

## DEVELOPMENT OF MARITIME TRAINING AND EDUCATION (MET) TO MEET FUTURE INDUSTRY DEMANDS

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**Abstract.** The global maritime industry faces significant challenges over the next decade as it copes with and recovers from the current economic downturn, deals with the growing shortage of experienced seafarers, complies with an increasing legislative burden and utilises new technologies to improve operational performance. Maritime Education and Training (MET) institutions will be obliged to engage more closely with industry to ensure that MET provision effectively supports the solutions to these challenges and is capable of meeting the changing demands of both industry and individual seafarers. While industry must recognise the benefits of such engagement and allocate appropriate resources to support it, MET institutions worldwide will also have to evolve from a 'one size fits all' approach to a more flexible and interactive style of delivery if they are to succeed and flourish in the future. Imaginative partnerships between MET institutions and industry bodies or individual companies will also help to drive the advancement of the international maritime industry.

The Tanker Officer Training Standards (TOTS) developed in 2008 by the International Association of Independent Tanker Owners (INTERTANKO) in conjunction with Warsash Maritime Academy (WMA), the Malaysian Maritime Academy and Marlins is an excellent example of how such collaborations can generate positive solutions to industry problems. In this case, an increase in tanker accidents initiated a co-ordinated response by INTERTANKO members and their partnering with MET institutions to address this negative trend by establishing a set of voluntary TOTS for INTERTANKO members. TOTS will ensure tanker officers' competence for general shipboard operations as well as those for specific tanker types such as crude, product and chemical tankers.

The future demands of industry, regulatory bodies and seafarers will inevitably drive the development of MET worldwide, including the development of non-technical skills and closer integration between shipboard and shore-based training. However, MET institutions must embrace the challenges ahead and actively pursue collaborative ventures with industry as part of their own progressive evolution.

### 1. INTRODUCTION

*"As everyone in shipping is aware, the global shortage of seafarers, especially officers, has already reached significant proportions and is now a source of genuine concern to all involved in the industry".* Efthimios E. Mitropoulos, Secretary-General, International Maritime Organization (2008) [1].

The growing worldwide shortage of experienced ships' officers is just one of a number of significant challenges faced by the global maritime industry over the coming decade but it seems likely that overcoming this particular challenge will be the most critical task ahead.

While the current economic downturn is alleviating the immediate demand for additional officers to some degree through vessel lay-ups and disposal of old tonnage, it is inevitable that this demand will grow rapidly again when the economic cycle swings upwards once more.

Recruitment, retention and quality of Maritime Education and Training (MET) will all be pivotal factors in meeting the increased demand but this will undoubtedly provide unique opportunities for MET institutions worldwide to collaborate with the key stakeholders (i.e. industry, regulatory bodies and seafarers).

From the assistance given to industry for recruitment activities, to the provision of higher level qualifications and continuing professional development (CPD) to aid seafarer retention, and the ongoing

development of MET delivery to meet the changing demands of key stakeholders, MET institutions will be required to 'raise their game' way beyond current expectations.

The introduction of new technologies to improve operational performance and an increasing legislative burden will also present considerable tests for the maritime industry in coming years but these can be passed if the key stakeholders engage more closely with MET institutions to source the necessary solutions, address the changing demands and drive the development of MET from a 'one size fits all' approach to a more flexible and interactive style of delivery.

The purpose of this paper is to review the key challenges for the global maritime industry over the next decade and to identify some of the opportunities for development of MET to help address those challenges and meet future industry demands.

## 2. BACKGROUND

Considerable growth has been seen over the past decade in the number of commercial vessels operating worldwide, as global trade increased rapidly and vessel operators invested heavily in their fleet expansion programmes to meet the associated requirement for cargo transportation.

Demand for both officers and ratings increased proportionately as a result and the BIMCO/ISF Manpower 2005 Update [2] estimated that there was a current shortage of 10,000 officers on worldwide demand of 476,000, and predicted that the shortfall would rise to 27,000 by 2015. The report also identified a continuing shift of the labour market away from OECD countries (Western Europe, Japan, North America etc.) towards the Far East, Indian sub-continent, Eastern Europe and China, and a need to progress Asian seafarers to senior positions to offset future shortages.

In the meantime, the world fleet continues to rely heavily on ageing officers from OECD countries in senior positions, with over 25 % aged over 50 and over 50 % aged over 40. The demographic time bomb is apparently ticking loudly, with potentially severe consequences if the issue is not addressed quickly.

The report concluded that recruitment and training levels needed to increase further to meet anticipated demand, while retention rates also needed to rise (with 10 % of officer trainees failing to complete initial training).

Earlier this year though, new research was published by Drewry Shipping Consultants [3] on the manpower shortage, which has apparently become more acute. The research assessed the current shortfall to be 33,000 officers on worldwide demand of 498,000, and predicted that the shortfall would rise to 56,000 by 2013 based on present trends. Even if the current economic downturn results in 10 % of new build orders being cancelled and vessel disposal rates increasing by 10 %, the research estimates that the shortfall will rise to 42,700 within four years.

While the statistics may vary, the message is quite clear: there is a significant, growing shortage of officers, which will have a major impact on shipping operations and the volume of world trade if it is not addressed in short order. The maritime industry is already seeing the negative impact on its operations and officers of reduced leave periods, increased workloads and rapid promotion without experience in depth, which will be exacerbated further as any shortfall increases.

Regulatory pressures will also grow in the coming years. The introduction of the International Ship and Port Facility Security (ISPS) Code has already produced an additional administrative burden on officers, along with a raft of existing legislation related to vessel operation, pollution, port state control, ballast water management etc. This burden will intensify as environmental issues come to the fore, including CO2 emission control and use of green technology.

The current comprehensive review by IMO of the Standards of Training, Certification and Watchkeeping for Seafarers (STCW) is also close to finalisation and will result in some additional mandatory training requirements (e.g. Bridge and Engine Room resource management training etc.).

Technological advances bring their own challenges as officers have to adapt to new specialised equipment, modes of operation and system requirements (e.g. integrated bridge systems, advanced propulsion systems, electronic control systems etc.).

This has been highlighted again by the discussions during the STCW review on the potential need for dedicated Electro-Technical Officers (ETOs) as a third officer certification stream alongside the traditional navigation and engineering routes. If this initiative is eventually ratified, having an electronic and electrical specialist included within a ship's complement would certainly alleviate the burden on the Marine Engineering team.

It is against this background that MET institutions have to evaluate current practice and modes of delivery before determining fitness for purpose and opportunities for innovative improvements.

### **3. CURRENT MARITIME EDUCATION & TRAINING PROVISION**

The range of academic and practical abilities of our officer recruits today requires a more structured approach to conversion of the young people into the highly-skilled staff needed for the latest generation of vessels coming on stream. Recent experience in the UK has shown that a significant proportion of our new entrants have not acquired the same depth of academic knowledge in key subject areas, such as mathematics and science, which have traditionally underpinned the nautical and engineering sciences undertaken by our officer trainees.

This has generated considerable pressure on MET institutions to first bring the new recruits up to an academic level commensurate with entry on to a marine certification programme and then, in conjunction with shipboard training staff, progress their academic and professional development to the level required for initial Officer of the Watch (OOW) certification.

It should also be noted that the duration of a typical UK officer cadetship today is only three years, a full year less than 20 years ago due to reductions in the minimum sea service requirement, watchkeeping time and shore-based tuition, which have resulted from global competitive pressures and the introduction of STCW '95. However, while the duration of an officer cadetship has decreased, the UK's course syllabi have been rationalised and increased to incorporate full academic exemptions to Master or Chief Engineer level.

At the same time, marine technology and equipment is evolving rapidly to meet the demands of a globally competitive industry in which reduced manning levels have to be effectively supported, and efficiencies and cost savings are sought in all areas (e.g. propulsion systems and fuel costs, cargo handling systems and port turnaround times etc.), while a clear focus remains on safety and environmental issues.

While UK government funding currently offsets the relatively low tuition fees being charged to our globally-focussed customers, the ability of MET institutions to invest heavily on a regular basis in new ranges of high-tech equipment is somewhat limited.

Financial circumstances dictate that our institutions maintain a complement of core generic equipment, such as Bridge and Engine Room simulators, which serve to deliver all STCW certification elements and some more advanced CPD training, while shipping companies will often use their equipment manufacturers for specialised training courses (e.g. integrated bridge systems, new propulsion technology).

The traditional "chalk and talk" approach in the classroom has largely been replaced with interactive whiteboards and electronic presentations to engage the computer-friendly generation, while a number of Intranet and computer based training (CBT) packages provide additional tuition and assessment tools.

Simulator time has also been integrated into the requirements for certification, with Bridge Watchkeeping courses now compulsory elements of OOW and Chief Mate courses.

The rising academic expectations of potential officer recruits and their parents have resulted in the development of vocational degrees as the mainstream routes to initial UK certification. The true value of marine qualifications is still not readily acknowledged outside of the maritime industry so the introduction of degree-based programmes has been a welcome development, with young officers having an early opportunity to gain an Honours degree to complement their professional qualifications.

The degree-based programmes also provide “added value” in the form of management and skills development, which should enhance the prospects for UK/EU Officers who are comparably expensive to employ. More importantly perhaps, the qualifications gained will provide the springboard for professional and career progression, whether an individual remains at sea or pursues opportunities in the wider maritime industry.

Consideration also has to be given to how the individual is developed to cope with the stresses and strains of life aboard ship, away from friends and family for long periods, as well as acquiring initial professional competency and the further development required before serving in higher ranks. This starts with the initial pre-sea induction, familiarisation and underpinning knowledge but progresses over time to encompass higher-level activities, which both engage the individual and provide a means of progression.

As do other MET institutions, WMA already offers some guided learning courses and a virtual learning environment (VLE) to facilitate off-site delivery of required underpinning knowledge. This is a more convenient, flexible and cheaper option for some of our students, particularly those from overseas, and is an area of the business that will inevitably increase in scope and size.

WMA has also incorporated a blended learning approach in the Honours degree programmes so that students can achieve the qualification without the cost burden of a full additional year of Academy-based training or the associated delay to their professional career progression.

Particular attention and much research is now being dedicated to ‘Human Element’ issues, such as leadership skills, individual workloads due to manning levels or operational demands, the fatigue and stress generated during lengthy or intensive sea appointments, and the common mistakes made under pressure.

There is also a growing demand for shore-based refresher training in areas that are impossible to replicate on board ship (e.g. live fire fighting) or where procedures are not used very often or change frequently (e.g. medical care). Some nations have already introduced mandatory refresher training as part of certificate revalidation (e.g. Proficiency in Medical Care) but there is an ongoing debate at IMO about the need to make this training uniform and compulsory.

Distance learning is being developed and improved, potentially enabling the technical content of a marine education to be delivered more flexibly and upon demand. However, unless shipboard workloads can be reduced, seafarers are unlikely to have much time to study onboard and the effectiveness of such training is then called into question. Also, while communication costs have come down, there is still a significant cost associated with delivery aboard ship.

Research by the Seafarers International Research Centre (SIRC) in 2005 [4] indicated that *‘seafarers had broadly positive views of CBT despite the fact that significant numbers of them had experienced problems in using CBT on board.’*

These problems included lack of support from senior officers, time available, range of resources, CBT design and fatigue. The report also advised that *‘in providing CBT on board it is important that ship operators do not regard this as an adequate substitute for the provision of leisure or recreational facilities/time.’*

While distance learning will play a bigger role in future, it does not suit everyone and the more supportive learning environment provided by a MET institution will still be needed for the foreseeable future as it facilitates the full professional and personal development of students, including the self-confidence, attitude and outlook that will enable them to survive and develop whilst at sea. However, time in a MET institution may well be reduced in future by the use of pre-attendance distance learning study packs/programmes, which might be of particular interest to overseas students but would not be a complete substitute for academy attendance.

#### **4. SUPPORTING RECRUITMENT AND RETENTION**

With the UK government's drive to raise the school-leaving age to 18 within a few years, it is likely that the combination of degree course provision, sponsored training in an age of top-up tuition fees, early professional certification and good employment/promotion prospects will attract the new generation of highly-skilled staff who are needed to manage and operate our expensive and high-tech merchant vessels.

WMA has already seen a substantial increase in the proportion of officer trainees starting degree-based courses, rising from 45 % upon first introduction in 2006/2007 to 63 % in 2008/2009. This looks set to continue as the maritime industry continues to raise awareness of the career opportunities available in a truly global business at a time when unemployment is rising in other sectors, resulting in more high calibre recruits being attracted to the industry.

In the meantime, MET institutions can make a significant contribution to reducing the current shortage of personnel, specifically by training more seafarers, training more quickly where appropriate (e.g. conversion of existing certificated officers to work in specialist short-staffed sectors such as LNG), using MET to address lack of experience (e.g. through simulation courses, manned model ship handling, management skills development etc.) and adopting new delivery approaches to increase accessibility (e.g. use of online learning through a VLE).

MET institutions can also support industry in their recruitment activities in a number of ways, including:

- Increasing capacity and resources to cope with the higher numbers of recruits needed by our industry (e.g. WMA has tripled its number of officer recruits within five years but has sustained this growth with increased staffing, supplementary teaching space, acquisition of additional technical equipment etc.).
- Provision of attractive, accessible MET programmes and comparable academic awards to other professional occupations (e.g. degree programmes), thus laying the foundation for a wider career in the maritime industry if they come ashore later on in their careers
- Raising the profile and acceptance of professional maritime qualifications through accreditation of prior learning and benchmarking to academic frameworks
- Promotion of careers at sea (e.g. hosting of careers events, publication of careers information for use by careers advisers, availability of comprehensive reference material on the institution's website etc.).
- Participation in industry events (e.g. sharing a careers stand with shipping companies at national/international events, supporting specialist engineering competitions etc.).
- Engaging with local/national media to raise the profile and awareness of media-friendly activities (e.g. demonstrations of specialist equipment such as simulators and manned models, supporting the filming of documentary programmes etc.).
- Spreading the word (e.g. attendance and speaking at local and international conferences, visiting schools and colleges to give presentations etc.).

MET institutions can also help to improve seafarer retention rates in various ways, including:

- Effective induction and familiarisation activities during the first academy period, with support staff available to deal with personal issues, homesickness, counselling, academic support etc.
- Successful preparation for the first sea phase, including delivery of necessary underpinning knowledge, STCW short courses and familiarisation with training portfolios to be completed aboard ship.
- Availability of academy staff by telephone or e-mail to assist with any training-related difficulties experienced by trainees during the sea phases.
- Delivery of high quality MET provision to support achievement of professional qualifications, competency and advancement.
- Availability of CPD opportunities (e.g. upgrading of professional certification, conversion to specialist sectors, management development, leadership training etc.).
- Providing access to postgraduate academic programmes (e.g. Honours and Masters degree programmes) for those officers seeking further progression opportunities, to either support their roles as senior ship staff or help them transition into other roles within the maritime industry ashore.

## **5. FUTURE TRENDS FOR MARITIME EDUCATION & TRAINING PROVISION**

Most of the maritime industry now realises that people are the industry's greatest assets, and this recognition will help to drive the development of MET provision through the 21<sup>st</sup> century. However, this will involve effective engagement with the key stakeholders and the sourcing of supporting funds, whether from national administrations or bodies, shipping companies, internal investment or a combination of available resources (financial or otherwise).

While the short term objective is to recruit and train sufficient new recruits to deal with the current officer shortages, longer term goals will focus on retention and development of these officers to eliminate skills gaps and restore a sustainable rate of professional progression.

The increased capacity and availability of high quality MET provision will be the initial building block for recovery of a sustainable and competent global maritime workforce. However, the longer term goals will not be achieved without meeting the aspirations and career goals of individuals, and MET institutions have a vital role in providing the right training and education opportunities (e.g. CPD, postgraduate awards etc.).

Some new MET provision will be introduced to comply with additional mandatory STCW requirements, such as Bridge and Engine resource management courses. Other provision will evolve from specific company requirements (e.g. bespoke simulator training) or other collaborative ventures.

A few shipping companies are choosing to set up their own training centres to ensure that some of their core needs are adequately provided for. For example, Maersk has now opened four training centres worldwide (Denmark, UK, India and China) covering a range of MET activities such as ECDIS and bridge simulation [5], and is now in a position to offer its spare capacity to the open market. Similarly, Anglo Eastern has recently opened its own Maritime Academy in Mumbai [6], at an initial cost of \$14m to train up to 400 officer cadets per year.

Ongoing technological advances will see the provision of online learning through a VLE, CBT, guided studies and blended learning programmes becoming mainstream activities. MET institutions will need to evolve their provision to a more flexible and interactive style of delivery if they are to succeed and flourish in the future.

There are likely to be a number of other shore-based training developments over the next 10 years, including:

- Increasing emphasis on team training, refresher training, environmental protection and ‘human element’ issues.
- Development of simulation with new technologies (e.g. virtual reality is now entering the marine simulator market place, which will enable future students to familiarise themselves with a new ship, even before it is built, by ‘walking’ around the ship’s machinery spaces and decks).
- Simulation will also allow experienced officers and pilots to experiment with different operational procedures, or help with activities such as port design, educating non-seafarers (e.g. solicitors for P&I), and casualty investigation.
- Greater integration between operational areas in simulation scenarios (e.g. exercise linkages between bridge, engine room and cargo operations, with an increasing emphasis on environmental protection).

Finally, the interface between shore and shipboard training will also develop in the coming years, including:

- An industry driven structure (e.g. “best practice” developed through collaboration between MET institutions, companies, regulatory bodies and seafarers).
- Closer integration between ship and shore-based training (e.g. training programmes involving distance learning or guided study aboard ship, the design of which complements the education or training delivery at the academy).
- Development of non-technical skills (e.g. interpersonal skills, leadership) and team effectiveness through shipboard evaluation and delivery.
- Effective and timely planning for future training requirements.

## **6. COLLABORATIVE VENTURES**

MET institutions will be obliged to engage more closely with key stakeholders to ensure that MET provision effectively sustains the solutions to the challenges ahead and is capable of meeting the changing demands of both industry and individual seafarers. At the same time, industry and regulatory bodies must be encouraged to recognise the benefits of such engagement and allocate appropriate resources to support it.

WMA has become involved in a number of collaborative ventures over recent years, ranging from working closely with individual companies to develop bespoke training packages (e.g. Bridge Team Management) or evaluate shipboard performance (e.g. WMA staff travelling aboard ship to review the effectiveness of bridge and engine room teams) to more extensive collaborations with groups of maritime partners.

Our collaboration with the International Maritime Training Trust (IMTT) two years ago has led to the development of a Postgraduate Certificate in Teaching and Learning for modular and blended learning delivery to Filipino lecturers in both the Philippines and at WMA. The key objective was to improve overall teaching practice, to the benefit of both lecturers and their students.

The Tanker Officer Training Standards (TOTS) [7] developed in 2008 by the International Association of Independent Tanker Owners (INTERTANKO) in conjunction with Warsash Maritime Academy (WMA), the Malaysian Maritime Academy and Marlins is an excellent example of how such collaborations can generate positive solutions to industry problems.

In this case, an increase in tanker accidents initiated a co-ordinated response by INTERTANKO members and their partnering with MET institutions to address this negative trend by establishing a set of voluntary TOTS for INTERTANKO members. TOTS will ensure tanker officers' competence for general shipboard operations as well as those for specific tanker types such as crude, product and chemical tankers.

In May 2009, the TOTS initiative won the Seatrade Award 2009 for the category of 'Investment in People', which recognises a significant contribution to the recruitment, training, retention and advancement of the industry's most valuable asset, its people.

WMA has also recently been awarded the co-ordinating role on the EU Commission's "Project Horizon", a 2½-year collaborative project to conduct research into the effects of fatigue on the cognitive performance of maritime watch-keepers under different watch patterns, using ship's bridge, engine and liquid cargo handling simulators. WMA will be working with 11 other European partners on this project, including Chalmers University in Sweden, Bureau Veritas in France, INTERTANKO and the UK's Maritime and Coastguard Agency.

There will inevitably be practical spin-offs from closer links with shipping companies (e.g. use of simulators to evaluate pilotage into new port areas for particular vessels, availability of guest company lecturers with specific current expertise etc.).

Other benefits may be gained from links with equipment manufacturers (e.g. evaluation of life saving appliances and fire fighting equipment through frequent use on training grounds, informed comments from specialist lecturing staff etc.).

Finally, there will be greater collaboration between MET institutions themselves, whether individually or through MET associations such as the International Association of Maritime Universities (IAMU), the Global Maritime Education and Training Association (GlobalMET) and the International Association of Maritime Institutions (IAMI).

An enormous amount of work is already being carried out in supporting fellow MET institutions, such as assistance with curriculum development, establishment of new course provision, peer review and information exchange. This will hopefully assist worldwide MET standards to improve significantly over the coming years.

## 7. CONCLUSION

MET trends in the 21<sup>st</sup> century will be driven in the short term by the need to address the significant shortages in officers, including the requirement for increased capacity and resources at MET institutions worldwide, while longer term goals will focus on retention and development of these new officers to eliminate skills gaps and restore a sustainable rate of professional progression. However, effective engagement with industry will be essential for identification of global priorities and gaining support for the necessary evolution of MET activities to meet future demands of key stakeholders.

Improvements in the quality of global MET provision will also need to be achieved if the overall standards of competency are to be raised, and this will be achieved through a number of concerted activities, such as academic collaborations (e.g. WMA's postgraduate course for overseas lecturers), effective regulatory oversight and audit of MET provision, upgrading of IMO model courses and work undertaken by MET associations such as IAMU, GlobalMET and IAMI.

Longer term trends will also include the introduction of more flexible and interactive MET provision, increased focus on the effective development of the industry's key assets (i.e. its seafarers) to meet future requirements, and a more collaborative approach to improving MET provision, which is fit for purpose in the modern, technological world.



In summary, MET institutions cannot afford to be complacent in the face of significant global challenges. They will be obliged to conduct proactive evaluation of future MET trends and design 'products' to fit the maritime industry's changing demands. This will entail keeping pace with technological advances and regulatory amendments, and responding effectively to global business developments, cultural changes and key stakeholder demands.

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