by existing maritime universities/faculties. Therefore we should try to establish ranking – picturesquely speaking – the list of maritime faculties or the whole maritime universities from the best ones to fair according to chosen criterions.

2. Purpose of the official ranking of maritime universities/faculties

Why should we assess existing maritime faculties/universities? The answer is very simple - to appoint the ranking leaders as the models to imitate by the rest of universities/faculties associated in IAMU. And only then we can commence:

1. The analysis and assessment of the current reality and the future needs of the education and certification system in the international maritime society.
2. The improvement of the existing education and certification system for competency of seafarers for the graduates of the high level maritime universities/faculties.
3. The initiation of the new global standard of the international certification system for competency of seafarers, including common examination and evaluation standards and methods.
4. The initiation of the new global standard of the international certification system for qualified experts in the field of maritime safety management, including common examination and evaluation standards and methods.

3. Open criterions

What should we assess?. The Author proposes the following open criterions, which are the matter of dispute in this paper:

1. **Academic position**
2. **Personnel potential**
3. **Orientation towards students**
4. **Co-operation, relation with environment**
5. **Selectivity**
6. **Infra-structure**
7. **Vocational market for the graduates.**

3.1. Academic position

In the final calculation it seems that this criterion should obtain the biggest weight factor – 20%. Academic position is defining by 8 components:

- academic authorisation to grant university degrees: BSc, MSc, DSc (and also in some countries special qualifying as assistant professor – *habilitation*),
- official government's education, research and maritime administrations categories,

- number of carried out postgraduate and doctoral studies,
- number of undergraduate, graduate, postgraduate and doctoral students,
- percentage of day's, evening, extra-mural and correspondence courses students,
- number of obtained scientific grants (local, national, foreign and international),
- number of faculties, branches of study, lines, specialisations, courses,
- possession of accreditation (for line, specialisation, studies, or specific program).

3.2. Personnel potential

In the final calculation this criterion should obtain the weight factor – 15%. Personnel potential can be defining by 15 components:

- number of academic teachers,
- number of students,
- number of teachers with highest sea diploma (masters and/or chief engineers),
- number of academic teachers to number of students ratio,
- number of professors to number of students ratio,
- number of full-time academic teachers to comprehensive number of all academic teachers ratio,
- number of full-time academic teachers to number of student ratio,
- number of teachers with highest sea diploma (masters and/or chief engineers) to comprehensive number of all academic teachers ratio,
- number of teachers with any sea diploma to comprehensive number of all academic teachers ratio,
- number of teachers with highest sea diploma (masters and/or chief engineers) to number of students ratio,
- number of academic teachers speaking in English to comprehensive number of all academic teachers ratio,
- activity of academic teachers on international conferences, number of presented papers,
- number of handbooks, monographs elaborated by academic teachers,
- obtained doctoral degrees and professors titles (for example in last 3-5 years),
- academic degree of lecturers allowing to conduct diploma and graduate seminars.

3.3. Orientation towards students

In the final calculation this criterion should obtain the weight factor – 15%. Orientation towards students can be defining by 8 components:

- range and form of individual studies,
- number of didactic publications,
- number of day's courses students to comprehensive number of all students ratio,
- number of hours in syllabus on diploma and graduate seminars,
- possibility, regularity and range of professors/lecturers and lessons assessment by students,
- form and range of social assistance for students (scholarship, research grants, hostels, etc.),
- cost of study and forms of payment,
- forms of extra-didactic and extramural activities of students.

3.4. Co-operation and relation with environment

In the final calculation this criterion should obtain the weight factor – 15%. Co-operation and relation with environment can be defining by 15 components:

- number of academic teachers calling out on business (travelling abroad) to comprehensive number of all academic teachers ratio,
- number of students calling out on business (travelling abroad) to comprehensive number of all students ratio,
- number of foreign visiting professors to comprehensive number of all academic teachers ratio,
- number of foreign students to comprehensive number of all students ratio,
- number of didactic programs prepared in foreign languages, especially in English,
- existing system of credit points (ECTS),
- institutional forms of contact and give aid to graduates,
- participation among first year students persons who came from other country regions,
- postgraduate studies scale,
- syllabus complying with national/international regulations and standards, e.g. STCW Convention,
- obligatory periods of special training and sea service,
- co-operation with ship owners and maritime administration,

- co-operation with international organisations and agencies, such as: IMO, IAMU, IMLA, IAIN,
- own academic magazine (common periodical for congregation and students),
- own publishing house and own editorial series.

3.5. Selectivity

In the final calculation this criterion should obtain the weight factor – 10%. Selectivity can be defining by 6 components:

- number of student candidates to admitted student on first year day's courses ratio,
- number of student candidates to admitted student on first year other modes courses ratio,
- formal requirements of enrolment on first year day's courses,
- formal requirements of enrolment on first year of other modes of courses,
- statutory number of allowed repeating examinations and provisory registrations,
- number of students names taken off the books (number of expelled students) to comprehensive number of all students ratio.

3.6. Infra-structure

In the final calculation this criterion should obtain the weight factor – 10%. Infra-structure can be defining by 7 components:

- possessed infra-structure objects,
- number of beds in academic hostels to comprehensive number of all students ratio,
- university library and its rank, number of possessed books,
- state of infra-structure,
- number of computers accessible for students,
- number of computer with access to internet to number of all possessed computers ratio,
- number of professional simulators (including full mission bridges/engine rooms).

3.7. Vocational market for the graduates

In the final calculation this criterion should obtain the weight factor – 15%. Vocational market for the graduates can be defining by 4 components:

- how many graduates obtains job in the first three months after graduate the university/academy,
- number of graduates obtained junior officer job on merchant vessels to comprehensive number of all graduates ratio,
- number of graduates with the highest sea diploma (masters and chief engineer) for merchant vessels to comprehensive number of all graduates ratio in last 50 years,
- number of graduates obtained lecturer job on home maritime universities/faculties to comprehensive number of all graduates ratio.

Particular components obtained by universities may be counted for example in scale from 0 to 100. Achievement of the highest values in the range of all components gives the result 100 points.

4. Conclusions

The Author does not think that presented criterions and their components are perfect to built official ranking - a full objective reference list, because he is standing on position that is very difficult to assess educational institutions. It is only Author's proposal to commence detailed discussion. Possible, acceptable ranking of maritime universities/faculties should be prepared not by one person but by international group of independent experts and with the utmost care. Author realises that reaching for other sources of information, receipt of new criterions for assessment or change of their weights can give brain different results. Therefore rankings prepared by different groups of experts may provide to different results, but no one group has a good reason for pretending to only accurate and objective appreciation. Ranking must be prepare very carefully and must be mature.

Ranking means the list of universities/faculties set in order from the best ones down according to successively reached results in competition in compliance with accepted open criterions. Due to applied quantity criterions we must be very careful when we want to form any quality assessments, opinions or automatic conclusions; for example: top of the ranking list = the best didactics and teaching methods. It can not be true.

What should we do? Author's suggestion is that we should establish working group of experts to prepare assumptions and criterions to establish independent, universal ranking. Next the working group should sent elaborated questionnaire to rectors, senators, academic teachers, students, graduates, ship owners, maritime administrations, and visit universities/faculties as many times as possible, if necessary also *incognito*. Why not?

The analysis and assessment of the current reality and the future needs of the maritime education and training system, as well as the certification system in the international maritime society.

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ABSTRACT

The heart of the current reality is the deterioration of the "quality" of the international shipping services, which is a merchandise provided by the shipping industry to the international shipping market. We have witnessed in the past three decades the process that the quality of the shipping services as a merchandise have severely deteriorated. While this deterioration of quality of shipping services in the international shipping market has developed on the one hand, the process of transformation, or even a collapse, of the reproduction system of the quality shipping services within the boundary of an individual traditional developed maritime countries has also simultaneously progressed. The challenge of today is, therefore, firstly to ascertain the dynamism behind such process, and secondly to establish a perspective into the task of how to reconstruct the reliable and efficient reproduction system of quality shipping services in the totally different environment called globalization.

1. Introduction

The highest values for the world community today, whether maritime or otherwise, are "safety", "quality" and "environmental friendliness". It is commonly understood that the production system based on the advanced technology, skills, and management technique, all of which are based on the most advanced scientific research, analysis and theory, produces reliable merchandises to the domestic and the international markets. The relationship between the end users of a merchandise and the general public as a third party in good faith and the producers is based on this mutual trust. The frequent claims against the deterioration of quality of international shipping services comes from almost all corners of the world today, therefore, should be interpreted that the reliability on shipping services have actually been seriously deteriorated, and that the very mutual trust between users and suppliers has also been critically eroded. It is essential to ascertain the dynamism behind this deterioration of the quality of international shipping services, thence to establish a perspective into the direction to overcome this vicious process.

2. The Current Reality

"Safety", "quality" and "environmental friendliness" are basically the values of the users of the merchandise, and of the general public. In shipping, they are shippers and the people in general. The highest value for the producer of the merchandise is "profitability". It is usually impossible for users and the general public to see or to have an access directly to the production system of any merchandise. Their behavior is based on the empirical wisdom that if a merchandise is safe, of a good quality, and is environmentally friendly, the production system of the merchandise can safely be assumed to be of high standard and reliable. Once this sense of trust is damaged, the direct eyes will reach to the production system, and the reality of the production system of the industry will be revealed openly to the public.

The international shipping industry was no exception when it was dominated by the national fleets of the traditional developed maritime countries(hereinafter TDMC) where the efficient vertically integrated production system consisted of all the elements necessary for the production of quality shipping services had been established in all the major shipping companies. The government of TDMC administered the domestic shipping industry, which consisted of these efficient shipping companies, through various policy tools from relevant legal and regulatory measures including the area of education and training of seafarers which is vital for high quality reproduction system of shipping services. The system itself thus established was the pride of the nation. A maritime casualty was regarded as a shame not only of a company, but also of the nation, because it was regarded to damage the trust on the production system of the nation. An accident was also regarded as an indelible disgrace for seafarers on board the ship not only in terms of damaging the credibility of their country, but also in terms of tarnishing their professional pride as seafarers. The government had promoted the maritime education and training backed by the policy tools based on the judgment that the well educated and disciplined seafarers were the very foundation of the reliable and efficient production system of the shipping services, of the sound professional and vocational ethics, hence of the ethos of the national pride.

The reality of today is that we are standing in the ruin of such vertically integrated system which had once so steadfastly been built in TDMC. The deterioration of the quality of the shipping services as the result of the deterioration in the suppliers' capabilities are the common reality of today. The familiar terms to describe the shipping industry are unsafe, sub-standard, environment damaging, etc. The collapse of an industry generally accompanies the collapse of the ethics and of the moral discipline, both of which once had been another features in the sound production system. They also had been the intangible spiritual asset of the industry. The very collapse of this kind has been experienced in the TDMC.

The dramatic transformation in the international shipping is usually called "globalization", but when the word is used, the definition is usually not given. In this paper, the word "globalization" is defined as the new environment for the shipping industry/society which allows the relevant parties to seek more and more transnational solutions, deviating from the traditional exclusive choices of the national alternatives, especially with regard to the area of the production system of the shipping services. The production system includes the maritime education and training institutions which constitute the vitally important function.

The globalization of the international shipping is almost synonymous with the environment which accommodates FOC as a legitimate international system. It is clear by now that globalization has led to the reorganization and realignment of the national flag shipping, especially of the shipping industry of TDMC, which can be featured as "restructuring...[a]t the heart of [which] is a new division of labor in shipping, not only between countries but between a variety of firms engaged in different aspects of shipping". "Such division of labor both by region and by function facilitates the development of truly 'least cost system'."(1) The result is the collapse of that very production system which had once been the norm in TDMC characterized by the vertically integrated system on corporate basis as well as national basis. Many functions once vertically integrated had been "sliced" to the newly established subsidiaries abroad, or to the sub-contractors in the foreign countries through transnational contracts, on cost efficiency standard. The shipping companies in TDMC had even lost their national identity as enterprises as the result of this process which has prevailed in the international shipping in the past three decades. The practical ground for the governments of TDMC to establish a national shipping policy has been lost. The national shipping policy is on the verge of disappearance in some TDMC, and has already disappeared in some others. The "globalised" national shipping companies now consider that the national shipping policy is not as their guardian , but as an unwelcome or harmful intervention by the national government.

The current reality in the process of globalization is that the reconstruction of the new production system of the reliable international shipping services is devoted in the invisible hands. There is no established authority nor organization that effectively administers or leads the globalised shipping industry toward the direction of achieving the new production system of reliable shipping services as the replacement of those which once had firmly been established in TDMC.

3. The challenge to the international maritime society

An argument on whether it is feasible to expect that the invisible hands will automatically bring about the reliable new production system in the globalised environment, and if so, on how such process will be, is very much necessary.

What makes the matter really challenging to us is (a) the conflict between the globalization with its by-products, which usually shun the traditional national factors, and the remnants of the traditional national institutional system, including the complications of the established interests among the domestic groups, and (b) the lack of parties who administer such conflict, or even the lack of very intention to do so. It is a matter of fact that the national shipping policy is powerless against the commercial decisions at the private corporate level to run the business on FOC environment which is a legitimate institution based on the OECD Code.(2)

The transformation of the traditional system of TDMC relentlessly progresses on the principle of cost efficiency toward FOC. Safety, quality and environmental consideration are always secondary or tertiary priority in this process. It is important to note that some of the functional elements of the vertically integrated system can not be sliced and remains within the national boundary, while the other functional elements can be sliced and outsourced beyond the national border. An integrated national shipping policy by any government to administer the whole production system of shipping services, whose key elements of production are divided so globally, will not be worked out under such situation as FOC exuberance. It could mean the end of the national shipping industry.

The homogenization of shipping services has also rapidly progressed in the past three decades. It seems to have spurred the orientation for absolute cost competitiveness in the international shipping market . This is containerization, the core feature of which is homogenization of liner shipping services. The differentiation of the shipping services as the merchandise has become extremely difficult. The economic theory teaches us that in a market where the same merchandise of similar quality by different manufacturers are traded, price is the only effective measure for differentiation. The freight rate per container has become the only meaningful competitive edge. The freight rates in the liner market have thus started to suffer constant downward pressure. The market controlling power of freight conferences has significantly weakened. The shipping industry has increased its effort to reduce their costs to cope with the pressure from the pricing side. This is one of the key factor for the shipping companies of TDMC to globalise themselves. The homogenization of the quality of shipping services seems to have worked to weaken the awareness on the quality of shipping services itself. A container is a container. Only the freight rate matters to the end users. The users have become more apathetic to the matters such as the flag of a ship, the competence, skill level, and nationalities of the crew on board the ship who is carrying their cargo. The substantial difference between container business and bulk carrier business has significantly been reduced.

The process of the development of division of labor in shipping industry has involved the slicing of ship-owning function from the traditional vertically integrated shipping company organization. It is well known that the shipping crisis of the 1980's had rapidly increased the number of the ships whose ownership had been transferred from the original owners to the banks and financiers who did not have any expertise in shipping business. It is natural that such banks and financiers had no knowledge on the crucial importance of the quality and competence of seafarers serving on board their newly acquired ships, nor on the crucial importance of day-to-day maintenance of the ships. Both are also two of the important elements for safety and quality of shipping services. To these new type of owners, the elements of crewing and maintenance, both of which are crucially important for safety and quality, were none of their business, but of the business of ship-managers whom they contracted out with. What once had been firmly shared as the universal value of the highest priority in the international shipping industry has lost its universality, having sunk down to the local norm of the ship-managers.

The slicing of the crewing function from the traditional production systems by outsourcing to the manning company abroad is the most important of all in the furtherance of division of labor in the shipping industry. The once firmly shared ethics, hence the ethos of professionalism as an integral element of the corporate culture had been lost. The heart of the matter is that the actual controlling power over the foreign seafarers working aboard the fleet of the company has shifted from the shipping company to the out-sourced crewing company located in the distant foreign country. It is practically impossible to administer all aspect of their activities. The power of life and death over the safety and quality of the national shipping industry has gone beyond the reach of the shipping company.

The success experience of the days of national shipping industry on the vertically integrated production system has been remaining so vividly in the minds of the industry. The shipping industry seems to be still innocently enjoying the luxury of taking it for granted that competent seafarers, and even the safety itself could be freely available like air or water. A comfortable notion long remains in our minds, as is usual for human. If a shipping company considers that the quality and competence of seafarers with equivalent license irrespective of the issuing authorities are more or less the same, the cheaper the wage, the better for the employer. And this has been the reality of the international shipping society up to this moment, despite of the hard reality that the fundamental transformation of the industry through division of labor in global scale has already passed the point of no return.

The division of labor in shipping industry has meant that many of the key elements of the industry have been outsourced beyond the national border. The outsourcing admitted the introduction of new profit-motivations to each of the divided element. Outsourcing of five elements means the admission of five new profit-motivations into the single production system now expanded globally. The danger, which alas is very likely, is that the first priority of such companies who win the contract of outsourcing is the absolute amount of their own profit out of the new business opportunities. The provision of the high quality goods and services to the clients is secondary. It is especially so in the case of crewing services. The crewing service is the business of number rather than of quality, because the remuneration is usually based not on the quality of the seafarers introduced, but on the number of seafarers introduced. As maximizing the absolute amount of the profit is the highest priority of their activities, a crewing company has all the reason to concentrate their effort to maximize the number of seafarers they introduce to their clients. Quality of individual seafarers is usually far way down on their list of priorities. How to educate, train, and discipline is not crewing agents' problem, but clients' (=ship-owners' or managers') problem. The power of controlling the seafarers is yet in the hands of the crewing company.

Outsourcing of seafarers has been concentrated to so called seafarer supply countries. The common feature of these countries is the lack of the domestic experience of the vertically integrated production system of the international shipping services in their history. They are usually heavily populated countries with immature domestic secondary and tertiary industries, hence with low per capita income. The level of the primary and secondary education is at modest level. The wage level of international seafarer labor market is very attractive for young people to decide to go to sea. The economies of such countries are benefited from the revenue of the seafarers, hence the countries find economic reason to encourage and support the export the labor force of seafarers into the international seafarer labor market backed up by the national industrial policy. The ethics of professionalism in seafaring human resource is not considered as prerequisite for the export of seafarers. The clearance of the minimum levels of various skills, experience and competency is sufficient. The vocational pride, loyalty to the clients, and the sense of professionalism to serve his own country through his seafaring career are not seriously questioned.

Conclusively, (a) the traditional vertically integrated production system in the TDMC has disappeared, (b) the production system based on the division of labor on global basis has replaced the traditional system, (c) the shipping industry of TDMC has surrendered its power to control seafarers to the crewing company abroad, thus they lost the power to control the quality of seafarers, (d) as the education, training, discipline, and certification are the area of the national sovereignty of the seafarer supply countries, the shipping industry of TDMC can exercise extremely limited influence over these areas, (e)as the ultimate priority of the crewing companies is to maximize the absolute level of profit, their highest interest is quantative, rather qualitative, hence quality orientation tends to be supplementary, (f) the administration of the seafarer exporting countries has the best interest in quantity rather than quality, hence the motivation to invest for the purpose of enhancing the quality of seafarers is weak (to keep the cost of production of export products minimum), (g) the division of labor system tends to increase the number of external profit-motivation, hence involves the risk of weakening the cost competitiveness, unless shrewdly managed, (h) the national government has lost the reasonable ground to administer and to establish the coherent national shipping policy, (i) hence the concept of the national shipping industry itself in TDMC could be at its twilight, and (j) all of these are the reality of the underlying mechanism of FOC system.

4. Maritime Education, Training and research – the basis of the vertically integrated production system

The trade volume of a country correlate closely with the vicissitude of the national shipping industry of that country.(3) It is also widely acknowledged that the international transportation is a part of the world trade. The world trade generates ocean transportation needs, then the shipping industry is activated to supply transportation services to meet such transportation needs. The shipping industries of TDMC had developed to meet the transportation needs of the respective countries to serve their domestic clients for the carriage of their export/import cargoes. The national shipping industry had served the development of the trade of its own country. Thus, there had been a reasonable ground for the national government to administer the national shipping industry to develop soundly through the national shipping policy. The policy goal had often been established in the manner to maintain the competitive edge in the cost of production of the shipping services through such measures as various tax incentives, operations subsidies, shipbuilding subsidies, and so forth, all of which had strengthened the competitiveness of the national shipping industry in the international shipping market. But it is important that the true policy aim is to facilitate other major domestic industries with the least cost of ocean transportation for their export/import cargoes so that their cost competitiveness in the international trade market could be best achieved.

Being one of the most important elements of the industry, education, training and discipline of the national seafarers had been the crucial part of the national shipping policy. Almost all the TDMC had established and administered this function by the national government. One or two maritime universities of 4 year education with boarding facilities and regiment system had been established for the clearly intended purpose of providing well educated seafaring officers to the national shipping industry. It was also aimed at enhancing the overall level of maritime education, training, discipline at the lower institutions through the synergy deriving from such maritime universities. The national policy as such had a logical and practical ground to use tax payers' money as a part of its industrial policy of the country. Maritime education, training, discipline, and research are costly. A significant amount of investment had been necessary especially to the maritime universities in terms of (a) facilities and equipments which often included training ships, (b) academic and training human resources, and (c) auxiliary necessities. Such maritime universities had been, and most of the case still is, put under the control of the Ministry of Transportation or of Maritime Affairs, and the Ministry of Education simultaneously. As the result, they have been firmly put in the bureaucratic webs and complications of the national government. Being controlled by the national budget and bureaucratic rules and regulations which covers almost all areas of their activities, including the personnel matters of academic as well as clerical staffs, the maritime universities have become one of the least flexible, sometimes organizationally the least dynamic institutions to transform themselves to meet the change of the environment timely. The national shipping industries in such nations have already transformed themselves to those of globalised entities through transnational division of labor. Their needs for educating, training and disciplining national seafarers domestically have dramatically been diminished. Thus, almost all the TDMC have seen the critical decline of the needs for such maritime universities. The governments have long lost the logical ground, which had been reasonable in the past, to maintain the maritime universities on the tax payers' money. Yet, due to the very practical reasons, it is impossible for the national government to cut the budgetary allocation to the national maritime universities. The only practical measures left for the governments are gradual decrease of budget to the maritime universities as well as MET institutions. The maritime universities tend to be deprived of the ability in many respects to make appropriate actions timely to adapt themselves to the fundamentally different production system of shipping services in the globalised FOC environment. The reality may be worse than this. The obligations under the national rules and regulations over the academic staffs and instructors extend to almost all area of their activities, such as curriculum, teaching methods, languages in the classroom, utilization of facilities and equipments, personnel deployment and assignment, various personal aspect of the personnel such as salaries, pension schemes, and so forth. The way of one's being usually rules his sense and mentality. It is practically the last thing to expect a revolutionary initiative to change the course of their traditional way of running the university spontaneously. It is quite likely to maintain their situation status quo, largely because it is much more comfortable to all. Maritime universities are probably the only key element of the production of shipping services kept within the national boundary.

What we observe today is either disappearance of maritime universities who once had enjoyed the reputation of excellence, or their substantial transformation away from the straightforward education, training, and discipline of seafaring human resources to more general academism and management oriented direction, fully utilizing the available academic resources. The academic and teaching staff of MET with tremendous amount of experience, know-how, and skills at the traditional maritime universities have been left behind or sideways, more and more isolated as the result of the transformation. So far, transnational or global solution to the rich MET-fitted human resource has seldom been observed, although it is logically the most desired thing under the globalised production system of maritime services.

On the other hand, the difficulty is deepening for the national government to find out the logical and practical reason to allocate tax payers' money to expensive maritime universities whose graduates are no longer expected to serve for their national fleet.

It is remarkable to see that there has not been any sensible and serious cries nor realistic actions in any part of the international maritime society urging to face this hard reality, and to find out realistic solutions to it. The internal barriers of bureaucracy surrounding maritime universities as national institution, and the external barrier of national sovereignty over the institutions of higher education seem to be offering euthanasia to the vitally important institutions for yielding high quality seafarers.

5. The certification system

The certification system is one of the key processes in the integral production system of shipping services of a country. It is the quality control mechanism within the system to check the quality and competence of seafarers as the vital element of the shipping services. As discussed in the preceding paragraphs, it also constitutes the part of the industry policy of the nation on the ground that the safe and reliable shipping services available for shippers and importers of the country is the very basis of the national trade policy. The high level of authentic licensing system had become a national institution of prestige under such circumstances.

The situation of the pure seafarer supply countries, which had started to play important role under FOC system, has shown a significantly different picture. The function of official certification of the quality and competence of seafarers under the administration of such countries seems to have succumbed to the power of the different motivations. Quantity orientation of exporting seafarers has prevailed over quality orientation.(4)

The certification system of respective countries has never questioned seriously in the past, because of the generous rules and regulations of the FOC flag countries. As the number of the seafarers from the pure seafarer supply countries has increased corresponding to the expansion of the ships under FOC flags, the credibility of the certification systems of the seafarer supply countries has been taken up more seriously. The recognition is quietly spreading that the defective certification system could be a serious flaw in the globalised production system of shipping services, therefore, it could be a serious vulnerability for the broader system of international trade system.

It is also remarkable to see here again that there has not been any sensible and serious cries nor realistic actions in any part of the international maritime society to face this hard reality for finding out the realistic solutions.

6. A perspective for breakthrough

The lack of coherence of the principal elements of the total production system of shipping services is the fundamental flaw of the international maritime society today. This is the clear reflection of the reality that there is no responsible party in the international maritime society who has been assigned to the task of reconstructing the integral production system of truly reliable shipping services based on new reality. This mission involves the task of finding the fundamental solution to mobilizing the key element for MET preserved at the most conservative institution of national maritime universities which are now on their steady way for disappearance or significant transformation to the new globalised production system. They are the indispensable resources for seafarer education, training and discipline.(5) The mission also includes the task of solving the shortfall of the present certification system administered under the national sovereignty into such a system which fits in properly to the globalised reality of today.

It seems clear now that there is no appropriate entity in the present international maritime society to take this responsibility. The closest to this seems to be EU who has been taking the initiative and leadership toward this direction on regional basis.(6) The initiative should, however, be taken not on regional basis, but on the international level.(7)

The possible clue may be the fact that FOC fleets are virtually the ships of TDMC.(8) Although FOC system is the most cost competitive system to the owners, it has become more and more apparent that the unfriendliness in safety and environmental protection inherent to FOC system is the Achilles' heels of the system. The fact that the port states, which are most often TDMC, have not complained of their accepting the financial and administrative burden in carrying out port state control against FOC ships is one of the clear illustration of this reality.(9) This means that the direct beneficiaries of reliably reconstructed integrated production system of international shipping services are TDMC. The conclusion from here is that it is fair and reasonable for the governments and the shipping companies of TDMC who effectively control FOC fleets to share at least the due financial burden of the work of reconstruction of the new system.

IAMU is the organization consisting of maritime universities of excellence from all corners of the world with the resources crucial to the highest level education, training, and discipline to seafarers, as well as research capability not only in MET related area, but also in the area of law and management. As such an organization of global nature, IAMU itself is significantly free from the domestic rules and regulations attached to the national universities. There is presently no entity like IAMU in the international maritime society which is qualified and suitable in many respects to take up the role of leadership toward the reconstruction of the new production system of shipping services which is most suitable for the globalised international maritime society of today and of the future.

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The Measures and Practices to Cultivate More Competitive Seafarers

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ABSTRACT

In the recent years, China's seafarers manpower sources have been concerned by many foreign shipowners. The number of Chinese seafarers employed on the ships flying foreign flags is increasing gradually. In order to cultivate more competitive seafarers for national and international shipping industry, several macro measures and practices are to be taken in China's MET.

1. Introduction

In China, the shipping industry is becoming more and more prosperous with the development of national economy. As a developing country, China's seafarers manpower sources have been concerned by many foreign shipowners. The number of Chinese seafarers employed on the ships flying foreign flags is increasing gradually. With Chinese seafarers entering the world maritime manpower market, the seafarer's cultivating standard is changing from mainly meeting domestic shipping industry requirements to meeting the international shipping requirements. Therefore, how to cultivate more competitive seafarers is becoming the highlight of China's MET.

2. The Feasibility and Necessity of Cultivating Competitive Seafarers in China

China, the largest population country in the world, has competitive priced maritime manpower resource. Many facts are advantageous to seize the opportunities to cultivate more competitive seafarers for shipping industry, such as the falling numbers of seafarers in developed countries and the increasing in developing countries, China's accession to World Trade Organization (WTO) reaching final stage, the fast growing fleets in the Asia-Pacific region and so on.

2.1 The Falling Numbers of Seafarers in Developed Countries

As we know, there has been a long-term decline in number of seafarers in developed western European countries. The insufficient maritime manpower has already affected shipping in these countries. Even in Asia, a number of developed maritime countries such as Japan and Singapore etc are following the experience of western maritime countries. As a developing country, China should seize the opportunities to train as many as possible qualified seafarers for international shipping. Chinese seafarers began to work outside China's shipping companies in the late 1970s after the government adopted "Opening policy". Nowadays, it is feasibility to cultivate and train more cadets at the Maritime Education and Training Institutions (METs) in China, because the international shipping can provide better incomes than the jobs on shore in China.

2.2 China's Accession to WTO Reaching Final Stage

China's enterprises have kept a clear head that if someday China enters WTO, they will face much more challenges in the world. In this case, the shipping company in China must recruit some qualified seafarers in international standards to reconstruct their seafarer teams to meet the requirements of global shipping competition.

The advantages of Chinese maritime resources are in two aspects. The employment is relatively cheaper; the officers graduated from maritime universities/colleges have higher comprehensive qualities. The disadvantage is the foreign language deficiency.

The advantages and disadvantage have told China's METs, in the prerequisite for meeting all STCW standards of training and certification, how to update the course system and teaching contents and methods to upgrade the quality of maritime education and training.

2.3 The Fast Growing Fleets in the Asia-Pacific Region

A number of countries in Asian and Pacific region have become important shipowning nations, and some of them including China have rapidly increased their shipping fleets over the last two decades and are among the largest 25 shipowners in the world. The demand for seafarers to serve the expanding national fleets and international shipping brings in good opportunity for China's METs to cultivate more competitive maritime personnel, and it is necessary for China's METs to do so if China is to become a major supplier of maritime manpower in Asia and Pacific region.

3. Many Other Maritime Representative Bodies in Asia-Pacific Region Concerning How to Cultivate More Competitive Seafarers in China's METs

China, as a potential major supplier of seafarers in the international maritime manpower market, has received keen attention for her maritime education and training from many other maritime bodies, such as the Hong Kong Shippowners Association (HKSOA), the Association of Maritime Education and Training in Asia-Pacific (AMETIAP) and Asian Shipowner Forum (ASF).

HKSOA wishes to create a nexus with China's METs for making graduates even more valuable than they are now and more readily employable.

HKSOA has visited 7 selected METs including Dalian, Shanghai, Jimei, Wuhan, Qingdao, Ningbo and Zhoushan and informally audited their education and training, staffing, equipment and facilities. The purpose is to set up a close relationship with METs and make some recommendations as to how it may be helped to upgrade the quality in English, professional working attitude, nautical and engineering skills, so that the maritime graduates will be able to not only meet STCW78/95 standards but also familiar with foreign shipping system and let the maritime graduates be more competitive on board of non-PRC vessels.

4. In Order to Cultivate More Competitive Maritime Personnel, the Measures and Practices to Be Taken in China's MET

In the current economic situation, under the leadership of Ministry of Communications, some macro measures are to be taken to ensure the cultivation of more competitive maritime personnel.

4.1 The Legislation of China's MET

Ocean-going shipping is an international busyness, so maritime education and training is of internationalization characteristics which are different from other higher education of engineering. Most advanced shipping countries in the world have legislated to ensure the maritime education and training development abiding by laws and regulations.

In the last two decades, under the "opening policy", China' MET has made considerable development. The number of METs and the scale of institutions have been in the first place in the world. However, up to now, there are not special laws and regulations for the maritime education and training in China, the long-term development plans of MET lack controlling under the special lows and regulations. It restricts the reasonable development of maritime education and training in some extents. In order to solve problem above mentioned, the Ministry of Communications will organize the maritime experts to do the researching about maritime legislation, and proceed to the next to complete the legislation.

Based on national and international shipping industry development situations, in the days to come, hope that the permission, qualifications, investments, and scales of METs' founding and development will be examined and approved by law.

4.2 Establishment of Comprehensive Optimized Cultivating System

Because of strictly implementing STCW78/95 convention, China has entered the "White List". On the basis of meeting the standards of STCW78/95 convention, China's MET, under the leadership of Ministry of Communications, is going to set up comprehensive optimized cultivating system above or beyond STCW78/95 for cultivating more competitive maritime personnel.

Under the new comprehensive optimized system, the following issues will be studied, such as the effective ways of sea-going practice, the possibility and necessity of setting up national sea-going practice shipping fleets, in-service seafarers training at METs, and the distributions, scales, institution levels, investment forms, management system of maritime and training institutes.

4.3 The Establishment of Maritime English Assessment System

Nowadays, Chinese maritime graduates' English communication ability is lower than that of South Eastern. This has become a major factor which weakens Chinese maritime graduates' competitive ability in the international shipping industry.

An English proficiency investigation has been made for Chinese maritime graduates. For example, at Dalian Maritime University (DMU), over 95% maritime graduates passed College English Test Band 4 (CET Band 4), and a part of them passed Band 6. Indeed, most of them have relatively good proficiency in reading and grammar, they have better English basic knowledge, but relatively poor listening and speaking ability. It is found that the

main problems lie in the English teaching methods and assessment system. CET records can reflect certain English proficiency, but it is not the effective assessment standard for maritime education and training.
The new maritime English assessment system will include reading, writing, speaking and listening assessments. It puts stress on the speaking and listening assessments, and guides the English teaching method and material reforming to the direction of improve English communication ability effectively in the same class hours.

5. Result

Hope to take above measures and practices to further improve China's MET above or beyond STCW78/95, and realize the object of cultivating more competitive maritime personnel in a few years.

Quality Issue in Shipping and Maritime Education

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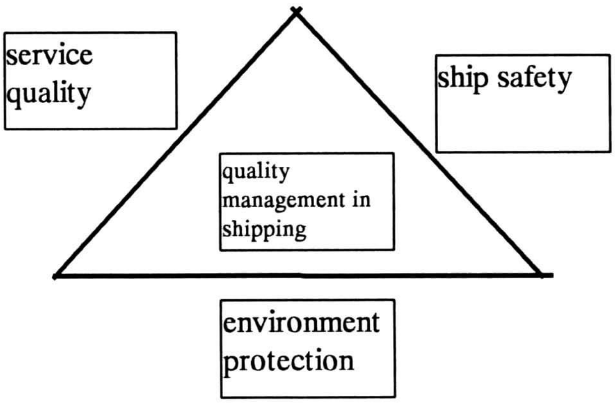
1. Introduction

This article explores both what quality of service is and what the quality of maritime education can be improved or guaranteed. The shipping industry is a service industry, based on a derived demand, which is particularly derived from manufacturing industries. The world manufacturing industry has been becoming sophisticated in terms of time(JIT manufacturing) as well as geography(global sourcing and manufacturing). The sophisticated manufacturing industry has been developing quality management, resulting in TQM(total quality management).

Shipping industry is not immune to the sophistication such as JIT and TQM. Shipping industry itself needs to be equipped with quality service, which means cost-effectiveness, efficiency and reliability. In addition to it shipping industry is asked to satisfy the requirements of international community to secure the safety of ships and hence the cargo and ocean environment.

The dimensions of service quality in shipping, thus, may be identified as following three factors-customer satisfaction, ship safety, and environment protection. 'service quality' in figure 1 means a service provided to shippers, freight forwarders that use shipping as a transportation means. 'Ship safety' means the safety of cargo as well as ship itself, which should be afloat and can navigate to the destination with seaworthiness. 'Environment protection' means the pollution control against sea caused by ship operation(like ship's crew sewage) or accident(like oil pollution) and polluted air emitted by ship's engine.

Figure 1. Three dimensions of quality management in shipping



Source: The author

Three factors of quality management in shipping is further explained in table 1. Table 1 shows that service quality is achieved by company-built measures; safety, by ISM code or ISO 9000; environment, by ISO14002. The service quality is mainly pursued by shore-based office; safety, by ship; and environment, by ship. Principal benefactors are shippers, cargo and ship, and general public. Service quality can be monitored by measuring gaps; safety, by audit; and environment, by audit.

Table 1 the elements of shipping service quality

	Service quality	Safety	Environment
Means to achieve	• Company-built measures such as timeliness, responsiveness • ISO 9000	• ISM code • ISMA code • SOLAS IX • ISO 9000	• ISO 14002
Principal actor	• Shore-based office	• Ship	• Ship
Principal benefactor	• Shipper	• Cargo and ship	•General public
How to monitor	• Gap(expectations-perceptions) measurement	• Audit	•Audit

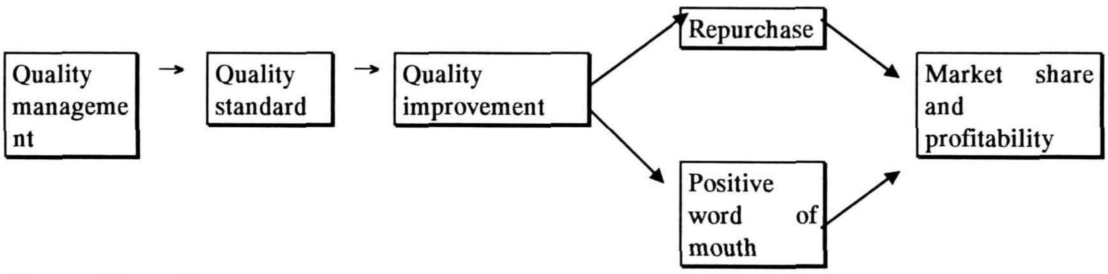
Source: The author

2. Why quality management in shipping?

It were Deming, Juran and Fiegenbaum who laid the foundation of quality control not in service but in manufacturing sectors. They suggested a set of steps or points- Deming's fourteen points, Juran's quality planning road map and Fiegenbaum's ten benchmarks.

Quality management has a positive effect on a company's market share and profitability. Quality management creates more employee sensitivity to the issue of quality. This generates a higher level of quality, which impacts on both increased repurchase and increased sales from positive word of mouth.

Figure 1 Benefits of quality management



Source: The author

The expectations towards market share and profitability make many shipowners and operators be committed to quality shipping. Ship management companies also developed the ISMA(International Ship Managers' Association) code. The ISM(International Safety Management) code has finally come into force internationally. High quality service itself is not an end but results in benefits for the organisation. The drive to quality in shipping sector has had three significant features: positive company image, lower costs and higher market share, and decreased liability.

• Positive company image

A reputation for high-quality service creates a positive image for shipping lines. Positive image helps a shipping company increase sales, obtain funds from various lending agencies, and recruit better personnel.

• Lower costs and higher market share

Quality enhancement increases productivity and lowers rework time, scrap costs, and warranty costs, leading to increased profits. Improved performance enables the company to increase its market share and gain competitive advantage through economies of scale.

• Decreased liability

Shipping companies have been facing complaints caused during the transportation or because of ship accidents. Successful launch of quality assurance system such as ISO and ism shall typically result in improved service performance and lower liability costs.

3. 'SERVQUAL' dimensions applied to shipping/logistics

In order to provide good service to shippers the dimensions which constitute quality should be identified. The model provided by Parasuraman et al is a good base to continue the discussion toward the quality dimension of shipping and logistics.

Parasuraman et al [1] has developed ten different determinants within the service quality after series of qualitative and quantitative studies; access, communication, competence, courtesy, credibility, reliability, responsiveness, security, tangibles and customer knowledge. Definition and examples of the determinants within the shipping services can be seen in table 2. The right-hand side column of the following table shows the dimension of service quality in shipping and logistics, composed by the author, who arbitrarily placed the quality dimension according to the SERVQUAL dimensions. For example, 'reliability' in SERVQUAL dimensions means delivery time, issuing bill of lading on time and correctly, and delivering the cargo at the promised time.

Table 2. Shipping services: customers' view of service quality

Dimension	Shippers' view
Reliability	• Delivery time • Issuing bill of lading on time and correctly • Delivering the cargo at the promised time
Tangibles	• Clean and undamaged containers • Modern looking equipments • Appearance of the invoice • Appearance of the communication materials
Access	• Convenient working hours • Accessibility by telephone easily
Communication	• Informing the shippers about the technical details
Understanding the customer	• Knowing the specific objectives of the shipper in terms of logistics
Security	• Confidentiality not giving the information about the customer to third parties
Credibility	• Reputation of the firm • Giving clear and right information about the logistics cost
Responsiveness	• Dependability in handling the problems • Responding the inquiry quickly
Competence	• Working with the personnel having expertise and knowledge
Courtesy	• Treating the shippers respectively and politely

Table 3 shows what sort of factors are regarded as the dimensions of quality in shipping and logistics. The

[1] Parasuraman, A., Zeithaml, V.A. and Berry, L.L. (1985), "The Conceptual Model of Service Quality and its Implications for Future Research", *Journal of Marketing*, Vol.49, Fall, p.41.

most common factors stipulated as the dimensions of quality concept are listed as reliability, transit time etc.

Table 3 quality dimensions of shipping and logistics quality

Researchers	**The dimensions of service quality**
Pearson[2]	Flexibility, frequency of service, transit time, reliability, regularity,
Bardi[3]	Transit time, reliability, willingness to negotiate, financial stability
McGinnis[4]	Reliability, transit time
Matear and Gray[5]	Fast response to problems, avoidance of loss or damage, on-time collection and delivery
John and Stephen[6]	Reliability, equipment availability, service frequency
Subbash and Srinivas[7]	Reliability, responsiveness
Bienstock[8]	Timeliness items, availability items, condition items

The expectations of customers may vary from company to company. A shipping company listed the expectations of its customers arising from six areas;[9]

- The negotiation and agreement of terms and conditions
- Purchase order tracking
- Transportation from customers' premises to port
- Seaborne leg of the cargo movement
- Transportation from port to customer's premises
- The handling of cargo documentation

4. ISM(International Safety Management) Triangle

International shipping industry produced its Code of Good Management practice in Safe Ship Operation around 1985 to give guidance towards safe transportation by sea. Some countries including the UK and Nordic countries put forward proposals which at last was developed to 'The Guidelines on Management for the Safe Operation of Ships and for Pollution Prevention.' After further revision of the guidelines International Safety Management code has been given a birth.

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[2] Pearson Roy (1981), *Containerline Performance and Service Quality*, Marine Transport Centre, University of Liverpool, pp. 120-121.

[3] Bardi Edward J., Bagchi Prabir K. and Raghunathan T.S. (1987), "Motor Carrier Selection in a Deregulated Environment", *The Logistics and Transportation Review*, Vol.23, No.4, p.5.

[4] McGinnis Michael A. (1989), a Comparative Evaluation of Freight Transportation Choice Models, Transportation Journal, Winter, p. 43.

[5] Matear Sheelagh and Gray Richard (1993), "Factors Influencing Freight Service Choice for Shippers and Freight Suppliers", *International Journal of Physical Distribution and Logistics Management*, p. 28.

[6] Kent John L. and Parker R. Stephen (1999), "International Containership Carrier Selection Criteria: Shippers/Carriers Differences", *International Journal of Physical Distribution and Management*, Vol.29., No.6, p.40.

[7] Mehta C. Subbash and Durvasula Srinivas (1998), "Relationship Between SERVQUAL Dimensions and Organisational Performance in the Case of a Business-to Business Service", *Journal of Business and Industrial Marketing*, Vol. 13., No. 1, pp. 44-45.

[8] Bienstock, Carol C., John T. Mentzer and Monroe Murphy Bird (1997), "Measuring Physical Distribution Service Quality", *Journal of the Academy of Marketing Science*, 25(1), p. 31.

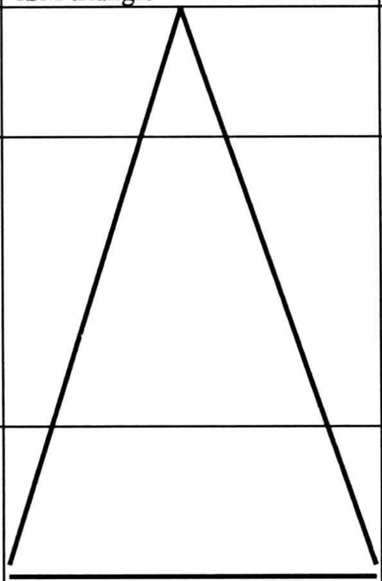
[9] *Containerisation International* (1998), Keeping Customer Satisfied", October, p.39.

This management code entered into force in 1998(1st July) for passenger ships, tankers, bulk carriers and high-speed craft, and in 2002(1st July) for other cargo ships and mobile offshore drilling units.

ISM code , after some revisions, was made mandatory through a new chapter IX to SOLAS. Under the regulations of the new Chapter IX of SOLAS, administrations are responsible for ensuring that, on the prescribed dates, each new or existing ship flying its flag holds a Safety Management Certificate(SMC) and that the operating company holds a document of Compliance(DOC) for that type of a ship. The administration may request another contracting government or recognised organisation to issue such certificates and periodically verify the proper functioning of the SMS.

The structure of the ISM code can be described as following diagram, which has been named as 'ISM Triangle' by the author.

Figure 2. ISM triangle

Who?	ISM triangle	main objective
Top management		The objectives of the code are to ensure safety at sea, prevention of human injury or loss of life, and avoidance of damage to the environment, in particular to the marine environment, and to property
Shore personnel		Safety management objectives of the Company should, *inter alia*: 1. provide for safe practices in ship operation and a safe working environment; 2. establish safeguards against all identified risks; and 3. continuously improve safety management skills of personnel ashore and aboard ships, including preparing for emergencies related both to safety and environmental protection
Ship personnel		The ISM code requires that the SMS should ensure: 1. compliance with mandatory rules and regulations; and 2. that applicable codes, guidelines and standards recommended by the organisation, administrations, classification societies and maritime industry organisations are taken into account.

Source: The author

The nature of the mandatory code has changed, from the initial proposal based on ISO9000 quality assurance principles to 'mundane' safety management code.

5. Quality Assurance in Maritime Education

Quality assurance has now become the issue of the 1990s as far as the shipping industry is concerned. The principle of quality assurance is a self-examination process that is designed to lead to continuous improvement in operation, in this case, in education. When shipowners are keen to establish quality assurance program, maritime college should train students to be qualified in entering that system of quality assurance. The graduates of maritime institutions will be exposed to TQM as soon as they are entering the Q.A. shipping company.

If a maritime college is to train people for employment by quality assured shipowners whether under the national or foreign flags, it should incorporate TQM.

5.1 Three Components

TQM consists of three components, which should be integrated: (1) the students(the clients), (2) the course(processor-1), the whole college(processor-2), and (3) the employers(the customers). We concentrate only on the processors.

5.2 A Quality Manual

Total quality management finally must produce a quality manual which explains and interprets the quality policy and which clearly states the procedures to be followed in following matters:

- Course design
- Teaching
- Assessment methods
- Staff development
- Course management
- Hardware procurement
- Maintenance

5.3 Miscellaneous establishments

After the setting up of quality manual, the following should be established

- A documented quality management system
- Statistical process control
- Quality manager: ensure consistency in quality levels, continuous improvements, and the elimination of waste across various departments or sections.

5.4 The Quality Management of Maritime Education

The quality management of maritime education can be listed as the following(very briefly):

- A defined organisational structure with
  (1) the responsibility, authority of personnel,
  (2) the personnel to perform inspection and verification for compliance with the quality requirements.
- Selection and recruitment of college staff-the qualifications and experience qualifications
- Staff development-encouraging and enabling staff to upgrade their qualifications
- Course design and course development
  (1) involving employers and students as well in course design
  (2) ensuring that up-to-date information on developments in the global shipping industry are received and disseminated throughout the college.
- Records- indexing, filing, storage, maintenance and disposition of quality records.
- Document control-procedures to control all documents(obsolete documents and changes to documents) and data that relate to the requirements of the Quality Manual.
- Quality system
  (1) establish and maintain a documented quality system.
  (2) the documented quality system, procedures and instructions should be effectively implemented.
  (3) planned periodic reviews of the quality system
- Internal quality audits-to verify whether quality activities comply with planned arrangements and to determine the effectiveness of the quality system
- External quality audits-TQM can be claimed to be established when it is audited and certified by an independent body.

5.5. The Subjects To Be Taught

The subjects to be taught at maritime institutions should comprise three systems: technical system, operational system and human system.

5.5.1 Technical System

This system consists of following sub-systems

- Hull
- Engine Room
  - Electrical installations
  - Propulsion
  - Services
  - Steering
  - Pollution prevention
- Navigation
  - Navigation
  - Moorings
  - Pollution prevention
  - Steering
- Cargo
- Safety
  - Fire protection and fighting
  - Life saving systems
  - Communications
  - Medical
  - Others such as Air conditioning, accommodation and food preparation

5.5.2 Operational system

This system consists of following sub-systems

- Navigation
- Propulsion
- CIQ and administration
- Emergency procedure

5.5.3 Human system.

This system consists of following sub-systems

- Organisational behaviour
- Human relationships

6. Conclusion

This article has explained what quality of service is and how the quality of maritime education can be improved or guaranteed. The common characteristics of shipping industry and maritime education is that they are service industries that require quality assurance system.

Quality assurance has now become the issue of the current decade as far as the shipping industry is concerned. This article has applied the principle of quality assurance of shipping companies to maritime education.

Maritime college should train students to be qualified in entering quality assurance program which shipowners have established because the graduates of maritime institutions will be exposed to TQM as soon as they enter the shipping company of quality assurance system. This article finally demonstrated how the quality assurance system in maritime education can be set up.

Forging Academic and Maritime Business Alliances

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ABSTRACT

It is hypothesized that IAMU goal of the worldwide excellence of maritime education revolving around safety management at sea and providing quality education and training are better achieved by strategic alliances between academic institutions and maritime businesses. Strategic alliances may be defined as forging association to further mutual interests.

Businesses and academic institutions have their unique strengths and weaknesses. Most commonly, educational institutions provide a service in the form of research, training, consulting, and intellectual property. Business organizations in return share knowledge about their state-of-the-art technology, operational processes, and employment opportunities for students. Many arrangements are possible ranging from business-supported educational research to licensing and patent developments.

Implementation of this approach is most likely to create a win-win situation for all parties involved in the experience. Essentially it will lay the groundwork for a healthy exchange of ideas between faculty, students, and business professionals. It will contribute to the infusion of additional revenues, and need-based innovative courses and programs resulting in improvement of educational standards and career development for students.

This arrangement will also lead to a collaborative research across disciplines. It will benefit not only faculty and "partnering" businesses, but also provide exciting opportunities for students who can assume a larger role under expert guidance. It will enrich the student psyche for research content and lead to a sense of commitment and conscientious dedication to the profession.

Given the complexity of global markets, demand for innovation, adaptation, and need for continuous improvement, both students and teachers must be creative in learning new behaviors, adapting to changing environment, and going beyond the demands of routine academic profession. This means that while content knowledge is important, process of sustained learning will define success in professional life made possible through strategic alliances.

1. Introduction

Historically, educators at colleges and universities have served an important, often critical, role as collaborators in research and problem solving for government and industry. In fact, one of the conclusions reached by the Commission on Industrial Competitiveness in the early 1980s was that both business and education could benefit from partnerships. Experience suggests that mutual benefits will accrue in such basic areas as faculty development, better-educated competent graduates, and cost-effective applied research for operational improvement.

This arrangement is nowhere more relevant than in the maritime industry. 'Maritime industry' refers specifically to all those organizations involved in the system of transporting cargo and people by water. In terms of present day practice, considerations must include the intermodal system of transportation from origin to destination. It is a segment of the international trading system, and as such must be considered in the context of total world trade. Managers in the maritime industry, therefore, need to understand the whole picture of worldwide transportation and trading systems, with all the forces that influence decision-making (e.g. shipping productivity, optimizing the use of increased capacity, greater speeds and fast turn around capability, impact of broadened scope of intermodal transportation and its interrelationship with trucking, rail and air transportation industries, etc). Based on one industry observer, considerable resources have been invested in major advances on the ship technology side perhaps at the cost of innovations in management techniques. This may be attributed to the conservative nature of the industry, and how set it may be in its own way of doing things. Perhaps one might view this as a challenge enough for colleges and universities to motivate the industry leaders to join hands in an effort to move us all to an elevated plateau.

2. Literature Overview

What is the role of an academic institution in the maritime industry? One might succinctly express it as to provide students with the essential material and experiences they need to become "safe, well-trained seafarers." In an eloquent introspection, Professor Lewarn suggests that maritime education and training (MET) institutions have failed in their attempt to raise skill and competency of mariners. In fact, he spares no one including faculty and other professionals in that indictment. Channeling and directing our collective energies toward the MET attributes, activities, tasks, and objectives, he urges benchmarking as a way to further IAMU's mission. Indeed, he acknowledges that the quality of institutional performance is "limited by resources, management commitment and staff capabilities."(11)

Maritime education and training (MET) is concerned with educational innovations, particularly those aimed at communicating abstract academic knowledge in a way that is helpful and meaningful to pragmatically oriented professionals and prospective seafarers. The dominant innovative tradition in this respect has been the development of experiential learning approaches including internship, and almost a yearlong sea duty.

Today, most maritime schools offer a mix of educational approaches --- the traditional lecture often combined in new and innovative ways with computer-based simulations. With these new educational technologies, maritime educators have begun to raise their aspirations from increasing student awareness and understanding to improving their commitment to the protection of life, property and the natural environment. These new aspirations create new challenges for the design of maritime education and training program, where the criteria for success are based on performance rather than cognitive comprehension. Yet the future poses an even greater challenge. The rapid growth of knowledge and increasing rate of social and technological change are making specific skill training more and more vulnerable to obsolescence. The answer seems to lie not in learning new skills, but in learning how to learn and adapt throughout one's career. An emerging concern in maritime education and research is, therefore, how individuals and organizations learn (10), and adapt ever so readily to the future needs of a maritime technical society.

Professor Hara (7) defines this futuristic maritime technical society as the society where rapidly proliferating technology will transform ship centered, self-completed function of today into a global transportation system integrating both land and marine transportation. Accompanying this will be the responsibility of the future merchant mariners to operate complex, technologically advanced ship systems, manage increasingly sophisticated organizations, and deal with highly technical problems such as oil/chemical pollution abatement, collision avoidance and satellite communication/navigation, etc. As one of the philosophers has said - "the genius of the future lies not in technology, but in our ability to manage it."

How much of what has been written about technology has become reality? How much may soon come to pass? How much will remain conjecture or fiction? It is undeniable that the impact computers and information technology will have on organizations of the future will be far-reaching and profound, affecting virtually all segments of our society. Also, as a result of downsizing and leaner/flatter structures, broader roles required of both workers and managers, and a more culturally diverse labor force – a workplace of today is quite unrecognizable from that which existed a few years ago (14).

Entry-level employees are being required to take on more responsibility and cooperate more closely with one another. More importantly, they must be able to see beyond their specific duties to demonstrate a business understanding of how their company and industry work, and how their jobs relate to the large corporate mission.

How many of our colleges and universities, let alone MET institutions, have resources to adequately prepare our students to such challenges? These resources encompass a wide array of factors such as informational, operational, physical, and indeed manpower. Compounding the challenge, many academic institutions have been hit hard by austere economic times and face stringent financial problems, in addition to being roundly criticized by industry for not keeping pace with its needs in the new global reality. Companies like AT&T, General Electric, General Motors, Motorola, Xerox and many others have their own "corporate universities" to re-tool their world-class workforce (14).

As colleges and universities, how responsive are we to the changing needs of maritime business employers or the new workplace competencies they require? How feasible is it to incorporate those needs in our curriculum to keep our students up-to-date and foster their smooth transition into an employer's workplace? Are there resources enough for educators and administrators to cope with these challenges – both present and in the future? A strategic alliance is a plausible answer.

3. The Need for Alliances

Strategic alliances may be defined as forging association to further mutual interests. These alliances are long-term commitments to leverage the strengths of collaborating partners to create new business practices, insights and ideas. Participating organizations increase their prospects for success by mobilizing their knowledge, skills, and assets that are mutually beneficial.

The need for academic and business partnerships is growing around the world. As businesses require more sophisticated skills and specialized knowledge base for their managers, there is increasing concern about the quality of graduates. Many business leaders and educators have expressed concern that shortcomings in education impoverish the intellectual and human resources of a nation. A large number of businesses have poured money in the local schools and universities reimbursing employees for college tuition or executive education. But there is not enough ROI for them in terms of improved productivity or performance in the workplace.

It is estimated that U.S. employers spend over $50 billion annually on formal and informal training. For employers everywhere, it clearly makes more sense to ensure that students get the proper education in their public schooling subsidized by taxes than expend more money and time for re-educating them at work. By getting involved in the educational process, businesses get better educated and better prepared employees at less cost.

Jeanne Meister, a pioneer in the area of corporate universities, identifies the following list of criteria for selecting a learning partner:

1. Shared vision where customer service, innovation, and continuous improvement are paramount to success.

2. Clear expectations for setting learning objectives and developing courses.
3. Flexibility and responsiveness in building a corporate/college alliance (this may include "teaching on site," sharing libraries, laboratories or equipment).
4. Complementary needs and goals. This may range from funding joint research to developing customized executive education programs.
5. Reputation and prestige of the educational institution.
6. Ability to collaboratively develop a clear path of study leading to a "new" accredited degree program.
7. Openness to experimenting with technologies to accelerate learning.
8. Ownership rights in intellectual property clearly delineated at the onset of the partnership.
9. Financial and non-financial measures carefully spelled out in advance and agreed to by the key players.
10. An infrastructure that is open to experimentation (for example, having the corporation assign a full-time equivalent to the academic institution to work on partnership matters).
11. Global education capabilities and network.
12. Commitment to building an open dialogue and continually renewing the partnership with fresh thinking.

The emphasis is on flexibility and creating a dynamic curriculum that is tied to the strategic issues of interest to the stakeholders (i.e. corporate partners). The familiar refrain – "It's the way we have always done things" will have to change to focus more on the student learner and less on the lecturer. This change must reflect a willingness on both our parts to commit to a larger cause, such as team performance or the well being of a community, above self-interest.

4. Alliances for Maritime Progress

Maritime academies - both federal and state - in the U.S. have recognized for some time virtues of seeking input from savvy alumni, businesses, and appropriate government and union executives to mold their respective curricula in keeping with the changing times. One illustration of such alliance was established between the U.S. Merchant Marine Academy (USMMA) and Sea-Land Service before it was acquired by A.P.Moller-Maersk in 1999. This relationship contributed significantly in the development of a formal program and academic major in logistics and intermodal transportation. Sea-Land's participation covered a large spectrum of activities including curriculum development, identification of competencies expected of USMMA graduates, development of "live case study", workshop in communication and interviewing skills, shipboard training, internship, etc. For Sea-Land, the value of this association resulted in a dependable pipeline of new talent to meet its future workforce needs (8).

It is reasonable to expect that similar approaches are adopted by sister colleges and universities around the globe. To quote Marcel Proust – The real voyage of discovery consists not in seeking new lands, but in seeing with new eyes.

Maritime businesses are now on a threshold of exploring newer vista of business opportunities unfolded by the Internet several years ago. The industry is captivated by promises of cost savings, operational efficiencies, and high profits. But the general gloom and doom of dot-coms has maritime executives looking for strategic partners to stay competitive.

In a July 31, 2001 report, eyefortransport described how APL, a global container transport company, has improved employee productivity and performance by adopting online learning as a strategy for staying ahead of technology growth, globalization, and customer demand. An informal collaboration with the third party provider, APL staff has fast access to the training and knowledge they need to quickly resolve critical business issues, respond swiftly to market changes and promote customer satisfaction. By adopting the real-time collaboration capabilities, APL has streamlined its training. The new technology has saved them hundreds of thousands of dollars in travel-related training costs.

5. Why These Alliances Make Sense for MET Institutions

Peter Bott, one of the partners of Andersen Consulting (now called Accenture) recently said that alliances were "a way of the future". An alliance between a business firm and an academic institution is a two-way street that provides the educational institution with needed resources, while permitting a business firm to gain from work being done by faculty and students thereby improving their competitive position in a global context.

It is obvious that the aims and objectives of IAMU are to raise skill and competency of mariners to ensure:

- Survivability of ships in all circumstances and conditions
- Safety of passengers, crew and cargo
- Protection of environment by eliminating pollutants
- Open and clear communication with diverse groups of crew

Therefore the efficacy of achieving these lofty ideals will depend on the extent of ownership by all those affected by these goals and ideals, the extent of their commitment, and methodology used in communicating its urgency. There is an opportunity for all stakeholders – students, educational institutions, maritime businesses, and all participants in an organization's value chain. There is an opportunity for all to make a concerted effort to harness, channel, and stimulate higher levels of achievement motivation. Both educational institutions and businesses need to join hands in approaching this challenge together to strive and create the climate, conditions, structures, and procedures that allow and reward those in whose hands this grave responsibility is reposed.

There is no easy solution to many variables at sea. All those involved in a variety of tasks on a ship must be driven by their own sense of personal responsibility. The challenge to collective (i.e. business and education) organization is to capture this innovative spirit and nurture it along to their fullest capability from the start.

The following points, by no means exhaustive, highlight key benefits accruing to both MET institutions and maritime industry partners:

<u>To MET Institutions</u>

- An opportunity to develop innovative/contemporary "real world" programs and courses from a global perspective and thus fulfill business and societal needs.
- Offer value-driven and cost-effective education, and generate revenues from training and skill development programs.
- Involve faculty in applied research, consulting, and updating knowledge of the industry operations
- Beneficiary to the funding possibility from local, central and other government and business agencies for leadership role in regional and economic development.
- Possible gains due to economies of scale as one becomes well versed in the operation and more businesses join the consortium.
- Involvement in the enterprise over time brings a sense of pride and achievement not unlike that of an entrepreneur.
- Develop technology infrastructure
- Assist partnering companies to develop and communicate new expressions of strategic intent for the higher education market.

- Patentable products and technology of commercial value can be a source of significant funding, revenues and stem the rising cost of education
- Gain recognition as a leader in reshaping a new view of higher education by producing knowledge and competent graduate.

To Maritime Businesses

- An opportunity to exchange ideas with faculty and students with unbiased objectivity and gain Meta perspective on business problems.
- Share strategic knowledge about trends in the market and workplace
- Cost effectiveness of faculty monitored research compared to professional consultants
- Improve competitive position through cooperative R&D programs.
- Increase visibility on a college campus and attract talented graduates
- Mentor student projects, advance opportunity for internship, professional careers and jobs.
- Donate equipment for technology infrastructure and educational improvements.
- Patentable products and technologies created in universities across the world have potential commercial applications at minimum cost to the company

Some of these benefits spill over to faculty and student areas as well.

To Faculty

- An opportunity to test one's ideas and knowledge to solve the "real world" problems of business and society.
- Conduct action-oriented interdisciplinary research that may keep them on the frontiers in their field resulting in basic/applied research and tangible insights.
- Develop a niche in the marketplace by providing a creative research-based service.
- Expose their students to "live case studies" and through team work, review and analysis
- Able to use a company's practical setting as a real-life laboratories to test their theories
- Patentable products of commercial value could bring in revenue in the form of royalties for both the faculty and University

To students

- An opportunity for "live case studies" and experiential learning – gain experience working on something that has *real* value or importance.
- Improve both analytical and interpersonal skills and capabilities.
- Receive a value-based education and appreciation for strategic thinking.
- Exposure to self-paced learning and team-based activities.
- Job possibilities with partnering companies.
- Increased awareness of the realities and challenges faced by partnering companies and others in the industry

In a maritime education and training system, providing excellent education to students is a raison d etre for all colleges and universities everywhere. It should be the top priority of all educators. Alliance with businesses will enable us to lead students beyond lectures and textbooks by engaging them in a creative experience from the start that will mature with age and experience. These alliances can save corporations millions of dollars in future training costs and help students get more prepared when they enter the workplace environment.

In summary, there is a compelling need to find new ways to sustain value creation in the world. MET institutions have an opportunity, an obligation, to make their mark by assiduously improving their approaches to education. Alliances with business will bring about changes that will challenge students to participate in their own learning. Energized together - universities, corporations and government - we can embark on a journey of discovery that will make a difference in the life at sea.

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Performance Criteria for the International Safety Management (ISM) Code

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ABSTRACT

There is an obvious need to conduct research and to gather and analyze data that could provide a sound, scientific, and objective evaluation of the ISM Code. The first step in organizing such a research effort is the identification of performance criteria. In this connection, the proposed paper poses and attempts to answer the following questions: What performance criteria are appropriate for assessing the ISM Code's effectiveness? How can "effectiveness" be defined and measured? The paper reviews past and ongoing ISM research, IMO documents, and relevant scientific literature to identify what analytical tools and indicators could be applied in evaluating the ISM Code. An argument is made that the application of a synthesis approach in the research, i.e., a combined qualitative-quantitative methodology, would provide the most comprehensive picture of the Code's effectiveness. The study concludes by proposing two sets of performance criteria – under the categories "output" and "outcome" – suitable for the assessment of the ISM Code.

1. Introduction

The first three years of the first phase of ISM Code implementation have elicited mixed reviews and conflicting verdicts – success ("The ISM Code's beneficial impact"), failure ("ISM: the bulb that failed to bloom"), and skepticism ("The ISM Code – is it working?") – have been heralded in the shipping news. Such assessments, however, seem to be largely based on oral testimony and anecdotal evidence. There is an obvious need to conduct research and to gather and analyze data that could provide sound, scientific, and objective evaluations of the Code. One of the first steps in such a research effort is identifying appropriate performance criteria, i.e., indicators that provide specific measures of safety and reveal how well the Code and its different components are doing in meeting its objectives (Osborne and Gaebler, 1992). Osborne and Gaebler (1992) give four good reasons why the performance of regulatory regimes such as the ISM Code should be measured and assessed:

- What gets measured gets done
- If you don't measure results, you can't tell success from failure
- If you can't see success, you can't learn from it
- If you can't recognize failure, you can't correct it

The objective of this paper is to offer criteria that might be applied in a research project evaluating the effectiveness of the ISM Code. It will pose and attempt to answer the following questions: How can the Code's "success" or "effectiveness" be defined? How can it be measured? What are some of the criteria appropriate for assessing its effectiveness? The study will commence by reviewing IMO meeting documents as well as past and current research on the ISM Code. The purpose of the review would be to identify what standards, explicit or implicit, have been or may be applied in evaluating the Code. The paper will also survey literature in the fields of policy analysis and safety science to identify analytical tools and frameworks that could be relevant in a scientific assessment of the ISM Code. With the reviewed literature as reference, the paper will then define effectiveness and propose a set of performance criteria.

2. Completed and ongoing ISM research

Albeit very small, there is a body of research focusing on the ISM Code. One study (Hahne et al., 2000) carried out by classification society Germanischer Lloyd analyzed survey forms filled out by 382 shipping companies. The forms contained answers to questions regarding the company's organizational structure and field of operations, safety organization / safety policy, qualification of personnel, and experience with implementation of ISM. The data gathered was not used to directly evaluate the effectiveness of the Code. It was used instead to evaluate the shipping industry's attitude towards ISM and its readiness to implement the Code. Together with the survey data, Germanischer Lloyd used the ISM certification process as a mechanism to identify what safety problems found aboard ship posed a hindrance to the attainment of the Code's objectives. One of the study's central findings was the existence of widespread resistance among industry personnel against "imposing" a safety culture aboard ship and against the introduction of what was perceived as yet another regulatory and documentary burden. The data also confirmed that the shipping sector as a whole was not ready for the ISM Code. Nevertheless, the German study is relevant to this paper in that it identifies factors that help determine the attitudes and perceptions shore- and ship-based personnel have of ISM and safety in general.

Another study (Hemquist, 2000) was conducted by the Swedish (P & I) Club. Using insurance claims activity as a criterion for evaluating the Code's effectiveness, the Swedish study indicated that "vigorous application of the ISM Code can significantly reduce claims exposure."

One on-going study (Anderson, 2001) intends to "consider the perceived conflict between the requirements under the ISM Code to produce... reports as a part of its SMS (safety management system)... on the one hand, and, on the other hand, the consequential production of potentially self incriminating evidence which could be used against those who produced that evidence: the ships master, or other seafarer... and the ship operator who will stand exposed to civil or criminal liabilities." Anderson's study focuses on the willingness of seafarers to submit reports of deficiency and non-compliance and how readily shore management acts upon such reports. Since this system of reporting is a novel concept in shipping and is the key to the SMS's self-perfecting mechanism, the level of activity in this area would also reflect upon the effective operation of the ISM Code.

3. IMO documents

IMO meeting documents were reviewed from as early as the 54th session (1987) of the Maritime Safety Committee (MSC) to determine what concerns influenced the framers to give the ISM Code the structure it has taken. Unfortunately, the review revealed a lack of detail in documented background information on the formulation process. This corroborates the difficulties referred to by Stenmark (2000), who headed a number of Swedish delegations to IMO and who mentioned in his study that the "preparatory work on the Code took place in working groups that, though officially constituted, employed unconventional work methods." Stenmark added that "minutes were not recorded... The meeting reports produced within IMO's different committees and subcommittees, where the Code was formulated, are summaries and reflect only decisions and contains proposals and drafts for whichever text may be under review at the moment." Nevertheless, there are at least two IMO documents that provide some indication of the Code's framers' expectations. One is an earlier version of the Code, the Guidelines on Management for Safe Ship Operation and Pollution Prevention (IMO, 1988), which had the purpose of providing "elements that can be used to gauge safety management and to develop and implement safety management." According to the document, the objectives of the guidelines were "to ensure safety, prevent human injury or loss of life, damage to the environment, particularly marine pollution, and damage to property." The other document, a submission by the Nordic maritime administrations (IMO, 1991), contains recommendations for revising the 1988 guidelines. According to the Nordic countries, the objectives of safety and environmental protection management should be the promotion of safe practices in ship operation, safe working conditions aboard ship, and the capability to handle whatever emergencies may still occur. They also offer the following criteria to determine whether the above objectives have been met: compliance with mandatory rules and regulations; observation of applicable codes, guides, and standards worked out by IMO, administrations, class societies, and industry organizations; and identification of risks not covered by the above sources and establishment of adequate safeguards (IMO, 1991). Though broad and general, the two documents give at least an indication of the Code's framers' expectations.

Examining the ISM Code itself gives us the same broad results. The Code states that its purpose is to provide an international standard for the safe management and operation of ships and for pollution prevention (IMO, 1993). Its objectives are "to ensure safety at sea, prevention of human injury or loss of life, and avoidance of damage to the environment, in particular to the marine environment, and to property." Section 12.2 of the ISM Code also requires the shipping company to "periodically evaluate the efficiency" of the SMS. In keeping with the general language of the Code, no detailed guidelines or standards are provided for this periodic evaluation of the SMS's efficiency. The Code only mandates that the review of the SMS be conducted "in accordance with procedures established by the (shipping) company." This is made clearer in Resolution A.788(19) which contains implementation guidelines to the ISM Code. Section 2.1.3 of the guidelines recommends administrations "not to use criteria in the form of prescriptive requirements as these may result in companies implementing solutions prepared by others. This may then result in difficulty for a company to develop the solutions which best suit that particular company, that particular operation or that specific ship" (IMO, 1995). In assessing an SMS's compliance with the Code's requirements, section 2.1.4 of the guidelines further recommends that administrations "ensure that these assessments are based on determining the effectiveness of the SMS in meeting specified objectives, rather than conformity with detailed requirements." In specifying objectives, companies are meant to consider the ability of the SMS to meet the following general safety management objectives (an improved version of the Nordic submission):

- provide for safe practices in ship operation and a safe working environment
- to establish safeguards against all identified risks
- continuously improve the safety-management skills of personnel ashore and aboard, including preparing for emergencies related both to safety and environmental protection

There is one more objective worth adding to the above list that is found in the introductory paragraphs of A.788, i.e., that "the application of the ISM Code should support and encourage the development of a safety culture in shipping." As far as a review of IMO documents go, the above summarize the maritime sector's expectations of the ISM Code. However, because the Code is designed to be non-prescriptive the challenge for this exercise is to translate these broad objectives, in addition to those that have been applied in the body of ISM research, into criteria that lend themselves to analysis and evaluation. There are at least two research disciplines that could provide us with analytical tools and concepts that could help us in developing these criteria – policy analysis and safety science. We shall look to policy analysis for analytical framework while we look at safety science literature to see how safety and safety policy is evaluated in other industries.

4. Policy analysis

Policy analysis is an "applied discipline or field" of political science "concerned with the evaluation of public policy." It has its origins in the 1960s when, during the US presidency of Lyndon Johnson, "social-scientific policy research and evaluation were widely celebrated as the proper basis for decision making in public policy" (Fischer, 1995). Perhaps the biggest debate in the discipline today is the relative preponderance of quantitative methods – such as, *inter alia*, microeconomics, econometrics, decision analysis, and statistics – in policy analysis. One classic example of the application of quantitative analysis in safety policy is Viscusi's 1979 study of the impact of occupational safety and health regulation. The study looked at the impact of the early years of the implementation of the Occupational Safety and Health Act of 1970 in the US by analyzing "pooled time series and cross section data on industry health and safety investments and injury rates for the 1972-1975 period" (Viscusi, 1979). The econometric analysis showed no significant effect of OSHA on workplace safety, mainly because the financial incentives were weak. A follow-up study was conducted in 1986 using an expanded series of data from 1973 to 1983 (Viscusi, 1979). Although the follow-up study showed an improved positive effect compared with the earlier one, the data was still inconclusive on the issue of OSHA's overall effectiveness and relevance to worker safety. Another quantitative study, "Direct and indirect effects of regulation: a new look at OSHA's impact," was completed by Bartel and Thomas (1985) by developing and testing "a three-equation model of workplace injuries, industrial noncompliance with OSHA safety standards, and OSHA enforcement." Like Viscusi, Bartel and Thomas did not find their empirical data conclusive. Nevertheless, their study concluded that OSHA had commendable, if indirect, effects on safety.

At the same time, there seems to be a rising tide against an exclusively empirical approach in policy analysis. There is, as it were, more than meets the statistical eye. Yanow (2000) sees the debate as being between analysts who believe "that it is not only necessary but also actually possible, to make objective, value-free assessments of a policy from a point external to it" (the positivist, empirical, or quantitative school) and those who believe that it is impossible "to stand outside of the policy issue being studied, free of its values and meanings and of the analyst's own values, beliefs, and feelings" (the interpretative, naturalistic, or qualitative school). Fischer emphasizes, however, that it is not a question of choosing one approach to the exclusion of the other. The quantitative approaches still play an important role in policy analysis but only as long they are applied "within the normative frameworks that give its empirical data meaning" (Fischer, 1995), in a methodology John (1998) prefers to call the "synthesis approach."

Baldwin and Cave (1999), Viscusi et al. (1996), Weimer and Vining (1999) offer introductions to the subject of policy analysis while Yanow (2000), Fischer (1995), and John (1998) offer methodologies that combine the qualitative and quantitative approaches.

5. Safety science

Safety Science is a multidisciplinary field of research into the science and technology of human safety. "It extends from safety of people at work to other spheres, such as transport, leisure and home, as well as every other field of man's hazardous activities." It covers, *inter alia*, the "physics and engineering of safety; its social, policy and organizational aspects; the management of risks; the effectiveness of control techniques for safety; standardization, legislation, inspection, insurance, (and) costing aspects" (Elsevier Science, 2001).

Kjellén et al. (1997) studied the economic effects of implementing a precursor to the ISM Code known as internal control (IC). In force in Norway since 1992, IC is a key regulatory strategy designed to ensure that companies comply with the country's safety, health and environment (SHE) legislation. It operates within Norwegian industry in very much the same way as the ISM Code does in international shipping. Kjellén et al. compared retroactive data covering ten years at an aluminum plant and calculated how much of the expenses incurred in implementing IC was offset by benefits in Q-SHE (quality, safety, health, environment). The study also determined IC's effect on Q-SHE related losses. The reported LTI-rate (number of lost-time injuries per 1 million hours of work) was used as the central criterion for measuring the safety program's Q-SHE effects. Kjellén et al. found that a significant reduction in the plant's operational (variable) expenditures was accomplished in parallel with significant improvements in Q-SHE related results.

Mitchison and Papadakis (1999) conducted a study on safety management systems under the European Union's Seveso II Directive (96/82/EC) which is the Union's equivalent of the ISM Code for certain establishments holding hazardous substances. Like ISM, the central feature of Seveso II is the implementation of a safety management system or SMS. Mitchison's and Papadakis' conclusions and guidance on SMS assessments are relevant to this study in that they conclude that the SMS under Seveso II is no different from those in other industries. Most SMS guidance are, as a rule, very general in nature and give emphasis to flexibility in structure and details. Mitchison and Papadakis (1999) warn against the adoption of an industry-wide safety performance rating system on the grounds that "the results will not in general be comparable across different establishments, and because the desire to perform well in the rating may prevail over the real objective, which is to improve overall safety... We remain sceptical as to the usefulness of rating systems based on simple and uniform formulae."

There are a number of safety science studies that adopted a particular safety criterion in order to identify a sampling of industrial plants that could be investigated for attributes that result in greater occupational safety. Cohen at al. (1975) was a questionnaire study "in which safety program practices of matched pairs of low and high accident rate plants were compared to determine factors that might account for the difference in safety performance." Smith et al. (1977), a companion study to the above, conducted on-site surveys "of a sample of 7 pairs of the questionnaire respondents in order to expand on the results of Cohen et al.." The findings confirmed the results of the questionnaire study and identified additional factors "in safety program practices that could account for plant safety performance." Simonds and Shafai-Sahrai (1977) used work injury frequency rates as their criterion for studying eleven pairs of industrial firms and identified ten positive factors that could be related to higher safety levels.

In his study, Hurst (1997) shows that findings from research activity could form the basis for developing practical tools to assess safety management and safety attitudes. In particular, Hurst describes how research work commissioned by the Health and Safety Laboratory (UK) were crucial to the development of STATAS (Structured Audit Technique for the Assessment of Safety Management Systems) and PRIMA (Process Risk Management Audit), analytical tools that have been employed for the assessment of management arrangements, risk control systems, safety management performance, safety attitudes, and safety culture.

6. Performance criteria for the ISM Code

After a broad sweep of some of the relevant literature, this study will now consolidate the information reviewed within the context of the ISM Code and translate them into criteria for assessing the Code's performance. Before moving on, it might be relevant to review Mitchison's and Papadakis' skepticism as to the usefulness of industry-wide safety performance rating systems. Mitchison and Papadakis actually qualified this viewpoint by conceding that such a rating system may be useful in evaluating changes. This was borne out by the industry-wide studies of Cohen et al., Smith et al., and Simonds and Shafai-Sahrai. This present study does not intend to propose performance criteria for an industry ratings system or to identify specified objectives for the ISM certification process. Rather, the criteria to be proposed in this paper are intended to be applied in evaluating the performance of the ISM Code as a regulatory framework. The rate of change in accident frequency in a given year relative to previous years, to take an example, could be one such indicator. In addition, while the Mitchison and Papadakis study is mathematical and theoretical, the authors themselves argue that a purely quantitative approach is inappropriate in evaluating an SMS. A qualitative system such as the SMS must also be evaluated qualitatively.

6.1 Effectiveness

One of the questions posed in the introduction to this paper was "How is 'effectiveness' defined?" Baldwin and Cave (1999) define effective regulation as one that addresses "the issue of whether desired results are actually achieved (irrespective of costs)." They contrast this with "efficiency" which takes into consideration the ratio of benefit to the cost to government of implementation and enforcement of regulations.

Viscusi (1979), on the other hand, draws a link between effectiveness and cost, not to government but to the industry being regulated. After comprehensive econometric calculations, he concludes in his study that the "conceptual analysis indicated that the effectiveness of job hazard regulations hinges critically on the economic incentives created." Adapted to the ISM Code, effectiveness could depend on the willingness of ship owners to run the risk of expensive delays due to ISM-related detentions or other activities.

According to Sagen, the effectiveness of the ISM Code does not hinge upon the compliance by shipping companies with mandatory instruments (a key objective of the Code) because this is already taken for granted through the issuance of statutory certificates. Instead, the true measure of the ISM Code's success is how effective enforcement is by administrations (Sagen, 1999).

The common thread between these three definitions is that effectiveness is measured by the positive results resulting from the enforcement of the regulatory regime. For purposes of this study, effectiveness is given the meaning from Baldwin and Cave, i.e., the state of the achievement of the desired results. To ask whether the ISM Code is effective is to ask whether it actually achieves the desired results it was designed to achieve, i.e., safer ships and cleaner seas. This leads us to the next question: "How can the Code's 'effectiveness' be measured?"

6.2 Dichotomy

To facilitate identification of performance criteria within a combined qualitative-quantitative framework, it would be useful to adopt the policy analysis concept of output and outcome. In the field of policy analysis, outputs are alternatively referred to as "policies" while outcomes may also be referred to as "goals." The dichotomy between output and outcome is a device employed in policy analysis that enables the researcher "to find out if policy intentions turn into reality, and when policies are successes or failures. The procedure allows the researcher to ask some pertinent questions about the effectiveness of the policy process" (John, 1998). Weimer and Vining (1999) offer this succinct distinction between the two concepts: "goals are the values we seek to promote and policies are the alternatives and strategies for promoting them." Examples of outputs/policies in the context of the ISM Code are the regime of port State control inspections and the system of SMC (safety management certificate) and DOC (document of compliance) certification. Examples of outcomes/goals are the promotion of ship safety, protection of the marine environment, and the development of a safety culture in shipping.

The designation of an item as either output or outcome is not necessarily set in stone in every case. Goals, perhaps reworded, occasionally become policies at another level as new goals are set. In other words, the divisions are not necessarily always clear-cut. Weimer and Vining (1999) advise that one should "start by formulating goals as abstractly as possible and policy alternatives as concretely as possible." The dichotomy also reminds researchers of the complementary nature of the quantitative (concrete policy alternatives) and qualitative (abstract and normative goals) methodologies.

6.3 Proposed criteria

The following objectives that were identified in the review of IMO documents will be used to form the basis for developing criteria for evaluating the ISM Code's performance:

- provide for safe practices in ship operation and a safe working environment
- to establish safeguards against all identified risks
- continuously improve the safety-management skills of personnel ashore and aboard, including preparing for emergencies related both to safety and environmental protection
- development of a safety culture in shipping

The task now is to identify performance criteria under the headings "output" and "outcome" as defined above.

6.3.1 Output

If output can be defined as the set of alternatives and strategies for promoting the safety values we seek to promote, then the performance criteria to be proposed under this heading will relate to activities that ensure that the ISM Code is in place as a safety regulatory framework. Following are the proposed criteria:

- *Port State control detentions related to ISM deficiencies or non-conformities.* The Secretary-General of IMO has directed the collection of "information on, for example, any significant drop, or otherwise, in the number of detention of ISM-certificated ships together with any information or action taken by port State control authorities in respect of ISM Code deficiencies" (IMO, 2001).
- *ISM-related spot inspections requiring demonstration.* Under the ISM Code, the maritime administration is expected to carry out controls to ensure that the SMS is functioning. An inspection that involves requiring ship's crew to demonstrate competence is normally a sign that there is reason to believe that the SMS might not be functioning properly. A high number of spot inspections could be linked to a lower level of safety.
- *Re-inspections related to ISM deficiencies or non-conformities.* A high number of re-inspections reflects on the number of inspections that led to deficiencies being noted for rectification. The data could be compared over time to see if there is a down- or upward trend, particularly involving major non-conformities.
- *Reporting of ISM deficiencies and non-compliance by shipboard staff.* The main criterion employed in the on-going study by Anderson. The willingness and actual use of this important mechanism gives an indication that the Code is functioning as it should.
- *Annual review and interim surveys results.* Non-compliance and deficiencies detected by auditors during annual reviews and interim surveys, particularly those categorized under major non-compliance, could be compared over time.

The above indicators or criteria could be observed by comparing a series of data over time to not only to gather absolute values but also to detect the rate of change, a technique used regularly in safety science. Quantitative criteria are highly desirable "because they facilitate more precise ex ante comparisons of effects" (Weimer and Vining, 1999), yet they need to be tempered by normative analysis.

6.3.2 Outcome

If goal/outcome can be defined as the set of safety values we seek to promote, then the performance criteria to be proposed under this heading will relate to measures that indicate whether the ISM Code is producing its intended results. Following are some proposed criteria:

- *Accident rate* and *injury frequency*. Cohen, et al. (1975) employed accident rate as the criterion in their study while Simonds & Shafai-Sahrai (1977) considered injury frequency. An effective ISM Code should result in a downward trend in accident rates and injury frequency not only in terms of personal injuries to seafarers but of vessels involved in marine casualties. It is worthy to note that accident and injury rates are commonly employed in safety science but does not seem to have been used in an evaluation of the ISM Code.
- *Mortality rate*. Nielsen (2000) estimates that 2,595 seafarers die every year while serving at sea. Observing the number of accidental deaths at sea over a period of time will give an indication of the Code's impact.
- *Safety culture*. A number of studies provide methodologies and criteria for assessing safety culture in the maritime sector. Ek and Akselsson (1999) evaluated the safety culture on board a passenger vessel in the Baltic Sea. Hahne et al. (2000) surveyed the attitudes and perceptions of shipping personnel. Stenmark (2000) aimed at "finding a workable definition of safety culture within a framework of organizational psychology." Sagen (1999) discusses the four columns of safety culture in the maritime field.
- *Lost-time injuries (LTI)*. Defined in safety science as "injury at work leading to unfitness for work and absence beyond the day of the accident," LTIs could be costly to shipping companies particularly in cases where the injured seafarer has to be flown out and replacement crew have to be flown in.
- *Vessel off-hire/delay*. Shipping companies incur losses for every day that a vessel is not engaged in loading, unloading, and transporting cargo. Delays could be caused by, *inter alia*, port State control detentions, accidents, accident investigations, vessel casualties, and vessel emergency repairs.
- *Crew repatriated or sent ashore for retraining*. An effective ISM Code should result in a decline in the number of crew sent ashore for retraining or repatriated for carrying invalid professional documents or for other ISM Code non-conformities.
- *Insurance premiums and claims level*. The Swedish Club study showed a link between the ISM Code and the number of insurance claims while Häkkinen (1995) confirms the link between safety levels and insurance premiums.
- *Active commitment of management to safety*. Kjellén et al. (1997), Cohen et al. (1975), and Smith et al. (1978) showed the positive link between greater safety and a management team that is actively involved in safety issues.

The two lists above do not claim to be complete and comprehensive sets of criteria for evaluating the ISM Code's effectiveness. The principal aim of this study is to show one way of learning lessons from other industries and disciplines that have had decades of experience in the assessment of regulatory frameworks and safety management systems.

While the ISM Code requires that shipping companies develop an SMS with a built-in self-perfecting mechanism, the Code itself is not equipped with the same type of mechanism. This is where research could be useful in identifying some criteria and overall industry goals that could give an indication of the state of the ISM Code, and provide a more scientific basis for drafting amendments. It might be difficult to attach minimum, maximum, or ideal values (whether numerical or normative) to the performance criteria until an initial study is conducted. However, scientific research into the ISM Code's performance could eventually lead to the development of practical assessment systems similar to those available to safety management in other industries.

7. Conclusion

During the February, 2001 session of the IMO Sub-Committee on Flag State Implementation, the Secretary-General of IMO made the following admonition: "We should not allow (the ISM Code) to become merely a paper exercise." This is in reaction to fears expressed by some sectors of the maritime industry that the physical trappings of a safety management system we now see in vessels and shipping companies are testimony to nothing more than just another cumbersome international maritime documentary exercise. This is why a studied basis should be made for giving any verdict on the Code's performance. If studies indicate that the Code is indeed achieving its intended results, then the fear is baseless. If studies indicate that the Code does not seem to make a significant dent in the accident statistics, then the research could also give clues as to how the situation may be improved. Mitchison and Papadakis (1999) emphasize that while safety performance measurement is useful in describing the present state of a safety management system, it is even more useful as a basis for improving the system's performance, i.e., by identifying weaknesses and targeting necessary interventions.

On the one hand, the non-prescriptive nature of that Code ensures that each SMS is tailor-fitted to the particular shipping company. On the other, it presents a challenge for assessment and evaluation. The dilemma facing the analyst is how to gather measurable and quantifiable data without intentionally causing the transference of prescriptive values to any ISM Code amendment exercise. This is the reason this paper advocates a mixed approach to evaluation. After reviewing ISM Code research, IMO documents, policy analysis literature, and safety science research, this study has proposed that a combined quantitative-qualitative approach of research be conducted. The paper has also offered the following criteria, under two broad headings, for evaluating the ISM Code's performance:

OUTPUT

- Port State control detentions related to ISM deficiencies or non-conformities
- ISM-related spot inspections requiring demonstration
- Re-inspections related to ISM deficiencies or non-conformities
- Reporting of ISM deficiencies and non-compliance by shipboard staff
- Annual review and interim surveys results

OUTCOME

- Accident rate and injury frequency
- Mortality rate
- Safety culture
- Lost-time injuries (LTI)
- Vessel off-hire/delay
- Crew repatriated or sent ashore for retraining
- Insurance premiums and claims level
- Active commitment of management to safety

Criteria could be added and deleted from these lists and a combination of any number of them could be applied in different studies. The above criteria are naturally subject to debate and are best assessed, justified, or rejected by the results coming out of any study that would apply them. In proposing these criteria it was shown that there is much that the field of maritime studies could learn from the experience in policy analysis and safety management in other industries.

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Education and Training as an Approach for Harmonization of PSC Regimes

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ABSTRACT

Port State Control (PSC) as control of foreign flag vessels in the national ports, has been defined as the last safety net. When shipowners, classification societies, insurers, flag State administrators have in one way or the other failed to do their job, Port State Control comes into the scene. In an ideal world, Port State Control would not exist but unfortunately, due to inescapable realities, Port State Control must remain a standard feature in the maritime safety field. With a view to eradicating substandard ships the Assembly of the International Maritime Organization adopted resolution, to promote the establishment of such regimes in the various regions of the world following the pattern adopted by the European region through the Paris Memorandum of Understanding on Port State Control (MOU) in 1982. Realizing the need to assist in enhancing safety and the protection of the marine environment in other regions, IMO was involved in the promotion of similar eight Port State Control regimes. As the PSC regimes covering the World are almost completed in year 2000 within the participation of 112 countries, Co-operation and harmonization between regional PSC regimes in various regions of the world should be considered as the next target to be achieved.

Based on the fact that the most important factor affecting the improvement and standards of PSC regimes is the human resources factor, it will be most important to investigate and propose a model training course for Port State Control Officers (PSCO's). This course should support the international and national needs and facilitate harmonized and effective implementation of such proposed course. This paper discusses the methodology dealing with the common aspects of PSC and stresses on the importance of PSCO's education and training as an approach for harmonization of PSC regimes.

Nomenclature

AASTMT	Arab Academy for Science, Technology and Maritime Transport
FSI	Flag State Implementation
PSC	Port State Control
IMO	International Maritime Organization
MoU	Memorandum of Understanding
USCG	United States Coast Guard
PSCO's	Port State Control Officers
EC	European Commission
DNV	Det Norske Veritas

1. Introduction

The responsibility of enforcing ships to comply with the provisions of the international relevant instruments rests upon the owners and masters of ships, whereas the responsibility of ensuring that ships comply with the provisions of the international relevant instruments rests upon the Marine Inspection Administration of the Flag State. However, due to the inability of some of the Marine Inspection Administration of the Flag State to fulfill its commitments toward foreign ships at the international level, and subsequently some ships are sailing in an unsafe condition, affecting the lives as will as the marine environment. Hence, the need for setting a new system to get over this problem is becoming more pressing than ever.

1.1 Flag State Implementation (FSI)

Flag State implementation is the national system of inspecting the national flag ships according to the national rules implementing the international conventions.

1.2 Port State Control (PSC)

Port State Control is a regional system of inspecting foreign ships according to the regional systems of implementing international conventions. Port State Control system aims at developing *a harmonized system* of inspecting ships at the regional level with a view to ensuring ships' compliance with the international safety standards and requirements in an attempt to eliminate sub-standards ships from the world fleet of ships.

1.3 Regional Agreements and Memoranda of Understanding

The International Maritime Organization (IMO) has issued numerous rules and international conventions to harmonize the system of inspecting ships. Nevertheless, the Organization's most significant achievement within this context was initiating the process of concluding regional cooperation agreements to exercise Port State Control. Considering that inspecting all the ships calling at the ports of a State is rather difficult and costly, concluding regional Port State Agreements is an effective way of ensuring that each of the States Parties to such agreements would inspect a certain percentage of the said ships, which would reduce costs and ensure that all ships calling at the ports of the region are inspected in accordance with a harmonized system and procedure of inspection to eliminate sub-standard ships.

All the States Parties to the said agreements are represented in the Regional Agreements/MoU Committee in charge of Port State Control. All aspects and activities of the Agreement/MoU are the responsibility of that Committee in which the most important issues are:

- Amending and issuing legislations relevant to the region, whether the said legislations are related to the control procedures and/or preventing sub-standard ships from entering the ports of the region, and
- Approving and providing training courses and seminars needed in the region for PSCO's.

The States Parties to such regional agreements shall abide by the requirements of the said committee.

1.4 The Powers of Regional Memoranda of Understanding

Regional memoranda of understanding have tremendous powers over their ports, under which they determine those countries the rate of detentions of the ships of which exceeds the general average and include them in the targeted flag ships' list (known as the black list). The ships of black listed countries shall be subjected to a concentrated inspection, under which the ship, her equipment, documents and manning are inspected in detail. If the rate of detention of a certain ship is high, or in case of failure to perform major repairs, the ship shall be prevented from entering all the ports of the region (banned).

1.5 Global Future PSC Trends

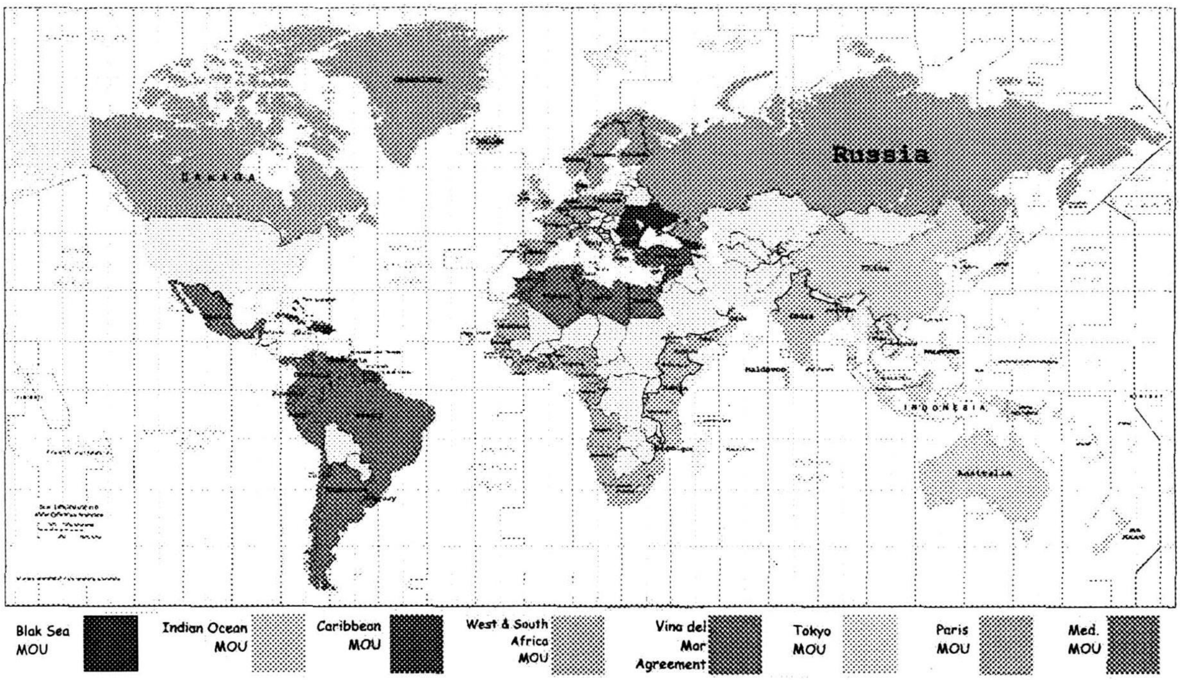
- Paris Memorandum of Understanding, 1982
  Under the prevailing global trend toward harmonizing the standards governing work in the global maritime field, and due to the variance of technological development, efficiency, and manning standards of the ships of the world merchant marine fleet, European countries started to develop criteria and standards for the world merchant marine fleet through Paris Memorandum of Understanding which was signed by European countries in 1982 (18 European countries in addition to Canada).
- United States Coast Guard (USCG)
  The United States of America is one of the pioneering countries with respect to Port State Control. It delegated the job to the Coast Guard which became responsible for performing Port State Control tasks in addition to other tasks. The United States Coast Guard issues monthly and annual reports about the ships which were detained and prevented from entering US ports, in addition to the Black List of the countries operating sub-standard ships.

The International Maritime Organization adopted the ship inspection criteria and standards of Paris Memorandum of Understanding. Within this context, the International Maritime Organization, the International Labour Organization, and the European Commission worked jointly to have the following regional Port State Control memoranda of understanding concluded in coordination with the countries of the world:

- Latin America Memorandum of Understanding, November 1992
  10 countries representing the countries of Central and South America.
- Tokyo Memorandum of Understanding (for Asian countries), December 1993
  16 countries representing the countries of the Far East.
- Caribbean Memorandum of Understanding, February 1996
  9 countries representing the countries and isles of the Caribbean Area.
- Mediterranean Memorandum of Understanding, July 1997
  9 countries from south and east Mediterranean countries.

- West and Central Africa Memorandum of Understanding, 1998
  All countries of West and South Africa.
- Indian Ocean Memorandum of Understanding, 1999
  18 Asian and African countries.
- Arabian Gulf Memorandum of Understanding (under preparation)
  The countries of the Arabian Gulf.

When the last MoU is concluded, the world will have been covered by nine regional memoranda of understanding, in addition to the United States Coast Guard. The process of harmonizing the standards of the concluded memoranda of understanding at the international level will then start with a view to establishing a global structure under which no sub-standard merchant marine fleet can operate at both the regional and international levels. This trend was initiated during a workshop held in the International Maritime Organization in June, 2000, in London, for the Secretariats and the Directors of the Information Centres of the concluded memoranda of understanding for the purpose of reviewing coordination methods and harmonizing work and ship inspection systems. It was been decided that this workshop shall be periodically held every two years.



2. Education and Training

Considering that it is universally acknowledged that Port State Control Officers (PSCOs) constitute the cornerstone of Port State Control System, and that Maritime Authorities would never be able to effectively contribute to PSC inspection unless PSCOs are well-trained, the International Maritime Organization has developed its IMO Model Course to this effect. The European Commission also contracted with Det Norske Veritas (DNV) for developing an advanced CD ROM course to be used in training ship inspectors of the Paris Memorandum of Understanding. Other educational institutions, such as the Arab Academy for Science, Technology and Maritime Transport, are developing advanced training courses to be conducted in the Mediterranean Area.

2.1 The Importance of Harmonizing Educational and Training Curricula

Due to the variance of expertise of the concluded memoranda of understanding, some of which started operating about twenty years ago (Developed MoU), while others had been operating for two years (Developing), it was expected that the level of expertise would be reflected on the standards of the national flag ships of countries Parties to developed memoranda of understanding, such as Paris MoU, or Tokyo MoU. However, analysis of the annual reports issued by the Regional memoranda of understanding indicates that the countries Parties to the developed memoranda of understanding were included in the Black List, which highlights the importance of harmonizing maritime educational and training curricula and programmes for marine inspectors at the international level and for all memoranda of understanding.

3. Analysis of current situation

Analysis of the annual reports concerning the ships which will be targeted under Tokyo and Paris memoranda of understanding, as well as US Coast Guard, gives the same indicator.

3.1 Tokyo MoU Report for the Year 2000

17 countries were included in the Black List. They have been classified on the basis of the MoUs they belong to as follows:

Analysis of Tokyo MoU Report (1998-2000)

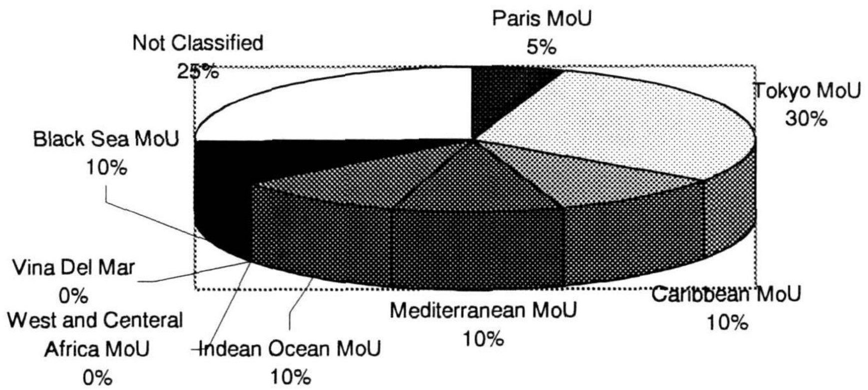
1.	Korea, Democratic People's Republic			
2.	Cambodia			
3.	Belize			
4.	Indonesia			
5.	Viet Nam			
6.	Turkey			
7.	Saint Vincent and the Grenadines			
8.	Honduras			
9.	Russian Federation			
10.	Malaysia			
11.	Thailand			
12.	Malta			
13.	Korea, Republic of			
14.	Taiwan, China			
15.	India			
16.	Cayman Islands			
17.	Iran			

	Memorandum/Agreement	C	F
	Paris MoU	1	0.9
	Tokyo MoU	6	5
	Caribbean MoU	2	1.7
	Mediterranean MoU	2	1.7
	Indian Ocean MoU	2	1.7
	West & Central Africa MoU	0	0
	Vina Del Mar	0	0
	Black Sea MoU	2	1.7
	Not Classified	5	4.3
		20	17

C = No. of countries

F = Country Factor = C/total(C)* total(No.)

Ex. Paris MoU (F) = 1/20*17 = 0.9

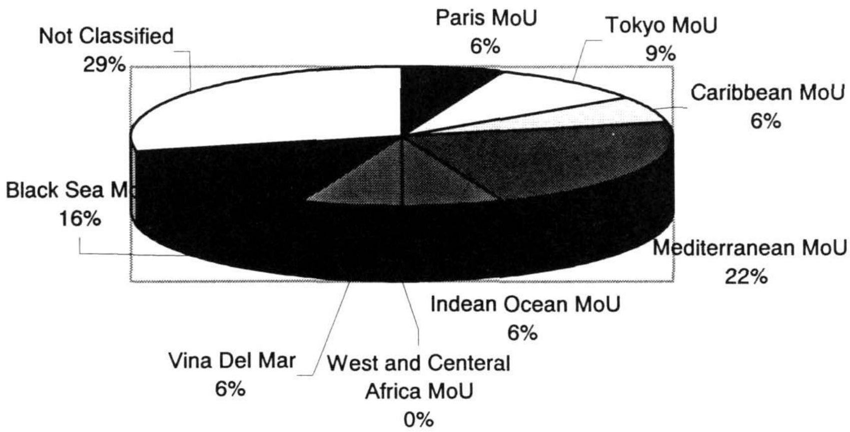


3.2 Paris MoU Report (97-99)

29 countries were included in the Black List. They have been classified on the basis of the MoUs they belong to:

1.	Albania			
2.	Honduras			
3.	Belize			
4.	Lebanon			
5.	Syrian Arab Republic			
6.	Romania			
7.	Cambodia			
8.	Turkey			
9.	Georgia			
10.	Algeria			
11.	Libyan Arab J.			
12.	Saint Vincent and the Grenadines			
13.	Egypt			
14.	Morocco			
15.	Mauritius			
16.	Bangladesh			
17.	Ukraine			
18.	Malta			
19.	Pakistan			
20.	Cyprus			
21.	Panama			
22.	Malaysia			
23.	Cuba			
24.	Russian Federation			
25.	Bulgaria			
26.	Thailand			
27.	Latvia			
28.	Croatia			
29.	Azerbaijan			

	Memorandum/Agreement	C	F
	Paris MoU	2	1.8
	Tokyo MoU	3	2.7
	Caribbean MoU	2	1.8
	Mediterranean MoU	7	6.4
	Indian Ocean MoU	2	1.8
	West and Central Africa MoU	0	0
	Vina Del Mar	2	1.8
	Black Sea MoU	5	4.5
	Not Classified	9	8.2
		32	29

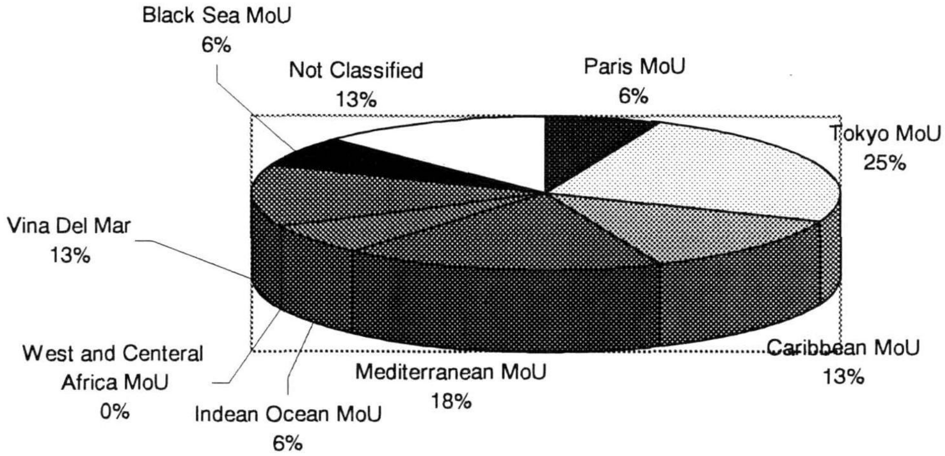


3.3 US Coast Guard Report (97-99)

14 countries were included in the Black List. They have been classified on the basis of the MoUs as follows:

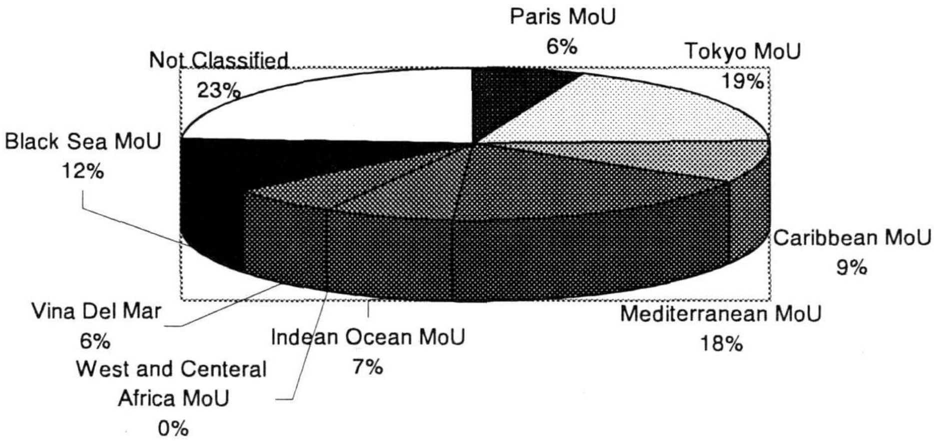
1.	Antigua & Barbuda			
2.	Belize			
3.	Cyprus			
4.	Honduras			
5.	India			
6.	Malta			
7.	Panama			
8.	Philippines			
9.	Russian Federation			
10.	Saint Vincent and the Grenadines			
11.	Thailand			
12.	Turkey			
13.	Vanuatu			
14.	Venezuela			

	Memorandum/Agreement	C	F
	Paris MoU	1	0.9
	Tokyo MoU	4	3.4
	Caribbean MoU	2	1.8
	Mediterranean MoU	3	2.5
	Indian Ocean MoU	1	0.9
	West and Central Africa MoU	0	0
	Vina Del Mar	2	1.8
	Black Sea MoU	1	0.9
	Not Classified	2	1.8
		16	14



The summary of the analysis of the annual reports of the memoranda of understanding could be presented in the following table.

		Tokyo	*Paris*	*USCG*	*Total*	*%*
	Paris MoU	*0.9*	*1.8*	*0.9*	*3.6*	*6.0*
	Tokyo MoU	5	2.7	3.4	11.1	18.5
	Caribbean MoU	1.7	1.8	1.8	5.3	8.8
	Mediterranean MoU	1.7	6.4	2.5	10.6	17.7
	Indian Ocean MoU	1.7	1.8	0.9	4.4	7.3
	West and Central Africa MoU	0	0	0	0	0
	Vina Del Mar	0	1.8	1.8	3.6	6.0
	Black Sea MoU	1.7	4.5	0.9	7.1	11.8
	Not Classified	4.3	8.2	1.8	14.3	23.9
		17	29	14	60	100



The above figure indicates that the names of different memoranda of understanding have been included in the Black List with slight percentage differences, which points out to some factors, one of them and most important is the harmonization of the standards of education and training of Port State Control officers. Also, the performance of any memorandum of understanding is related to the performance of all the other memoranda of understanding.

4. Educational and Training Programmes

In view of the current situation of different methods and levels of training and education in the area of Port State Control, it is recommended to classify courses into the following categories:

4.1 PSC Course (Level I – One Week)

The importance of Sea/Shore based personnel knowledge in regard of PSC work and practices was recorded in many cases. Accordingly, a one week course is recommended for general knowledge for Sea/Shore based personnel. Outline of PSC Course – level I, may contain the following items:

.1 Introduction:
(FS and PSC regimes and Instruments, Non-Convention ships and ships below Convention size).

.2 International Conventions
(STCW & ISM Code, GC & IGC Code, BC & IBC Code, BCH Code, IMDG Code, Load Line & Load Line Remarks, Tonnage Measurements, MARPOL, SOLAS, COLREG, ILO No. 147)

.3 Ship Classification and Surveys

.4 Agreements and MoU's

.5 Guide Lines for FS & PSC
(Life saving Appliances, Ship documents and Crew qualifications, Navigation and Communication equipments, Fire fighting Equipment, Hull and Safety in general, Machinery and electric installations, Cargo Safety, Pollution, Crew Accommodation)

4.2 PSC Course (Level II – Two Weeks)

This course can be designed for new PSCO's based on IMO Model Course. (Theoretical material given in Level I in one week and Practical Aspects in One week)

4.3 PSC Course (Level III – Four Weeks)

This course can be designed for advanced Training for PSCO's based on the EC model course developed by DNV using CDROM and other related materials, (Theoretical material given in Level III in Two weeks and Practical Aspects in Two weeks). Outline of PSC Course – level III, may contain the following items:

.1 Introduction
(Background, team building, qualifications of ship inspectors, training needs and plan)

.2 Formal Aspects
(International instruments – Global and regional – Co-operation, IMO and ILO, Flag State and Port State regimes, Conventions on Maritime Safety and Pollution prevention, Ship Classification, interaction between Administration and Classification Societies, Non Convention ships).

.3 Technical Aspects
(General ship knowledge, Stability and Load line, Dangerous Cargoes and pollution aspects, Electrical installations, Hull Constructions, Fire Safety, Lifsaving – Appliances, Communication and Navigation Equipment).

.4 Operational Aspects
(Safety Management Systems, Operational Control of drills – firefighting – lifsaving – bridge/cargo operations, Manning).

Although there are educational and training programmes as already stated, it is imperative that training programmes should be adapted to the actual practice of inspectors and not mainly achieving the theoretical part of the International conventions. On the other hand, the problem of harmonizing the procedures of PSCO's work has to be overcomed. For example, varied memoranda of understanding issue what is termed "PSCOs manual" containing the procedures which inspectors should perform before, during, and after the inspection. At the same time, the International Maritime Organization issued Circ.787 containing similar information. Therefore, the procedures should be harmonized by observing the Organization's publications which should preferably be included in the training programme for inspectors.

Conclusions and Recommendations

Considering that the success of Port State Control mainly depends on education and training, and considering that Port State Control is a regional system, which means that the standards of education and training vary from one area/region to another, which adversely affects the inspection standards in each region, and due to the need to harmonize and improve the standards of inspection under varied memoranda of understanding, it is extremely necessary that educational and training programmes for inspectors should be harmonized, with particular emphasis on the importance of harmonizing the actual performance of inspectors by using a unified procedures manual and a unified international code of symbols. The items of the standard educational and training programme should be determined up to the required standards, in addition to utilizing modern technologies in conducting these programmes.

The training and Education for PSCO's is not only the type of training needed in this area but also the training and education for Sea/Shore based Personnel.

References

Paris MoU, Web Site

Tokyo MoU, Web Site

US Coast Guard, Web Site

Mediterranean MoU, Web Site

IMO Model Course (PSC)

IMO Conventions and Circulars

EC Model Course (PSC – advanced training)

AASTMT Courses (PSC – different levels)

Information Support for Navigator Providing Maritime Safety

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ABSTRACT

Introduction of information technologies into maritime safety improvement process makes maritime universities face the problem of training navigators for competent information usage. The present paper focuses on the main trends in solving this task.

1. Introduction

Training specialists in maritime academies and advanced training aims at improvement of maritime safety by making the most efficient use of the information available aboard. Constantly growing number of information sources, increasing requirements to its trustworthiness and accuracy requires changes in maritime training quality. The leading role here is played by the ability to correctly evaluate information and to make up the optimal decision. Presently training process in maritime academies and skill improvement courses for navigators incorporates certain innovations. They are: elaboration of automated information systems based on satellite navigation, automated radar plotting systems and radio transponders. All the information sources go with capacities of electronic cartographic systems.

2. Requirements to navigation accuracy

Wide usage of GPS Global Navigation Satellite System (GNSS) gives the possibilities of high accuracy navigation in all the areas of the World Ocean. According to IMO Resolution A.529 (13) 1983 ship's position is to be known with radial error of $R < 4$ miles ($M_0 < 2$ miles) and probability of $P = 0.95$. The above requirement concerns the areas where ship's manoeuvring is not restricted. For narrow waters, passages and port waters according to Global Radio navigation System requirements adopted in 1995 on the 19th IMO Assembly ship's position error should not exceed 10 meters with probability of $P = 0.95$ ($M < 5$m). IMO resolution A.860 (20) of November 27, 1997 confirmed the ship's position accuracy requirements regarding future Global Navigation Satellite System.

Presently the problem of high accuracy navigation has been solved both for coastal and deep sea voyages. However it should be mentioned that there exist certain factors which do not depend on position accuracy but nevertheless influence navigation safety. For instance, surf beat unknown not shown in navigation guidebooks or insufficient information on tide phenomena.

While plotting not far from navigation dangers, if necessary, the observations should be of high accuracy (M_0 = 2-5 m). At differential GNSS operation variants cartography errors should be also considered. Thus, average square errors in nodal point position on cartographic graticule (intersection point) do not exceed 0.2 mm in the map scale. Mark stations are mapped with the same accuracy. However, due to the paper deformation in reprints map frame dimensions may differ in 1-2 mm. Analysis of different maps showed that outline points position on the cartographic map is characterized by average square errors of 1.0 mm. Mapping of other points no sea maps is carried out with less accuracy, mainly due to cartographic generalization.

It should be also mentioned, that until recently accuracy of depths mapping on sea maps produced in this country is evaluated by average square error of ± 1.5 mm in the map scale, and isobathes are drawn by limited number of depth, their pattern serving as usual for better visual perception of underwater landscape. Taking into account both depth errors and depth mapping errors we can speak of total limited error in mapped depth of 4-6% of actual depth.

3. Factors influencing maritime safety

The main factor influencing maritime safety in coastal and narrow waters is that on the maps of some countries actual depth may prove to be less than mapped depth. Thus, on the USA Atlantic coast and Central America maps, where low water level is accepted as datum in 50% cases heading level may be lower than datum. In some areas (Alaska, Mexico, USA Pacific coast, the Philippines and the Hawaiians) heading depth is lower than datum in 25% cases.

Another important problem of high accuracy navigation is so called "coordinate problem".

For instance, in Russia state coordinate system was adopted in 1942 (CK-42). This system includes topographic sea gravitation maps and other guides. GLONASS (Global Navigation Satellite System) uses universal geocentrical coordinate system ПЗ-90, which served as basis for modernization of state geodesic net CK-2 and for reference coordinate system 1995 (CK-95).

In order to introduce ПЗ-90 into operation all over Russia, CIS countries and world community it should be given national status, parameters of correlation with other coordinate systems should be published, including correlation with WGS-84.

Presently in different countries various regional and local national coordinate systems are used in marine cartography, with data coming from GNSS indicators and shore based RNS. Their lists and WGS-84 conversion formulas are given in International Hydrographic Organization guidance S-60. Data on ПЗ-90 and CK-42 are not listed therein. Guidance formulas are approximated, and resulted error in coordinate conversion can be as high as 25 m or even more. Today there exists neither international standard which would predetermine obligatory S-60 application nor acceptable coordinate systems which would provide necessary accuracy and recommended conversation formulas.

During IMO Maritime Safety Subcommittee meeting in 1997 International Electric Engineering Commission introduced NAV 43/7/4 of April 17, 1997, where the problem of different coordinate systems usage in ocean navigation was thoroughly investigated. Analysis of the document shows that NAVSTAR indicator-receivers give observation readings in WGS-84. Conversions in ПЗ-90 and CK-42 and not carried out as there are no conversion formulas approved by respective Russian and USA bodies. As a result, data obtained on equipment in different coordinate systems may considerably vary and may not meet IMO and IKAO requirements.

The problem of agreement between coordinate systems became still more urgent due to wide application of maps based on ECDIS in navigation. Up-to-date ECDIS combine maps of different brands. One and the same ECDIS for sailing in different World Ocean areas may combine charts based on different coordinate systems. Navigator should be ready to act under such circumstances and to correctly evaluate accuracy of obtained information.

Globalization of navigation systems raised the problem of determination of correlation between ПЗ-90 and WGS-84, prevention of errors connected with the systems application to different cartographic projections, and training navigators with respect to obtained information analysis.

However, together with technical problems in coordination of information received from different positioning systems there are difficulties caused by maritime specialists competency level.

Under present navigation conditions navigators has to deal with navigational information received from different systems operated according to different physical principles and, therefore, having errors of different origin. Ship's speed can be measured in respect to water – by patent, dynamic pressure, induction or other log, or in respect to bottom – by Dopler acoustic log. With implementation of GNSS operated in differential mode navigator got one more way to calculate ship's course and speed values in respect to ground. Thus, at navigator's disposal there is a large set of values of one and the same ship's parameter, and actual value selection is carried out by navigator based on his own knowledge and experience. The same situation can be observed with other ship's parameters, such as coordinates and course.

Training navigators for operations with large volume of various information is the main task for maritime educational institutions. This problem becomes more important with implementation of information transfer systems – radio transponders – into everyday use.

In 1998 Maritime Safety Committee adopted MSC.74(69) recommendation proposed by Maritime Safety Subcommittee and operation requirements to ship transponders. In October 1998 M.1371 Guidance was issued containing main principles of AIS structure and operation. In accordance with the latest edition of SOLAS Convention, Chapter V, adopted by Maritime Safety Subcommittee NAV-45 in September 1999, additional paragraph 1.5 was incorporated into Rule 19, which determines requirements to AIS installation terms depending on vessel type.

Optimization of the message format if transmitted via transponder will allow determination of information which is of vital importance for safe navigation excluding unnecessary and complicated information which distracts navigator from his main task. Continuous automatic identification of the vessel under control excludes the necessity to use expensive and ineffective VHF-radio direction finders.

Due to exchange of ships' coordinates determined at high accuracy (by global differential navigation satellite system – 5-10 m) and information exchange on current route we can increase accuracy of passing parameters determination and, therefore, provide safe passing at sea.

It is proposed to transmit via transponder the following three types of information:

1. Static:
   - IMO number (if any)
   - Call sign and name
   - Ship's length and width
   - Type of vessel
   - Location of sip position determination antenna on board (aft, stern part, starboard, portside)
2. Dynamic:
   - Ship's position (indicating system accuracy and integrity)
   - UTC
   - Course in respect to ground
   - Speed in respect to ground
   - Own-ship course
   - Navigation status (anchored, steered etc.) – set by hand
   - Angular speed (if possible)
   - Angle of heel (if possible)
   - Angle of roll and pitch (if possible)
3. Voyage information:
   - Draft
   - Dangerous cargo (type)
   - Port of destination and ETA (under Master's order)
   - Voyage plan (main points)

Besides there may be short messages on ship's safety.

However, in this situation information about oncoming vessel will increase the possibility of correct decision, but at the same time the information can make navigator trust the data without checking it. This can be clearly seen during transmission of information on navigational situation from shore based maritime safety systems. This information is of obligatory type, i.e. it is considered as immediate guidance on board. However, if high accuracy position determination system is installed onboard and if it is possible to evaluate navigational situation in a certain moment, navigator is to make independent decision using positive maritime experience as a guidance. In order to make the decision navigator should not only possess navigation experience, but also psychological strength, confidence and deep knowledge. All the above qualities can be acquired on board during voyages but there is no doubt that much cheaper and safer way of gaining knowledge is during simulation training.

4. Conclusion

In the course of high accuracy navigation and electronic cartography systems development another problems may arise, which can change navigator'' work. Still, maritime safety is one of the most important issues. Presently we can draw to the following conclusion: simulation testing should be obligatory for maritime universities graduates, just like regular control testing using conning bridge simulator should be obligatory for competent navigators. The testing will allow utilization of the whole scope of information which navigator receives during voyage, assistance of experienced instructors, evaluation of competency in information analysis and navigational decision making. Such testing should be necessary step for navigator before he takes his place on conning bridge.

Identification of internationally accepted standards of environmental management and quality assurance that should be incorporated into Maritime Safety Management System

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ABSTRACT

The requirements for management at sea are established by IMO conventions and EU directives. Technical progress, incidents at sea resulted in development of standards for ship and her supervision. However, ISM Code should comprise requirements established in ISO 14001 and 9001 and also in the European regulation EMAS.

Not only do the seafarers play an important role in the protection of marine environment, but also staff members of maritime institutions and administrations and other operators or managers are often in charge of marine pollution prevention and response.

ISM Code establishes that every shipping company should develop, implement and maintain Safety Management System which includes and relates to environmental protection policy in compliance with relevant international and flag State legislation. The Code also establishes that the shipping company should clearly define and document the master's responsibility with regard to implementing the safety and environmental protection policy of the company.

In order to broaden the range of instruments in the field of environmental protection and to encourage the shore-based operators and managers to adopt a pro-active approach in this field, the EU adopted EMAS regulation. On a voluntary basis such companies may gain added value in terms of regulatory control, cost savings and public image.

Many companies implement the ISO 14001 in order to provide-themselves means for managing and improving their environmental performance. For instance, Stocznia Szczecinska S.A. has taken actions to obtain ISO 14001 Quality Certificate in the field of environmental protection. Internal audits have led to work out the Environmental Management System Quality Book based on ISO 14001 norm. In this respect legal compliance, improvement of environmental performance and external communication as well as employee involvement were relevant.

The ISM Code should also require shore-based companies to work out and implement the ISO 9001 standards. This process should take into account needs, organizational solutions and pertinent activities of a company through development of implementation of systems with a corresponding spirit pertaining to the ISO standards with total commitment of people involved TQM at getting a quality system certified.

As a result, the SMS would be a complete and almost a perfect system. It would guarantee a good environmental management and high quality standards among shore-based maritime companies.

1. Introduction

It is impossible to have a completely safety system. Human make mistakes and equipment can fail. It is necessary though to anticipate what might cause an accident and ensure that risks can be avoided before they become critical (Chauvel,1997). The establishment of the maritime safety management system (MSMS) in the international maritime society is then paramount. The evolution of safety concepts in shipping was made through establishment by IMO of Load Line Convention, Safety of Life at Sea Convention (SOLAS), Marine Pollution Prevention Convention (Marpol), Safety Management (ISM Code), STCW Convention and other. The improvement of MSMS will be reached if the environmental management and quality assurance standards are incorporated into the MSMS in a more cohesive manner.

Also not only do the seafarers play an important role in the protection of marine environment, but also staff members of maritime institutions and administrations and other operators or managers are often in charge of marine pollution prevention and response ('organisations' – as defined in ISO 9001 :2000). The shore-side operations may lead to disaster linked with human lost and pollution of the environment if the operators are not trained how to plan and perform properly and safely their tasks and also how to minimize the risk, deal with emergency and non-standard situations effectively.

Some selected requirements of environmental management and quality assurance are presented below as being worth to be studied and eventually to be incorporated into MSMS.

2. ISM Code

The ISM Code (chapter IX. of SOLAS) recommends safety and environmental policy to be drafted by describing how the objectives will be implemented. The ISM Code is based on a new approach to safety, because it sets out to provide a management system which will anticipate possible contingencies and focuses on the unique characteristics of ships as mobile units and the need to protect the marine environment. The purpose of this mandatory code is to stimulate and encourage the development of a safety based culture in the maritime sector. William A O'Neil, Secretary-General of IMO said:

'[...] the ISM Code aims at contributing to safer shipping and cleaner oceans by laying down requirements for a clear link between shore and sea staff of a company and for a designated person to strengthen that link. A key aspect of the ISM Code is that companies must have a verifiable safety management system in place. For the system to be effectively implemented there must be a commitment from the top, responsibilities assigned and measures in place to remedy deficiencies [...]...the ISM Code represents a component of invaluable importance and significance in IMO's strive to improve safety at sea and preserve the marine environment from pollutions by ships.' (Chauvel,1997). This statement shows how important the ISM Code is for safe operations at sea. Also in this respect F. Lorentzen, President of BIMCO added :

'[...] the mandatory nature of the ISM Code will ensure that no shipping company will be able to escape the process. ISM will accentuate the positive aspects of the Safety Management System and everyone in the company can benefit from the enhancement of safe practices in ship operations. Reduced damage, improved safety consciousness, greater professionalism and improved morale are likely to bring genuine cost savings and better efficiency...' (Chauvel 1997). For the above reasons this Code must be a key-element of the MSMS.

3. ISO 14000 Standards

The ISO 14000 standards were established in order to promote the environmental management policy within an organization to minimize its negative impact on the environment. They specify requirements for an Environmental Management System (EMS) so that an organization could formulate a policy and objectives taking into account legislative requirements and information about significant environmental impacts.

This standard is applicable to any organization that wishes to :

- implement, maintain and improve an EMS;
- ensure itself of its conformance with its stated environmental policy;
- demonstrate such conformance to others;
- seek certification/registration of its environmental management system by an external organization;
- make a self-determination and self-declaration of conformance with this International Standard (www.praxiom.com/ ISO-14001).

Any environmental management system should comply with all the requirements of ISO 14000 standards.

For instance, ISO 14001 is organized around the following five principles:

1.Environmental policy
2.Planning actions
3.Implementation and operation
4.Checking and corrective actions
5.Management review (www.praxiom.com/ISO -14001).

The EMS should be periodically reviewed with a focus to continual improvement (www.praxiom.com/ISO-14001).

For example, in Poland Stocznia Szczecinska S.A. shipyard has taken actions to obtain ISO 14001 Quality Certificate in the field of environmental protection. Internal audits have led to work out the Environmental Management System Manual based on ISO 14001 standard. This led to legal compliance, improvement of environmental performance and external communication as well as employee involvement.

4. EMAS Regulation

On the 19th of March 2001 the European Parliament and the Council of the European Union have adopted the regulation allowing voluntary participation by organizations in a Community eco-management and audit scheme (EMAS). This regulation took over and replaced Regulation (EEC) 1836/93 of 29 June 1993. By establishing this regulation the Community wants to promote sustainable growth, broaden the range of instruments in the field of environmental protection and commit organizations to adopt a pro-active approach in this field. On a voluntary basis the organizations may gain added value in terms of regulatory control, cost savings and public image. The EMAS is available to all organizations that have environmental impacts, providing a means to manage these impacts and to improve their overall environmental performance. Organizations are encouraged also to produce and make publicly available periodic environmental statements. Special significance is given to : legal compliance, improvement of environmental performance, external communication and employee involvement.

The process of implementation involves seven steps :

1) Environmental Policy

Before working towards any improvement of the organization's impact on the environment, one should formalize the nature of overall approach, and produce an environmental policy for organization.

2) Environmental Review

One should review the site wished to be registered to identify all its environmental effects and judge their significance. This should be compared to stated policy and to environmental regulations. Finally it should be identified what needs to be improved.

3) Environmental Programme

One should include specific targets in the environmental programme and compile a list of priority areas. The programme exists in order to put the organization's environmental policy into practice. Once the priorities have been set, the programme must be implemented ensuring a clear chain of responsibility at every stage.

4) Management System

The programme must be properly organized and documented, with fully trained personnel responsible for. It at all levels, and it must be fully integrated into the organization's existing management structure.

5) The Audit

The programme's progress must be audited at regular intervals. Some activities, such as the treatment of effluents and hazardous waste, should be audited more often than others. These audits must be objective, systematic, and fully documented.

6) Environmental Statement

The EMAS requires all participating organizations to issue a public statement linked to the audit, outlining in clear and concise language exactly how they have met their stated objectives. Summary data on the environmental impacts needs to be in the statement.

7) Validation

Before publication, the environmental statement must be validated by an accredited verifier, who is independent of the site's auditor (www.praxiom.com/EMAS).

Many other European rules, some directives f. ex., could be a also matter of consideration while elaborating the MSMS.

5. Quality management standard : ISO 9001 : 2000

ISO 9001:2000 applies to all types of organizations. It doesn't matter what size they are or what they do. It can help both product and service oriented organizations achieve standards of quality that are recognized and respected throughout the world.

ISO 9001 2000 has replaced the previous ISO 9001:1994 standard. In addition, the former ISO 9002 : 1994 and ISO 9003 : 1994 quality standards have been discontinued. The requirements of the family of ISO 9000 Series, and the ISO 9002 in particular, were used to develop the ISM Code. (Dendura, 1997)

The ISO 9002 standard adopted by International Organization for Standardization concerned quality management within the framework of contractual relations between a company and its clients (Jedral, 2000). This standard was precisely used where a contract between two parties requires demonstration of a supplier's capability to provide the product or service supplied. It contained 18 provisions which form the quality management system focusing mainly on four issues :

- management commitment and responsibility
- contract review
- production process control
- methods of inspection and prevention of quality deficiencies (Chauvel, 1997).

According to Willingale (1998) the Quality Assurance system will highlight that ship management is a people-based industry relying almost entirely on the human element. If the people involved do not have the correct levels of training, experience, ability and attitude then the best designed management system will ultimately fail.

6.Conclusion

The MSMS need to be broaden by environmental and quality management standards. They can be found in various codes, regulations and conventions as IMO Conventions : SOLAS and ISM Code, ISO standards, European Community regulations like EMAS (fig.1). As a result, the MSMS would be a complete and almost a perfect system. It would guarantee a good environmental management and high quality standards not only among seafarers but also among shore-based maritime companies. The possible scheme for MSMS is presented below.

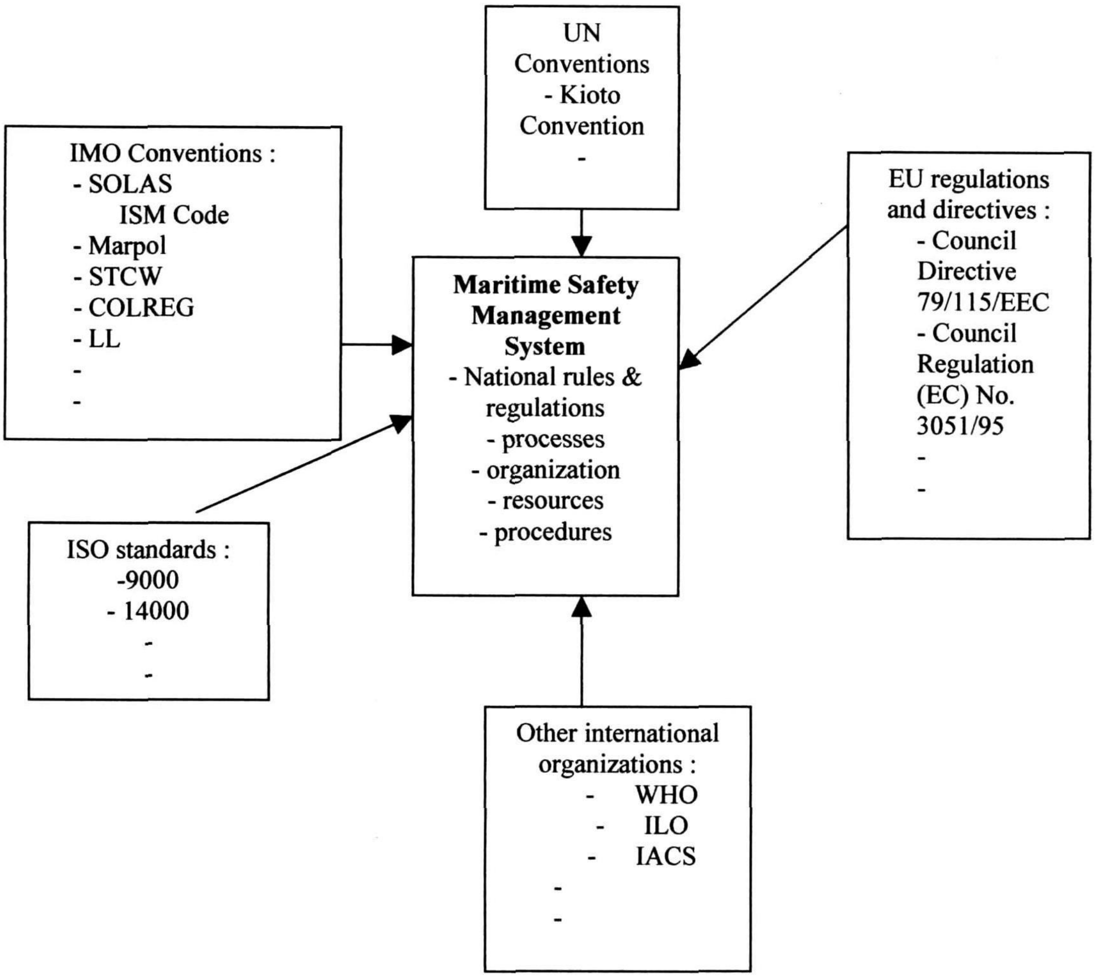

Fig. 1 Scheme of requirements taken into account for MSMS.

William A O'Neil, Secretary-General of IMO said:
„...Adequate standards of safety and environmental protection exist in many companies but this, by itself, is not enough. Good safety management requires a commitment through all levels of a company's hierarchy and effective communication channels between the management ashore and those on board ship are perquisite of safe sea operations." This is provided by the above mentioned codes, standards and regulations. Hopefully the incorporation of quality and environmental standards to the MSMS will prevent us from catastrophes at sea and on the shore.

Many other standards and regulations haven't been presented in this manuscript. The others, which would contribute to strengthening the MSMS, exist perhaps or will appear in the near future. This will be an interesting subject for further research.

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Maritime University Curriculum and Technology Planning for the 21st Century

Part I: Projecting Maritime Education and Training Technology Needs Using Quantitative Technology Forecasting

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ABSTRACT

Throughout the maritime industry, success follows those who stay ahead of the curve, technologically speaking. This truism applies to the Maritime Universities as well, where maritime education and training continuously changes to adopt new technology in industry. But what does a technology curve look like? How do you know where you stand, or what's coming next? How can you tell *when* technology change will happen?

As a method of predicting the future, technology forecasting is unique in its use of quantitative time-based information to arrive at reliable projections of the technological future. Many methods have been developed to project in time technology diffusion, performance envelopes, and substitution rates. Technology precursor relationships have also been identified, wherein fixed time-lag relationships that emerged during technological transitions in the past provide projections of time-lag relationships of future technological and curriculum change. With just such a critical piece of information, maritime university educators can plan new curricula and learning technology investment with confidence.

This paper, Part I of a series, introduces quantitative technology forecasting, the focus of research and applications at the Center for Technology Forecasting at Maine Maritime Academy. Important methodologies, sample forecasts, and implications for projecting the future of maritime education are presented.

1. Introduction: Working Definitions

The term "technology" defines a lot of things to a lot of people. The worldwide popular media assume we all understand technology as something related to computers, communication, television, or the Internet. Yet, to the anthropologist, historian, engineer, or mariner, technology means much more. Technology is *all* the methods, materials, and systems that enable, displace, or amplify human activity. At the largest scale, to capture the greatest meaning, technology can be defined as any human creation that provides a compelling advantage to continue to use or improve that creation.

"Technology forecasting" is a term used also to define a lot of different things people do. Much of what is cast as technology forecasting is simply the dreaming up of prognostications or scenarios, many times the fanciful thinking of a "futurist". Typically, the accuracy of such predictions falls rapidly with distance in time. The definition used by those practicing quantitative technology forecasting is given as: the process of using quantitative methods to project in time the intersection of human needs and technological capabilities.

2. Quantitative Technology Forecasting

2.1. Quantitative Technology Forecasting Methodologies

Quantitative technology forecasting has been applied successfully across a broad range of technologies including communications, energy, medicine, transportation, and many other areas. A quantitative technology forecast will include the study of historic data to identify one of or a combination of several recognized universal technology diffusion or substitution trends. Rates of new technology adoption and rates of change of technology performance characteristics take on common patterns. The discovery of such a pattern indicates that a fundamental trajectory or envelope curve has been found and that reliable forecasts then can be made. These quantitative methods have proven accurate in predicting technology change in thousands of applications across technologies as diverse as carbon-based primary fuels to consumer electronics, on time scales spanning centuries or only months. Technology diffusion patterns and the driving social needs can be identified through study of historic, time-referenced data, from which the projection in time of new technology adoption can be determined reliably and accurately.

The quantitative forecasting techniques are, to use the words of mathematician and theorist Gregory Bateson (Bateson 1977) "explanatory principles", that is, their applicability is sufficient for the purposes of explaining technology diffusion patterns and forecasting technology adoption. Many researchers have attempted to substantiate the commonly found patterns through application of thermodynamics and other advanced systems theories, to varying success and acceptance in the field.

Several of the many techniques in quantitative technology forecasting are ideally suitable for projecting technological change in maritime education and training, and are introduced in more detail and illustrated with examples here.

2.1.1. Logistic Growth Projection

Forecasters had their first significant successes in predicting technological change when they used exponential models to project new technology diffusion. It was deemed only logical that a new technology would at first be selected by one, than perhaps two others, and these people in turn, two others each, and son on, in a pattern of exponential growth. Ultimately, as in any natural system, a limit or bound on total would be reached, leading early researchers next to the logistic (or sigmoid, or so-called s-shaped curve) to model technology diffusion. Some of the earliest published works in this regard were by the American demographer Raymond Pearl and the English actuary Benjamin Gompertz. In the 1950's and 1960's, researchers in the United States such as Lenz, Martino, and Vanston, and others around the world [e.g., the very prolific Marchetti (Marchetti 1977)] refined the methods and showed that the logistic model was an excellent construct for forecasting technological change with virtually universal application across technologies and other individual and social human behavior. Figure 1 illustrates the idealized logistic curve of technology adoption or diffusion. Figure 2 shows the logistic growth of the supertanker of maritime fleets presented in a format that renders the logistic curve linear. (Note the scaling of percentage). A further example, Figure 3, shows the logistic pattern of discovery voyages of the Western Hemisphere. (Note the earliest voyages have been lost from history. Figure 4 shows the growth pattern of a recent computer virus that infected computers on networks worldwide.

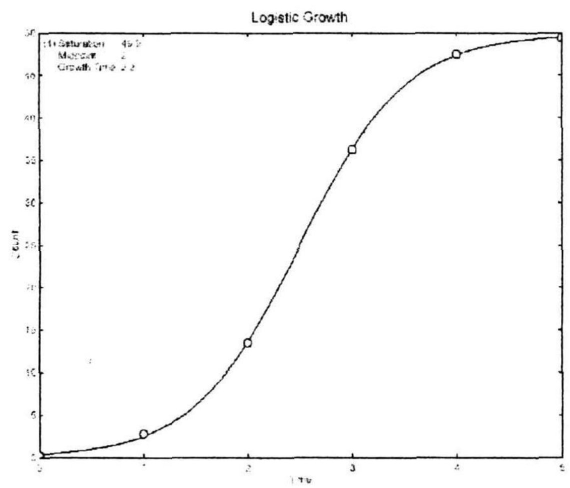

Figure 1. Ideal logistic growth curve (Adapted from Meyer et al, 1992).

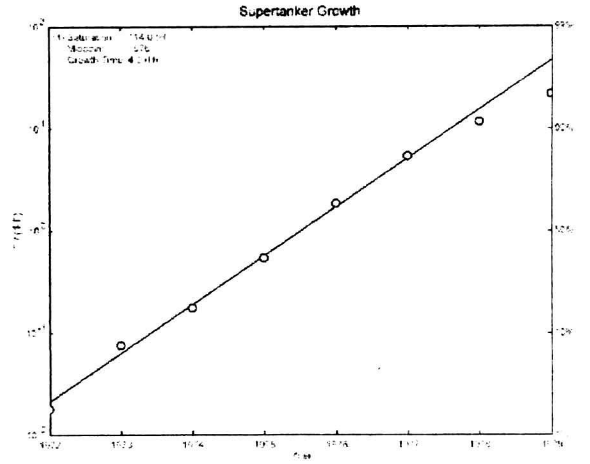

Figure 2. Logistic growth of the supertanker (Adapted from Modis 1992).

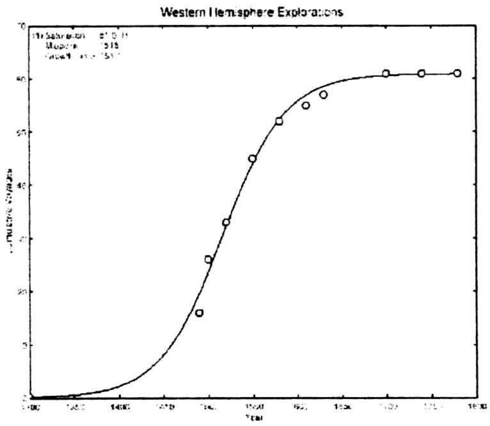

Figure 3. Logistic pattern of discovery voyages of the Western Hemisphere (Adapted from Modis 1992).

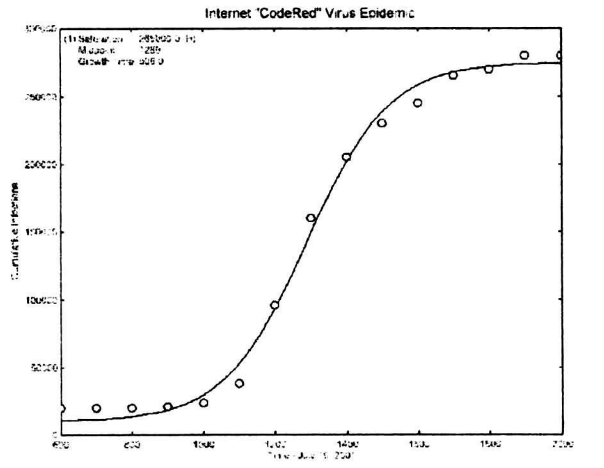

Figure 4. Logistic growth of a recent network computer virus (Data from Danyliw and Householder, 2001).

2.1.2. Constant Rate of Change (Performance Envelopes)

Technology change occurs within dynamic and complex systems of human behavior. The growth and diffusion of technology impacts and is impacted by the activities of humans as individuals and groups of varying scale. The adoption of new technology requires intellectual, material, energy, and other resources to be redirected, increased, and otherwise managed as required in the implementation of the new technology. When a new technology comes along having the substantive compelling advantage such that it will successfully substitute for the incumbent technology, humans tend to go about the changeover in a methodical way, seemingly to maintain equilibrium in the vast array of a culture's interacting and interdependent social, material, and economic systems. The result is that the adoption and change of substitute technologies is far from random and rarely sudden, and usually follows a smooth transition, at a rate either consciously or unconsciously maintained by the forces for equilibrium in society. Forecasters call the sequential performance levels of adopted technology that follow along an identifiable curve a *performance characteristic curve*, and search for its telltale shape in the history and projection of a technological area. Figure 5 shows an example of the performance characteristic curve for transistor density on a microprocessor chip, the popular "Moore's Law". Figure 6 shows the performance envelope of industrial energy substitution, pointing to the fuel cell as the next leading energy conversion technology.

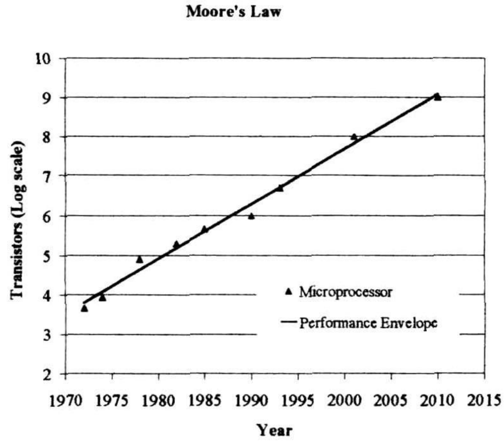

Figure 5. Moore's Law - Performance envelope of microchip transistor density (Data from Intel Corp. 2001)

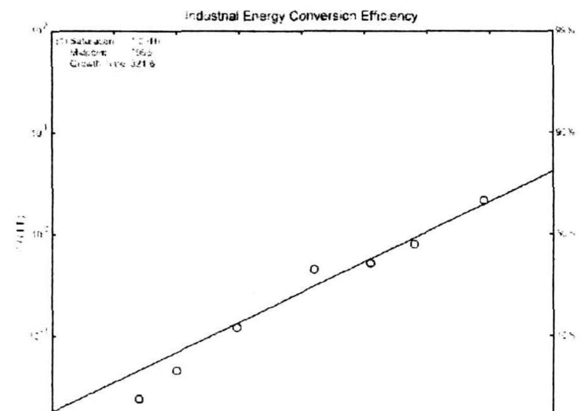

Figure 6. Performance envelope of industrial energy conversion technology (Adapted from Ausubel and Marchetti, 1997).

2.1.3. Logistic Substitution

The transition from one technology or performance level to the next tends to follow a neat, managed pattern. In the 1960's, Fisher and Pry (Fisher and Pry 1971) analyzed hundreds of technological substitutions in history and devised a method to graph the substitution patterns in linear fashion, thus giving us the popularly applied Fisher-Pry projection of technology substitution. Figure 7 illustrates the typical logistic substitution pattern. Studies have shown this remarkable logistic substitution pattern in technologies as diverse as the substitution of automobiles for horses in personal travel and the substitution of latex for oil based paints. In the maritime industry, published reports show the logistic substitution of motor-over-steam-over-sail in ship propulsion technology (see Figure 8), and, with possible implications for the maritime education and training, the substitution of simulators for real-time flight experience in aviation training.

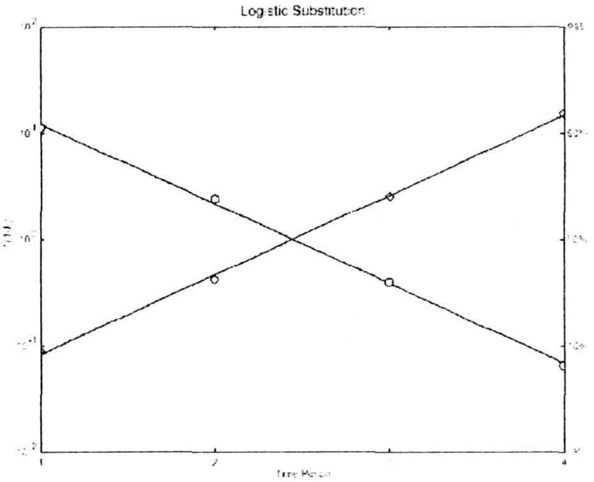

Figure 7. Typical logistic technology substitution (Fisher-Pry display).

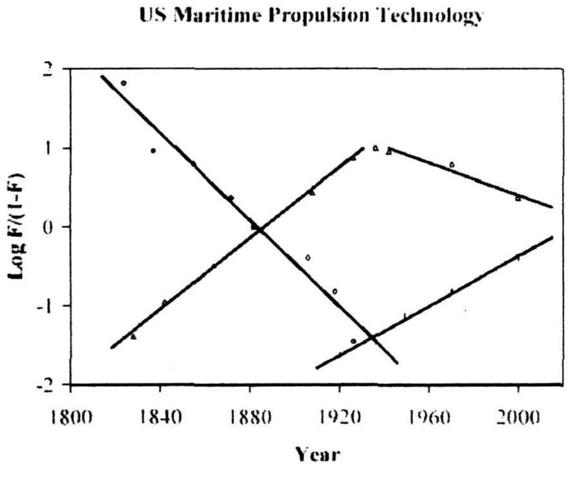

Figure 8. Substitution of US maritime propulsion technology (Adapted from Modis 1992).

2.1.4. Precursor (Lead-Lag) Growth Trajectories

The implementation or adoption of a technology has been shown to vary logistically. When one technology is dependent on or otherwise closely related to a previous development, the two trajectories are usually linked in a steady lead-lag relationship (see Figure 9). Studies have shown that the worldwide discovery of petroleum resources has led the production of oil by a fixed period of time over many decades. Studies have shown also that the diffusion in USA industry of networked desktop personal computers followed the same shape logistic trajectory as the precursor technology, stand-alone PCs.

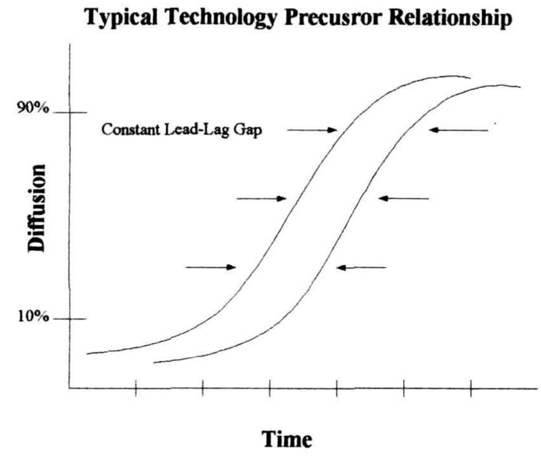

Figure 9. Constant lead-lag logistic relationship.

2.1.5. Anthropological Invariants

In the grand history of the progression of technological change, one of the striking results is evidence of the invariance of human behavior in many areas. While technologies offer many and perhaps infinite variety of how to get things done, the things humans do want to get done, generally, have remained the same for hundreds and thousands, perhaps millions of years. For example, travel and communication patterns, depicted in broad averages of commuting or foraging times, or in numbers of human exchanges, have been shown to be constant across time and cultures. The anthropological benefits in applications of technologies can be viewed as artifacts of unchanging human behavioral preferences. As an example, Figure 10 shows the more or less constant accepted (and, by implication, engineered and designed) risk of death by automobile in the United States over nearly an entire century.

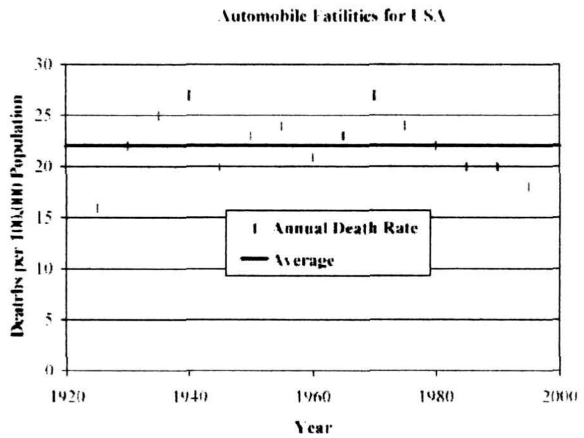

Figure 10. Risk of having a fatal automobile accident in the US (Adapted from Marchetti 1994).

3. The Center for Technology Forecasting at Maine Maritime Academy

3.1 Mission of the Center for Technology Forecasting

The mission of the Center for Technology Forecasting is to advance the art and science of technology forecasting, performing technology forecasts in maritime and other technologies to support the learning outcomes of students, the decision-making effectiveness of industry, government, and other institution leaders, and the enlightened understanding of human progress for the 21st century. The Center is undertaking primary research in advanced areas of system modeling, through theories of complex adaptive systems, evolutionary systems, theories of swarm behavior, etc., that show promise of extending our understanding of technology change and diffusion. The Center is interested in performing both broad and narrow studies of technology change in the maritime industry and maritime education and training.

3.2. Projecting Maritime Education and Training Technology Needs

The sample technology forecasts given in this paper point to new ways to understand the future needs of the maritime university. Table 1 lists suggested technology forecasts with references to the forecast samples above to illustrate the advantages and possible outcomes of the forecasts in the future of MET. The C4TF is looking for collaboration and support in these and similar areas of inquiry.

Inquiry	Forecast Technique (Sample)	Application in MET
How quickly will a new maritime technology be adopted?	Logistic Curve (Figures 1-4)	Timing the adoption of new training curriculum needs
Is our lab equipment obsolete?	Substitution (Figures 7-8) and Precursor (Figure 9)	Timing and amount of lab investment decisions
Can I reduce staff and offerings in certain degree programs?	Substitution (Figures 7-8)	Timing of course and curriculum change
Should we invest in new education technology?	Logistic Curve (Figures 1-4) and Substitution (Figures 7-8)	Timing and investment in education technology
What is the life expectancy of our PC network hardware?	Precursor (Figure 9) and Performance Envelope (Figure 5)	Timing and investment in technology infrastructure
Are the technology topics in this technical textbook appropriate?	Logistic Curve (Figures 1-4) and Substitution (Figures 7-8)	Optimize education value for students
What will be the typical crew size in the future?	Logistic Curve (Figures 1-4) and Invariants (Figure 10)	Appropriately sized training teams
Is there a custom-training opportunity for the future pleasure cruise industry?	Logistic Curve (Figures 1-4) and Substitution (Figures 7-8) and Performance Envelope (Figure 5)	Successful investment in new curriculum offerings

Table 1. Suggested technology forecasts for maritime university planning

4. Technological Challenges for Maritime University Leadership

4.1. Key Areas of Technology Change in MET

The general accelerated diffusion of technology change in most societies over the last several decades, and continuing today, poses serious challenges to the Maritime university administration and academic leaders. The areas of technology of most significance to the maritime education and training are found in three arenas: maritime, personal, and education technologies. The response, or preferably, the strategic plan to meet these challenges takes the forms equivalent to production, marketing, and new product development.

Terrestrial technology change has a history of inevitably transiting to sea. That is to say, advances in land transportation, communications, and other technologies, find their way aboard ship once proven sufficiently reliable and deemed seaworthy within the risks and bounds of maritime safety. Maritime education and training must be current with maritime industry technology skills requirements. Personal technology, from wireless communication devices to palmtop organizers, is changing the classroom (and extra-classroom) learning expectations and study habits of new students. Education technology, such as advanced turbine simulators, asynchronous distance learning technology, as well as tailored academic support systems for accounting, admissions, etc., is advancing in installations, complexity, and of course, cost.

4.2. Meeting the Challenges of Technology Change with Technology Forecasting

The maritime university executive is wise to trace the future trajectory of all these technologies, as they will impact the future operation and success of the school. Using analogies from industry, there are three areas where technology change will impact school decision-making: production, marketing, and product development.

The executive should ask, for example: When will I need to make investments in my curriculum to include training in a new technology undergoing adoption in industry (such as, say, fuel cell power plants)? A technology forecast will show the logistic growth of the technology and indicate when and to what degree the technology is being or will be utilized in the marketplace. Further, a historic perspective gained from precursor relationships of curriculum adoption versus industry adoption will tell the executive when to begin training in a new technology, very likely ahead of, and better able to help define, new education and training standards.

Having the teaching (by business analogy, "production") resources in place in a timely fashion will provide the competitive, relevant course content that attracts new students (the "marketing" parallel in business). Finally, the new graduating cadet, by analogy the "product" of the school, trained in skills not too far in advance of the technology adoption so as to be unusable, nor too far behind so as to be obsolete, is better prepared to serve society or to add value for the customer's of his or her company's business. All these positive results for the maritime university are reflected in the reputation of the university leadership.

4.3. Experience at Maine Maritime Academy

4.3.1. Electric Machines Laboratory

Projections of technology change were used in at least two strategic decisions regarding curriculum planning at MMA. A decision was made to relocate the electric power laboratory to make room for more classrooms in one of the campus academic buildings. Some consideration was given at first to reduce the overall size of the laboratory by eliminating floor space not utilized in the original lab room. However, arguments presented showing trends in maritime propulsion toward greater use of electric rather than steam energy, such as the US Navy's "all-electric ship" strategy, the continued diffusion of solid state drive technologies, and the highly distributed power on board cruise vessels, led to a decision for a larger electric power laboratory.

4.3.2. Fuel Cell Power Plant Research

An opportunity arose where MMA could partner with US government agencies, a key US shipbuilder, and other education institutions to explore the adoption of fuel cell power plant technology for both terrestrial power generation and ship's power. The performance envelope (Figure 6) of energy conversion, stretching over three centuries and forecasting fuel cell technologies to lead the energy conversion, was instrumental in securing Academy approvals to participate in the multi-million dollar research proposal.

5. Strategic Education Technology Planning

Part II of this series of papers on Maritime University Curriculum and Technology Planning for the 21st Century (see Walk 2001) provides specific procedures to include technology forecasting in a comprehensive strategic technology planning program for the maritime university.

6. Conclusion

Quantitative technology forecasting has a remarkable record in predicting change in technological performance and the timing and adoption of new technology. Various techniques of technology forecasting can be used to analyze trajectories of technologies influencing the maritime and education industries to improve maritime university curriculum and technology planning for the 21st century.

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Maritime University Curriculum and Technology Planning for the 21st Century

Part II: Strategic Education Technology Planning

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ABSTRACT

The Maritime University administrator is faced with enormous challenges at the dawning of the 21st century. New simulators and laboratory equipment, obtained at high initial costs and requiring specialized maintenance and upkeep, become obsolete in only five years. Certification agencies "raise the bar", the standards for curriculum content and outcomes, seemingly every year. Students often come to the school with computer technology skills more advanced than that of their instructors. The most important, and arguably difficult, responsibility of the Maritime University administrator is to understand this environment and develop a comprehensive strategic education technology planning.

The timing and level of sophistication of new education technology is critical to assure the preparedness of students entering the maritime workplace. With every area of the global economy undergoing continuous technological innovation, increasing amounts of time must be devoted to tracking and trending a host of technology changes that might impact curriculum content.

Other emerging technologies promise advantages for the academy. Distance learning facilities increase the reach of isolated schools. On-line, interactive curriculum support systems increase student/faculty interaction and encourage idea exchange and team learning. Increasingly sophisticated simulator systems replace high-maintenance-cost hands on equipment.

This paper, Part II in a series, presents a new and unique solution in the form of a simple analytical tool, for Maritime University leaders to identify, assess, and then implement *only the most appropriate* technological opportunities.

1.0. Introduction

This paper describes an executive decision making tool developed and applied by the author in high-technology private industry. It has been adapted for the educational organization and herein is detailed its use for the maritime university or academy. The tool has shown excellent success helping leaders identify and select strategic initiatives for their organizations. The tool, a centerpiece for effective strategic education technology planning will help the maritime university officer sort through the often overwhelming number of technical and organization opportunities, or even threats, at hand, to achieve more consistent results and minimize over or under-investment in critical education resources.

2.0. Strategic Education Technology Planning

2.1. Technology Forecasting and Strategic Education Technology Planning

Strategic decisions involve forecasts. The better the forecast, the better chance of success of the strategic plan. Since coming into favor in American industries in the 1960's, strategic planning has focused mainly on financial scenarios and marketplace predictions. Over the last several decades, in response to and to stay ahead of the rapid change in technology across society, leading businesses and organizations have made strategic *technology* planning a cornerstone of their overall strategic planning effort. Leading educational institutions joined in the practice of drawing up strategic technology plans as computing, communication, and other technologies began to have a major impact, and portend drastic change, in education delivery and learning methodologies. Technology will be the principal driver of education change in the future.

The maritime university has had to keep up with technology change occurring throughout the maritime industry, from ship propulsion and operation technology to cargo handling facilities on to the logistic deployment of resources and transportation of goods. Now the academy must also keep up with technology change throughout the education "industry", from distance learning to on-line, interactive curriculum support systems on to increasingly sophisticated simulator systems. The "keeping up" promises to become more and more challenging with the current acceleration of industry and education technology change. New planning tools are required.

The drift and flow of technology change is a current to be reckoned with on the ocean of change on which the maritime university sails. The academy officer or executive must be able to forecast technological change and make sound decisions regarding the future course of the academy. Quantitative technology forecasting has been proven to be an excellent predictor of future technology performance and adoption times (Walk 2001). Technology forecasting thus is a critical part of strategic education technology planning and decision making for the maritime officer, and is a critical component of the decision tool presented in this paper.

2.2. Quantitative Technology Forecasting – An Introduction

Quantitative technology forecasting has been applied successfully across a broad range of technologies including communications, energy, medicine, transportation, and many other areas. A quantitative technology forecast will include the study of historic data to identify one of or a combination of several recognized universal technology diffusion or substitution trends. Rates of new technology adoption and rates of change of technology performance characteristics take on common patterns. The discovery of such a pattern indicates that a fundamental trajectory or envelope curve has been found and that reliable forecasts then can be made. These quantitative methods have proven accurate in predicting technology change in thousands of applications across technologies as diverse as carbon-based primary fuels to consumer electronics, on time scales spanning centuries or only months. Technology diffusion patterns and the driving social needs can be identified through study of historic, time-referenced data, from which the projection in time of new technology adoption can be determined reliably and accurately.

Several of the many techniques in quantitative technology forecasting are ideally suitable for projecting technological change in maritime education and training, and are introduced in more detail and illustrated in Part I of this paper series (Walk 2001).

2.3. Sample Impacts of Technology Forecasts in Strategic Education Technology Planning

The following are illustrative of the benefits and advantages of technology forecasting as an integrated part of strategic education technology planning.

2.3.1. Simulators

Simulators, the pride of many technical schools as icons of relevance in curricula, also signal the predictable end of a technology, arriving at schools late in the technology life stages. In a time of rapid technology substitution, simulators might not provide effective student career preparation as in the past.

2.3.2. Industry versus Curriculum Adoption Lag Times

The lag of the curriculum content adoption curve for a new technology is likely fixed soon after the up-tick of the logistic curve of a diffusing technology in industry. Measures of the lag-time of curriculum adoption following industry adoption might include counts of chapters in textbooks, market share or percent of curricula hours, etc.

2.3.3. Downward Diffusion of Laboratory Technology

There should be evidence of smooth downward diffusion of laboratory technology through the tiers of education – research university, second-tier universities, technical schools, high schools, etc. Such a forecast will help establish adoption times, and thus investment times, at the maritime university.

2.3.4. Substitution of Textbook Technology Subjects

Targeting and timing text and course content to a projection of technology performance level or adoption might help increase adoption rates of new technology in industry. Students would enter the workplace ready to manage the latest technology and be immediately productive, rather than being prepared only to operate declining or obsolete technology, and requiring unproductive on-the-job training to perform with new technology.

2.3.5. Invariants in Education Technology

The history of the adoption, and also the rejection, of new technologies in the classroom and in the field is evidence of anthropological invariants in what is commonly or collectively called education. What technology we require, or tolerate, in a classroom can be told by reading the tealeaves of accepted and rejected historic learning technology, helping us to avoid blunders such as huge investments in ineffective digital technology.

3.0. The Opportunity Wheel Decision Tool

3.1. Origins of the Tool

The author once served as Product Manager, a junior executive position responsible for a major product division of a leading international manufacturer of electronic instruments. The duties of the position included strategic planning for new products and services. Reporting directly to the position were development and design engineering staff, salespeople, and marketing managers. Indirect reports included manufacturing staff. The position held profit-loss responsibility and included serving on plant operating committees and the corporation strategic planning committee.

The product manager was at the center of new product technology initiatives and the person whom to contact if you had a new idea on an existing or new product. The author was besieged, and often under considerable pressure, to accept the ideas for product changes from all corners of the company. Sales people invoked the promise of extravagant revenues if only their idea was chosen. Marketers warned of competitive moves and championed their concepts of product morphology. Engineers had their pet exotic technologies they wanted to see integrated into the product line. Manufacturing was always conservative in regards to what, when, and how much they could and could not produce. And finance wanted guarantees of profit and high rapid return on investment or no money would be authorized for development.

Deciding on which new product or product improvement to follow posed significant challenges. Individually, each idea usually stood on its own merits, at least within the experience and world-view of the person suggesting the idea. The problems came when new ideas in one department conflicted with or simply did not fit within another department's outlook or realities. Sales wanted to sell something manufacturing couldn't make. Engineers wanted to design something marketing could not promote. And finance held out veto authority based on financial projections others either did not understand or did not believe. And so on.

This author had seen executives make poor decisions that wasted resources, talent, and capital pursuing "lop-sided" product technology opportunities that led to disasters. Lop-sided, that is, because though a product and its technology were outstanding in some aspects, they could be a disruptive or impossible task to the company in other aspects. Products went to market late; specifications changed time and time again; profits did not materialize. The sales department was driving engineering; marketing was driving production; finance was putting pressure on product management. Sometimes the new product or technology pitfalls were overlooked, other times the pitfalls were ignored, either way at serious peril to the company. It was often as if a ship's captain set sail solely because of strong winds at sea but ignored or overlooked the safety of the crew and the preservation of the cargo. The author saw executive ignorance, arrogance, and obfuscance in new product and technology development that wreaked havoc in the operation of previously well-managed companies.

To avoid the problems other executives had made and were making, the author developed a tool to evaluate new proposals and opportunities in a balanced fashion. Balanced, that is, across all the many constraints and capabilities of the company. The author led his reports in a process where new opportunities were scored on likely impact in eight major areas of the company. A new product would have to show promise of successful implementation everywhere in the company to be accepted for investment and development. People from different departments had to listen to each other's concerns, collaborate and achieve consensus on the benefit or advantage of a new technology. The politics of currying favor with the product manager to win approval of one's idea ended. Intimidation and rivalries at the planning meetings ceased when everyone had to understand everyone else's problems and solutions for a new opportunity to be accepted.

3.2. Using the Opportunity Wheel

The decision process is shown in Figure 1. The Opportunity Wheel is an arrangement of spokes about a hub. The spokes represent the major areas of the company involved in new product offerings; the hub is the new idea or opportunity. The major impact areas to be evaluated are Customers, Sales Channels, Technology Strategy (from technology forecasts), Competition, Profit, Product Portfolio, Skills/Resource Plan, and Production. Figure 2 lists the evaluation criteria used by the planning group to select or reject the opportunity.

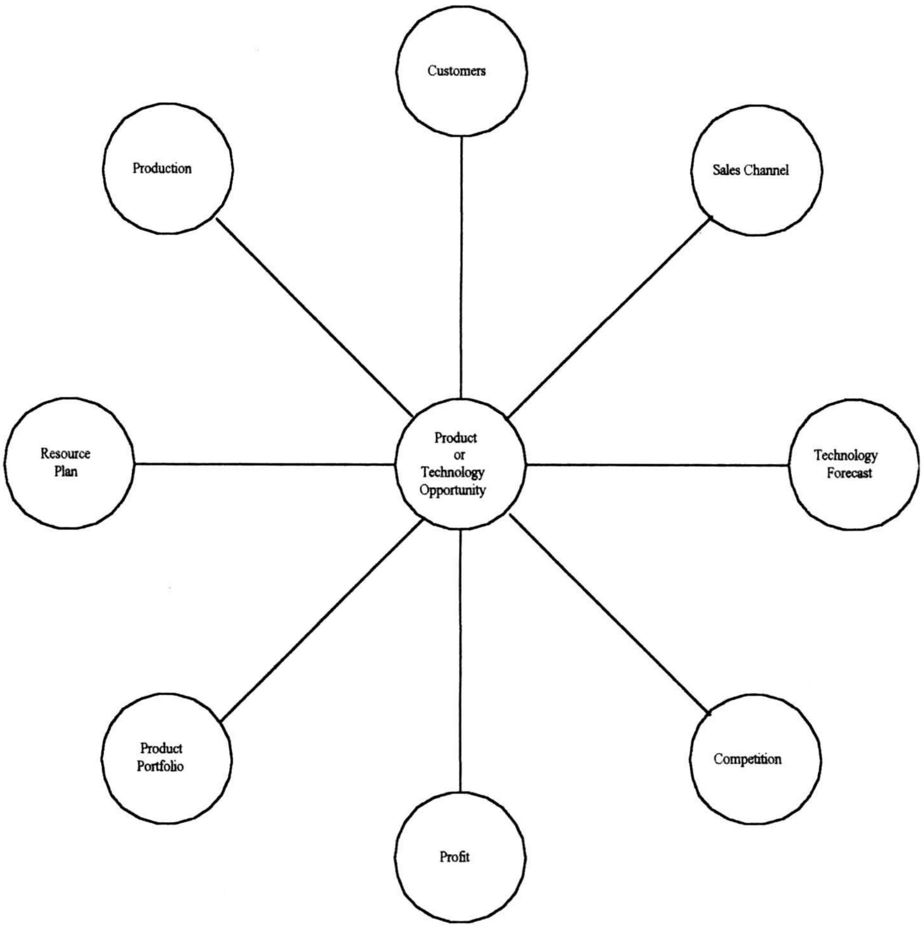


Figure 1. Technology Opportunity Wheel

The decision-making process procedure is as follows.

1. A new opportunity is written in the middle circle.
2. The evaluation team assigns a point value at each spoke based on criteria specific to that area
3. The scores are tallied for an overall score for the idea or opportunity
4. A passing score means a product development plan begins.
5. A failing score means the idea is rejected.
6. A marginal score means that low-value areas are reconsidered to see what changes can be made to increase the overall score of the idea.

The criteria are scored on a simple, three-value (0, 5, 10) point scale. Usually, "10's" and "0's" are quickly identified and consensus easily achieved. If the group is divided on a score, a compromise "5" is assigned and discussions quickly move on to the next impact area.

A high overall score, or O-score, in itself is not sufficient to "pass" the test. A new product or technology could score high in many areas and fail in several others. To select a "lop-sided" idea could spell disaster for the company as the zero-score areas face serious disruptions and fail to meet objectives. To avoid such problems, a new idea is rejected if it has two or more "0" scores. Also, the new idea must have at least 2 "10" scores to pass. It is no use pursuing mediocre (too few "10's") or risky (too many "0's") products or technologies.

3.3. Sample Application of the Opportunity Wheel

A high-tech company serving in the electric power industry was considering expanding their product offering to include on-line measurement systems replacing standard hand-held devices. It seemed to be the trend in other industries and so made some strategic sense. The product manager, marketing manager, and technical specialists used the Wheel to evaluate the new product technology. The exercise resulted in the following:

Customers: (10) (Same customer base)
Sales Channel: (0) (Sales team technically inadequate)
Technology Forecast: (5) (Within forecasts)
Competition: (5) (Equal to the competition's recent initiatives)
Profit: (5) (Nominal profit expected)
Product Portfolio: (0) (All new concept)
Resource Plan: (0) (No proficient design engineers on staff)
Production: (5) (Require some modification of production facilities and supply chain)

Overall Score (30), with 1 "10" and 3 "0's"

The new product concept was rejected on account of a low O-score. With three "0's", it was decided that raising the overall score would involve considerable time and expense.

3.4. Advantages of Using the Opportunity Wheel in Strategic Planning

The list of advantages of using the Opportunity Wheel tool in strategic planning is long. To mention a few: The old politics of influence peddling, intrigue, and favoritism are replaced with an objective, consensus-based process, optimizing company investment and resources in future activities. Strategic planning documents are no longer filled with visionary language and wishful thinking, but contain valuable, realistic, doable plans. All new ideas are given full attention and evaluated using consistent criteria assuring all individuals that their ideas will receive equal due process in evaluations. After some experience with the Wheel, incomplete or otherwise poorly considered ideas don't even make it to the group for consideration. Everyone involved in the process learns to respect the expertise, experience, and opinions of others, to see other departments not as barriers to overcome but partners with whom to work together for success.

4.0. The Opportunity Wheel in Strategic Education Planning

4.1. Analogous Impact Areas for the Maritime University

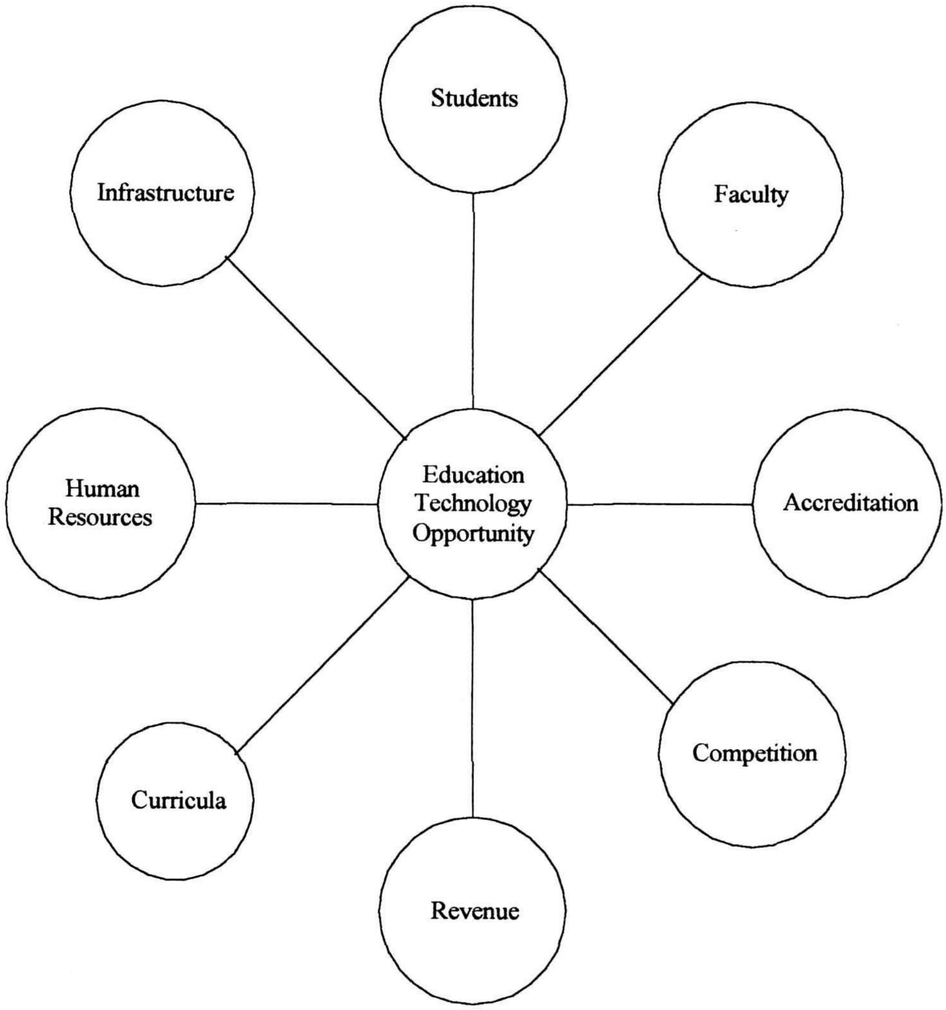
The Opportunity Wheel was adapted for the maritime university executive or officer and planning groups. See Figure 2. Appropriate impact areas are assigned to spokes that are closely analogous to business model impact areas. New evaluation criteria are adapted for the new scoring process, shown in Figure 3. The evaluation procedure and scoring remain the same (See Section 3.2.).

4.2. Using the Opportunity Wheel in Strategic Education Planning

The opportunity evaluation and decision-making are the same for the maritime application as described for the business or corporation. The maritime executive can bring his planning group or heads of departments together and perform an objective and thorough evaluation of new opportunities. The new ideas can be as simple as development of a campus on-line bulleting board to the consideration of a new curriculum targeting technology change in industry. The Wheel scales to all levels of decision making.

4.3. Sample Application from Maine Maritime Academy

In 2000, Maine Maritime Academy established the Center for Technology Forecasting, a research, teaching, and service center dedicated to furthering the science of quantitative technology forecasting, with a focus on the maritime industry and across the full spectrum of technological development. The program has been a success, meeting early goals of attracting students, working with other education institutions, providing consultation to local industries, and providing services to government planning agencies. How would the opportunity scored if the Opportunity Wheel had been available at the time the concept of a new center was being considered? Here is what might have been the result:



Impact Area	Comment
Students	Future recruits and possibly returning graduates
Faculty	To be directly and indirectly involved in new program or technology
Accreditation	Academic associations, standards boards, government agencies
Competition	Other maritime universities, other institutions, private companies
Revenue	Net annual or planning period income
Curricula and Education Technology	Courses, subjects, lab equipment, etc., and all learning technologies
Human Resources	Support personnel of all kinds
Infrastructure	Physical plant, education support resources, other assets

Figure 2. The Opportunity Wheel and Impact Areas for Strategic Education Technology Planning

1. Students
   a. Student opportunity not identified
   b. Significant advantage for many students
   c. All students advantaged
2. Faculty
   a. Little or no faculty interest, experience, or relevant teaching skills
   b. Of interest to some faculty willing to peruse the opportunity
   c. Of interest to nearly all faculty
3. Accreditation and Academic Mission
   a. Low probability of or negative impact on accreditation or licensing status
   b. No effect on academic standards requirements
   c. Enhances accreditation or licensing status
4. Competition
   a. No new significant edge over competing institutions
   b. Significant advantage over some competing institutions
   c. Significant advantage over competing institutions
5. Revenue
   a. No changes in revenue in the foreseeable future
   b. Some acceptable loss or a certain small gain in revenue in the short term
   c. Major probability of positive revenue change
6. Curricula and Education Technology
   a. Outside current curricula plans or education technology forecasts
   b. Adds to curricula plans or education technology forecasts
   c. Fits curricula plans or education technology forecasts
7. Human Resources
   a. Major new resources must be identified, acquired, and trained
   b. Increases workload of some resources, or train or add some new resources
   c. Present faculty, staff, and administrative resources are sufficient
8. Infrastructure
   a. Demands major infrastructure improvement
   b. Some infrastructure improvement required
   c. Infrastructure can accommodate change with minor impacts

Scoring: a = 0 points, b = 5 Points, c = 10 Points
Overall Score < 40 Points: Not an opportunity.
Overall Score = 40 Points: Possible opportunity. Consider ways to improve scores.
Overall Score > 40, with at least 2 10's and no more than 2 0's: Begin Strategic Plan.

Figure 3. Impact Area Evaluation Criteria and Scoring

Students (5)
Faculty (5)
Accreditation (5)
Competition (5)
Revenue (10)
Curricula and Education Technology (10)
Human Resources (10)
Infrastructure (10)

Overall Score (60), with 4 "10's" and no "0's"

This exercise indicates that use of the Wheel would have supported the decision to found the Center program, and would have served as a good indicator for the program's success. A score of 60 is not necessarily low. Experience has shown it to be rare that scores obtain above 60 in a new technology opportunity.

5.0. Advantages for the Maritime University Executive

The rapid changes taking place in the maritime industry organization, operations, and technology places demands on the leadership of the maritime universities to continuously track and update technologies and curricula of their schools. Whole departments or degree programs can begin and end in only several years. The maritime university executive ultimately is responsible for student outcomes, the measure of success of the maritime university's programs, measured largely by the value added in the application of new technology for the graduates' employers or in service in public organizations.

Private industry has found that the executive influence on the outcome of new product initiatives is highest at the beginning of the program. This concept is adapted for the maritime executive and illustrated in Figure 4. The ability to influence student outcomes is maximized at the earliest stages of new curriculum and education technology adoption. The rapid change of technology forces the maritime leaders to make the right choices up front of the new program process. There is little room for error in decision-making and little or no time available to redesign new education opportunities in today's rapid pace of technological change and in the competition to provide the highest quality students to the world's maritime labor markets.

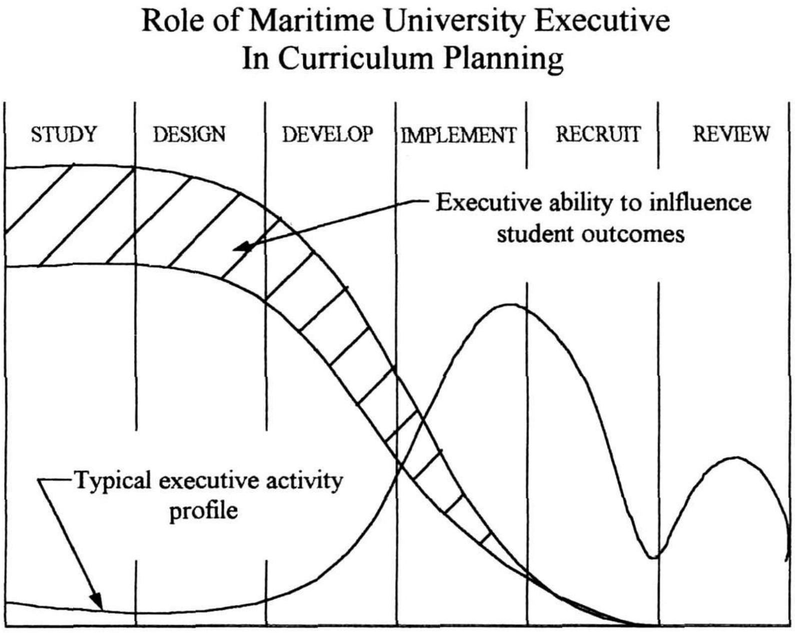


Figure 4. Students Outcomes and the Influence of the Maritime Executive (Adapted from Roussel, et al, 1991)

6.0 Conclusion

Technology will be the main driver of education change in the future. New tools are required to evaluate and select new technology in maritime education and training. The Opportunity Wheel is simple to use, encourages collaboration and cooperation across departments and divisions of the school, and brings new technology and other program ideas to full light and scrutiny by all those who would be impacted by their implementation. The tool can help reduce the risk of failure and help assure success of adopting new education technology or program changes. This new decision making tool will engage maritime university leadership at the very beginning of the strategic education technology planning process, at the optimal point of executive influence on student outcomes.

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TRENDS IN DEVELOPING MODERN CURRICULA IN MARITIME EDUCATION

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ABSTRACT

In a rapidly changing world and a swiftly evolving technology, ideal education curricula are impossible to achieve. What education can do is to provide the basics and teach a methodology of self-development. It is extremely important to find ways to meet the requirements of the new economy.
In other papers, I argued how modeling method in maritime education could be a scientific solution to a better understanding and, of course, for best solutions of the problems arise. For example, I obtained very good results using modeling in maritime transportation (Constantinescu, 2000).
In this paper, starting from an existing maritime education modeling chart and in accordance with the future needs of the maritime education, we define and analyze the main steps in maritime education modeling: description of actual curricula, identification of goals, correlation with general educational models, recognition of job requirements, development of a local curricula which individualizes maritime education, development of aid curricula, development of initial and continue training, prepare for life-long learning. Then we analyze the stages of the development of a new system and also maritime educational measurement and evaluation.
In order to obtain a better standard of maritime education, some important measures have to be undertaken to ensure that more modern curricula are developed. Our proposed model allows the development of new education structures or the restructure and modernization of existing curricula. Its chain structure provides also very important feedback information.

1.Introduction

Generally, curriculum development in education has become one of the most important issues for academic institutions concerned about the quality and effectiveness of their courses in an era of rapidly changing technology and production processes. The modeling method, which has been successfully used in diverse activities, could have a strong impact on maritime education. While the broad technological progress, which has taken place over recent years, has caused a great need for technology education, the existing educational structures have not developed at the same rate. Therefore, the modeling method in maritime education could be a scientific solution to a better understanding and, of course, for best solutions of the problems arise.
In many applications models are necessary. The term "model" is usually used for a structure, which has been used purposely to exhibit features and characteristics of some other objects. Generally only some of these features and characteristics will be retained in the model depending upon the use to which it is to be put.
The modeling method is built upon a mental activity, which allows one, through several logic operations, to process previously obtained information in order to create a theoretical model. This developed model is then reproduced as a practical model with which to experiment. The practical model reflects all theoretical functions and interactions, which can be easily performed, controlled and measured during an experiment.
The experimentally obtained results are essential to assess the practical model and to develop further or improve its status and features. After this process, the improved material is ready for next trial, which in this case is a large-scale experiment. This process can be repeated satisfactorily for several consecutive steps. After a number of iterations the final version of the model is reached.
Some models are concrete, but more often are abstract models, especially in operational research. These models will usually be mathematical in that algebraic symbolism will be used to mirror the internal relationships in the object (often an organization) being modeled.
There are a number of reasons for using modeling:

a) The actual exercise of building a model often reveals relationships, which were not apparent to many people.
b) Having built a model it is usually possible to analyse it mathematically to help suggest courses, which might not otherwise be apparent.
c) Experimentation is possible with a model whereas it is often not possible or desirable to experiment with the object being modeled. It would clearly be politically difficult, as well as undesirable, to

experiment with unconventional economic measures in a country if there was a high probability of disastrous failure. The pursuit of such courageous experiments would be more (though not perhaps totally) acceptable on a mathematical model.

The essential feature of a mathematical model in operational research is that it involves a set of mathematical relationships (such as equations, inequalities, logical dependencies, etc.), which correspond to some more down-to-earth relationships in the real world (such as technological relationships, physical laws, marketing constraints, etc.).

2.The Dynamic of Maritime Education

Under the 1995 Amendments to the STCW Convention, all candidates for certification as deck or engineering officers are required to complete what is described as "approved education and training" and meet the standard of competence specified in the relevant section of the part A of the STCW Code.

The maritime education can be defined as a set of interdependent processes such as teaching, learning, researching and resources including human, material and information that function harmoniously to achieve specified educational objectives. This content can be analysed in four categories: knowledge, know-how, wisdom and the character (Bloom, 1996).

Knowledge enables the people to understand what they learn in relation to what they already know. Knowledge is both practical and theoretical. Know-how differs significantly from knowledge and enables people to put knowledge to work. Wisdom is the ability to distinguish what is important from what is not. Wisdom enables people to set priorities on how to use resources of time, energy and emotion. Character is a combination of knowledge, know-how and wisdom coupled with motivation. It is up each educational organization to identify what to include in each of these four categories. It appears that in maritime higher education, attention is given only to the first of the four categories, with the last two not even given lip service.

In maritime higher education, the lecturers often believe that at the university level they sole duty is to develop knowledge and pass it on to the next generation. The development of the students' character is none of their business. The list of knowledge that the students are expected to acquire is usually a composite of what is required for accreditation and what the faculty decides itself. In general, the accrediting authorities have to pay attention to either wisdom or character in accordance with the goal of the maritime education.

The educators involved in the development of modern curricula in maritime education tend to characterize the curriculum as the complementary relationship of a syllabus and its related teaching and learning processes (Chandler, 1992). Moreover, they have recognized that the teaching/learning process is a highly dynamic one.

We must point out that the curriculum process in maritime education is extremely complex and particular, with many components and interactions. It demands the involvement in naval course programme and syllabus development of those who posses an intimate knowledge of both maritime and educational processes. It is essential that curricula comply not only actual and future maritime sector needs, but also possible changes on labour market regarding job requirements.

2.1 Analysis of Actual Maritime Education System

To achieve a better standard of maritime education, some important measures have to be undertaken to ensure that more modern curricula are developed. Using modeling, we can improve maritime education. The method appears to be extremely efficient in planning a modern curriculum and, even more importantly, its chain structure provides an opportunity for further system development. It allows for the restructuring and modernization of existing study systems without undesirable disturbances and heavy expenditures.

To build a new model in maritime education, firstly we have to analyze the actual educational system in order to identify all disfunctionalities and also the components to be improved. This way, according to Pudlowski (1995), we can see the maritime education system as a chart. Therefore, we must investigate every link because, as a dynamic process, it's better to do changes priority into the main cells. In consequence, the following actions must be undertaken:

- definition of goals
- description of knowledge, skills and attitudes to be developed during the study
- recognition of students' demands from, and expectations of, the subjects taught in the curriculum
- investigation of the interaction between the structured subjects and those based upon it
- examination of teaching methods and their effectiveness
- evaluation of the subject's content
- observation of the teaching process within the subjects
- examination of teaching aids and their usefulness
- analysis of current teaching results.

These actions are essential in evaluating the study system under investigation and may be extremely valuable and helpful in the modeling of a new education structure.
A team including both educational and professional specialists may better carry out the analysis of the actual system. It is known the difficulty to compatibility these two directions for an objective point of view.
Also we consider to be very important that both teachers and students are costumed with a double perspective: investigated and investigator.

2.2 The Need of a New System

A new maritime education system has to be adapted to the reality of the 21st century. Its final goal must be a relational one, according to play an important role as an information processor and distributor on maritime market.
The development of a new educational system is based on the dynamic of the actual maritime world. The main influence factors could be:

a) Society's demands
b) Social changes
c) New tendencies in the world

For more details we recommend the paper by Fukuoka (2000).

3. Future in Maritime Education

3.1. How to Build a New Model

As we have already mentioned, there are two possible situations in developing a new system. The first involves the development of a completely new system, which cannot be related to any existing system, so the entire process is carried out from scratch. As we have already mentioned below, this is not an adequate solution foe education. It may, however, be encountered when developing entirely new specialties, where many envisaged subjects are completely original. Frequently, the development of a new education structure is based upon the examination of the existing system.
We have to take into account the other two important components of the building process, such as educational methods and teaching aids. Therefore, the main steps in modeling maritime education could be:
a) description of actual curriculum
b) identification of goals
c) correlation with general educational models
d) recognition of job requirements
e) development of a local curriculum, which individualises maritime education
f) development of aid curriculum (English language and computer science)
f) development of initial and continue training, prepare for life – long learning
g) according between theoretical and practical formation.
Every of the above-mentioned steps could be interpreted as a subsystem with inputs and outputs, but all of them are interdependent processes based on teaching, learning, researching. For this model the process variables are both the human resources (teachers and students) and material / information resources (equipment, computers, others aids). These resources must be harmoniously used to achieve specified educational and/or maritime objectives.
In order to test the efficiency of the model, it's necessary to experiment the practical reproduction of the model. The including activities must be easily controlled, measured and assess. On the other side, a major difficulty regarding experimental results is determining of control groups and experimental groups, taking into account the great importance of maritime work.

3.2. Globalization vs. Curriculum

The globalization of the world economy and commerce determine economical and political changes and the opening of international markets. These have made it possible to establish closer economic, industrial and business relationships between countries. In this context, maritime economy, however an international sector developed this dimension. International companies currently recruit foreign national able to practice their profession on the international level. Maritime academic institutions must respond to this trend by preparing their graduates for this new role.
Therefore, in designing modern curricula special care should be taken to ensure that essential qualities and knowledge are included in all courses to form a modern professional profile adapting for the international requests. The curricula in maritime education must include:

- Technical knowledge and skills;
- Intellectual skills;
- Excellence in computer proficiency and in the application of computers;

- Attitudes;
- International standard of practice;
- International business practice;
- International cultural background;
- International maritime law background;
- Foreign language proficiency.

The internationalization of maritime education offers the opportunities for academic institutions to break down cross-cultural barriers, thereby promoting international collaboration, trade, goodwill and development.

4. Conclusions

Everyone accept that maritime education modeling is a real difficult process. On the other hand, in the globalization context, the educational changes are absolute necessary.

To improve the maritime education, we may consider the modeling method. This means time and effort and we are not sure about results, but we have to try.

As we have shown above, the modeling method allows creating and developing new educational structures. Also, its chain structure provides also very important feedback information.

Curriculum reflects the educational policy of academic institutions. Therefore, any changes according to a specified model affect both the structure and the content of curricula. But curriculum changes are not enough. New methods, strategies and teaching aids must be consider.

A new educational system also supposes a new educational management, which needs a great effort from academic staff.

Finally, we conclude that an inter-academicals collaboration could promote important potential in maritime education and it could also be useful in creating a new educational system.

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Reorganization Plan of Master Course Program of KUMM Responding to the Changing Maritime World

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ABSTRACT

The KUMM is now planning to make an overall reorganization of the master course of graduate school. The reorganized master course will be consisting of 3 divisions as follows,
Maritime systems management (MSM)
Maritime transportation science (MTS),
Ocean mechanical & energy science (OME),
The marine shipping industries and maritime science & technology are now changing drastically. The recent noticeable trends are # structural change of Japanese shipping industries characterized by globalization, # globalization of world maritime society especially regarding with safety and environmental problems, # rapid developing computerization and information technology. The reorganization is aiming to respond those changing situation of maritime societies. This paper intends to introduce the whole outline of the reorganization plan. One of main points of reorganization is to set up a new division of MSM, in which two Chairs of Maritime safety management and Maritime technology management. Secondly, the paper gives a bit more precise explanation on the objectives and features of each new division from the viewpoints of increasingly serious problems of safety and environmental deterioration concerning regarding marine transportation activities

1. Introduction

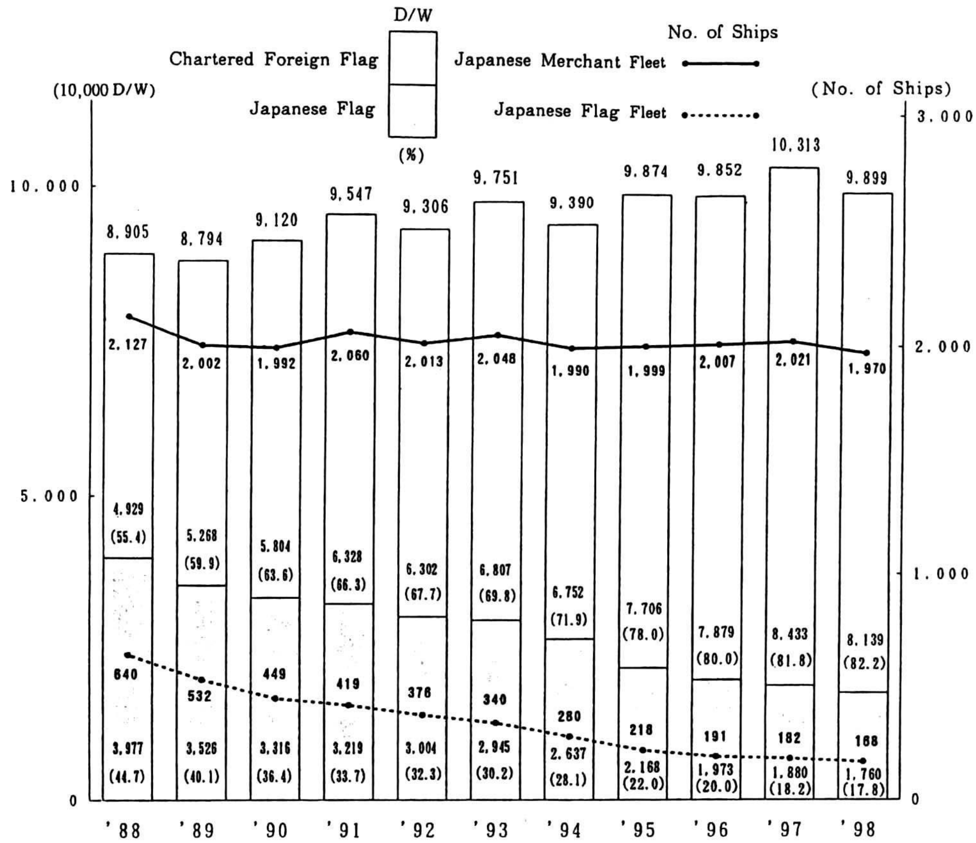
Recently the situations surrounding the Kobe University of Mercantile Marine, KUMM, though not especially only KUMM but also other maritime study institutes, are changing drastically in the various aspects concerned. Those aspects are, for example,
Maritime societies both of Japan and the world,
Rapidly developing computerization and information technology,
Increasingly serious safety and environment issues,
Decrease of population at age 18 and decrease of young applicants for maritime jobs.
In addition, the government is going to change drastically the university policy for the sake of financial curtailment and for activating the university in response to social and industrial movements. Main points of governmental plan are, i) introduction of business administration to the budget system, ii) unification of universities, iii) introduction of university achievement assessment.

Those trends require the education and research systems of KUMM to make a reform in both aspects of substance and procedure. The KUMM, therefore, has carried out an overall review of its education and research systems, and have made a reform plan of them intending to respond the changing situation in and around the KUMM. This report describes briefly the current situations concerned, and the reform plan, though which is still now under discussion. The plan is comprehensive over the whole system of KUMM. Here description, however, will be focused mainly on the plan of Master course of graduate program.

2. Rapidly changing Maritime Society

2.1 Structural change of Japanese shipping industries

In these years, Japanese shipping industries have been changing their performances drastically due to keen competition in the world shipping business. The following points could characterize their change.
Continuous flagging-out of Japanese merchant ships
Multi-nationalization of ship manning
Rapid decrease of young age seafarers and ratings
Separation of ship operation & maintenance division to outer other company
As can be seen in Figs.1, 2, Japanese merchant fleet is continuously flagging out and a number of Japanese



Source: Ministry of Transport [The Current Situation of Japanese Shipping]
Oceangoing ships of 2,000G/T and over.

Fig. 1 Size change of Japanese merchant fleet (JSA2000)

<Breakdown of the Japanese Merchant Fleet>

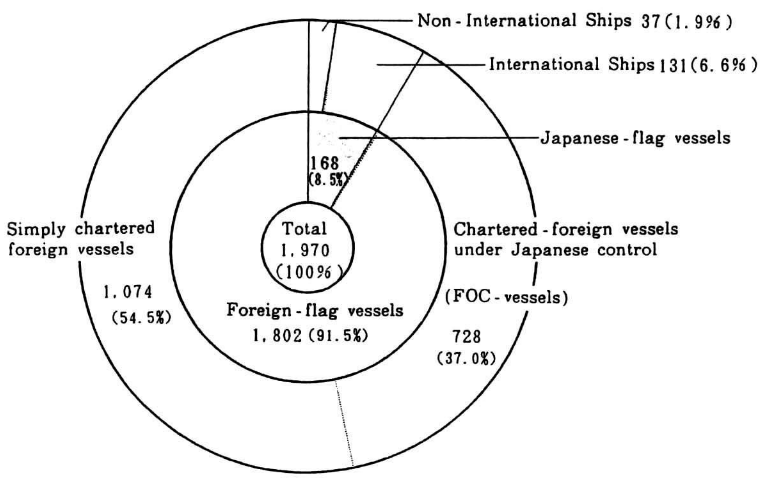


Fig.2 Break down of Japanese merchant fleet(JSA2000)

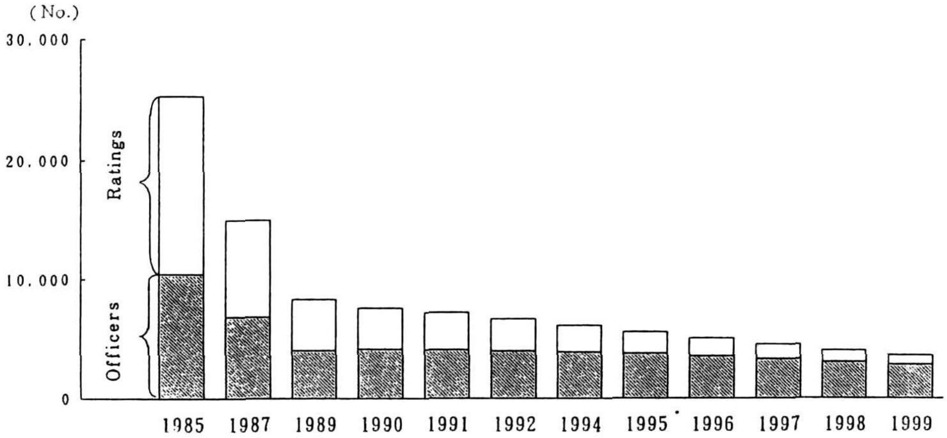


Fig.3 Change of Japanese seamen employed by 24 Japanese leading oceangoing shipping companies (JSA2000)

<Remark> #The number of seamen employed by Japan's 24 leading ocean going shipping companies in 1999 was 3,585.

#This number is approximately 40% of the number of seamen 10 years ago and reflects a decrease in the number of Japanese ships.

#Japanese seamen are required to not only fulfill the duties as navigation staff but also play the roles of trainers and supervisors of foreign seamen. Japanese seamen are also required to be qualified to handle ship Management and corporate management on shore.

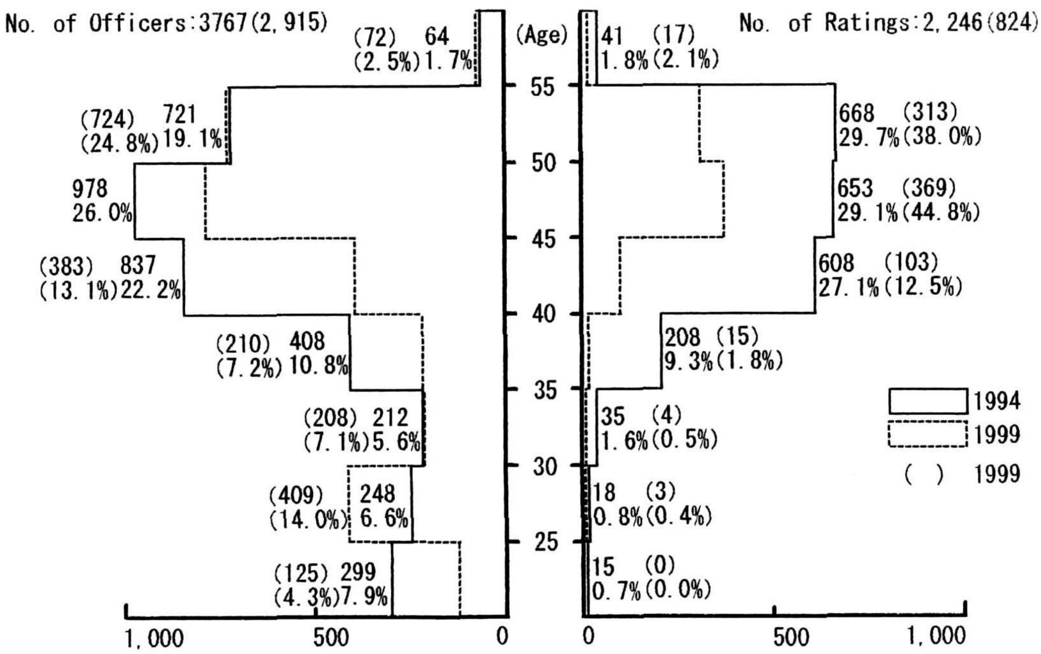
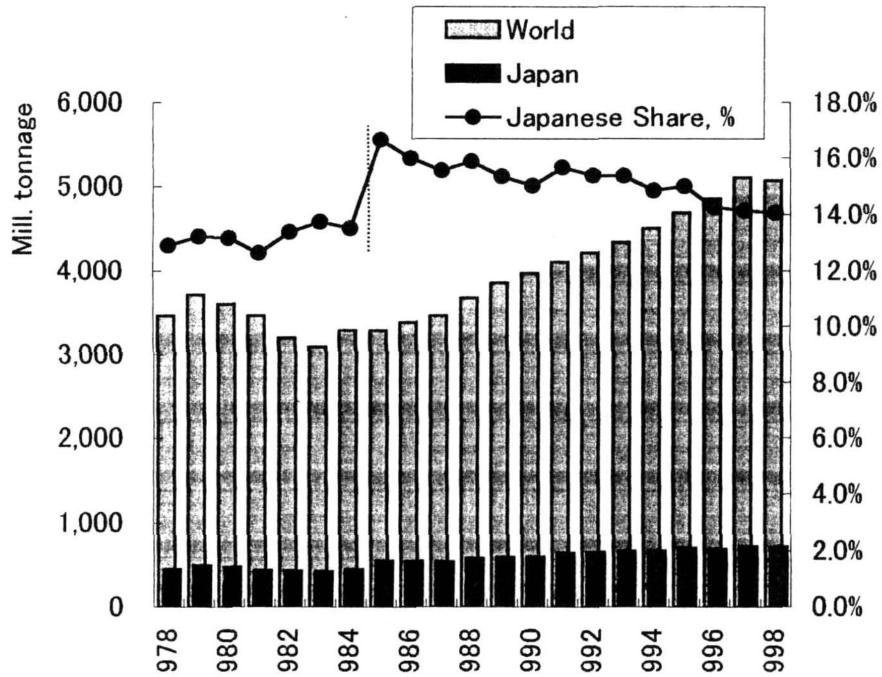


Fig.4 Remarkably distorted age composition of Japanese seamen (JSA2000)

flagged vessels have decreased to only 168, the percentage of 8.5% in 1998. Moreover, even among those 168 Japanese flagged ships, 131 are recognized as the international ship, which is allowed to be manned with a foreign crew except a captain and a chief engineer. This trend means that Japanese merchant fleet has been becoming to be operated overwhelmingly by foreign seamen. Owing to this trend, the number of Japanese seamen employed has been rapidly decreased as shown in Fig.3. The figure also suggests that the decrease of fresh seamen employed has been seriously more rapid. As a result, the age composition of Japanese seamen has been distorted to such an extent that young seamen under aged 30 are less than 15% as shown in Fig.4. On the other hand, Japanese shipping companies, however, are keeping, or rather, expanding their activities worldwide in the seaborne trading as shown in Fig.5.

The trends reviewed above may show on one side a business progress of Japanese shipping industries, but on the other side, also show that most fundamental essentials, that is, vessels and seamen, supporting such vital Japanese shipping business have been becoming dependent almost on the charter from foreign countries.

Other trend to be noticed from a technological viewpoint is the separation of ship operation and maintenance works to outer other company from shipping company. In addition, it should be also noticed that Japanese ship building industries are now losing their dominant share in the world. The Japanese shipping companies have taken a role of integrating the Japanese shipping system so far. Taking above trends into consideration, however, the Japanese shipping system is going to be disintegrated as far as viewing from technological aspect as shown in Fig.6.



Remark) : Japanese statistic is shown,
Before 1984 : Only import and export trade
After 1985 : Cross trade added to import and export trade

Fig. 5 Change of waterborne trade of World and Japan.

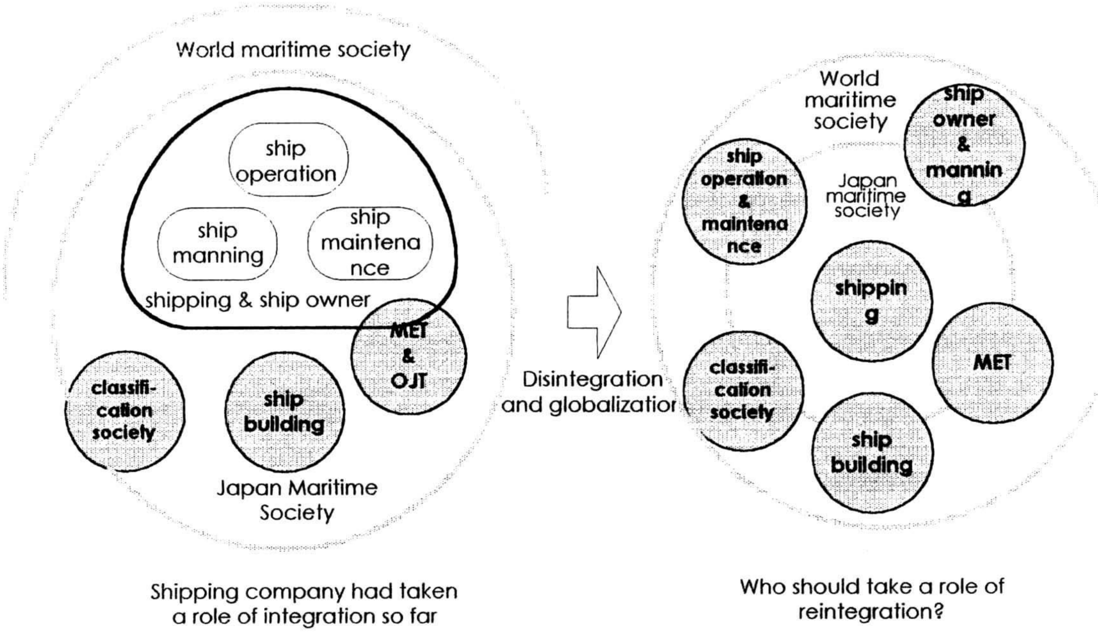


Fig.6 Disintegration of Japanese maritime shipping system

2.2 Globalization of maritime society

The progress of globalization of maritime society is now noticeable especially from three viewpoints. The first is the globalization of Japanese shipping industries themselves, of which recent trend could be characterized by the keywords "transnationalization" and "globalization" as reviewed above. The second is the globalization of the world shipping system especially in regard to the safety improvement such as seen in the introduction of ISM-code, STCW95, and/or the amendment of SOLAS etc.

The third is the globalization in regard to the environmental problems, especially to worldwide environmental problems such as ocean pollution, global climate change etc. As for the environmental problems caused by ocean shipping, the regulations and/or countermeasures for environment protection should be considered from the worldwide viewpoint whether an environmental pollution in question is local or global, because foreign ships might be the polluter even in the case of local pollution. There have been enacted so far, therefore, various international regulations regarding the issues such as waste disposal, bilge discharge, hull bottom paint, oil spill etc. Further, the global environment problems are deteriorating seriously year by year and require strengthening the global regulations and countermeasures.

3. Tasks required for maritime university

3.1 Demand and shortage of highly competent seamen

While Japanese shipping industries are still now keeping their business actively and globally, their own vessels and seamen capacity is rapidly and continuously shrinking and almost dependent on the charter from foreign countries. This situation poses some problems to be considered.

The first is the problem regarding the Japanese seafarer's competence required to be higher and higher. They have to take a role of leader and/or key person not only for ship operation but also for multinational crew management when they are on board, and when on shore, they have to be engaged in management works of a large number of chartered ships.

In spite of those requirements, it is becoming difficult to bring up such highly competent seamen by the OJT of shipping industries themselves due to disappearance of young seafarers. The second is the problem regarding that how and by whom those high competent Japanese seafarers could be brought up.

The third is the problem of the shortage of talents supply for various industries related with ocean shipping industries. There are many various industries and organizations supporting ocean shipping such as pilots,

maritime education & training, inspection, insurance, ship building, ship machineries, administration etc. Those industries need skilled talents of ship operation. Those talents have been supplied from the seafarers of shipping industries so far. In near future, however, it would be impossible to that supply due to the drastic decrease of Japanese seafarers as shown in Figs.3, 4.

It would be afraid therefore that the manpower would shrink to the extent not enough to support Japanese maritime industries if the situation was left as the current trend goes. According to METHAR Report (2000), the European maritime societies have actually faced with this problem, and at present they are considering various procedures for improving the situation.

These problems require the KUMM to reform its education and research system in order to bring up highly competent persons especially in the field of maritime management.

3.2 Education and research responding to globalization

The globalization of Japanese shipping industries, and globalization of safety and environmental problems require the Japanese maritime society to contribute for construction of the safer, more environmentally sound, and more resource-saving world maritime society in partnership with foreign maritime societies.

Education and research responding to globalization should be carried out in two aspects. One is to strengthen the curriculum for cultivating the international sense. The other is to strengthen the academic exchange with foreign universities, researchers, students etc.

3.3 Reintegration of marine shipping systems

As already seen in Fig.6, main components of marine shipping systems, that is, shipping management, ship building, ship operation & maintenance, ship manning, are now going to disintegrate to separate companies and/or separate countries. In order to make a comprehensive system reliable, safe, and efficient, it is inevitably important to synthesize all components appropriately. As for the marine shipping system, in Japan, such system integration or synthesization has been done mainly by Japanese shipping companies so far. If the disintegration as shown in Fig.6 would proceed further, how and by whom the reintegration or synthesization could be done?

For achieving an appropriate system synthesization, it would be essentially important to investigation of the relation between each component, and to analyze practical data of each component collected by the use of information network at the viewpoint of total system. As said repeatedly in this report, reliability, safety, environment protection, energy saving are becoming so important that the role of reintegration of marine shipping system is also becoming more important. This role is considered to be a new important task of maritime university. Responding to this new task, it is needed to strengthen the education and research of the field regarding maritime technology system management, system assessment method, system risk management, information management etc.

4 Reorganization of master course of KUMM

The master course is planned to reorganize as shown in Table 1 in responding to the tasks required from the changing maritime society.

Table 1 Reorganization of Master course of KUMM

<Present>

Divisions	Chairs
Maritime science	Nautical studies
	Maritime studies
Transportation & information systems engineering	Transportation systems engineering
	Information systems engineering
Ocean electro-mechanical engineering	Ocean mechanical engineering.
	Electro-mechanical engineering.
Power systems engineering	Marine engineering
	Nuclear engineering

<Future plan>

Divisions	Chairs
Maritime systems management	Maritime safety management
	Maritime technology management
Marine transportation science	Marine transportation engineering.
	Marine information science
Ocean mechanical & environmental science	Ocean mechanical engineering.
	Environmental material science

The four divisions of present course are reorganized sweepingly to three divisions of Maritime systems management (MSM), Maritime transportation science (MTS), and Ocean mechanical & energy science (OME). The main objects of reorganization are as follows.

A main point of reorganization is to set up a new division of MSM. One important object of MSM is aiming to bring up highly competent persons being able to engage in management works both on board and on shore of maritime industries. MSM has other object, seemingly unrealistic, to develop a synthesization of nautical and engineering education at the point viewing the marine shipping system as a total system.

One important object of MTS is to carry out newly the education and research of package engineering. MTS is also intending to strengthen the education and research of port management at the viewpoint of total logistic system

Main object of OME is to carry out the education and research on ocean field from various aspects not only of transportation, fishery, but also of resources, ecology, environmental base etc.

General points of education & research for all three divisions are mainly as follows.

* Environment protection and safety should be most important objectives in any field of education and research
* Computer and information technologies are given a great importance both in means and subjects of education and research
* Emphasis is put on the education for cultivating international sense both for students and young researchers by the use of various means such as English teaching, academic exchange, acceptance of foreign lecturers, and foreign students, internship abroad etc.

Main points of education and research of each division are as described in Table 2.

Table 2 Main points of education and research of KUMM new Master Course plan

Divisions	Chairs	Main points of education & research
Maritime systems management	Maritime safety management	Planning & management theory and technology on maritime systems at the viewpoints of synthesization and globalization *System management for safety and environmental protection *Management not only for individual ship but also ship fleet *Lifecycle planning & management of technology systems *Study on international systems of maritime society
	Maritime technology management	
Marine transportation science	Marine transportation engineering	Techno-economic theory and technology for optimum and synthetic global transportation systems of cargo and person *Logistic and port management for optimum synthesization *Package engineering for safer and higher qualified global marine transportation *Information & communication systems of nautical environment and ocean environment
	Marine information science	
Ocean mechanical & environmental science	Ocean mechanical engineering	Mechanical and energy theory and technology for safe and environmentally-sound transportation, ocean development *Mechatronics engineering for intelligentialization of marine technics *Energy and power engineering for marine mechanical systems *Material science for innovative future energy systems
	Environmental material science	

5. Conclusion

The KUMM is planning to reorganize its master course program. One of important objects of reorganization is to set up a new division of Maritime Systems Management, which is intending to carry out the education and research for bringing up highly competent persons for management works in the maritime societies. The reorganization is aiming also to strengthen the education and research responding to the globalization of world maritime societies. To do so, KUMM is intending to develop academic exchange activities with foreign maritime universities. To develop the academic exchange would be valuable for all maritime universities. The author would like to propose to construct an academic information network, for example, a library network by the use of Internet system, among the member universities of IAMU as one procedure for developing their academic exchange.

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Marine Environmental Issues in Maritime Education and Training

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ABSTRACT
In recent times there has been an increasing interest the impact of shipping and ports on the marine environment. Paradoxically, while shipping and Ports are seen as contributing to pollution, the industry is also seen as an environmentally acceptable form of transport, particularly when compared to road and air.
Environmental legislation, for ships and ports, at the local, regional, national and international level is set to increase in the next ten years. An awareness of this legislation and the environmental issues should have a higher profile in maritime education and training.

This paper will outline:

- current environmental issues associated with shipping e.g. antifouling
- environmental and socio-economic impacts of the issues, and
- important environmental legislation as it affects shipping

Shipping and Port operations exert pressures on the marine environment.

1. Introduction

Shipping and Port operations exert pressures on the marine environment. Shipping is seen by some as a contributor to marine pollution. In 1990, while being non-specific, marine transport is estimated to contribute some 12% of marine pollutants. Land based inputs were estimated as making the largest contribution. Others see marine transport as being the most environmentally acceptable mode of transport, particularly when compared to road and air (GESAMP, 1990).

Shipping safety and marine pollution are inextricably linked and in addition to legislation regarding ship safety, environmental legislation, for ships and ports, at the local, regional, national and international level is set to increase in the next ten years. An awareness of this legislation and the environmental issues should have a higher profile in maritime education and training.

Shipping and port activities can impact on the marine environment in two main ways:

- Accidental impacts: - e.g. oil spill resulting from collision or grounding/stranding, loss of deck cargo. The incidents tend to be unique and can be only anticipated by scenario setting. Legislation can help to minimise risk and mitigation of the effects of the accident can only be approached from a "toolbox" perspective

- Operational impacts e.g. toxic effect of antifouling paints, discharge of Sox and Nox emissions. The impacts, from ship and port operations, generally tend to be chronic and are often controlled by legislation. Mitigation of effects of operational impacts can be planned and controlled.

2. Environmental issues associated with shipping

2.1 Accidental Risks

Marine accidents, groundings or strandings may result in localised damage and disturbance to the seabed, but may also lead to loss of:

2.1.1 Oil, either as cargo or bunkering fuel, or **Hazardous cargo**, including noxious liquid substances and harmful substances carried by sea in packaged form e.g. pesticides, liquefied gas. The effects will be unique to the situation but the fuel or cargo will have a wide range of toxic or physical effects on marine habitats. The main impacts of both oil and chemical spills are either physical, e.g. smothering by crude oil, or, toxic, e.g. lethal effects of spilt oil or chemicals. It is thought that Birds, molluscs and fish eggs and larvae are particularly at risk from accidental spills.

GESAMP data, collected between 1973 and 1981, suggests that 400-300 thousand tonnes of oil entered the world's oceans by tanker accidents during that period (GESAMP, 1993).

2.1.2 Collision with marine mammals - While not common, collisions do occur and are particularly associated with high-speed craft. Also propeller injuries have been reported on marine mammals.

2.2 Operational Risks

2.2.1 Operational oil spills cargo and bunkering fuel – Operational spills are usually small but repetitive. The effects of these spills are chronic and localised. Impacts on marine habitats, include, physical disturbance, toxic to sensitive species and organic enrichment of the sediments. Annual operational spills of oil (in tonnes) have been estimated as:-

Non-tanker accidents – 750-200
Operational discharge 1080-600

Representing the second largest input of oil into the marine environment (GESAMP, 1993).

2.2.2 Emissions -Sox, Nox, CFC's and VOCs are all regarded as contributing to atmospheric pollution leading to global warming, poor air quality and acid rain. The input of Sulphur and Nitrogen Oxide by shipping is small in global terms. However in regions with a large volume of shipping traffic; there maybe significant regional problems (ImarE, 1996).

2.2.3 Antifouling toxins – The biocides e.g. TBT, Triazines, in some antifouling coatings can leach into the surrounding water and accumulate in benthic organisms and sediments. These biocides, by their nature, are harmful to a range of marine organisms. The nature of the toxicity is chronic and can effect such functions as morphology, growth and reproduction of a range of marine species.

2.2.4 Discharge of ballast water and associated non-native species – The introduction of non-native species via the discharge of ballast water is well documented. These species can be detrimental to local species through competition for space or nutrients or they can be toxic and affect local fisheries.

2.2.5 Noise - Some evidence that vessel noise can disturb marine mammals and fish. There is particular concern over cetaceans that may experience disturbance to feeding and breeding. Cargo handling noise may also disturb mammals e.g. seals and waterfowl.

2.2.6 Ship and boat wash – Ship wash may result in erosion of intertidal and shallow water habitats. The resuspension of sediment may also lead to resuspension of toxins in the sediment. Currently there is great concern regarding the impact wash generated by fast-craft.

2.2.7 Waste disposal at sea/ in port – Marine mammals and birds can swallow or become entangled in plastic litter form ships, often leading to fatalities. Distinguishing between ship or land garbage is difficult.

Beachwatch 96 (UK) estimated that shipping generated some 17.4% of the total debris collected on UK beaches.

2.2.8 Dredging and disposal of spoil –Maintenance and capital dredging disturbs the seabed leading to damage of benthic ecosystems (physical and smothering by sediment), increased levels of suspended sediments and attendant pollutants/nutrients in the water column. In addition, the disposal of dredge spoil can also damage other benthic communities by smothering and/or increasing the uptake of contaminants or nutrients by being resuspended into the water column from the dredged sediment (ABP, 1999, ANON, 1998, De Jong, 1997, GESAMP, 1990, ICS, 1993).

3. Environmental and socio-economic impacts of the issues

3.1 Socio-economic impacts

In addition to the direct biological, ecological and environmental impacts of shipping, there are indirect impacts on the economics and sociology of maritime regions. These are generally less obvious than the direct impacts. However there is evidence emerging that the general public are becoming more aware of the issues. A study carried out by the European Commission in 1999 (ESPO, 2001) based on the views of representative samples of the population in each of the 15 member states threw light on the attitudes of the general public towards the environment. It found that :

- 8 out of 10 Europeans believe they live on 'a planet in danger';
- 5 out of 10 believe that it is necessary to 'fundamentally change our way of life and development if we want to halt the deterioration of the environment' and that 'making regulations stricter' is the best means of delivering this change.

But

- 8 out of 10 believe that an environmental protection policy must take into account 'social and economic effects'.

It also found that industry spokespersons are the least trusted on matters of the environment (environmental protection organizations are the most trusted).

3.1.1 Sustainability

The International Year of the Oceans in 1998 focussed attention on the need for sustainable management of the ocean resources. Much attention has been placed on the sustainability of marine ecosystems, particularly coastal areas. The increasing exploitation of the coast continues on a global scale and the need for the sustainable development of human activities becomes increasing important in Europe as well as the rest of the world. Shipping represents one of the human activities that exert a pressure on the coastal marine environment. Paradoxically, while shipping is seen by some as a contributor to marine pollution, in other areas it is seen as being the most environmentally acceptable mode of transport. The many global Short Sea Shipping initiatives recognise this fact.

3.1.2 Socio-economic impact assessment

The assessment of socio-economic impact of shipping is multifaceted and not easy to assess. The interests of maritime regions that could be affected by shipping are:

Ports, harbours and marinas
Health of residents and visitors to maritime cities and environs
Fisheries
Shellfish beds
Tourism
Nature reserves,

All of the above have a high socio-economic value to maritime regions. Ironically, tourism, ports, harbours and marinas are not only impacted by shipping operations, but may themselves contribute to socio-economic impacts (Tait & Dipper, 1998, Viles & Spencer, 1995).

3.2 The main activities associated with shipping that are known to have a socio-economic impact.

3.2.1 Oil Spills - Operational or accidental spills of oil or other hazardous cargo can affect all the named sensitive areas, the previously discussed physical and toxic affects can affect the regions fisheries, by smothering shellfish beds and its toxic nature to fish eggs and fry. In addition, the tainting of fish and shellfish flesh by oil is known to impact on fish sales, following an oil spill. Fishing grounds and shellfish beds maybe come subject to closure orders. This will have a direct affect on the fisheries economics of the area.

The physical affects of an oil slick will impact directly on the nature reserves and indirectly on tourism, resulting in a loss of tourism income to the region. Examples would be the loss of amenities due to oil cover, with these areas becoming unattractive to visitors. The loss of bird or marine mammals, due to oiling, leading to the nature reserves being less attractive to visit.

Harbours and marinas that are oiled maybe themselves closed or seen as a less attractive to visit leading to loss of income in habour and marina dues and the indirect loss of income generated in associated areas.

3.2.2 Emissions – There is some evidence that the input of Sulphur and Nitrogen Oxide can lead to localised poor air quality, which could have health implications for local residents.

VOC's from cargo, may cause environmental and health damage at a local level.

3.2.3. Ballast Water - Discharge of ballast water may lead to the introduction of non-native species. Historically many of the established introduced species have an impact on shellfish beds. These take the form of competitive or pathogenic species, either of which can have a detrimental affect on the commercial shellfish beds.

Additionally, Some toxic or harmful species are known to be transported in ballast water. Toxins accumulated by shellfish can be harmful to the health of human and marine mammals e.g. PSP.
The vibrio bacterium causing Cholera, *Salmonella* sp. and faecal coliforms are also known to be transported in ballast tanks and represent human health hazards (Rawlings *et al.*, 1999, Knight *et al.*, 1999)

3.2.4 Garbage - Marine debris is generally unsightly and not attractive to visitors, thus impacting on tourism. Medical products associated with debris may pose a health risk. As stated before, it is difficult to distinguish between land and marine debris.

3.2.5 General contamination - As outlined previously, there are many sources of contaminants associated with shipping, e.g. antifouling, dredging activities. Any contaminant that is bio-accumulated in marine organisms, particularly shellfish. may pose economic and health risks (Barrow,1997, De Jong,1997).

4. Environmental Legislation as it Affects Shipping and Ports.

As stated earlier, shipping safety and marine pollution are inextricably linked. Some environmental legislation deals directly with environmental protection eg MARPOL, while other instruments are primarily aimed at at ship and human safety, eg SOLAS, but indirectly have an influence on environmental safety.

4.1 International Legislation

The Marine Environmental Protection Committee (MEPC) of the International maritime Organisation (IMO) are committed to implement regulation in order to mitigate the effects of shipping on the environment. The MARPOL Convention was adopted in 1973 and covers the regulation of pollution of the seas by shipping. Originally intended to cover oil pollution as OILPOL and subsequently MARPOL, it now covers many other contaminants:

Annex I- Oil
Annex II – Noxious Liquid Chemicals
Annex III – Harmful Goods (packaged)
Annex V – Garbage
Annex IV- Sewage
Annex VI – Air Pollution (Nox, Sox, from ship exhausts and emission of ozone depleting substances

In addition IMO are committed, by means of new Annexes to MARPOL or by new conventions,

- to:Global prohibition of TBT in Antifouling coatings, application ban by 2003, with total ban by 2008, and
- Control and management of Ships' Ballast water to minimise the transfer of Harmful Aquatic Organisms (IMO,2000)

Also of Interest to IMO are, dumping at sea, double hulls, prevention of accidental pollution (SOLAS), compensation for pollution and the designation of "special areas"(IMO, 1998,a, IMO, 1998,b)

4.2 National legislation

Many countries and regions are now adopting their own legislation with regard to the protection of the marine environment. Examples include:

From 1 July 2001, Australia has new mandatory ballast water requirements. Any ship arriving in Australian waters will be required to undergo a ballast water risk assessment and then undertake an approved management option. Interestingly the legislative framework for the new requirements is under the Quarantine Act, 1908 (AFFA, 2001)

The European Union has recently legislated on air emissions and port waste reception. Increasingly the EU is looking at shipping in sustainable terms within the framework of integrated coastal zone management.

Increasingly, regional governments and individual Ports implement legislation or guidelines with respect to marine environmental protection.

5. Education and Training

Within STCW, the protection of the marine environment and the prevention of pollution are recognised as being important within training for navigational watch keeping. In addition, the special requirements for tankers are also recognised.

The ISM Code provides an international standard for the safe management and operation of ships and for pollution prevention.

Education and training to STCW and the ISM code will give a basis of knowledge and understanding of the maritime environmental issues. Many IAMU institutions educate their students to a higher level, some offering postgraduate courses in environmental issues. However, more could be done to educate seafarers to the environmental and socio-economic impacts of shipping and port operations.

6. Conclusions

There are many environmental issues associated with Shipping and Port operations. Some of these issues have socio-economic impacts on the communities in maritime areas. However, shipping is seen as an environmentally acceptable method of transport.

International, national and local legislation and guidelines help control and regulate the impact of shipping and port operations on the marine environment.

Increased training is needed in the environmental and legal issues and is recognised within STCW and the ISM code. Education and training in environmental issues will lead to a better educated workforce with a deeper understanding of the environmental and socio-economic impacts of shipping. This better awareness should help in the further development of legally compliant and ultimately a sustainable industry.

The challenge remains to reduce environmental damage by maritime operations to a level that is acceptable and sustainable.

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Evaluation of Traditional MET Credentials: Empirical Evidences from Maine Maritime Academy

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ABSTRACT

Seafarers with traditional MET credentials often find it difficult to pursue higher education because of their lack of a university background. Presently, there is no documented standardized procedures to evaluate MET credentials for entry into advanced degree programs. The author explains the graduate admissions process used at Maine Maritime Academy and a methodology to evaluate applications from seafarers who do not possess a baccalaureate degree. The study's findings are statistically significant and will serve as a valuable tool in evaluating superior MET licenses. Furthermore, its findings will be a useful document for external accreditation bodies that accredit institutions of higher education--maritime as well as non-maritime--that admit seafarers without a baccalaureate degree.

1. Introduction

Seafaring is a very demanding profession with little room for error. Contemporary trends in global business such as aiming for high quality outputs and zero-defects are really nothing new to the repertoire of a well-trained, qualified and conscientious seafarer. Following umpteen checklists and standing orders and being prepared to face the worst adversity during the best of times as well as the worst of times is very much a seafarer's daily routine. It takes a strong and unique individual to be a successful seafarer. The uniqueness comes not from the possession of any extraordinary intellectual capacity but from that of simple commonsense (euphemistically referred at sea as behaving in a "seaman-like manner") and from the willingness to subject oneself to the rigors of self-discipline of the highest order and separation from near and dear ones for prolonged periods of sailing.[1] It also comes from the individual's mental and physical aptitude to face the unknown, whether that be hurricane force winds at sea or militant stevedores pilfering cargo in port. The sea is certainly no place for incompetence, negligence or complacency, for it can be tranquil one day and ruthless the other. The only way seafarers can gain respect from their fellow shipmates is by knowing his/her job and performing their duties in the most professional manner. They know when they go to sleep each night that their lives are truly in the hands of their colleagues. And for every conscientious seafarer who takes over a watch at any time of the day or night, nothing could be more satisfying than the confidence of fellow shipmates in his/her professionalism. There is a common bond among seafarers from all over the world that far surpasses distinctions based on color, creed, nationality, religion, or socioeconomic stature. That bond comes from their professional pride and their wider view of the world which their land-based colleagues often do not fathom. If anyone is worthy of being called a global citizen, it is a seafarer for s/he is a true citizen of the world regardless of the port of call or the flag at the ship's stern.

The complexities that challenge a seafarer's life have not eased in the 21st century despite various technological advances, and the profession remains paradoxical. While it provides a good source of income and a better living standard especially for those from poorer countries, the agonies of being far from one's near and dear ones and the rigors of working in an hostile environment take a significant toll on the seafarer's mental and physical well-being. As a result, many seafarers seek opportunities to escape from this paradoxical existence. Many of them have gone on to occupy increasingly complex shore-based management and technical positions with their former employers after sailing for several years on their vessels.

One other solution to this paradox is through higher education. However, many seafarers are handicapped in this context because of their lack of a formal university educational background that leads to the typical baccalaureate degree. Oftentimes their certificate of competency as a master mariner or a chief engineer does not receive adequate recognition from the traditional academicians that make the higher education admission decisions. It is rather ironic that a master mariner credential is found inferior to that of a fresh college graduate with little to no real-world experience. Accordingly, the seafarer's application for higher education may be turned down by a traditional university although the person in question may have successfully commanded the largest oil tanker afloat through the most treacherous navigational areas besides being a proven leader with exceptional commercial understanding.

The advanced degree programs offered by reputed maritime universities in different parts of the world often recognize this double standard and grant admission to those seafarers without a formal university educational background based on their life experiences. However, traditional universities find themselves unable to grant such admissions to seafarers partly for fear of their external accreditation bodies and primarily because of their lack of familiarity with the traditional MET curriculum and the competencies of contemporary seafarers. Furthermore, the community of maritime academicians and professionals has not produced adequate support materials that would make the task of their university colleagues (charged with validating the equivalency of seafaring licenses) any easier. Maritime institutions have developed their own admission standards and policies, and are documented in their respective program catalogs.[2] However, there is hardly any global or even regional co-ordination of such standards and policies.[3] There is an immediate need to convince the traditional university academicians about the true academic worth of MET credentials and the dilemma facing seafarers. It is the author's expectation to make such a contribution in this field using 15 years of data collected by the Maine Maritime Academy (MMA) graduate office. This data will be analyzed to examine the academic performance of all MMA graduate students that includes those with a traditional baccalaureate degree from a recognized university as well as those admitted based on traditional MET credentials. The author's challenge is to prove that the academic performance of those admitted based on the equivalency argument will be as good as that of those entering MMA graduate program with a traditional baccalaureate degree.

2. Background on Traditional MET Credentials

Seafarers fall into two basic categories, licensed and unlicensed. Unlicensed personnel may undertake pursuit of deck or engine licenses upon accumulating the appropriate level of sea-time. Licensed officers pursue progressively higher licenses (certificates of competency) and go on to become captains or chief engineers ultimately. Although the basic credentials for beginning a seafaring career varies from country to country, a good number of licensed officers originate from a national or regional maritime academy. The academic programs at some of the maritime institutions lead toward a baccalaureate degree in addition to an entry-level license.[4] However, the maritime institutions in many countries continue to be training-oriented and go little beyond the professional component. This was typical of the British apprentice system and is still found in the Commonwealth group of nations.[5] Seafarers that originate from these countries do not graduate from their maritime academy with a baccalaureate degree although they are often selected for their training based on a highly competitive exam and very often they constitute the cream of that nation. There is an interesting local perception in countries like India that it is those applicants who are unable to get admission to professional institutions (such as a maritime academy) that go on to a traditional university and complete their baccalaureate credentials.[6]

Seafarers are an enterprising bunch and undertake higher education in various fields ranging from business to technology. The usual impediment that stands in their pursuit of higher education, i.e., the absence of a baccalaureate degree, was discussed earlier. An exception to the above are the maritime universities themselves. Many maritime universities offer advanced degree programs today. It is seven of these universities that have spearheaded the foundation of the International Association of Maritime Universities. The availability of higher education options is a prerequisite for membership in IAMU. Maine Maritime Academy is one such university and represents the Americas in the IAMU.

2.1 Higher Education Options at Maine Maritime Academy

Maine Maritime Academy established a Department of Graduate Studies and Research in 1985 and began offering a unique modular program--MS degree in Maritime Management--in 1985. It follows the executive MBA pattern and is scheduled in five-week modules to meet the work commitments of typical seafarers seeking a shore-based middle management career. The Department's offering was expanded in 1996 with the introduction of an additional MS degree program in Port Management and again in 1998 with the introduction of the MS in Logistics Management.[7] The Loeb-Sullivan School was established in 1997 with the creation of the undergraduate program in International Business and Logistics. Presently, the School consists of the graduate component as well as the undergraduate component, each having its own administrative head.

3. The MMA Graduate Admissions Process

The MMA graduate program accepts application from those possessing a baccalaureate degree or its equivalent. In addition to the basic educational requirement, the students should appear for the GMAT or GRE exam as well as the TOEFL test if their medium of instruction is not in English. They should also write a personal essay as to why they seek admission in addition to submitting three personal evaluations of their managerial potential.[8] The MMA graduate admissions process is totally independent of the institutional undergraduate admissions office and its staff, and is the sole purview of the graduate admissions committee. It is chaired by a graduate faculty-member. Other members of the committee include the Director of the program as well as two other graduate faculty members. Once the admission package is complete, the graduate admissions committee scrutinizes each applicant on a case-by-case basis. While applications from students with a baccalaureate degree are relatively easy to evaluate, considerable attention is given to those that seek admission based on the equivalency argument.

3.1 The MMA Criteria for Handling Non-Traditional Applications

When the admissions committee receives an application from a candidate without a baccalaureate degree, the equivalency argument is based on the candidate's professional credentials and managerial experiences. In general, a person serving as a master or a chief engineer or possesses the requisite license is perceived to possess the basic undergraduate educational credentials. Furthermore, a person who possesses a chief mate's license and has sailed as a chief officer is also given the equivalency because of the immense managerial and commercial responsibilities of this officer on board a ship. The educational contents for attaining these licenses have sufficient academic content and mathematical rigor to make the equivalency argument when combined with a significant sailing background. While it is beyond the scope of this paper to prove how many years of seafaring experience would equate to the general education component of a typical baccalaureate degree, the MMA committee looks for at least six years of such experience. The Committee also would like such a candidate to have at least one year's experience at the senior officer-level that involves significant managerial and leadership responsibilities. No candidate is admitted based purely on meeting the minimum academic threshold. In addition to meeting the equivalency argument, these candidates are subjected to the same admission rigor as the others in the other three areas. The final decision to admit is based on the votes cast by the individual committee members. A simple majority is required for admission. The Chair of the graduate admissions committee is responsible for all final decisions regarding admission as well as advising the Program Director on individual cases as to why a particular applicant was rejected and whether or not that person could reapply on overcoming specified deficiencies.[9] The author contends that MMA graduate admissions committee has applied these standards consistently over the last fifteen years and built up sufficient experience that can be disseminated and shared with other institutions.[10] Section 4 of the paper describes the study methodology and its findings. The crux of the analysis is academic performance outcomes as measured by grade point averages.

3.2 Pool of Accepted MMA Graduate Students

Table 1. Nationality of MMA Graduate Students

Class	Nationality					
	U.S.	India	PRC	Canada	Others	Total
1987	4	3				7
1988	3	3	2		1	9
1989	10	4	3	1	4	22
1990	6	2	1	4	2	15
1991	5	4		3	1	13
1992	8	1	6	1	3	19
1993	1	4		1	3	9
1994	9	2	3		3	17
1995	5	3	4		2	14
1996	2	4	1	1	4	12
1997	4	1			2	7
1998	4	1	1		2	8
1999	1	3			1	5
2000	3	1		1	5	10
2001	3	1		2		6
Totals	68	37	21	14	33	173

The MMA graduate offerings have attracted students from many countries in addition to those in N. America. Table 1 shows the nationalities of students admitted dating back to the first graduating class (of 1987). Approximately 40% of the students have come from the U.S. with the rest being from India, the People's Republic of China, Canada and other nations respectively. The other category includes students from 24 nations. A year-wise distribution of the other category is shown in Table 2. The above statistics are based on the year of graduation rather than the year admitted into the program.[11]

Table 2. MMA Graduate Students from the Others Category

	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	Totals
HK		1														1
Kuwait			1			1										2
Sudan			1													1
Cyprus			1													1
Pakistan			1		1											2
Ghana				1							1			1		3
Panama				1												1
UAE						1										1
RoC						1										1
Egypt							1									1
Liberia							1									1
Thai							1				1					2
Holland								1								1
Argent								1								1
Russia								1	1	2		1				5
Nigeria									1							1
Romania										1						1
Austria										1						1
UK												1				1
S'pore													1			1
Ukraine														1		1
Sweden														1		1
S. Korea														1		1
Venzla														1		1
Totals	0	1	4	2	1	3	3	3	2	4	2	2	1	5	0	33

4. Methodology

Table 3 (next page) shows students granted admission based on the equivalency criterion. The 37 students under this category come from 11 countries, 18 being from India alone. All these students possessed senior professional licenses, viz., Master Mariner, 1st Mate or Chief Engineer and met the MMA graduate admissions criteria discussed earlier.

Table 4 shows the average GPA of each graduating class. Furthermore, each class was divided into two categories. The BS category consists of those admitted with a baccalaureate degree and the MET category, those admitted based on the equivalency argument. It can been seen that students under the MET category outperformed students entering the program with traditional baccalaureate credentials in all years except 1995. Furthermore, 5 among the 12 students with a perfect transcript (GPA = 4.0) were admitted based on their MET credentials.

Table 3. MMA Graduate Students Admitted with Traditional MET Credentials

Class	U.S.	India	HK	Kuwait	Cyprus	Canada	Ghana	Nigeria	UK	S'pore	Venez	Totals
1987	1	2										3
1988		2	1									3
1989		3		1	1							5
1990						2	1					3
1991		3				2						5
1992	1											1
1993		3				1						4
1994		1										1
1995	1	1						1				3
1996		2										2
1997	2						1					3
1998		1							1			2
1999										1		1
2000											1	1
2001												0
Totals	5	18	1	1	1	5	2	1	1	1	1	37

Table 4. GPA Comparisons 1987-2001

Year	GPA Comparisons		
	Class	BS	MET
1987	3.568	3.530	3.618
1988	3.631	3.584	3.725
1989	3.600	3.594	3.620
1990	3.715	3.706	3.753
1991	3.732	3.627	3.900
1992	3.527	3.509	3.857
1993	3.560	3.342	3.832
1994	3.506	3.491	3.750
1995	3.580	3.585	3.563
1996	3.674	3.650	3.794
1997	3.521	3.446	3.621
1998	3.641	3.526	3.988
1999	3.750	3.687	4.000
2000	3.708	3.701	3.777
2001	3.807	3.807	
Averages	3.635	3.586	3.771

4.1 Statistical Analysis and Testing the Results

Although the mean values reported in Table 4 are highly in favor of MET students, the possibility of random factors contributing toward such an outcome cannot be ruled out. Accordingly, a normal distribution is assumed, and statistical analyses and tests conducted to add credence to the study's findings.

4.2 Testing the Mean Values of the Two Populations

Null hypothesis H_0: $\mu_1 = \mu_2$ (Mean GPA of the BS population = Mean GPA of the MET population)

Alternate hypothesis H_1: $\mu_1 \neq \mu_2$ (Mean GPA of the BS population ≠ Mean GPA of the MET population)

where μ_1= the mean GPA of BS students and μ_2= the mean GPA of MET students. The hypothesis was tested for the population (1987-2001), and Z value obtained by dividing $\mu_1 - \mu_2$ by the SE of the difference of the means. Table 5 summarizes the results.

Table 5. Testing the Difference in Means

1987-2001	Composite	μ_1	μ_2	$\mu_1 - \mu_2$	SE	Z Value
Mean	3.621	3.587	3.749	-0.162	0.046301	-3.49886
N	173	136	37			
Variance	0.0699	0.0666	0.0612			
SD	0.2644	0.2582	0.2472			

As the Z value (=-3.49886) < -1.96, the null hypothesis is rejected and alternate hypothesis accepted; i.e., the means of the two populations are statistically different for reasons other than random factors.

4.3 F Test for Testing the Equality of the Variances

The equality of the two population variances was tested as follows (Berenson and Levine 1996):

Null Hypothesis H_0: $\sigma_1^2 = \sigma_2^2$ (Variance in the GPA of the BS population = Variance in the GPA of the MET population).

Alternate Hypothesis H_1: $\sigma_1^2 \neq \sigma_2^2$ (Variance in the GPA of the BS population ≠ Variance in the GPA of the MET population).

The test was conducted for the entire 15 year population as well as three separate 5 year populations, viz., 1987-1991, 1992-1996 and 1997-2001. Table 6 summarizes the results of the F test. Accordingly, the null hypothesis that the variance in the GPA of BS students = the variance in the GPA of MET students cannot be rejected.

Table 6. F Tests and Results

Years	$\alpha = 0.05$		$F = S_1^2/S_2^2$	$\alpha = 0.005$		Results
	Lower Tail	Upper Tail		Lower Tail	Upper Tail	
1987-1991	0.5525	2.01	1.0362	0.3937	3.07	Accept
1992-1996	0.5128	2.49	1.1112	0.3546	4.44	Accept
1997-2001	0.4255	3.38	0.9725	0.2653	7.55	Accept
1987-2001	0.6667	1.6	1.0882	0.5319	2.11	Accept

5. Conclusions and Recommendations for Future Research

The study analyzed the academic performance outcomes of MMA graduate students ever since it began. It was observed that those granted admission based on traditional MET credentials outperformed those admitted with a baccalaureate degree in all but one of the years. The data and results were tested for scientific credibility. The first null hypothesis that the mean GPA of BS students = the mean GPA of MET students was rejected and the second null hypothesis that the variance in the GPA of BS students = the variance in the GPA of MET students was accepted at traditional confidence levels. It is expected that the findings of this study will help all universities and institutions, whether maritime-related or not, in giving appropriate consideration to applications from seafarers with traditional MET credentials. Its major contributions include a mechanism for evaluating the academic equivalence of those that possess superior seafaring licenses as well as meeting the needs of external accreditation bodies of higher education.

Although the study's findings are significant, it must be noted that a majority of students admitted under the equivalency criterion originated from one country, viz., India. Extending this further, 29 out of the 37 students admitted came from the Commonwealth group of nations. The possibility that these individuals receive a better level of secondary school education than those from other countries cannot be ignored. Also, in the case of countries like India, it cannot be ignored that a lucrative merchant marine career is placed in higher esteem than traditional university education. It is suggested that future research be conducted in these areas to fine-tune this novel effort to document the academic equivalency of traditional MET credentials.

Endnotes

[1] The author spent a good decade at sea. His longest stay on any ship was 14 continuous months.

[2] E.g., See MMA Graduate Catalog, p.27.

[3] A forum like the International Association of Maritime Universities could assume the leadership in filling up such a noticeable lacuna in traditional MET education. For a description of the goals and activities of IAMU, see IAMU Journal (2000, 68-9).

[4] This is typically the case with all U.S. maritime academies except the Great Lakes Maritime Academy that only offers an associate degree.
[5] The deck and engine license programs at the Singapore Polytechnic, Singapore are good examples.
[6] However, the Indian government-sponsored college for navigating officers began granting degrees (as part of the University of Bombay system) beginning in the early 1990s.
[7] The program in Port Management was offered from 1996 to 2000 and then shelved temporarily because of lack of demand.
[8] For further details, see MMA Graduate Catalog.
[9] The committee also typically advises any incoming students of their weaknesses and possible alternatives to remedy the same.
[10] The author has served as the Chairperson of the MMA Graduate Admissions Committee from 1987 onwards.
[11] This is because the MMA graduate students have a window of up to five years to complete their degree requirements without disrupting their professional obligations.

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Are the New Technologies Taking us to the Polyvalence in the Merchant Marine?

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ABSTRACT:

Nowadays the civil ships are suffering transformations in its equipment, which is used for their propulsion, navigation, communications and security. Due to the special features of the maritime transportation, the ship´s crews are more and better prepared over time.

In addition, the use of new technologies makes the management, operation and maintenance of the ships to be more comfortable easier and, therefore, makes possible that even accomplishing the STCW-78/95 convention, new marines can be taught throughout a high-level theoretical and practical preparation.

This paper studies the knowledge that the officials must have according to the STCW-78/95 convention and the syllabus that the polyvalent officials must study, which complies all the topic of this convention.

INTRODUCTION

Every transformation or technological renovation implies a change in the shapes and ways to make things, and even to the social structures. If, in addition, these changes are produced in a traditional mean, which is contrary to any innovation such as the maritime world, this transformation will be slowly introduced until it will be adopted as habitual practice within the vessels.

Since the end of the XXth century and now in the beginnings of the XXIst one, technology has advanced very quickly, although its incorporation into the maritime domain has been very slow -because of the reasons mentioned above- and very differently between vessels.

Nowadays there are vessels with a sophisticated technology and whose crews are well formed, whereas there are other vessels which navigate by the same seas, ports and channels and which are considered traditional and whose crew cannot be considered as a professional one in most of the cases.

HISTORICAL BRIEF

Let us make a brief historical review of the advance in the navigation techniques of the XX^{th} century, without commenting the previous ones.

At the beginning of the XX^{th} century, to calculate the position at the sea, the marine must do it by watching the stars, the planets, the moon or the sun. For this, he needed a sextant to measure the height of the observed star, a very precise chronometer to determine the hour at the Greenwich meridian, a nautical almanac prepared for the astronomers (it predicted the position of the stars selected in the Greenwich meridian every hour and some nautical tables which were useful to make the necessary calculations, to calculate the positions and to situate it into the navigation map); last, he needed a nautical map of the zone where he was navigating.

In addition, he used a magnetic compass in order to calculate his course, conveniently situated in a binnacle and with its corrector elements in order to can correct it for the magnetism, which is on board.

The gyroscopic compass was introduced after the WWI although it took more than twenty years to introduce it into the merchant marine. Nowadays, all the vessels higher than 500 TRB built since September of 1984 or later are provided of a gyrocompass.

To calculate the navigated distance there was a mechanic log and to calculate the depth there was the sounding lead. Since 1925 the echo sounder and, later, the ultra-echo sounder ones, which are used nowadays.

Also at the beginning of the XX^{th} century the radiophony are starting to be installed into the vessels. Altogether with the wireless telegraphy, the direction finder starts working in the 20's and could be used in bad weather conditions such as fog or to localise a ship in danger. The direction finder is going to disappear nowadays thank to the GMDSS.

After the WWII the RADAR was becoming one of the most important and indispensable equipment into a vessel. Later, the ARPA was introduced and, nowadays, almost all the vessels higher than 10000 TRB have it.

The DECCA began in the UK and was introduced in 1947, whereas in the USA there was the LORAN, which are hyperbolic systems with which one can calculate the situation in every moment within the covert area of one of those systems.

Between 1957 and 1964 the systems of navigation by satellite were developed and, from 1967 on, they are liberalised for commercial use. This system was the real predecessor of today's GPS, constituting nowadays the primate system of navigation which covers all over the world, giving data concerned to the situation, the direction and the speed in every moment whose precision is higher than the other system's one. The GPS/GLONASS, with differential correction techniques, has become equipment, which is commonly used in every vessel.

Another equipment which is strongly used is the ECDIS (Electronic Chart and Information System), which combines an intelligent database called ENC (Electronic Navigation Chart) with the entry of other navigation equipment's data such as the GPS, the gyrocompass and the log. This provides all the information, concentrated in just a place and in real time, to the Official of Navigation. In addition, the ECDIS can take interfaces to other equipment such as the NAVTEX, the echo sounder, the automatic pilot, the RADAR, the ARPA the wind indicator and even the new AIS (Automatic Identification System).

One cannot forget the communications advances made in the last years, such as the GMDSS, the fax, the telex, the e-mail, the Internet with slow, medium and high velocity of the data, the ISDN (Integrated Service Digital), the videoconference, the low sweeping TV, the correction of the electronic letters and the INMARSAT, with its new fourth generation satellite systems which can work with a velocity of data up to 432 Kbps.

Today, there are also the integrated bridge systems, which are designed in order to achieve an optimal navigation, to reduce the charge of work, and to improve the operational conditions when proportioning all the necessary data in the position of the watchkeeping deck.

In the engine room the evolution has also been very important. At the end of the XXth century all the handling and operations the necessary for the good work of the vessel were manual.

It must be remarked that the taking sounding, bilge levels, parameters of the machine's working, full of diary consumption tanks, etc... was manually made every hour and was written in the engine logbook.

The start of working and later coupling to the electric switchboard of the electricity generators was also manual. The drive of the main engine was always made from the engine room so that while navigating one must always take care about the telegraph.

The entry of the automatization and the computers in the marine installations has made possible that every operation which was manually made become automatic and programmed. In addition, the taken data goes to a database where an expert system analyses it and indicates the system and the place where the failure is, so in every moment one can access to any data.

STCW-95: COMPARISION BETWEEN NAVIGATION AND MARINE ENGINEERING MINIMUM REQUIREMENTS OF STUDIES FOR OPERATIONAL AND MANAGEMENT LEVEL

Studying deep inside the Convention STCW-95, the minimun requirement of knowledge for to get the Master and Chief Mates or Chief Engineer Officers professional title, are included in the tables A-II/1 and A-II/2 for navigation and the tables A-III/1 and A-III/2 for marine engineering, and if we compare both tables, we found the following differences:

NAVIGATION

1. Navigation
2. Handling and stowing of the cargoes

MARINE ENGINEERING

1. Naval Marine Engineering
2. Electrical, Electronic and Control Installations
3. Maintenance and Repairing

Weather, we development the subjects that we can get the both tables (Navigation and Marine Engineering get the follow table:

Table nº1

NAVIGATION
1 Coastal and Celestial Navigation
2 Equipment and Electronic Systems for to Aid Navigation
3 Meteorology and Oceanografic
4 manoeuvring and Steering of the Ship
5 GMDSS
HANDLING AND STOWING OF THE CARGOES
6 Handling and stowing of the Cargoes

Table n°2

MARINE ENGINEERING
1 Metallurgy and Knowledge of Materials
2 Mechanical Technology
3 Thermodynamic and Heat Transmission
4 Mechanical and Hydroninamic
5 Engine Diesels
6 Steam and Gas Turbines
7 Auxiliary Marine Engineering, Electrical, Electronics and Control Installations
8 Electrical and Electronic
9 Naval Automatization
MAINTENANCE AND REPAIRING
10 Maintenance and Repairing

Table n°3

COMUN SUBJECTS FOR NAVIGATION AND MARINE ENGINEERING IN ACCORDANCE WITH STCW-78/95
1 Maritime English
2 Ship theory and Shipbuilding
3 Prevention of the Contamination
4 Maritime Safety
5 Naval Medicine
6 Transport of Dangerous Cargoes
7 International Maritime law

Table n°4

BASIC COMUN SUBJECTS TO NAVIGATION AND MARINE ENGINEERING
1 Mathematics
2 Phisica
3 Chemical
4 Grafic Espression
5 Computer

Comparing the tables n° 1 and 2, we can observe, that the difrent between navigation and marine engineering from the STCW-95, is only of five subjects from navigation to marine engineering and ten subjects from marine engineering to navigation, the remain subjects of the tables n° 3 and 4 are comuns between both careers

In the aforementioned comparation, we can see that, if we incorporate properly the five subjects from the navigation to marine engineering careers, we could get a new Master or Chief Engineer polyvalent, which will be more complete that the actuals, and his interdisciplinarity give to him more and deep knowledge of a ship and a better utility for the society.

All above is thinking and projected for students of university level that wish to get the maximum level in the Merchant Marine, and for a maximum time of study of five years divided in two cycles of three and two years or four and one year, with a total of 400 credits (one credit is equal to ten hours), in this case the student will arrive to the university with eighteen years old and will finish with twenty three years old.

The aforementioned include summer sea practice between the 3rd and 4th and 4th and 5th, and from this last one, the student will make the professional practices.

One very important things is that we are into the XXI century and we have the responsability that the Seafaring that we are preparing just now in the university, will work in the XXI century, therefore we must forget the old teaching system from the last century, that we got, the actual lecturers, and to study all new technologies advances incorporates to the ship, removing all subjects that are obsolet or only is util a little be of it, for example (celestial navigation, etc.).

Also will be convenient to give a call to the International Maritime Organisation, for to make a new revision and actualisation of the STCW-78/95, for to change the obsolete requirements of the tables A-II/1,2 and 3 and A-III/1,2 and 3, and to put it up to date.

Another very important part for the actual teaching, is the possibility to do practices of several subjects with simulators that make easier of study bettering the compression level and reducing the docent charge.

CONCLUSIONS.

If one analyse the function of the Officially of a vessel all along the XXth century, one can see that it has been progressively changing from an active role to a more passive one. In this new role, the interpretation of the data and the analysis of the situation are more required than the specific one not many years ago.

Furthermore, the quality of the material and the reliability of the installations have made that a more manual technique was not required, but an interdisciplinary formation, which covers all the sections of the vessel, that is, a polyvalent knowledge.

Nevertheless, when focusing the polyvalence it should be taken into account that the marine environment is naturally very hostile and its problems have a different dimension to the terrestrial ones. That is why it is necessary to conjugate well the different aspects of a vessel and to try to achieve a symbiosis of one to each other. In the measure that this is achieved the future will pass to the polyvalence of the Officially in a vessel.

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Information Literacy: A Framework for Developing Mariners as Lifelong Learners

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ABSTRACT

In this, the information age, there are more possibilities than ever before to be an informed professional mariner and an astute citizen of the world. In fact, businesses within and associated with the maritime industry have corporate information centers and/or are networked to take advantage of online information resources. Information such as patents, specifications, periodical articles, encyclopedias, technical or engineering handbooks, and the Internet can add tremendous value to our work and decision making processes. However are we systematically educating our students to make the best possible use of information resources during their time at our institutions and after they leave? Are our graduates in control of their learning, self directed and fluent in locating, evaluating, and using information? If not, then they are not adequately prepared to be modern day lifelong learners. More importantly, they will not have the ability needed to maintain professional skills as worldwide mariners.

Information literacy is the term used by those in higher education world wide to label that set of abilities that ensures a person recognizes when information is needed and has the ability to locate, evaluate, and use effectively the needed information. Our various maritime educational institutions should develop top-notch information literacy programs to fully equip our graduates with the abilities to be savvy consumers of information.

This paper will explore the concept of information literacy – its definition, its pedagogical and professional value, its relation to information technology. Standards of competency will be identified. Several model programs from higher education institutions will be highlighted. An institutional quotient test will also be presented to determine the readiness of institutions integrating information literacy into their curriculums.

1. The Information Age

In nearly every corner of the developed world, information is rapidly proliferating. There are more books, magazines, newspapers, newsletters, and scholarly journals being published now than ever before. Increasingly, many of these publications are available online via computer access. The online environment has also produced other unique information resources such as listserv's, web sites, Internet search engines, chat rooms, and more. Using information now is like drinking from a fire hose.

The technology of information is primarily responsible for its seemingly ubiquitous availability. Computing and telecommunications will continue to evolve to bring us untold access. We already see major developments with satellite and other wireless technologies to extend the availability of the Internet and make it increasingly less expensive. In the near future we can expect to have information at our fingertips without clunky computer workstations. We will start to see full access in the form of inexpensive hand held devises anywhere in the world – whether on land or at sea.

At the same time, much information comes to us unfiltered – particularly that which is online. This will likely be the case for quite some time. The Internet is an ungoverned and relatively open environment where anyone can publish and have their work show up on a search engine. Documents can be copied and reworked. As a result, we begin to wonder about validity and authenticity. While much information is easy to access, is it reliable?

As the Association of College and Research Libraries (2000) states, "The uncertain quality and expanding quantity of information pose large challenges for society. The sheer abundance of information will not in itself create a more informed citizenry without a complementary cluster of abilities necessary to use information effectively." Most of our workplaces and institutions of higher education do not effectively utilize the information resources available to them.

2. Definition of Information Literacy

Information literacy is a set of abilities requiring individuals to "recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information." (American Library Association, 1989). Over the years, there have been various interpretations of the breath and depth of what constitutes information literacy. Some have narrowly construed the concept to be no more than the ability to use library tools to find information. Others have taken a much broader view and have raised the intriguing idea that information literacy is "a new liberal art which extends beyond technical skills and is conceived as the critical reflection on the nature of information itself, its technical infrastructure and its social, cultural and even philosophical context and impact." (Shapiro and Hughes 1996). For most institutions of higher education that have implemented programs of information literacy, the definition adopted lies somewhere in between. Model programs (Smith, 2001) include the following literacy components:

Tool literacy - The ability to use print and electronic resources including software.
Resource literacy – The ability to understand the form, format, location and access methods of information resources.
Social-structural literacy - Knowledge of how information is socially situated and produced. It includes understanding the scholarly publishing process.
Research literacy – The ability to understand and use information technology tools to carry our research including discipline-related software.
Publishing literacy – The ability to produce a text or multimedia report of the results of research.

2. The Relationship of Information Literacy to Information Technology

It is important to understand the distinction between information literacy and information technology. They are related. Information technology skills enable one to use computers and software. Information literacy is concerned with critical thinking, information searching, analysis and evaluation of content.

Information literacy is a construct for dealing with and selectively navigating the seas of the information age. Computer technology skills are usually necessary, but so are reasoning and discernment. Information literacy is broader than computer literacy. It is ultimately about being self-directed and in control of ones learning.

3. Standards of Information Literacy Competency

Over the years standards have been developed to provide guidance in measuring competence in information literacy. Many times, individual institutions develop their own standards. However, in recent years, the Association of

College and Research Libraries has lead the way in developing model standards. Today most of the best programs look to ACRL and make adjustments based on the needs of the home institution. Many simply adopt the standards in whole. Below are the basic standards outlined by ACRL (2000):

- Determine the extent of information needed
- Access the needed information effectively and efficiently
- Evaluate information and its sources critically
- Incorporate selected information into one's knowledge base
- Use information effectively to accomplish a specific purpose
- Understand the economic, legal, and social issues surrounding the use of information, and access and use information ethically and legally

4. Model Programs in Higher Education

Australia

Learn Network, South Australia
http://www.tafe.sa.edu.au/lsrsc/learn/leadraf.html
Provides services, publications, a listserv and a web based communications hub.

Deakin University Library, Melbourne
http://www.deakin.edu.au/library/reschsk.html
Instruction and access to quality information resources.

Europe

EDUCATE, Ireland, France, Sweden, Spain, UK
http://educate.lib.chalmers.se/
A project produced by several institutions of higher education. It is geared towards developing information literacy among scientists and engineers.

Malaysia

Universiti Putra Malaysia, Selangor
http://lib.upm.edu.my/inflite.html
A course required of all first year students.

United Arab Emirates

United Arab Emirates University, Al Ain
http://www.libs.uaeu.ac.ae/
Utilizes modules to instruct students and faculty in library research.

United States

California Maritime Academy
http://www.csum.edu/library/infofluency/
A developing program consisting of course integrated assignments designed to help first year students meet the ACRL Information Literacy Standards. Course integrated assignments during the second, third, and fourth years create the opportunity for students to become more fluent in their use of information resources.

Earlham College
http://www.earlham.edu/~libr/courses/
Long considered a model program for integrating library use into the curriculum

Florida International University
http://www.fiu.edu/%7Elibrary/ili/iliprop1.html
A proposal recommending an information literacy requirement of all undergraduates

United States Naval Academy
http://www.usna.edu/Library/shipmate.htm
An example of a commitment to information literacy at a military academy

University of Washington, Seattle
http://www.washington.edu/uwired/
A highly developed, award winning program.

5. Institutional Readiness

You can encourage or develop an information literacy program at your institution. How you begin depends upon your particular environment. Take a look at the Information Literacy IQ (Institutional Quotient) Test authored by Oberman and Wilson (1998). It is the best instrument available to help you assess the readiness of your institution to integrate information literacy into the curriculum. They suggest that you consider your information infrastructure, your learning/teaching environment, the role of librarians at your institution, and the commitment to information literacy among your colleagues. When answering the questions from the IQ test, you will arrive at a score. As the excerpt below indicates, the score will help you decide upon an approach that will be most appropriate for your institution.

0–3 You are taking "First Steps"

Why not initiate a local discussion with librarians and faculty about the role of information literacy on your campus?

- Invite a librarian/faculty member from a model program to assist you in beginning a discussion.
- Identify and share some articles on information literacy.
- Check out selected Web sites on information literacy.
- Identify your regional accreditation requirements for information literacy.

4–6 You are "On Your Way"

Why not form a campus committee or utilize an existing committee, such as a teaching, learning, and technology roundtable to address information literacy?

- Define information literacy.
- Develop a program proposal for information literacy.
- Identify faculty-librarian development opportunities or propose them.

7–9 You are "Experimenting"

Why not implement a pilot information literacy program?

- Examine "best practices" at institutions similar to your own.
- Construct an assessment tool.
- Consider scalability.

10–11 You are "Full Speed Ahead"

Why not consider establishing a fully developed information literacy program?

- Provide an evaluation of the pilot program.
- Clearly articulate the goals of a fully developed information literacy program to faculty and students alike.
- Construct a mechanism for continual evaluation and renewal.

12 + You have a "Model Program"

Why not consider sharing your information literacy program as a model program?

- Give a paper at a professional meeting (e.g., AAHE, EDUCOM, CAUSE, a conference in a discipline).
- Maintain a Web site that is linked to the Institute for Information Literacy (I.I.L.) Web site.
- Publicize your success and share your experiences.

6. Pedagogical and Professional Value

Imagine our online resources, corporate libraries, and academic libraries being used effortlessly as we study or just simply think and make decisions. Consider the possible results of our work if we were so fluent in utilizing these resources that they were common place extensions of our personal knowledge base. Currently, these expensive information resources are among the last places that business people, administrators, researchers, and even students look when they need information. (Stienke, 1991). Why? Because the information environment is complex and needs to be learned.

The maritime industry is rapidly changing. So are the associated areas of transportation, supply chain management, and global trade. Innovations in technology will not slow down. We live at a time when our personal knowledge bases must evolve quickly in order to stay abreast of new advances. Many changes lie ahead. Our industry's ability to identify the need for information – to find information – to critically evaluate and make decisions with that information is key to its health and well being. We deserve to have an industry of mariners who are quick studies – who fully understand the information environment. Lets graduate mariners who are information literate.

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The Role of Leadership Training in Maritime Education

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ABSTRACT

Leadership, the ability to motivate others to think and act in a way you wish them to, should be an integral part of upper level maritime education and training (MET). The need for maritime officers to define tasks in clearly understandable terms to crews and shore-side organizations (particularly those of diverse socio-economic and cultural backgrounds) is vitally important to efficient, environmentally sound, and safe operations. Even more importantly, the ability to understand how such personnel may be motivated to accomplish these defined tasks is imperative for success, particularly at sea. Understanding the interplay of task definition and human motivation are several important skills for becoming a more effective mariner. These skills are a part of the human factors area of maritime operations and can be incorporated into maritime education.

1. Introduction

> *"It is by no means enough that an officer...should be a capable mariner. He must be that of course, but also a great deal more. He should well be a gentleman of liberal education, refined manners, punctilious courtesy, and the nicest sense of personal honor"* John Paul Jones (1775)

In his 1775 letter to the United States Congress, the man considered to be the father of the American Navy (and one of that nation's outstanding mariners) voiced his belief that an officer needed more than just technical competencies to be successful. They need much more. And in this modern day of our industry, we find ourselves caught up in the wonders of technology. Fewer people man our ships. The background, experience and culture of the crew of a vessel may be widely diverse. We often lose sight that the crewmembers are an asset, just as is the ship's propulsion machinery or its radars. Senior management is responsible for the performance of the crew, just as they are responsible for the operation of the propulsion machinery or the radars. Ship owners have little reluctance in providing equipment that will enhance the safety of efficient operation of a vessel. These same ships must also have a competently trained crew and skilled officers to lead them if it is to truly operate in a safe and efficient manner. The senior leadership of the vessel must ensure that the assets represented by the crew are used with the same efficiency and effectiveness as any piece of modern electronic equipment. As has often been stated, "Good men with poor ships are better than poor men with good ships." Ship owners are beginning to recognize that they must crew their ships with quality leaders as well as with quality equipment.

The question is where does a ship owner find quality leaders? They are not advertised in the daily flood of mail touting new equipment for their vessels. They should rightly look to the Maritime Universities that provide the seafarers of the future to provide potential leaders that have not only the necessary professional skills to be a "capable mariner," but they should have a good "liberal education." Included should be graduates who have been formally trained in the principles of sound leadership; a foundation that can be refined as they assume increased positions of responsibility.

It is quite natural for a young person just going to sea, particularly if they are ambitious, to wish to learn how to gain the requisite skills to become an effective leader as a ship's master or chief engineer. Some people are said to be natural-born leaders for whom success is foreordained. History in all of our cultures has examples of these giants of mankind. Certainly much can be learned from studying these leaders of the past. These natural-born leaders are, however, a rarity and these historical persons did not rely solely on their natural talents. They developed them through study and experience.

For the majority of us, to become effective leaders, we need to be helped; to be shown the principles and a systematic way to develop our leadership skills during our life experiences. There is no easy road to becoming an effective leader, for it demands ability, but also hard work and most importantly a high regard for justice and fairness in our dealings with our subordinates and the highest attributes of moral behavior.

2. Leadership Defined

Working definitions of leadership are many, and since by nature leadership involves human behavior, difficult to describe precisely or to be easily researched by the scientific method. Humankind does not look favorably upon research using humans as subjects when controls and experimental techniques can have detrimental effects on them or, as in this instance, the organizations in which they work. Accordingly, research on leadership is usually limited to surveys, interviews, or the study of data believed to be symptomatic of good or bad leadership with a hope of finding causal relationships. The results of this research have been, for the most part, inconclusive (Yukl, 1998). What research that has been done in some structured "experiential" manner has also been somewhat mixed and inconclusive (Day, 1971:Day & Hamblin, 1964;Farris & Lim, 1969; Gilmore, Beehr, & Richter, 1979;Hand & Slocum, 1972; Herold, 1977; Lowin and Craig, 1968; Lowin, Hrapchak, & Kavanagh,1969; Misumi & Shirakashi, 1966; Porras & Anderson, 1981; Sims & Manz, 1984; Wikoff & Crowell, 1983). A complete survey of research in leadership is beyond the scope of this paper, and the authors leave the reader to do so outside of this work. Stogdill's monumental *Handbook of Leadership: A Survey of the Literature* in 1974 reviewed nearly 5,000 pieces on leadership, and that was over 25 years ago. Given the modern industry's newfound interest in corporate "leadership" that number has tripled since.

In reviewing these and other works three factors seem to emerge in a "consensus" definition of leadership. First, leadership involves basic human relationships between the leader and follower that facilitate leading through influence. Second, the ability to clearly define and articulate tasks and to create a "vision" is important. And, third, differing situations seem to call for differing ways in doing the former two to be successful. That is to say that there is no one "right" way of leadership to apply to all situations. Accordingly, the authors offer the following definition as a basic starting point from which to design a training program:

> *"Leadership is the ability to influence others to think and act in the way one desires them to"*

The definition includes the concept of "influence" and task definition ("in the way one desires"), but leaves it implied that successful implementation of leadership is situational. By applying leadership training in various scenarios (at-sea, student activity organizations, athletic teams, etc.) it becomes obvious to students that the choice of skills to employ will vary according to the situation. Accordingly, in designing a training program one can concentrate on two primary areas, that of motivation and that of being able to create clear task definitions or an inspiring vision. Focusing on these two leadership concepts can provide a basis upon which to build a leadership program at an institution.

3. Leadership Versus Management

Before progressing towards a model it may be useful to explore leadership as it relates to management. There are differing opinions as to how leadership differs from management, if at all. It seems obvious that some leaders are effective motivators or excel in forging an inspirational vision while being ineffective in coping with the day-to-day operations of an organization. It is also clear that some managers do not exhibit any ability to persuade people to achieve in any area other than one they have been given authority over by some outside power. Few researchers have ever indicated that managing and leading are equivalent. Most agree that they are qualitatively different and some believe that they are mutually exclusive. Those in the latter group think that managers tend to get people to do things efficiently and tend to be oriented towards the status quo while leaders tend to be innovative and marshal consensus in a group to work toward those efforts, usually framed in a vision for the future. For example, Bennis and Nanus (1985, p.21) proposed that managers do things right while leaders do the right thing and imply that the two are very differing activities.

Bass (1990), Hickman (1990), and Kotter (1988) are among those who feel that while for the most part involving different processes, it is not productive to view managers and leaders as specifically different types of people. There are many examples of people who could both manage and lead. To view one person as a leader and another as a manager may be too simplistic a view of the world and presumes that once labeled as one or the other, it may be impossible to function, or train otherwise.

The authors embrace the view that they are both complex human activity that can be mastered by the same person and that may have interconnecting skill sets attributable to them. Accordingly, the skills commonly related to management (planning, organizing, controlling, communicating, etc) are a part of the leadership training model to ensure a more inclusive program for the student.

4. Motivation

As mentioned, motivation is one of the two primary aspects of the working definition of leadership. Getting people to move, act, think, etc. has been the topic of many theories and is deeply imbedded in how one views some basic questions on mankind. Are people fundamentally good or evil? Are they active or passive beings? Are human traits and behaviors inherited or learned? Your answers to these questions may well form the foundation of your beliefs as to how people may be motivated. For example, if one believes that if left alone people will not work for the overall good of the group you will erect specific and rigid boundaries for acceptable behavior as a part of getting people to achieve. Or if you believe that people are passive you will need to provide constant stimuli to get things accomplished. And if you believe that human traits and behaviors are predominately inherited, then there probably is no need to train individuals at all, just define the criteria for leadership, assess students as to whether they meet them and then label those that do as "leaders".

What is important to a model for training students in leadership (and management) is that the institutions decide which assumptions and theoretical approaches are to be the bases for the program. There are many to choose from and can be found not only in the literature on leadership, but in theology, philosophy, sociology, psychology and any other field that may help define your culture and beliefs about what motivates human beings. It is vitally important, however, that the institution go through the process of defining theoretical beliefs in order to provide a leadership training program with a firm foundation from which to operate. Whether you choose the "self actualizing" hierarchy of Maslow's (1954) needs, French and Raven's (1959) power taxonomy, the teachings of Mohammed or Budha, or McGregor (1960) and Ouch's (1981) assumptions of X, Y, or Z people types, the institution needs to decide on what it believes moves people to action, to be motivated, and build the program from there. As there are differing beliefs from country to country, from culture to culture, from gender to gender, etc., this paper will not advocate any particular motivational theory. Rather, we advocate that you develop or adopt one as a basic step in developing leadership training, and recognize that in today's' maritime world future mariners will encounter great human diversity that must be accounted for in adopting a personal leadership style. The understanding of diversity, cultural or otherwise, must be a part of any effective leadership training program at maritime universities.

5. Task Definition and Vision

To clearly define a task requires an ability to understand the nature of the work being attempted and the objective desired, as well as an ability to effectively communicate with people. To describe the skills needed to create and relate a compelling and inspirational vision is more difficult. They appear to be a joint product of experience, personal commitment, dedication to a set of values, intuition, and circumstances that create a "window of opportunity" for change (Bennis & Nanus, 1985). It is essential to have a good understanding of the organization or social group, it's culture, and the underlying needs and values of those you wish to lead. Rarely are visions created through the sole efforts of a single person. Rather, they are the formed from the contributions of many over time through discussions, from exploratory activity, and the refinement of ideas that emerge from such efforts. From leadership research, theoretical thought, and practitioner insights Yukl (1998, p.446) provides six useful guidelines to help in the formation of "visions". They are:

1. Involve key stakeholders – *they must be supportive of your efforts*
2. Identify strategic objectives with wide appeal – *developing shared values for the group*
3. Identify relevant elements that already exist in the "old"- a *link to traditional values can be effective in transitioning to the new*
4. Link vision to the core competencies of the group – *people must be convinced that no matter how hard realizing the vision may seem, it is not outside the realm of possibility*
5. Evaluate the creditability of the vision – *be prepared to successfully defend it*
6. Continually assess and refine the vision – *as time changes the world, visions may have to adapt or credibility may be lost*

In essence, task definition and "vision making" require critical thinking skills, effective communication skills, the ability to understand and share the culture of those the vision is meant to be for, and an awareness of the need to constantly re-evaluate credibility.

6. The Ingredients of a Model for Leadership Training

We have identified the two major skill and knowledge areas that need to be incorporated into a model for a leadership program. Students need to become versed in a) motivation techniques and b) task /vision definition. The former may vary somewhat from culture to culture and each institution must identify the motivation criteria it wishes students to be familiar with. The latter have been more specifically defined above and do not change significantly between institutions of the world (in particular, there has been much new research done on critical thinking skills that can be used). After the desired skills and knowledge are identified, the methodology to be used to develop students in them should be chosen.

Three categories of learning activities at maritime universities are suggested as methodologies. The first is the traditional classroom curriculum, the second is special training programs, and the third is experiential learning opportunities. All are inherent in most models of traditional maritime education and, therefore, make instituting a leadership development program less daunting there than at many other types of institutions of higher education. They do, however, have differing roles to play in providing leadership skills and knowledge. The authors' suggest the following as a guideline for selecting when to use which:

Desired Outcome		Methodology
Knowledge	------------------->	Informational Activity
Skill	-------------------->	Training Activity
Experience	------------------>	Experiential Opportunity

When knowledge is desired, as in concepts of motivational theory, cultural awareness, etc., the traditional methodologies of information transfer seem appropriate. This usually takes place in the formal academic curriculum of our institutions. When skills need to be learned, training methodologies are often developed and applied to help students learn and perfect the skill. When experience is needed to better understand the application of knowledge and skills, practical experiential opportunities are usually provided to the student. Take for example, the need for maritime students to understand certain emergency procedures. They will take classes to acquire the knowledge of when abandoning a ship may be necessary, then be trained in lifeboat and survival techniques, and finally be offered the opportunity to participate in abandon ship drills to better understand the reality of the whole evolution. It should be understood, however, that despite being fundamentally different, there is overlap in these three methodologies. They are not meant to be mutually exclusive activities, but rather to reinforce one another to provide an effective learning paradigm.

What is suggested is that institutions try to identify which outcome is to be focused upon in which methodology, and supported in which other(s). In so doing, a tentative master plan of leadership development will emerge than can be used as a blueprint or map for implementation.

7. The Maine Maritime Academy Program

7.1 Planning and Design Phase

1984 Maine Maritime Academy made the decision to institute a planned program of leadership and management training. The Academy hired a faculty member to teach economics and management and to design and implement a program to develop leadership and management competencies in students. A local steering committee was formed to help develop an action plan for designing a program. In summary, the action plan began with simultaneously conducting a literature review, holding a series of focus group discussions with industry leaders, and making visitations to institutions that had existing leadership development programs. The purpose of these activities was to gather a list of skills, knowledge and attributes believed to be related to leadership (including the adoption of a motivation model), create a list of definitions in order to create a shared vocabulary, and to compile a list of "best practices" being used.

In the middle of 1985 those tasks were completed and the steering committee proceeded to align skills and attributes with the best practices discovered from the visitations. In addition, the committee created an ideal "chronological order" for skills, knowledge, and attributes to be taught and practiced. From that ideal plan a program was designed that utilized existing curricula and training activity, identified any new courses and activities needed and estimated the costs of implementing the program. In 1986 a cost feasibility study was done and the "ideal" program readjusted to account for the reality of resource availability. That year implementation of the program began. However, the full implementation of the program described below was not completed until the 1995-1996 academic year.

7.2 The Program Today

In designing the program the Steering Committee used the methodology schema describe in part 6 above. Skills, attributes, and knowledge were identified and scheduled to be addressed in curricular coursework (including laboratories), specific training programs, or structured experiences. The committee in an earlier phase had already adopted a theory of motivation that placed primary emphasis on task achievement, recognition of success, autonomy (being responsible) and the attraction of the work itself as motivating criteria. Accordingly, for this program to be effective, those criteria had to be in place if students themselves were to be motivated to learn leadership. In addition, it was recognized that any lack of clear structure to the program, or uncaring instruction, or any lack of trust in relationships between students and staff would inhibit student motivation for leadership development. Accordingly all program activities were undertaken with these principles in mind. They are considered key to a successful program.

Unfortunately, a full description of the program at Maine Maritime Academy would take more than the space allowed for this paper. Therefore, the program will be only outlined except where special mention is warranted.

7.3 Academic Curriculum

Maritime students are required to take courses in written communication, a specially designed set of courses that explore different cultures through the humanities, and several courses that explore human behavior as individuals and in groups. A "Writing across the Curriculum" program also infuses significant writing in other courses within their major fields of study. Likewise, oral communications and questions of ethics are infused into both maritime concentrations. Engineers are also required to take a management course and a technical writing course as part of the curriculum. These courses particularly address the skills needed in task definition and creating a vision, including critical thinking.

7.2 Special Training Programs

A program titled "Personal Development" was created that required students to meet one hour per week, similar to a class, in small groups to discuss a variety of issues deemed important to officer development but not often found in coursework. Included in these classes were concepts of management and leadership that were scheduled to be addressed during the times in their four year training that would make them pertinent to the particular stage of education and training they were in. For example, cultural awareness was addressed just before students embarked on their annual international cruises. Leadership principles and group exercises are addressed as the third year students begin to assume leadership roles in the student body. Guest lecturers are used as well as institutional staff.

All students participate in a weeklong orientation program when they first arrive at the academy. Among other issues, students are trained in teamwork, confidence building, "followership", and fundamental human relationship skills. In addition, all students who are chosen for leadership roles in the Regiment of Midshipmen, as cadet leaders on board the training vessel, as residence hall managers, student orientation leaders, or peer counselors are given special leadership and management training before assuming their responsibilities. Most of these programs are initially a week long with follow up training occurring periodically throughout the year, sometimes with student leaders from other institutions in order to share experiences and best practices.

7.3 Experiential opportunities

Many experiential opportunities were already in existence when the Steering Committee first began its deliberations. Those experiences, however, were not linked to any education and training other than the on-the-job learning that took place. If students developed leadership, it was ad hoc learning, almost accidental and certainly not by design. The Leadership and Management Program aligned those experiences with academic curriculum and training programs specifically designed to help students maximize the benefit of experience.

Experiential learning opportunities in leadership include positions in the student regimental organization, the ship management organization, residential managers, athletic teams, student clubs (over 10), the orientation program, the Regimental Training Program (a year long program training first year cadets), Presidential Guides (a student public relations group), the band, the drill team, academy-wide committees, and the watch system. Students are prepared for these activities through classes and special training programs.

Of particular note is the annual training cruise where upper-class students must mentor an underclass student for the entire cruise, and where those most senior must train and evaluate the performance of students junior to them. Those seniors are graded not only on how they performed technically on their watch but as John Paul Jones stated, "a great deal more". They are graded on their ability to manage and lead others as an integral part of being an officer.

Lastly, students are recognized for their experiences through a set of awards that students are allowed to wear on their uniforms (ribbons) or frame to hang on a wall (certificates). These awards are made at an end of the year banquet and publicized.

8. Summary

It is important that maritime officers have the ability to create safe and efficient voyages. They cannot do so alone, but must depend on others to perform in the way the officer wants them to. Exercising knowledge, skills, and understanding to motivate others is leadership. Although difficult to specifically define or scientifically research, enough is known that maritime universities can design programs for future officers that introduce them to leadership in a structured way. Such a design requires analytical thinking about what to include in such a program, effective methodologies to help students acquire the critical skills and knowledge identified, and resources to implement the program. It is hoped that this paper has provided some guidance in so doing.

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Maritime training and research activities using a high-tech training ship "Fukae-maru"

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Abstract

The Sea Training Center of Kobe University of Mercantile Marine is a unique Center, which provides students with opportunities of research on maritime affairs and instruction in seamanship skills utilizing the training ship and the small vessels. The Fukae-maru is a 449GT's training ship belonging to the Sea Training Center, and is a high-tech training ship equipped with modern apparatus for navigation and a data processing computer with Local Area Network (LAN) system connected with optical fiber for collecting data relating to navigation and engine conditions at sea as well as in port. Therefore, she has been used for onboard training to undergraduate students as an ordinary training ship and for research activities on safety navigation, effective operation and environmental protection to graduate students and academic staff as a floating laboratory.

The details of the short-term training programs using the Fukae-maru are introduced and the advantages of the training curriculum over other training methods are discussed in this paper. The authors also introduce research activities, which have been carried out on the Fukae-maru. As a summary of this topic, the effective use of such a high-tech training ship not only for onboard training but also for research activities is discussed and proposed to achieve the main purpose of maritime universities over the world, which is shown as a slogan "Safer shipping and Cleaner oceans".

1. Introduction

Kobe University of Mercantile Marine (KUMM) has been established on 26th May 1952. The purpose of establishing KUMM is to provide students with a good knowledge of theories and technology required especially in the field of marine science and engineering, and to instill high intelligence and rich culture into the students so as to enable them to contribute to the development of sea transportation and other marine industries.

The Fukae-maru has been taken an active part in the history of KUMM. The present Fukae-maru corresponds to the third generation being counted from the founder. She has been built in October 1987, and she is now 14 years old.

The highly developed technology and equipments have been adopted in the Fukae-maru for the purpose of education, practice, training, investigation and research. Then these facilities have taken an active part now and have contributed very much. In this paper, the recent activities of the Fukae-maru are introduced, and the ideal image in the future of her as a training ship, which belongs to KUMM, is discussed.

2. The Principal Particulars of the *Fukae-maru*

Owner: Ministry of Education, Culture, Sports, Science and Technology
User: Kobe University of Mercantile Marine
Belonging: Sea Training Center, KUMM
Delivered: 14th October 1987
Builder: Mitsui Engineering & Shipbuilding Co., Ltd., Tamano Works, Japan
Kind of ship : Training ship Type : Twin decks Flush decker
Plying limit : Greater coasting service, Class : JG
Gross tonnage: 449 tons, International gross tonnage: 674 tons

Loa : 49.95m, Breadth : 10.00m, Depth : 6.10m/3.75m, Draft : 3.20m
Main Engine : Diesel 1,100KW×1, Engine Room M0 qualification
Propeller: 4 bladed CPP with anticlockwise turn
Service speed : 12.5 Knots, Cruising range : 3,000 Nautical miles
Complement : 64 Persons (Captain and Crew 12, Professor 4, Cadet 48)

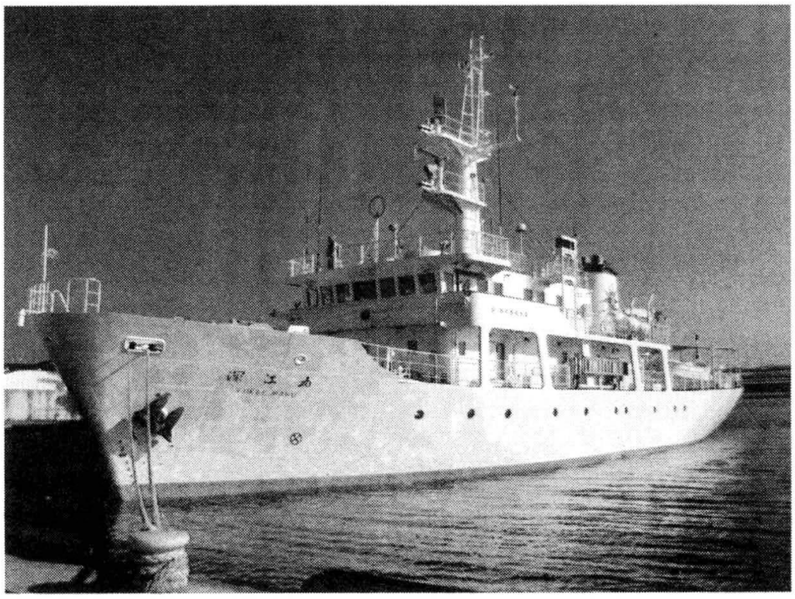

Fig.1 The Fukae-maru berthing at the mooring pond of KUMM

3. Sea Training Center

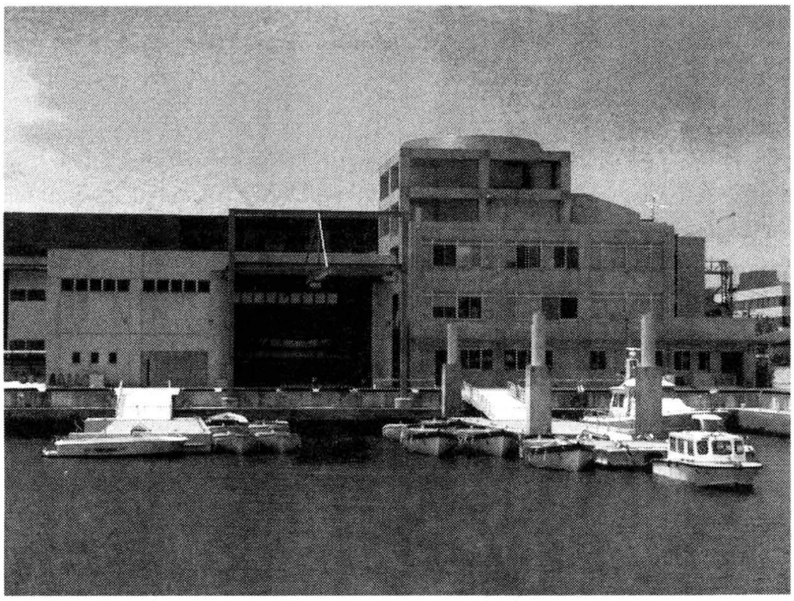

Fig.2 The Sea Training Center of KUMM

The Sea Training Center has been established in May 1983, and been refurbished in 1997 to research and to instruct about maritime affairs of the university as a superlative degree of maritime training organization which Japanese Government admitted. Therefore, the role of the Sea Training Center is never to aim the course concerning seafarer's qualification, and this Center is peculiar facilities for the students of KUMM.

The purpose of establishing the Center is as follows.

① Administer the training ship and the other small vessels of KUMM

② Management of each practice facilities around mooring pond
③ Execution of boat seamanship and ship management practice provided in curriculum
④ Research and instruction in seamanship skills on maritime affairs

Training ship "Fukae-maru", training boat "Hakuo" and "Muko-maru", cruising yacht "Kleiner Berg", cutters etc. belong to this Center. In addition, there are Ship Handling Simulator, Radar Navigation Simulator, Rope Work Exercise Room and Marine Communications Exercise Room as attached training equipment for students. Moreover, there are cutters, yachts and boats as student's club activities.

4. The results of service of the Fukae-maru for one year (1st. April, 2000 ~31st. March, 2001)

The days of service of Fukae-maru of the previous year were 112 days. Besides this, there are a lot of lecture and handling practice of navigation instruments onboard, and visits. However, these are not counted on 112 days. The number of people who visit Fukae-maru berthing at the pond of KUMM exceeds 700 for one year.

4.1 The purpose of the activity and days of service

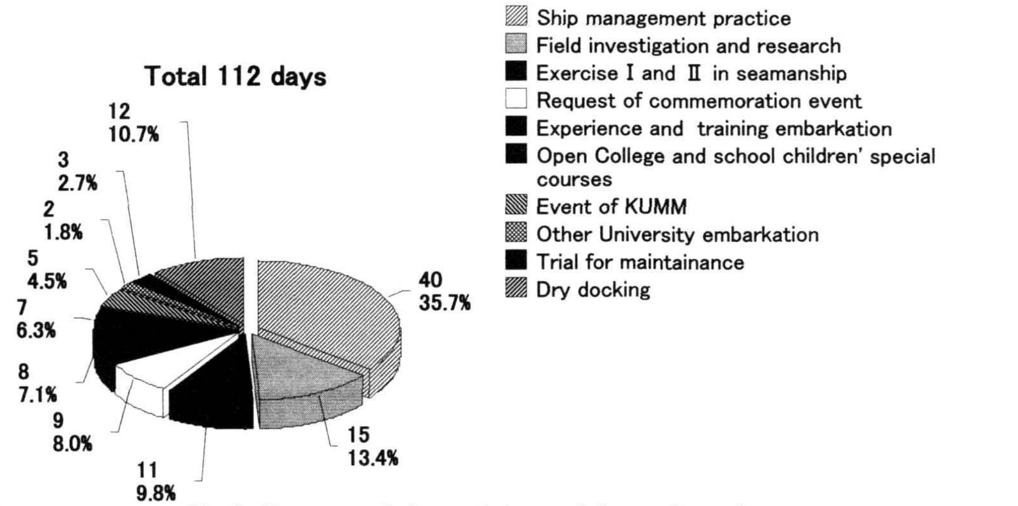

Fig.3 Purpose of the activity and days of service

4.2 The total number of person onboard

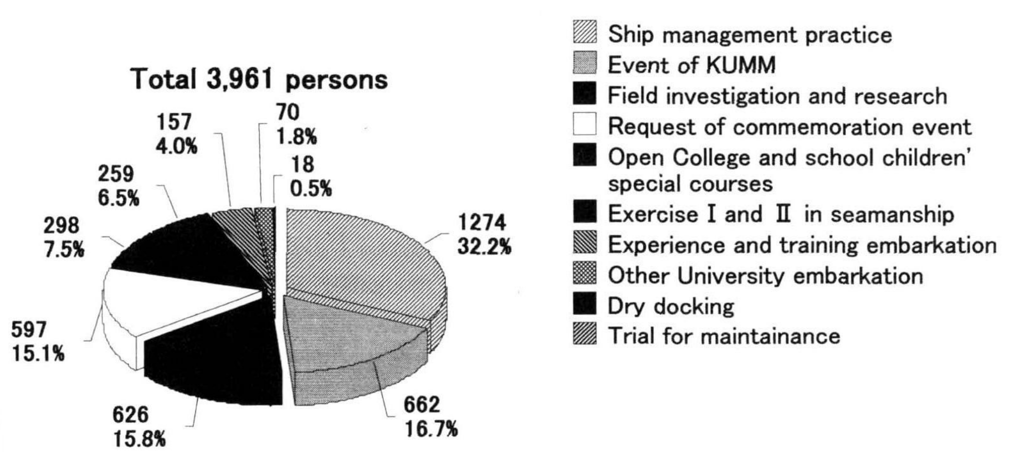

Fig.4 Total number of person onboard

4.3 The classification and percentage of person onboard

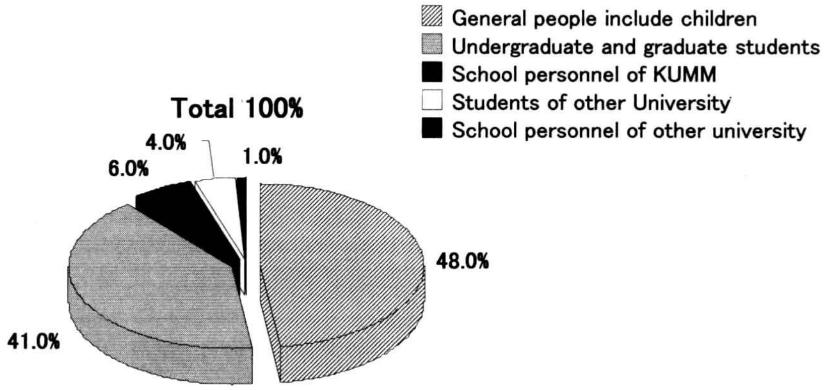

Fig.5 Classification and percentage of person onboard

5. Short-term training program of the Fukae-maru

The four departments are prepared in the faculty of KUMM.

① Department of Maritime Science
  Nautical Science Course
  Marine Engineering Course
② Department of Transportation & Information Systems Engineering
③ Department of Ocean Electro-Mechanical Engineering
④ Department of Power Systems Engineering

Maritime license of deck officer or engineer is classified into the six classes respectively. The curriculum of Department of Maritime Science is organized to meet the third grade deck officer or third grade maritime engineer licensing requirements. The student who hopes for the acquisition of the maritime license can take a national examination after completing the on-board training, described later. The on-board training is done with the large-scale, ocean going, training ships of National Institute for Sea Training, Independent Administrative Institution, Ministry of Land, Infrastructure and Transport. The above-mentioned students must complete on-board training I of 3 months and on-board training II of 3 months by graduation of the faculty. Then, they proceed to the Sea Training Course of 6 months to get the 12 months' embarkation career for the license. The fleets of training ships are shown below.

① Ginga-maru 4,888 GT's, Loa 115m, Diesel engine 4,560KW 1set, Cadets 180
② Seiun-maru 5,884 GT's, Loa 116m, Diesel engine 7,723KW 1set, Cadets 180
③ Hokuto-maru 5,877 GT's, Loa 125m, Steam turbine engine 5,148KW 1set, Cadets 160
④ Taisei-maru 5,886 GT's, Loa 125m, Steam turbine engine 5,148KW 1set, Cadets 140
⑤ Nippon-maru 〈Tall ship〉 2,570 GT's, Loa 110m, Diesel engine 2,206KW 2set, Cadets 120
⑥ Kaiwo-maru 〈Tall ship〉 2,556 GT's, Loa 110m, Diesel engine 2,206KW 2 set, Cadets 130

The university is taking charge of the practical education in navigation, ship handling, seamanship, marine safety, communications, navigational aids and maritime regulation etc., excluding the embarkation career, demanded as a superlative degree of maritime training university in Japan. To enhance the content of the practical education for the students more, and to make the understanding deepened, an experiment and a short-term training program onboard the Fukae-maru are executed. The students other than department of marine science need not acquire maritime license, therefore, the on-board training is not imposed. However, ship management practice or the experiment onboard the Fukae-maru has been imposed at the third school year in consideration of the viewpoint by which abundant education talent is promoted about maritime affairs.

5.1 Nautical Science Course, Department of Maritime Science

5.1.1 Ship management practice I -1 <at the first school year : 2 days>

This onboard practice is the first time experience for freshman of undergraduate. Students experience the works such as watchkeeping, leaving and entering port, anchoring and watch on deck as an initial introduction for various onboard practices, which will be developed in the future. The urgent drill such as boat station and fire station is done; moreover, the students experience various stations, which relate to the service of the ship. Basic posture concerning the maritime affairs and seamanship skills, which will be needed, is acquired. And they train the natures such as cooperation and seamanship through the life and joint work onboard.

The main content of ship management practice I -1

Attention and information of onboard practice, Deck and engine watchkeeping, Steer handling experience, Visit of narrow channel, Emergency station drill, Handling of fire fighting apparatus and lifesaving appliances, Visit of anchor work, Visit of work on leaving and entering port, etc.

5.1.2 Ship management practice I -2 <at the second school year : 2 days>

Students deepen knowledge concerning maritime affairs by investigating and reporting the problem about the ship equipments and structure, maritime regulations and marine traffic regulations.

The main content of ship management practice I -2

Investigation of equipments of the ship, Deck and engine watchkeeping, Visit of narrow channel, Emergency station drill, Handling of fire fighting apparatus and lifesaving appliances, Anchor work, Work of leaving and entering port, etc.

5.1.3 Ship management practice I -3 <at the junior : 2 days>

Ship maneuver and anchoring work are executed in individual or the team. Two buoys are set up about 1.5 nautical miles apart, then student's practice approaching to the buoy and leaving using main engine with controlling the ship. This practice is the summary of ship management practice I .

The main content of ship management practice I -3

Ship maneuver with controlling main engine, Deck and engine watchkeeping, Visit of narrow channel, Emergency station drill, Handling of fire fighting apparatus and lifesaving appliances, Anchor work, Work of leaving and entering port, etc.

5.1.4 Ship management practice II <at the senior : 4 days>

As a summary of the faculty education concerning maritime affairs, and inspection of knowledge such as ship management and the seamanship skills, ship management practice II is executed. Passing through the inland Sea, the improvement of the ability demanded by the deck officer in charge is aimed at. Ship maneuver and anchoring work are executed in individual or the team. The program of this practice encourages the students to develop their leadership for a captain.

The main content of ship management practice II

Ship maneuver and anchoring, Navigation schedule planning, Deck and engine watchkeeping, Narrow channel passing, Emergency station drill, Handling of fire fighting apparatus and lifesaving appliances, Anchor work, Work of leaving and entering port, etc.

5.1.5 Exercise I and II in seamanship <at the junior 2 days, senior 1 day>

Students have exercise I at the latter term of the junior and exercise II at the first term of the senior. Man-over-board maneuver and Z trial maneuver are done by changing various elements. Then students report the analytical result based on the acquired data with a report of the control characteristic of CPP ship. Work of leaving and entering port and practice of the operation of the navigation equipment are done at the same time.

5.2 Marine Engineering Course, Department of Maritime Science

5.2.1 Ship management practice <senior 4 days>

Students embark the Fukae-maru as a summary of the knowledge learnt by a lecture and a current practice. First, they practice main engine and auxiliary engine operation for two days onboard the Fukae-maru of the university pond and understand the structure and function of them. Then, they have a four days onboard practice to understand an overall engine plant as a summary of ship management practice.

The main content of ship management practice

Engine and deck watchkeeping, Main engine and auxiliary engine operation, Visit of narrow channel, Emergency station drill, Handling of fire fighting apparatus and lifesaving appliances, Anchor work, Work of leaving and entering port, etc.

5.3 Laboratory in Transportation System Science II, Department of Transportation & Information Systems Engineering 〈junior 4 days〉

Students understand the outline of the service of the ship, and do various experiences onboard besides the watchkeeping, steer handling, etc.

The main content of Laboratory in Transportation System Science II

Attention and information onboard, Watchkeeping experience on deck, Steer handling experience,
Visit of narrow channel, Emergency station drill, Handling of fire fighting apparatus and lifesaving appliances, Visit of anchor work, Visit of work on leaving and entering port,
Investigation of ship equipment, Harbor investigation, etc.

5.4 Department of Ocean Electro-Mechanical Engineering and Department of Power Systems Engineering

5.4.1 Ship management practice 〈junior 4 days〉

Students understand structure of engine, the basis of the operation of main engine and auxiliary engine, and the engine plant through the practice. Then they understand the outline of the service of the ship, and do various experiences onboard.

The main content of ship management practice

Attention and information onboard, Watchkeeping experience on engine and deck,
Main engine and auxiliary engine operation, Steer handling experience,
Visit of narrow channel, Emergency station drill, Handling of fire fighting apparatus and lifesaving appliances, Visit of anchor work, Visit of work on leaving and entering port, etc.

6. Other activities

6.1 Investigation and research cruise

The investigation and research cruise is executed in season of spring and summer. A lot of students and researchers participate from other universities and research laboratories to this cruise besides that of KUMM. The cruising period is for about 4 days in spring, 9-10 days in summer. The area of activity is decided according to the content of the theme of investigation and research.

6.2 Commemoration or request cruise, experience embarkation

Openings to the public and experience embarkation are executed in cooperation with such as maritime organization of Hyogo prefecture and Kobe city for a day to 3 days. At this time, the enlightenment activities are done to the public includes children about the protection of oceanic environment, the importance of the sea and marine transportation.

6.3 Training onboard

Onboard training is executed for the new instructor and staff, staff group, research group of KUMM and for various research groups outside.

6.4 Open college, Experience embarkation for children

The open college is executed for the man and woman more than the high school student for 4 days to 10 days depending on the theme of the course. Moreover, experience embarkation like a summer school and summer seminar is executed for the school children for a day to 2 days.

6.5 Event of KUMM

The experience embarkation for new undergraduate students and general person at the University festival is executed.

6.6 Training onboard of other university

The ship training is executed for the students of Department of Engineering of Kobe University and University of Osaka Prefecture for 2 days to 3 days.

6.7 Trial run

The trial run is done at least once every week when there are neither various practices nor experiments. The check and the maintenance of main engine, auxiliary engine and various ship equipment are done at this chance. In addition, the preparation for various service which will be done in the future and ship maintenance are done while berthing at the mooring pond of KUMM.

7 LAN systems as a floating laboratory

One of the features of the Fukae-maru is having a data processing room, which conveys not merely data from the apparatus through LAN system using optical fiber to a microcomputer, but also remote control signals to each equipment, thus making it possible to perform experiments, research and survey through this data processing system. In addition to that, a large number of apparatus and systems with the latest electronics technology are adopted. This kind of ship with such a system is called a "high-tech ship", and is expected to answer the needs of the new era and solve any problems, which might arise in the course of the students' training, experiments and research, as well as instructors'. The LAN system of the Fukae-maru can be collected about navigation information, main engine and auxiliary engine information, ship maneuver information and oceanic weather observation information. Moreover, a display, a record and an analytical function of the recorded data are possessed. These are composed of the main device set up by the data processing room and data input-output, display device set up in a fixed place. Necessary data can be collected 0.1-second cycle in high-speed system when experiment, research and investigation are carried out.

7.1 Number of measurement points

A lot of measurement points shown as follows are prepared.

① Navigation system: 23 points (Time, Heading, Ship speed, Lat., Long., Wind, etc.)
② Integrated radio navigation: 12 points (Time, Lat., Long., Ship course, Ship speed, etc.)
③ ARPA and RADAR: 198 points (Own ship's and Target's Course, Speed, Azimuth, Distance, etc.)
④ Navigation log: 7 points (Ship course, Ship speed, Wind, Engine revolution, Telegraph instruction, etc.)
⑤ Track plot: 8 points (Time, Lat., Long., Turning ratio, Distance run, etc.)
⑥ Engine control system
  Main engine thermal efficiency calculation: 5 points (Fuel flowing quantity, Shaft horse power, etc.)
  Monitor of temperature for data logger: 9 points (Main engine exhaust, etc.)
  Warning: 177 points (Main engine and auxiliary engine)
⑦ Environment system: 33 points (Lat., Long., Current, Temperature, Depth, etc.)
⑧ The weather trend: 8 points (Time, Lat., Long., Depth, Wind, etc.)

7.2 Other functions

Connection with campus information network

8. Investigation and research done recently using Fukae-maru

Researchers and students in various fields use the Fukae-maru. And various experiment, investigation and research are done.

The research themes done recently are shown as follows.

- Observation of the greenhouse effect gas in air and sea water
- Observation of flow structure under the sea water of Osaka Bay
- Observation of microorganism and physical observation of surface sea water
- Measurement of optical characteristic of aerosol in sea area
- Measurement of the sun radiation
- Performance evaluation experiment of new type hybrid fender with oil mechanism
- Performance evaluation experiment of the device of movement prevention on ship berthing
- Experiment of new type oil curtain expansion for oil spill of the ship
- Research on arrangement of control button of ARPA and RADAR panel
- Collection of radar reflection in the area of Seto inland sea for education
- Measurement of sinking volume from sea water level of a man who fall into the sea
- Measurement of sea water level of the midship of hull side in high waves
- Research on human factor about duty officer on watch
- Measurement of sight function of duty officer on watch
- Action record of eye movement of duty officer on watch

- Measurement of human body reaction when ship in shake
- Evaluation of the usability of wheelchairs in oscillatory environments
- Basic experiment of data acquisition and transfer system for ship navigation using IP network
- Basic experiment concerning ship operation management system which uses IT
- Performance evaluation of new navigation system with ECDIS
- Development experiment of embarkation person's monitoring system of a ship
- Evaluation experiment of anti-fouling paint of a ship
- Application experiment for anti-fouling paint of a ship using biodegradable high molecule compound
- Investigation of marine traffic in narrow channel
- Basic experiment of wind power generation of the ship under way
- Generated electric power supply from ship to land
- Performance experiment of ship propulsion on passing year's change
- The relation between shaft horsepower and ship speed
- Basic experiment of forecast system of ship movement
- Research on monitor technology of combustion pressure of diesel engine
- Measurement of diesel exhaust element by optical penetration method
- Experiment of electric propulsion by shaft generator of a ship
- Construction of ship support medical network by training ship

9. Vision for utilizing the Fukae-maru

The area where Fukae-maru acts mainly is Seto Inland Sea, which is called "Setonaikai" in Japan. This is the waters of about 240 nautical miles from east to west, 10-30 nautical miles from north to south enclosed by the Honsyu, Shikoku and Kyushu is dotted with a lot of large industrial zones and is abundant fisheries of the fishery resource. For this situation, not only a domestic and foreign merchant vessel but also it is crowded with the fishing boat and fishing gears day and night. Moreover, the narrow passing waters enclosed by islands such as Akasi straits, Bisan Seto passages and Kurusima straits range there. This water is under a peculiar weather condition and sometimes becomes a severe condition such as dense fog and rough sea according to low-pressure passing. Therefore, a mental tension is always compelled for the captain and duty officer on watch for the safety service of the ship. Students can inspect the knowledge and skills of seamanship acquired by the current university education while doing various experiences in each scene through onboard practice. Besides this, participating in the investigation and researches concerning an ocean and the ship, etc. while using the ability, which she can have as floating laboratory, is an important mission. In addition, it is also important to open to the public and to hold experience embarkation for young generation in cooperation with the municipality and the schools etc. in region, and to do the enlightenment activity about maritime affairs and the marine transportation. The authors will propose that she should positively develop the next stage of effective activity for contribution to the society while maintaining the type of ship originally as a training ship of Kobe University of Mercantile Marine in cooperation with another universities, research laboratories and enterprises etc. related to maritime affairs in the future.

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Maritime Education and Training - the future is now!

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ABSTRACT

Maritime education and training (MET) is, of course, but one sub-set of the wider education and training system in general and, as such, MET providers must be cognisant of both current educational practices and the wider environment within which education operates. To some extent MET is still coming to terms with the changes brought about by STCW 95 however, emerging shifts in education in general pose even greater challenges for educators and MET providers alike.

Following a brief review of the current approaches to the provision of MET the paper suggests that the changes which have occurred to date are relatively minor compared to the major changes which are beginning to sweep through the practice and provision of higher education in general.

Education is rapidly becoming globalised, massified and increasingly treated as a commodity. Each of these issues is examined before detailed consideration is given to the implications for both educators and providers of maritime education and training.

Following the detailed consideration of the implications for MET the critical issue of how to turn these challenges into opportunities is examined and some solutions are postulated. These solutions provide some insights into how MET could create its own future.

The paper concludes that if the providers of MET do not start developing their own future in a coherent, structured and systematic way then others will impose it on them. MET providers will then, again, be faced with a situation similar to STCW 95 where educational change was imposed leaving the MET providers to deal with the positive and negative aspects of the imposed changes.

1. Introduction

The adoption of STCW 95 has already caused significant changes in the way maritime education and training providers go about their business. Courses have been redesigned, quality systems put in place and approval from the marine administration to provide training obtained. These changes have, essentially, been imposed upon training providers and in many cases this is deservedly so. By forcing providers to concentrate on what graduates should be able to do versus what they should just know a greater emphasis on the educational process, pedagogy, is occurring. This is but the tip of the changes with which maritime education and training providers will have to grapple. The whole of education is undergoing change with much of the change being driven by the seemingly unstoppable force of globalisation, the exponentially growing force of the internet, and the inevitable force of commercialisation. Educational paradigms are rapidly changing and it is therefore critical for the survival and growth of maritime education and training that these changes are fully understood so that the decisions on how best to meet these changes are made in an informed way.

2. Education, Training and STCW 95

Maritime education and training has traditionally focused on preparing students to become seafarers and, in the case of cadets and officers, providing courses of study aimed at assisting them to gain a certificate of competency/licence. During the 1960's/1970's a move towards a more academic approach became discernable with two distinct avenues emerging. One approach, adopted in countries such as Australia and UK, was to integrate certificate of competency studies into sub-degree courses and offer broader and deeper studies at degree and post-graduate level for those who chose to further their studies. The other approach, adopted in countries such as Japan and USA, was to incorporate certificate of competency studies into bachelor degree courses which provided broader studies than that required for the certificate of competency alone. Additionally, some countries such as Singapore and Malaysia continued the traditional approach of providing courses of study aimed entirely at gaining a certificate of competency.

Then along came STCW 95 which can be seen as an indictment of maritime education and training worldwide.

> *"We consider ourselves to be professionals. We get our institutions quality assured. We consider we produce safe, well trained seafarers. But on a range of objective measures many maritime education and training institutions have failed. Failed that is to produce safe, well trained seafarers. In short we have failed to act effectively. STCW 95 bears witness to this failure as it is not just about the competence of seafarers, it is also very much about the competence of those of us who educate and train seafarers as well as the institutions in which we work."* (Lewarn, 2000a)

As professional educators we should be ashamed that it has taken an international convention to drag maritime education and training into the world of modern educational practice. STCW 95 emphasises that education and training outcomes must focus on what the learner is able to do rather than just what they know. This approach is not new to educationalists but just ask yourself why it is that so many countries and their maritime education and training institutions have experienced difficulties in adopting the STCW 95 competency based approach to learning. (Lewarn, 2000b). For those maritime education and training institutions where certificate of competency studies are incorporated into bachelor degree courses there is evidence eg Nakazawa (2000) and Zec et al (2000), of a real conflict between the academic approach and the competency based training approach. Anyone really involved in education should recognise that the approach adopted in STCW 95 is a reflection of criterion referenced training, which was in vogue in the 1970's, and competency based training, which is currently in vogue. (Lewarn, 1997). Are we so involved in the technical and research issues associated with maritime education and training that we neglect the fundamentally critical educational issues?

Perhaps of equal concern to maritime education and training professionals should be the fact that STCW 95 is a change imposed by regulators on educators. Whilst it is hard to deny the right of the regulators to determine what the graduate from a maritime education and training institution should be able to do it is certainly overly restrictive when regulators prescribe just how maritime education and training should be carried out eg location, study pattern, teaching methods, delivery medium. It is important for maritime educators and trainers to become more involved in educational issues and take greater control of the educational processes. STCW is a relatively minor change when compared with the major changes emerging in education in general and they pose even greater challenges for educators and maritime education and training providers alike, particularly if the regulators are out of touch with modern educational practices and trends and are overly restrictive and prescriptive.

3. Education, Training and Change

Education today is in an era of rapid and sustained change. The old paradigms are increasingly irrelevant and being replaced by new paradigms. These fundamental shifts in higher education are reflected by Inglis et al (1999) and are summarised in the following Table 3.1.

Table 3.1 Old and New Paradigms in Higher Education

Old Paradigm	New Paradigm
Take what you can get	Courses on demand
Academic calendar	Year round operations
University as a city	University as an idea
Terminal degree	Lifelong learning
University as ivory tower	University as partner in society
Students 18-25 years old	Students all ages
Books primary medium	Information on demand
Tenure	Market value
Single product	Information reuse/exhaust
Student as necessary evil	Student as customer
Delivery in classroom	Delivery anywhere
Multicultural	Global
Bricks and mortar	Bits and bytes
Single discipline	Multi-discipline
Institution centric	Market centre
Government funded	Market funded
Technology as an expense	Technology as a differentiator

The challenges posed by STCW 95 pale into insignificance when compared to the challenges created by these changes and, of course, maritime education and training is not insulated or immune from these changes.

These changes can be analysed in a variety of ways but for the purposes of this paper they are considered in terms of three major underlying trends, namely:

- education is becoming globalised
- education is becoming massified
- education is increasingly being treated as a commodity.

Globalisation of education services has seen the demise of traditional student catchment areas and the rise of borderless education services. There has been an increase in competition as providers set up shop in overseas countries. This may occur through a physical presence, a partnership arrangement or flexible learning systems. Additionally, students are increasingly mobile and are willing to travel overseas for their education. Globalisation changes the way in which educational institutions conduct their business and provide their services.

Massification of education has occurred as education services become increasingly accessible to more people. Flexible learning opportunities for students are enhanced through the increased use of the wide range of media and technologies now available. Education is moving from learning which occurs 'just in case' to learning which occurs 'just in time' ie lifelong learning. Massification changes the way in which educational institutions deliver their services.

Commodification of education is not new as educational services have been bought/sold over many years. What is changing is the role of academic staff. Traditionally, academic staff designed courses, prepared support material, taught students, set and marked examinations. This work is becoming disaggregated as the various elements are outsourced such that the educational process becomes more like managing a logistics chain. Courses have increasingly limited intellectual property value as more and more material is publicly available through the internet. Commodification changes the academic ethos away from scholarship towards commercialisation.

These trends have led to fundamental changes in the relationships between the education service provider (seller/MET institution) and the education service user (buyer/MET student) such that education is increasingly market oriented ie it provides what the customer wants not what it thinks the customer wants.

4. Implications and Opportunities for Maritime Education and Training

Traditionally maritime educationalists and trainers have concentrated on the technical aspects of their disciplines but with such fundamental shifts occurring in education in general it is obvious that maritime educationalists and trainers will need to embrace these changes if their future is to be assured. Students studying at maritime education and training institutions have a right, as well as an increasing expectation, that the services they are purchasing are aligned to the changing community norms about the quality and delivery of education. These norms are increasingly international in nature and best practice now means benchmarking with organisations in other countries.

Education is becoming increasingly globalised and maritime education and training is lagging in this trend. One way to ensure a future in the global market place is to develop meaningful alliances and networks. Alliances do exist between provider institutions as well as between providers and users but it is postulated that greater use of joint ventures and memoranda of understanding could be made to improve the accessibility and quality of maritime education and training.

Until relatively recently networking between maritime education and training institutions tended to be somewhat superficial with many expressions of good intent but not a great deal of action. This has changed. The creation of the Association of Maritime Education and Training Institutions in Asia Pacific (AMETIAP) in 1996 and the International Association of Maritime Universities (IAMU) in 1999 has provided a real impetus to improve collaboration between maritime education and training providers. At present both networks are relatively inwardly focused but both networks, as they grow, will inevitably bring a more global approach to the quality and delivery of maritime education and training. Networks provide opportunities to grasp the new paradigms in education.

The massification of education has, to a great extent occurred as more and more providers grasp the benefits of flexible learning. Flexible learning can be taken to mean the provision of valid and reliable learning experiences by utilising the best pedagogical mix of location, study pattern, teaching method, study material and delivery medium. Lewarn (2000c) describes the main elements of each facet of flexible learning in the following Table 4.1.

Table 4.1 Elements of Flexible Learning

Element	Variables
Location	- on campus; - off campus (workplace, home).
Study Pattern	- full time; - part time; - combination of above.
Teaching Method	- lecture; - tutorial; - workshop; - distance education; - simulation; - discovery techniques (labs, site visits).

Study Material - print (books, notes);
- audio (tapes);
- visual (videos);
- multi media (CD Rom).

Delivery Medium - personal (face to face);
- technologies including:
  - teleconferencing;
  - videoconferencing;
  - radio;
  - TV;
  - Computer (e-mail, internet ie on-line learning, floppy disc, CD).

As just-in-time learning replaces just-in-case learning and lifelong learning gains yet further acceptance maritime education and training providers will change the way in which learning is delivered to the student. Apart from study schools, workshops and distance education it is inevitable that online/digital delivery will play an increasing role and, provided conservative marine administrations agree, seafarer students will also benefit from these changes. Flexible learning, properly delivered, is not a cheap option and it is therefore important for providers to determine whether to 'go it alone' or partner with others. The dangers of all providers 'going it alone' and trying to 'reinvent the wheel' are obvious and as such collaborative arrangements between providers seem a sensible way to proceed in order to maximise the skills of the collaborators and also to maximise the benefits to students.

Education as a commodity is very much part of the new paradigms in education. Maritime education and training operates in a specialised niche market which, traditionally, sells its services directly to its customers ie its students. Commodification leads to the consideration of what apart from teaching services, can be bought/sold. Research by Coaldrake and Stedman (1998) into the suite of tasks normally undertaken by academic staff shows that academic work can be disaggregated as illustrated in Table 4.2.

Table 4.2 Suite of Tasks undertaken by Academic Staff

- assessing students' credentials and giving credit for entry
- designing and co-ordinating units and courses of study
- designing and developing resources used in learning, including textbooks, videos and computer packages
- assessing resources for quality
- navigating and advising students through choices of study options
- delivering instruction eg lecturing, demonstrating practical work in laboratories
- acting as guide and mentor to students, either individually or in groups
- assessing, evaluating and providing feedback on student progress
- certifying completion of award programs.

Accepting that education is increasingly globalised and massified it becomes evident that the various elements of academic work could be disaggregated such that they could be carried out by different persons in different locations. This is happening now particularly in the context of online delivery of learning where the globalised communications systems are used to maximise learning opportunities for students. For example, the curriculum design may occur in two partner institutions who, then employ content experts, learning resource material developers, tutorial support, assessment markers all in different locations but all connected via the internet and managed by the partner institutions. Maritime education and training providers have not yet grasped the potential of conducting business in the manner described but networks such as IAMU make this scenario increasingly likely. The inertia of the existing system should not be underestimated but the question is not whether the nature and structure of academic work will change, but what the timing and extent of change might be. (Coaldrake and Stedman, 1999).

5. Conclusion

It must be clear that few maritime education and training institutions posses either the resources or all the skills necessary to fully grasp the opportunities presented by the rapidly changing education environment. It also seems evident that to maximise the benefits which these opportunities present far greater collaboration is necessary between maritime education and training providers. A truly global maritime university could be developed: not a WMU but an organisation set up and run in a business like manner, taking the best courses and skills from the partner institutions, and using flexible learning techniques to the maximum: a virtual maritime university. Many universities are involved in this kind of venture now so if maritime education and training providers want to survive and grow it is essential to participate in these changes - now.

Will it happen? If maritime education and training providers want it to - yes. The key point is that the future is in our hands - now! If we do not grasp the opportunities now then others will do it for us again.

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The Role of Training Ship in TUMM

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1 Introduction

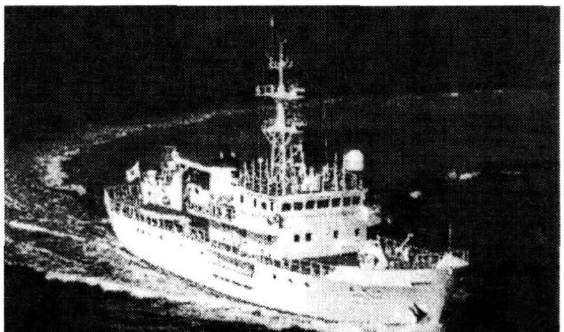
Japanese seafarer's education system in the university and maritime colleges belonging to the ministry of science and education, has peculiar system for gaining a seafarer's certificate. In order to gain a third officer's license, the students must take one year's onboard training in the National Institute of Sea Training of the Independent Administrative Institution (KOUKAI KUNRENSHO). The National Institute for Sea Training (KOKAI KUNRENSHO) has own large training ships including famous sail training ships Nippon Maru and Kaiwo Maru.

Besides of these training ships, the universities and the maritime colleges has an own 400 gross tonnage class of training ship . Tokyo University of Mercantile Marine (TUMM) has also T.S.Shioji Maru the Third. This ship was built in 1987 for training and researching in our university.

In this paper, we introduce the role of the training ship SHIOJI MARU in education and also researching.

2 SHIOJI MARU The Third

Fig. 1 shows a general arrangement of Shioji Maru the Third, Table 1 shows the principal dimensions of this ship. Besides of a rudder and a CPP, this ship is installed with a bow and a stern thrusters for controlling the ship's attitudes.



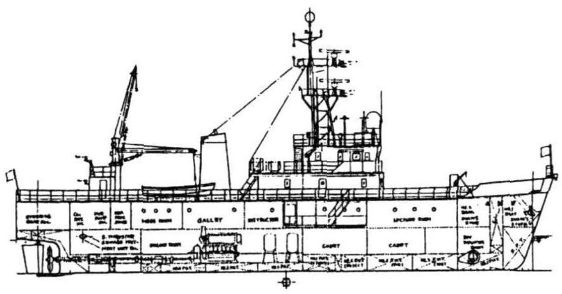


Fig.1 Shioji Maru The Third and Its General Arrangement

Item	Dimension	Item	Dimension
Length	49.9m	Propeller	4 blades CPP
Breadth	10.0 m	M/E	Diesel 1400PS
depth	3.00	Bow Thruster	2.4 tons
Gross tonnage	425 tons	Stern Thruster	1.8 tons
Displacement	785 tons	Speed	14.1 knots
Cb	0.555(Full)	Crews/Cadets	62(7crews)

Table.1 Principal Dimensions of T.S.Shioji Maru

This ship has very excellent data acquisition system using a local area network system (LAN) shown in Fig.2.

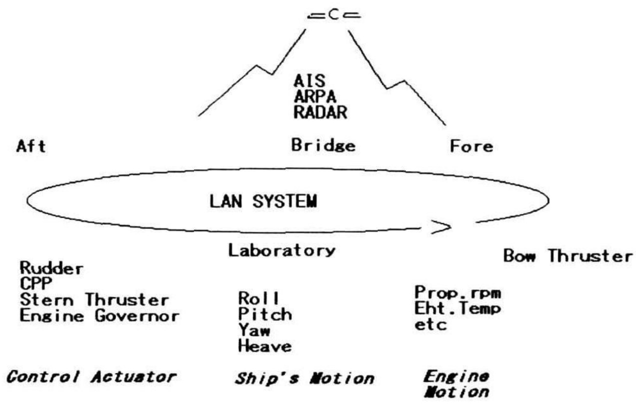


Fig.2 Local Area Network System for Ship's Data Acquisition

3 Education on board

The training period of navigation and engine course are 3 days in the third and fourth glade, respectively. The main voyage area are outside of Tokyo Bay and near the Izu islands.

Curriculum of Navigation Course

Besides of the ordinary navigation watch training and the fire station discipline, the students are imposed on the following actual on-board tests and analysis. And they must submit the report about these experiments in the ship

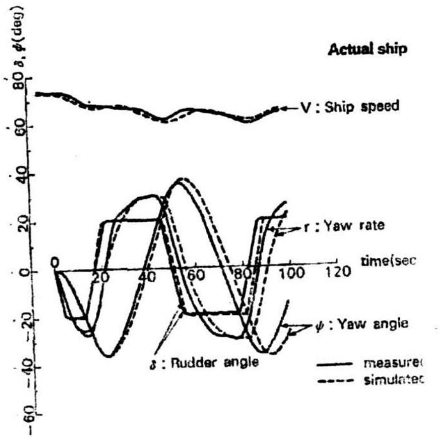
>> Zig-zag test : to gain the maneuvering index(Fig.3)

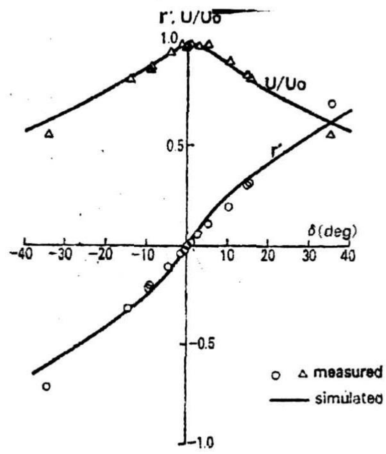
>> Spiral test : to examine the course stability (Fig.4)

>> Turning test: to examine the basic maneuvering characteristic(Fig.5)

>> Backing test: to the stopping ability

>> Fuel oil consumption: to examine the basic performance of the ship





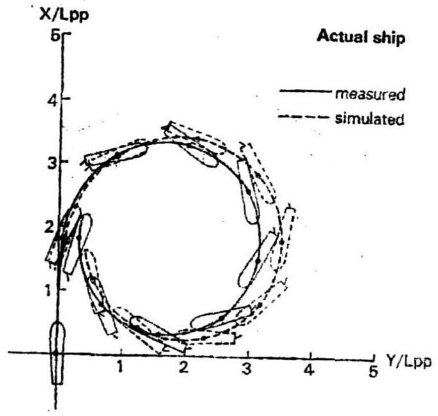


Fig.3 Zig Zag Test Fig.4 Spiral Test Fig.5 Turning Test

4 Other universities education

Shioji Maru is used for sea experience of the students in the departments of naval architecture of YOKOHAMA National University and University of Tokyo. They navigates for 2 days before a summer vacation associated with each university.

5 Researching of Under Graduate , Master and Doctor courses

The students of university in the undergraduate must write a thesis before graduating. Some students including the foreign ones use the summer voyage of the ship for completing their thesis. They can freely access the computer system in the laboratory to obtain the ship data and control the ship using the rudder and propeller and two thrusters.

6 Reserching

Researching is another important role of Shioji Maru. Our university has long histories of the researches using the ship. Their researches are carried out as independent research in our university or cooperative one with other organizations including the government institutes and private maritime companies.

Main results are as follows:

<u>Co-research works with governmental organizations and private companies</u>

>> Developing of Various Types of Autopilot Systems including Roll Reducible one

>> Automatic berthing experiments which was the first experiment in the world

1989. This project ' The Development of Integrated Intelligent Ship' was initiated with the ministry of transportation and our university. See Fig.6.

>> The project for making the IMO maneuvering standard booklet(1987)

>> The project for making the IMO seakeeping standard about the capsizing in following sea(1998- 2000)

>> New Type of Onboard Wave Observer System. See Fig.7

>> Development of Integrated Navigational Aids including GPS and AIS(Automatic Identification System) with Institute of Harbour and Ship Research Institute(2000-2005)

>> Development of Wind Vane Type of Dynamic Positioning System (with Delft University)(1999-). See Fig.8

>> Development of New Type of Computerized Guidance and Control System(with Norwegian Institute of Technology)(2000-) See Fig.9

>> Development of New Position System using RTK-GPS in Tokyo Bay. See Fig.10.

>> Development of Satellite Communication system between Shore and Ship including Image Processing Data with the NASDA(2002-)

>> Development of Stable Artificial Horizontal Plane(2001-) .

Main Doctoral Thesis

>> The development of minimum Time Berthing System

>> The Development of New Type of Engine Governor System

>> The New Types of Automatic Guidance and Control System using a modern control theory

>> The Development of Collision Avoidance System using Neural Network Theory

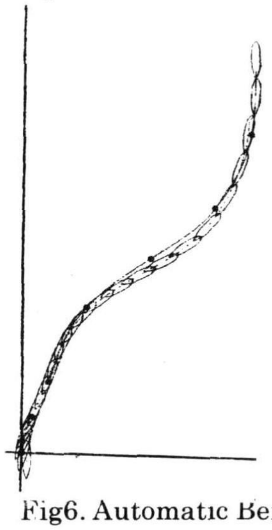


Fig6. Automatic Berthing System

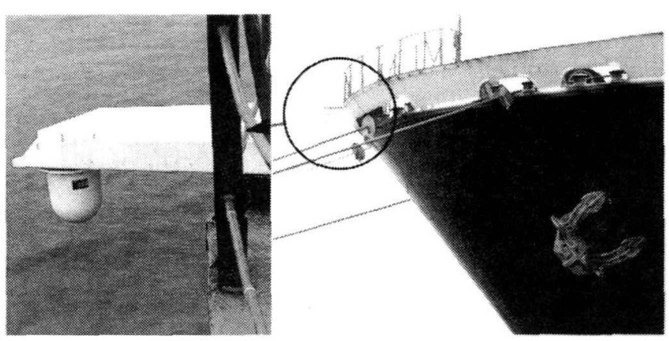


Fig.7 Wave Observing System

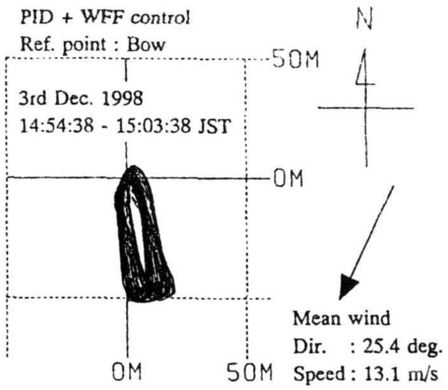


Fig.8 New DPS System

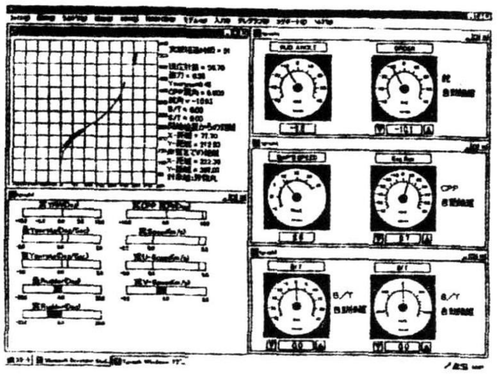


Fig.9 Guidance System of Shioji Maru

7 Conclusion and Remark

In this paper, we discussed about the role of our educational and research ship Shioji Maru. We can conclude that such small type of training ship is important not only as student's training but also as research ship. Shioji Maru is open to all students and researchers including the foreigner who are interesting in maritime research and education fields. See Photo.2

Photo.2 Sea Training by Cadets

AUTHORS INDEX

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