Quantitative Technology Forecasts of Select Maritime Technologies and Implications for Maritime Education and Training

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Introduction

This presentation provides an overview of a twelve-month research effort intending to provide quantitative technology forecasts, over 5, 10,20 or more years, of the diffusion and performance improvement of up to four select maritime technologies and to consider the implications of the identified technological changes in maritime education and training. This presentation provides a review of the intent and expected results of the research as outlined in the project proposal!, provides a brief report of initial research results, and announces formal seminars and informal discussions at the 4th General Assembly in Alexandria as part of the development methodology of the quantitative technology forecasts called for in this project.

Report on Activity to Date

Initial research has focused on establishing background intelligence in quantitative technology forecasting pertinent to the development of forecasts for the maritime industry and maritime education, preliminary to the detailed development of specific quantitative technology forecasts called for in this project. Making use of resources at Maine Maritime Academy, University of Southern Maine, University of Maine, the Massachusetts Institute of Technology, and various publications from several private consultancies in technological forecasting and market trending, substantial research has been conducted in the following areas:

1. Advances in theory and techniques of quantitative technology forecasting applicable to research in this project;
2. Research of the prior art of technological forecasting in maritime industries and maritime education;
3. Recent or current published activity in technology forecasting and trending in maritime industries and maritime education.

This preliminary research has resulted in a broad collection of information and data applicable to the development and analysis of quantitative technology forecasts for planning in maritime education called for in this project. What's more, the research has identified resources of prior and ongoing studies of the future of maritime industry and technology, enhancing the ability to:

1. Compare and contrast results of quantitative technology forecasting versus other predictive methods;
2. Validate, corroborate, and establish confidence in the quantitative technology forecasts resulting from this project;
3. Identify authors, institutions, organizations, and publications where time-stamped data of technological change and adoption rates applicable to maritime industry and maritime education.

Planned Activity at IAMU 4th General Assembly

Plans for activities at the 4th General Assembly in Alexandria include scheduling and leading formal seminars and informal discussions of technological change and adoption in maritime industry and education. IAMU leaders and member representatives will be invited to attend discussions that stress conceptual thinking appropriate to quantitative technology forecasting methodology to consider 1) the performance criteria that have led to the adoption, substitution, and overall evolution of certain maritime technologies, and 2) the fundamental human utility driving the technological changes.

Advanced Training for Senior Cadets Based on Cargo Handling Simulator

Leader: Gdynia Maritime University
Partner: Istanbul Technical University

Project intends to prepare a set (6-8) practical exercise on cargo handling simulator in connection with other elements of navigation's education like: passage planning, teamwork, electronic navigation, cooperation with port facilities and stability.

Apart of typical cargo calculations exercise in more complexly methods will follow in other disciplines of education.

As observed many students study different discipline separately without necessary correlation between them.

In proposed project group of experienced academic teachers and experienced practicers will try to establish multidiscipline exercises. The basic is cargo operations.

Both Gdynia Maritime University and Istanbul Technical University have installed model equipment Transas Cargo Simulator - modern tool for teaching.

IMO models courses including Model Course 2.06 "Cargo and Ballast handling Simulator" are very helpful in organising by teaching staff typical training courses.

Modern instructor should present especially to cadets (non experienced officers) whole spectrum of problems which can arise before and after planning of cargo operations.

Young students should understand that knowledge taken from different topics and discipline during period of education is strictly connected each other. In final stage of education navigators should have a chance to pass exercise more complicated and inter disciplined exercises.

Complex of problems content<; topics of preparation to voyage and passage planning knowledge of particular terminals regulations and safety rules in cooperation with shore side, safety aspects of manoeuvring and approaching terminals, berth, loading buoys etc.

Understanding of contents of procedures and check list, communications with shore side etc. etc. Only then, cadets can pass main problems written in model course like for example: tank arrangement, pipeline arrangements all operational problems etc.

A list of more problems arise after completing of loading. Calculations of stability, trim in port of destination, analyse of fuel, water consumption navigational problem in full boarding conditions (limiting water, squad, restricted areas, colreg rules, system of reporting, cargo, safety and other documents etc. Group of teachers should prepare detailed algorithm of complex exercises.

Final report of preparing exercises should be presented to Chair of IAMU / Nippon Foundation / Secretary of IAMU after completing of project that's means on March 2004. Materials-instructors booklet and set of exercises - will be free distributed to all IAMU Members interested in above problem.

Results of project will be presented on V General Assembly in 2004 and will be published in IAMU News and/ or IAMU Journal.

Prof. Dr. Bogumil Laczynski
Master Mariner
Gdynia Maritime University

IAMU Model Course on Training in the Operational Use of the Electronic Chart Display and Information System (ECDIS)

Adam Weintrit
Gdynia Maritime University

The major role of the navigational department of IAMU member universities is to provide their students with effective and highly leveled maritime education and training. Standing at this point of view, the Author would like to consider in the project the effective training methods for navigators in compliance with STCW'95 convention and the set of IMO model courses. In addition, he would like to consider additional training programs, which aim at higher competencies than the minimum requirements for the competencies shown in the STCW.

The International Maritime Organization published in 2000 *IMO Model Course* 1.27: *The Operational Use of the Electronic Chart Display and Information System (ECDIS).* In the Author opinion this model course program could be arranged on higher level.

In the project new approach to the maritime education and training MET in the field of ECDIS is the subject of research. In an Author opinion IAMU should to consider and make a decision to start forward with IAMU Model Courses on higher (academic) level than STCW convention which seems to be minimum of minimum only.

IAMU model course on training in the operational use of the Electronic Chart Display and Information System (ECDIS) as a sample is the first on the long list of IAMU model courses to be elaborated.

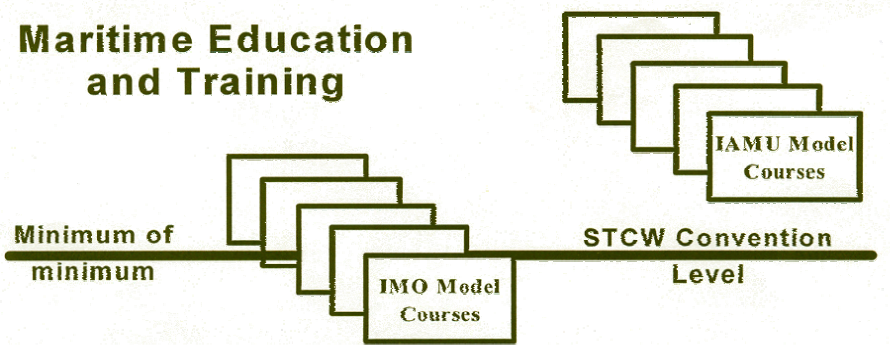

Fig. 1. IAMU Model Courses on higher (academic) level than STCW convention

The main objective of the IAMU Working Group III is to promote the global maritime excellence. WG-III is directed toward 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 IAMU members should analyse and assess existing

education systems offered by maritime universities/faculties, including proposed model courses. Research is based on the results of Polish Working Group on ECDIS. The Author would like to present GMU model course on training in the operational use of the Electronic Chart Display and Information System (ECDIS) based on simulators. He is the head of electronic chart and ECDIS laboratory in Navigational Department at Gdynia Maritime University, with 18 years experience in the field of electronic charts.

The IMO's Sub-Committee on Standards of Training and Watchkeeping at its thirty-second session (200 I) developed *Interim Guidance on Training and Assessment in the Operational Use of the Electronic Chart Display and Information System (ECDIS) Simulators.* The Author was the father of this document. He was the chairman of Polish Working Group which prepared document submitted to IMO forum. Next he was the chairman of STW Sub-Committee Drafting Group on Development of Guidance, which reviewed Polish document taking into account of discussions in the plenary session. The drafting group elaborated document STW 32/WP.7, which was approved at the plenary. The Maritime Safety Committee, at its seventy-fourth session approved this interim guidance.

In the project the Author presents his point of view on simulation and technology in maritime education and training and the methods of maritime pedagogy, especially in the electronic chart systems field to be adopted by the IAMU member universities/faculties.

Study on Systematic Usage of SHS in MET

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Kobe University of Mercantile Marine

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Features of this Project

This research project aims at the establishment of curriculum design strategy for maritime education and training institutions, including simulator-oriented education, which meets the goal ofWG-1 at IAMU.

This research project provides a very unique opportunity to achieve the research purposes by the collaboration of international joint members from different MET institutions of different countries. The members are composed of typical types of MET institutions such as KUMM which is in a seafarer-demand-country, DMU, SMU and ITUMP which are in seafarer-supply-country and KMU and MNMU which are in a position of transitional period to seafarer-demand -country.

We believe that this type of research-aim and member-formation is one of the typical activities to achieve the tangible result of IAMU from the viewpoint of utilization of IAMU-networking and activation of WG-activity.

Research Purpose

The goal of this research project is to establish curriculum design strategy for MET institutions, including simulator-oriented education.

In this research project, two steps of survey are planned. 1 st stage of the survey is to collect data for considering "strategy for curriculum design" that is available to every grade of maritime institution and that is suitable to each maritime institution when one is about to set up specific curriculum. 2nd stage of the survey is to collect data and consider how to introduce ship-handling simulator training into the curriculum from the viewpoint of strategic curriculum design.

Regarding the establishment of curriculum design strategy, the significance of know-how for improving curriculum becomes a key. Due to the quick advance of technology and the rapid change of market requirements in the international maritime community, MET institutions are urged to design their own curriculum as to meet the expectations from domestic or international seafarers-market.

In order to set up specific curriculum that is suitable to each MET institution, attention should be paid to whether the country is seafarer-demand-country or seafarer-supply-country or between. The curriculum should not the same depending on the difference that the country stands on which side.

In this research, strategy for curriculum design is proposed that is available to every grade of MET institution in the international maritime community.

The 1st Stage of the Survey

The 1st stage of the survey was planed as follows. Firstly, the investigation on the current reality of shipping industry was prepared. The survey items were (a) number of merchant vessels under operation of own country and (b) number of seafarers with nationality of own country. These data were used to identify whether the country is seafarer-demand-country or seafarer-supply-country or between.

Secondly, the investigation on the current reality of (c) job opportunities of graduates as seafarers was prepared. Finally, the investigation on the current reality of (d) curriculum structure was also prepared. Survey was implemented by using survey format of questionnaires for four member countries and those representative universities in the term of the latest five years of 1998 to 2002.

As the result of this survey, two indices were taken up to identify whether a country is seafarer-demand-country or seafarer-supply-country. One is "self-sufficient-ratio" of seafarer of own country and the other is "job opportunity ratio" of graduates as seafarers.

Self-sufficient-ratio of seafarer of own country (Rss) is expressed by the ratio shown as below:

Rss = Nswn / Nnec = Nswn / (Nsh X Nav)

Nswn: Number of seafarers with nationality of a country
Nnec : Necessary number of seafarers to operate fleet under operation of a country.

Where,

Nnec = Nsh X Nav

Nsh : Total number of ships under operation of a country
(including Native Flag, Flag of convenience and Chartered vessel)
Nav : Average number of officers to operate a ship

If the fleet is mostly operated by foreign seafarers, the value of Rss comes to zero. This means that the country is seafarer-demand-country. When the fleet is mostly operated by seafarers of own country, the value of Rss comes close to 1.0. In such case, it can be said that the country is seafarer-supply-country.

Another index taken up here is job opportunity ratio of graduates as seafarers. Job opportunity ratio of graduates as seafarers (Rjo) is expressed by the ratio shown as below:

Rjo = Njob / Ngrd

Njob : Number of graduates got job on board
Ngrd : Number of graduates from a MET institution

When the percentage of job opportunity ratio is high, the graduate students have high possibilities to be able to go to sea whatever the ships are of own country or of foreign countries. So that such country is supposed to be seafarer-supply-country.

Figure 1 shows the results of data analysis. Job opportunity ratio (Rio) relatively gives reasonable result in good order. Regarding the self sufficient ratio (Rss), further checking of source data seems to be necessary. However, the results express a tendency in good order.

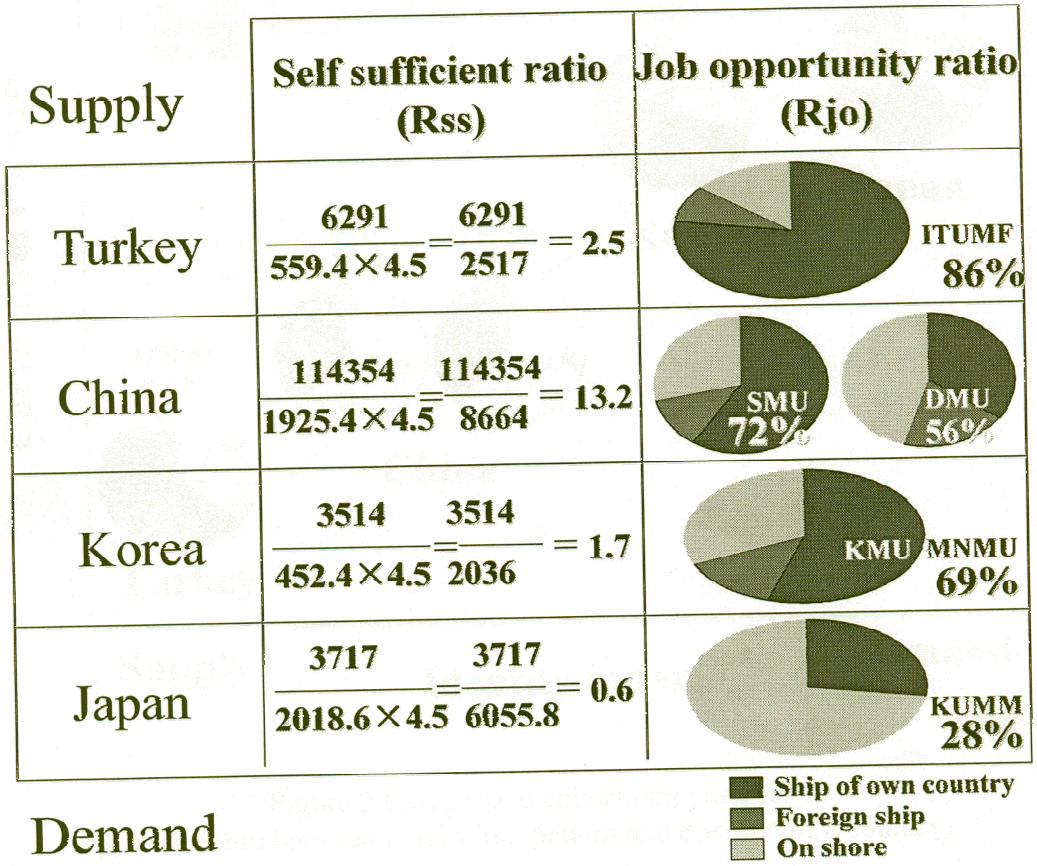

Figure 1: Results of data analysis
Job-opportunity-ratio (Rjo) and Self-suffIcient-ratio (Rss)

In order to analyze the pattern of curriculum of each MET institution, by focusing on the subjects of lectures, curriculum structure was categorized into four groups such as General basic subjects, Specialized basic subjects, Nautical subjects and advanced maritime subjects.

Figure 2 shows the relationship between the identity-index whether the country is seafarer-demand-country or seafarer-supply-country or between and the categorized pattern of curriculum. The features of the curriculum structure are expressed by the ratio of percentage share of nautical subjects to advanced maritime subjects in simple manner.

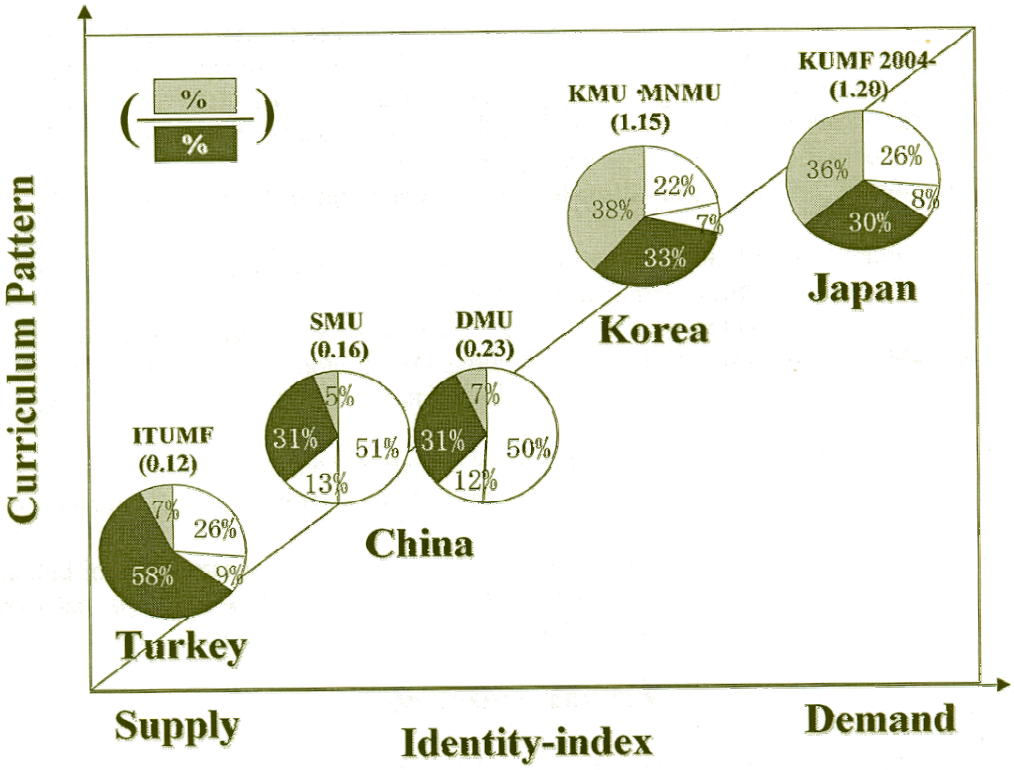

Figure 2: Categorized curriculum pattern
(Relationship between curriculum pattern and position of a country)

When a MET institution is about to design the curriculum as to meet the expectations from domestic or international seafarers-market, a recommendable pattern of curriculum can be suggested from this diagram.

To provide more strategic suggestion for the curriculum design, further discussion will be made among project members hereafter.

The 2nd Stage of the Survey

The 2nd stage of the survey is to collect data and consider how to introduce the ship-handling simulator training into the curriculum from the viewpoint of strategic curriculum design.

The quality required to the students is not the same depending on the difference that the country stands on. In MET institutions of seafarer- demand-country, ship-handling simulator is used not only for enhancing the vocational ability but also the academic research ability. The arrangement of the ship-handling simulator training in curriculum may not the same depending on the difference that the country stands on which side. In this research, strategy for introducing ship-handling simulator training into the curriculum is proposed. The 2nd stage of the survey is planned as follows. The survey items are the current reality of the arrangement of simulator-oriented training in curriculum in each MET institution and the current reality of the training formation.

The questionnaire will be arranged to ask whether the ship-handling simulator training is introduced in the curriculum as the regular educational program, how the training program is implemented, what is the training purpose, how many students in one group, how often in a week, how about the scenario, who is the instructor, how to assess the skill progress, how many credit units are provided and so on.

Survey will be implemented right after this meeting by using survey format of questionnaires for four member countries and those representative universities.

The 2nd international joint meeting will be held in one of the member countries around top of January 2004 to discuss how to introduce ship-handling simulator training into the curriculum from the viewpoint of strategic curriculum design.

Conclusive Remarks

This research project aims at the construction of the systematic curriculum design strategy including ship-handling simulator training that meets the goal of WG-I at IAMU. When MET institutions are about to design their own curriculum, specific curriculum should be designed as to meet the expectations from the seafarers market of their own country. The results of this research project will be able to provide better suggestion for the design of the curriculum that is suitable to each MET institution.