23RD INTERNATIONAL MARITIME LECTURERS ASSOCIATION CONFERENCE

DURBAN, SOUTH AFRICA
29 JUNE - 03 JULY 2015

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TEN LESSONS IN PROVIDING MET REMOTELY

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Abstract
The environment in which MET is provided is changing as fast as the maritime industry itself. Technology has not left the subject behind but in the same way that the seafarer may over rely on the electronic gadgets around them, the MET tutor must not over rely on available technology either. Speaking from experiences of leading postgraduate MET courses and course units for over eight years, the author relates twelve lessons to bear in mind when developing and delivering on-line or blended learning programmes.

The use of on line technology seems appealing for a number of reasons, largely obviating the need for students to travel to attend a residential class. However, problems associated with students accessing learning material are often under estimated. Such problems will be discussed in detail in the paper. Individual approaches from students do vary though in almost all cases, the path of least resistance is chosen. This applies to seasoned upper managers as well as recently qualified graduates. Techniques of encouraging students to take a more yielding path are also discussed.

These are just two examples of common but often under estimated issues. The paper which follows considers an additional ten matters which should assist future providers of MET, having learned lessons from past experiences. More specifically the experiences involved the delivery of a blended learning postgraduate certificate (Lloyd's List 2007), of one year’s duration which incorporated a blend of on line and face to face classroom delivery. This was not a cheap option but one which was financed by a substantial trust fund input. However, the results were equally substantial.

On a larger scale, a two year entire MET related MSc is also referenced, where the experienced nature of the students proved to be a major advantage in achieving course objectives, if utilised appropriately.

Introduction
As any form of technology is introduced into an industry, a teething period has to be anticipated. It is a form of change on a large scale and like any such change, it has to be managed carefully. Just as the introduction of automated engine room machinery and Electronic Chart Display Information System (ECDIS) on the bridge of ships for example, met with resistance from the more seasoned professionals, so it is in the MET domain, with experienced teaching staff viewing progressive on-line teaching and learning techniques with suspicion. Research has shown this to be the case with the elder students as well. A study by Patterson and McFadden (2009) concluded;
“Results of the study found that online students were significantly more likely to dropout than campus based students. Age was found to have a significant unique affect on dropout in both programs with older students more likely to dropout”.

Yet like it or not, on line provision is here to stay and the view of many MET institutions is that if they want to compete with other institutions in a business sense, they need to adapt and adopt the necessary facilities. This is a sentiment also expressed by Mariasingam & Hanna back in 2006;

“The number of online degree programs offered by universities, both within the United States and in other countries around the globe, has expanded remarkably from the year 2000 to 2005. Recent research [Pond (2002), Twigg, (2001), Swail and Kampits (2001), Nielson (1997)] indicates that this rapid expansion has superseded our understanding of how to plan, organize, and evaluate these programs effectively”.

The cost of the hard ware in terms of computer and internet friendly equipment is one major issue but another far less well identified matter is the knowledge and expertise necessary to provide on line MET. Teaching staff cannot be expected to be able to produce internet friendly materials without some form of guidance. The link between the capability of the computer software and the presentation of the teaching material in order to facilitate learning, which is the most important factor, is oft forgotten. Therefore the facilitators of the delivery need to consider that link very carefully. It is not simply a case of a lecturer familiarising themselves with, for example, all the bells and whistles of PowerPoint, which was hard enough to achieve 20 years ago. IT interfaces such as moodle (Modular Object Oriented Dynamic Learning Environment. A course management system for on line learning, Brandl (2005)) can be enormously complicated for the novice and it is unreasonable to expect teaching staff to pick up the finer nuances of the software without some form of coaching. In fact it is not unusual for am MET institution to employ staff for the sole function of providing this link between the technology of the software and the teaching staff. In many cases, these individuals develop into pretty good teaching staff themselves, especially in on line form. As Machado & Tao (2007) observe;

“Learning management systems are becoming ubiquitous technology adopted at institutions of higher learning. Before these systems can be considered effective the user experience must be studied and analyzed to provide the optimum solution to meet pedagogical needs of both faculty and students”.

However, this paper primarily concerns the role of the teaching staff and how they manage the delivery of the material. Not surprisingly, there are differences between delivering a postgraduate programme in a classroom and on line. The author has experience of both and is well placed to assess the difficulties associated with developing the latter from the former.
What follows are ten lessons learned from eight years’ experience of developing and delivering a series of postgraduate MET courses.

**Lesson One – Know your learners**

This is one of the most important mantras the facilitator (trainer / instructor / teacher / tutor / unit leader) needs to bear in mind. Of course there will be a syllabus which needs to be covered but the way in which the objectives can be achieved should be entirely to the imagination of the facilitator. So how do they know what the learning needs (Kim & Bonk, 2006) of their students are? Ask them. With knowledge of the background, current practices and gaps in knowledge of their students, the facilitators can pitch the delivery of the material toward the specific needs of their students. It would be over simplistic to suggest all students in a group had the same needs but without determining what the needs are, the facilitator runs the risk of falling into the ‘spray and pray’ trap (Ellis 1997). This means that they simply spray the students with material praying that some sticks in their memory to enable them to achieve the outcomes.

It is not a difficult or complicated mechanism to find out what the students’ backgrounds are. In fact, as will become apparent later in the paper, the function of finding this out can help facilitate the icebreaking procedure. This will help break down communication barriers, as cited by Berge (2013) between the student and tutor and also between students, more of which later. Students may have enrolled on a course having progressed from an undergraduate degree programme and are looking to maximise their academic qualifications in order to increase their chances of landing a lucrative career. They may have spent a number of years in employment, having attained an undergraduate degree years before and are looking to extend their academic portfolio. This may result in a promotion in their employment, which may be a motivational factor (Kim & Frick 2001, Haller 2014). It is not uncommon for students to appear on postgraduate programmes between jobs and entirely self-funded. Neither is it uncommon for students to choose to study entirely for their own interest, where no particular employment incentive exists. Whichever position they are in, they are all customers of the MET provider (Ayala et al 2014). Once again, there is a very simple mechanism for determining what the students’ expectations are: ask them.

The issue about knowing your learners extends beyond simply holding dialogue with them at the start of the course. They should have access to enough information for them to make an informed decision as to whether the course is suitable for them in the first place. It is most disheartening for both student and tutor to find that the course turns out to fail to meet their expectations in terms of subject matter, (Richter 2012). This is another trap easy to fall into if marketing materials are not prepared accurately. The path from the moment the prospective student first becomes interested in the course right through to the moment they achieve their award and all in between, should be
completely aligned. Academics may call this Constructive Alignment but whatever it’s called the student is entitled to expect the marketing material, course material, assignments, assessments and the value of the qualification in industry to completely configured and aligned. Often, they are not and as suggested, if the time it becomes apparent that the student is not suitable for the course manifests itself after they’ve paid for and started the material, then it is easy for the student and tutor to loose heart to the point where they all feel they’ve been wasting their time and effort (and money, in the case of the student or their employer). Biggs (2012) explains another function of Constructive Alignment pertinent to this paper;

“A design for teaching that is based on the assumption that students are not at the end of a transmission process but actively construct their own knowledge. Teaching is then a matter of engaging students in appropriate learning activities, not just transmitting content”.

Such alignment at the beginning of the process also makes it easier for the student to explain their reason for choosing the study and for the facilitator to relate the course material to the students’ needs and expectations.

Lesson Two – Motivate your learners

In this context motivation does not mean threatening or frightening the student. Though facts are hard to ignore, such as the amount of time that may have to be devoted to the study, these issues should be covered in a positive light. At postgraduate level, as with most levels of study, students should actually enjoy studying (Hatakka 2012). This is often a difficult notion to entertain yet it can be the key to success.

Once again, this lesson relates to others to follow, considering that the student needs to know what will be required of them not just in terms of time but in what kind of assignments and assessments they’ll be asked to complete. This will be dealt with later but the main task in motivating the student is to relate the course material to their interests and their objectives. It may not be practicable for the marketing material to cover everything the student needs to know about how the course will advantage them but dialogue with the tutor (or Subject Matter Expert, as they may be called) should yield all. The tutor may not necessarily know the technicalities of the job or industry in which the prospective student may work but they should have enough information from the student to be able to provide sound advice as to how the course may advantage the student.

For example, the exclusively on line MSc Ship Operations was developed by Warsash Maritime Academy on the loose premise of expediting the transition of senior seagoing staff into shore ship management positions. Whilst a number of such individuals have undertaken the programme, either funded by their employers or by themselves, the course has also attracted many who had already made that step already or whom had only worked ashore in a shipping company, never having stepped
aboard a ship. Both backgrounds were equally worthy of inclusion on the course, pending suitable management experience and it was not difficult to contextualise the function of the MSc in the career path of either type of student (Demirel & Ziarati 2012).

The value of the study and qualification within the context of the career path of the student is a common motivational factor. It is one worth considering during the dialogue between the prospective student and the course tutor / facilitator.

**Lesson Three – Explain the journey and how to reach the destination**

The notion of *Constructive Alignment* (Biggs 2012) is crucial at this stage since the course representative (tutor / facilitator) will need to be confident that the path between the start and end of the study is smooth and methodical. No doubt the *selling* of the merits of the course to the student will have played an important part in the students’ decision to apply and enrol. However, now the student has enrolled they will be anxious to know what they are letting themselves in for. At the stage of enrolment, the student will be thinking they know what they want but they don’t necessarily know the detail of how to get it. That is where the course representatives will need to furnish the student with the detail.

It is most likely that the programme will be sub-divided into several units or modules and again this paper will discuss this further later. However, the enrolment stage is the one at which to supply this detail. Explain how the programme will be sub-divided and the titles of the various units or modules and the order in which they will run. There is usually a good reason why certain subjects need to run after certain others and the ubiquitous *project* unit, commonly runs toward the end of the programme, with the students having been furnished with the required research and study skills earlier on. It is not sufficient simply to list the unit headings to the student at this stage but also to describe the various means of how their progress will be monitored.

There may be different *routes* to the qualification, whereby certain units maybe optional or choices of units may be offered. The pathway to the destination must be explained since even within a broad subject heading, a student may have various preferences in unit heading, where options do exist. This is the point at which to discuss options and preferences. It is not simply the privilege of the tutors to play to their strengths in terms of the subject matter they cover, the student will be well advised to choose the units they prefer, since this will also enhance their motivation toward the work. It will also reduce the chances of them dropping out of the course, if they find themselves studying material in which they have no interest.

It will be important to let the students know how their progress will be monitored in terms of assessment and assignment. Whichever of the assessment techniques selected, from those to be
discussed later, the students should be informed at an early stage. It is not fair to the student to tell them to wait and see. Success is much more likely if they are prepared for the activities they will encounter during the course.

Arguably the major issue to be confronted by the student is the amount of time they will be required to devote to the study. This is especially the case if they are in full time employment and undoubtedly, their home and social life will be affected. It is not uncommon for 12 to 15 hours per week to be necessary for postgraduate study, so that might translate into a whole day over the weekend and two or three evenings during the working week. The family of the student will need to know this as well and prepare for this, as well as the student themselves.

Lesson Four – establish and encourage icebreaking before the course starts
As part of the induction process, contact with the various members of the course team and other students should be encouraged. This is not an easy process even for the most seasoned professionals and is likely to be even less easy for younger participants. Therefore the course team have a part to play in encouraging this. As well as tutors introducing themselves to their students, students introducing themselves to each other should be encouraged. It may be surprising just how much they have in common with each other, especially if, for example, they are at similar stages of their career. At the start of one of the MET postgraduate certificate courses, cited earlier, two female members of staff from two different MET institutions in the same country but several hundred miles apart were introduced to each other, as part of the icebreaking session. All present in the classroom witnessed how they identified with each other within seconds of their introduction. The support they afforded each other not only during the course but in their respective jobs has endured for years. Their respective success in their studies was attributable in no small part to the icebreaking session at the start of the course.

It is possible that the course team themselves may be spread over a wide geographical area, so they need to present a united front to start with. Few impressions discourage a prospective student more at the start of a course than a disparate course team, where questions to two different course team members yield different responses.

As a relatively experienced academic, the author has also been surprised at just how much peer support can be created by a group of inter-active students. The difference between dependent, independent and inter-dependent learners has been discussed at length in the past (Angeli 2013) and the latter two types are greatly preferable to the former, as far as the course tutors are concerned. For a start this results in less effort from the tutors (who are just as entitled to the path of least resistance as the student) but also builds a support network apart from the MET institution. This
does not preclude the intervention of the institution staff but it complements the existing more formal support network. For example, if a student is having difficulty with an assignment task, rather than repeatedly pester ing the tutor in a way that implies the tutor should do the work for the student, other students should be approached so they can work as a collaborative team. As well as enhancing peer interaction it leads to peer support (Lee et al 2011), where the students help each other. This does not mean doing the work for each other but it does mean discussions related to potential different interpretations of assignment tasks.

**Lesson Five – subdivide units into books or learning cycles**

Practically nothing intimidates a student more than seeing vast passages of unbroken text in front of them. It looks like a mountain. The author remembers receiving a huge cardboard box of books and files at the start of his distance learning based Master’s degree. It looked and weighed as heavy as a mountain. Perhaps the analogy that units should be delivered in small, bite sized chunks is a little too fanciful, yet it is important to attract the student, not deter them. This is where the technology can help and certainly those more familiar with modern technology than the standard tutor or instructor will be able to help. Web pages with the study materials should look appealing and be easily navigated. They should be numbered so the student can see how far they have progressed as they work through the various tasks and assignments. Rather than incorporate large chunks of text on the pages themselves, links to academic papers or book chapters (bearing in mind copyright legislation) can be included via hyperlinks. Short film clips either created by the unit leaders or tutors themselves can help liven up the appearance of the page and links to professionally made television or documentary clips can help explain more detailed technicalities.

Tasks should be abundantly clear, especially those which will be graded and count toward the final marks. The time allocated to the various tasks within the unit or module should be made clear, usually at the start, so that the students will be more able to methodically and accurately divide their time during their week to their study. Dates by which certain tasks should have been completed should also be made clear. This will help individual students gauge their progress to enable them to understand where they should be within the unit or module at a particular time. If this information and guidance is not stated then the tutors can guarantee this is the line of questioning students will engage upon.

It is also good practice to state objectives or learning outcomes at regular intervals depending on how the units are sub-divided. All of this helps present a student-centred approach to the study (McCabe & O’Connor 2014). It empowers them by giving them the option of how they achieve the academic aims of the course. It is fanciful to suggest that the students do the work when they want to, as though they can complete their allotted tasks within a calendar year (or two) from the start date of the course.
This does not work. Learners need hand in and completion dates even in the short term and they will value this information at the start of each sub-division of each unit. The consequences of late hand-ins can be a matter for the individual MET institutions to decide but students do value deadlines and it is very likely the mature postgraduate student in full time employment is used to this style of work anyway.

Lesson Six – Relate the course material to real life incidents and topical issues
This advice helps the developers of the material, the course team, as well as the student. Real life incidents attract attention and therefore there is likely to be more material in press, journals and publications available for both course developer and the students to access, to assist in their critical evaluation. What is more, the students will have an opportunity to exercise judgement as to which sources of information are academically robust, or otherwise. Again, think of prospective employers of these students after completion of their studies. A sound grasp of real life will be amongst the expectations upon the students, since they may well have to deal with future incidents similar to those previously studied and analysed.

For example, few industries attract such a narrow minded approach from the popular media than shipping. It loves to report on a shipping accident particularly if it involves the spillage of oil into the environment. How many general or dry cargo ships have been reported as being tankers by local media, especially when there has been a leakage of fuel into the environment. Regrettably, shipping is an industry in which we never seem to have to wait long for the next high profile incident. Whilst this is lamentable in terms of the reputation and perception of the industry it does mean a regular supply of case studies, which can be utilised expediently for teaching and learning purposes.

A useful presentation technique is to include a case study of an incident which will have a long term aftermath, for example a prosecution. The matter appears significantly topical whilst it saturates the popular press, even though the incident may have taken place several months or years before. As an alternative, some topics never seem to go out of fashion in the trade press, if not the popular press. An example of this may be the Maritime Labour Convention (MLC) 2006 which has been discussed at length before, during and after implementation.

On a more general level, the Postgraduate Certificate in Maritime Education and Training ambitiously attempted to change an MET culture, so all the material and exercises were directly related to the work of the participants. The students were all full-time lecturing staff at various different MET institutions, though each in a particular localised zone of the world. For the record, the course succeeded in convincing the participants of the various different approaches that may be adopted when
delivering MET, as they subsequently demonstrated, though the broader national and international culture was less malleable.

**Lesson Seven – encourage student interaction and exchange of experiences**
The subject of peer support was covered earlier yet this topic of student interaction is something additional. The abstract of this paper cited how the industry-hardened experience of students on postgraduate courses can be used to the advantage of all. Abrami et (2011) have researched and also espouse interaction between distance learning students. By encouraging discussion and interaction between such students, their own life experiences can become central to the theme of a unit or subdivision of a unit. This may be the case, for example, when a particular function such as vetting or ship inspection forms part of the study. It is not unusual and could almost be relied upon that at least one of the students on the course will have been involved in some kind of ship inspection regime in the past, either as an inspector or being inspected. Not only does this incorporate a real life dimension to the study but it appeals directly to some students themselves. Few techniques help to make a student feel more valued and empowered than when contributing to discussions about their own work.

Those that do not have related experience are certain to learn more and be more willing to learn from their peers, than their tutors. Again, this relates to the path of least resistance. Whoever the student is, there seems to be an instinctive scepticism of what academics tell them. This is by no means unhealthy if it leads learners to question sources of information. Yet they are much more likely to accept the word of their peers with whom they will feel a closer bond because they are *more like them* than the academics.

Additionally, on line courses are likely to attract students from around the world, vast distances apart. A productive exercise may be to compare and contrast certain maritime regimes from different parts of the world represented by different students. Once again this helps student’s feel valued and empowered (Finn & Schrodt 2012), if they are able to relate issues to which they are closely involved.

**Lesson Eight – integrate these factors into the course material and exercises**
It is not good practice on the part of the course team to leave the preparation of the course material until the last minute. This is akin to students leaving the hand in of their assignments to the last minute. However, it may pay the course team to be flexible. This means that certain exercises later in the course may be adapted to the nature of the background of the course participants, particularly group work. One benefit of web based course material is that unlike hard copy, it does not all have to be prepared and ready before the course starts. The later learning cycles or subdivisions of units can be left hidden until the time comes for them to be started. The detail of these can be adjusted once the
course has started so it appears to identify with the students’ backgrounds and experiences. For the reasons stated earlier, this approach is more likely to yield a more enthusiastic approach from the learners.

Exercises and tasks involving groups, studies by Tsay and Brady (2012) such as a discussion forum can be very productive, though a frequent problem is enticing the participation of the shy and reluctant. An incentive may be introduced into the grading criteria of later assessments so, as an example, marks are awarded on the basis of the scale and quality of contributions to the forum. What appears as favouritism must be avoided and younger, less industry-hardened students may feel at a disadvantage to the more seasoned professionals in such cases. It is up to the course team to ensure they avoid favouritism and ensure each student is made to feel equally welcome and valued.

One might cite Wenger’s Communities of Practice (2011) as a mechanism in which the students sense of identity within a group as being significant here. At postgraduate level, every participant will have built up some experience whether in industry or academic. It could be that the younger students may have more academic experience than their elder colleagues. The experience of all of them can be used for referencing whilst fine tuning the final units and exercises.

Lesson Nine – vary assessment techniques

Course team members, whether tutors or developers, will draw on their own educational experiences whilst creating a new programme. They may recall how huge swathes of text or piles of books will have intimidated and maybe discouraged them in the past. Huge banks of questions may have had the same effect. All such recollections may help forge on-line material in development and the negative aspects should be avoided. As cited earlier, 4000 word assignments are not the only way to assess a learner’s understanding of a topic (Biggs & Tang 2011) Bearing in mind the element of student-centred learning, a key feature of on-line provision, a series of smaller tasks can be equally effective as a means of judging a student’s academic ability as a preparation for final, summative graded assessments. Group work, especially involving a forum, can be highly effective and efficient. Consider the objectives of a postgraduate degree, cited in lesson six, such as forming and defending an argument. Forum based exercises are ideal for this since each contributor to the forum is likely to have to defend their interpretations when questioned by other forum participants. The intention is not to create a row but it is to create a lively discussion. Few exercises are likely to bring out the background experiences of the participants more than this and if there is a requirement to practice referencing skills as well, then a number of objectives can be achieved if the assignment brief is clear and efficient enough. An interesting discussion is also more likely to draw in others who may have felt a little shy or reluctant to engage initially.
From a tutor’s / facilitator’s point of view, it is a sound choice to allow students to practice their academic writing, or Academic Literacy, as espoused by Wingate (2012). This does not necessarily have to be in the form of thousands of word reports, though they have their place. Shorter interpretations of a few hundred words will give the student the opportunity to demonstrate their academic writing skills, incorporating the issues cited above. This leads us on the often thorny matter of referencing. References may be used to demonstrate a current knowledge of an issue but they should also be used for more divisive purposes to compare and contrast published views and to justify options or arguments. This is arguably one of the most difficult elements of postgraduate study skills to impress upon students new to this level.

To this end, it may well serve the course well to include a separate session or unit devoted to study and research skills (Feldon et al 2011). The nature and IT capability of the students may lend itself to more ambitious assessment techniques. Part of one exercise set by the author of this paper, required the student to hold an informal interview a colleague (office or shipmate, for example). In response a fascinating insight into the capabilities of some students, way in excess of the author I might add, has been illustrated. Sound files have been posted and in some cases, filmed interviews posted onto the on-line pages for evaluation. It has not been a requirement to demonstrate such IT savvy and most students posted a text file but even so, such events make tutoring the course an even greater pleasure. This fulfils the old adage that tutors should never underestimate the capability of their students and when it occurs, all benefit.

**Lesson Ten – Be there**

Lesson one started with an educational mantra and the lessons conclude with something very similar. A major difference between on-line and classroom based MET is the physical separation and it is highly likely some students will feel isolated. (Ludwig-Hardman & Dunlap, 2003). Tutors have to work hard to convince students that this should not be the case. As technology and communications have developed so rapidly in the past few years, it is easy to forget that those on ships do not necessarily have regular internet access, so tutors may not expect each time scale to be followed strictly, through no fault of the student. Some seafaring students have to download blocks of material in one go whilst their ship is in port, to facilitate their study over the following period at sea. Course material developers would be well advised to remember this when designing course pages and learning cycles.

These hazards can be anticipated and should not come as a surprise to the course representatives. Equally, these seafaring students should take note of hand-in dates and endeavour to ensure they post work in good time if the date appears in the middle of a sea passage. Over three years of running an exclusively on-line programme, the author has never witnessed late hand-ins from seafaring students in such a position. With a little planning and forethought, these hazards can be overcome.
Though on-line courses are developed to overcome distance and separation, it is not unusual for some students to live close to the MET institution providing the programme. It would be a mistake in this instance, to snub the fact by failing to invite such individuals into the MET for a face-to-face exchange. As espoused earlier, all forms of communication should be explored.

As the first assessment approaches, most students will be wondering if the work they have produced up to that point is good enough or if they need advice. Some will be more active in seeking feedback (Holland & Garfield 2012) than others but tutors can take it that almost all students will be asking themselves the same question. So a little filmed sound bite of a tutor demonstrating an understanding of how the students are likely to feel, at this point, will go a long way to convincing the students that the course team possess such empathy.

Conclusion
Prospective MET academic staff bearing a reluctance to embrace IT technology as a means of delivering MET will find their teaching options limited. As has been cited, many academic institutions, MET and others, have encountered severe problems in combining the expertise required to run the technology and that required to deliver the material to paying customers. This paper has been composed with the aspiration of advising MET institutions planning to deliver on line training of some of the pitfalls which may be encountered and how to overcome them.

Wrestling with communication issues is only likely to be part of the problem and whilst it may sound an easy option to blame the technology, when success proves elusive, much can be achieved by the attention to human issues and consideration of the student.

References


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Holland, L., & Garfield, J. (2012). A Scaffolded Approach To Teaching Research Skills To Postgraduate Students


Training the Trainers Lloyds List 30th July 2007


SAMTRA’s Road to eLearning in the South African Maritime Industry

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Challenges identified in the South African Maritime Industry

In short, maritime related education training via any sort of distance learning method has not been facilitated for 20+ years. There are various reasons why, but ultimately it comes down to combined lack of initiative from the higher education sector as well as the actual maritime industry sector. South Africa is a small maritime nation having a small maritime industry which has not resulted in the demand for education and training in the maritime education and training field as would be seen in other parts of the developed world.

Education towards a maritime qualification in South Africa has followed the traditional model. Students go to class at an accredited institution. They then have to spend time in classes in order to qualify for examinations based on attendance of classes. If you don’t attend a certain number of classes you can’t write the exams. Lecture periods are not always very time management friendly for the students.

Attending fulltime lectures has its merits but is a very time consuming activity related to this particular learning path, pursuing a career at sea, and does not necessarily guarantee candidates with the desired outcomes. For a full time working student this totally excludes opportunities for further studies in the maritime sector.

Facilities providing the STCW required education and training to obtain a marine qualification for foreign going service in South Africa are limited and they themselves face limits for the provision of maritime education and training. Physical limits in terms of location and facilities, financial limits in terms of cost to provide education and training and human resources limits in terms of qualified sea-going experienced staff.

Education and training provider facility operating procedures and policy, changes in curriculums and the restructuring of higher education and legislation have also worked towards reducing the possibility of pursuing part time studies towards a maritime qualification or furthering one’s own qualifications to a higher level.

Access to online resources to pursue a maritime qualification remains a challenge in that maritime related education and training is not available in South Africa from any education and training provider.
facilities. Most facilities boast an “online school” however this turns out to be mostly fulltime student support related to attending full time classes. At best, a sort of blended learning scenario.

Although technology and internet availability advances have been made, access to the internet and online resources also remain challenging although not insurmountable. Many technology platforms exist through which effective online learning can be distributed and presented. The possibility to download for later use and upload at a later stage when and where an internet access point is available further reduces the challenges of technology and internet access.

Human resources provide the greatest challenge to providing maritime related education and training in the maritime industry in South Africa. A critical shortage of subject matter experts who are well qualified, have relevant sea-going experienced and are “teaching inclined” exists. These would include actual classroom lecturers, whether full time or part time, instructional designers and course developers with marine qualifications and sea-going experience.

International trend observed has been to offer blended learning solutions mostly. The terms “distance learning”, “guided learning” and “part time” learning have been used when discussing the provision of online learning.

**INTRODUCTION TO DISTANCE LEARNING**

**Distance learning advances**

Efforts at providing a distance learning option have been made in South Africa for some time now. Prior to the computer age it was all parcels of books and assignments sent via courier or postal services to and from students. Another name for this is “correspondence learning”. The option of telephonic support should a lecturer or student want to discuss relevant issues was also available.

Along with the WWW and the availability of affordable and user-friendly computers in the late ‘90’s, efforts at providing a more streamlined distance learning method by using electronic documents were developed. With the introduction of the internet and email facilities the concept of distance learning took on a whole new approach. Learning materials and assignments could be distributed almost immediately. Online collaboration allowed for instant responses and the development of online communities.

Study anything, anywhere at any time. All learning resources provided online in a variety of formats, available as streaming data for instant viewing or for download to view later on any compatible digital device. Everything is done online via the internet.
**Blended learning**

Not a new concept to the education and training environment, blended learning is a way of utilising learning time much more economically. A student would carry out some self-study time using the distance learning/eLearning method as well as attend short courses on specific subjects. This method can be accomplished effectively by having the student learn large amounts of learning materials, complete formative online assignments to maintain or promote a certain level of progress. The training program is then finalised with a short period of key area training and moderated assessments at an institution. The student is able to continue full time employment but still have the benefit of a short period of face to face training where required.

**Benefits and drawbacks**

eLearning creates benefits for the class room teacher as well as the student. Distance learning has few boundaries and restrictions in terms of location and time. Distance learning can be facilitated with an LMS anywhere, anytime. Using technology available today courses are no longer boring sessions of book reading or listening to a lecturer's boring voice. Interest can be increased by incorporating interactive activities, multimedia or social activities into the learning process. Cost effective solutions to the traditional method of knowledge transfer can be easily incorporated into the eLearning process.

eLearning actually fits into today's fast paced, I-want-it-now, on-the-go lifestyles. With ever improving technology and the spread of connectivity people are living the modern life that demands alternatives to the traditional ways.

There are some drawbacks to eLearning in that certain practical skills better left to a practical training environment are not easily picked up with on-line training. Students may feel a sense of isolation in that they are on their own with a particular source of worry and not have classmates to share a learning goal or challenge with. This can be somewhat alleviated by online resources such as forums, chat rooms or social media.

Costs wise, eLearning can eliminate the need for costly and time consuming travel, requirements for accommodation should the student not live close to the learning institution as well as the student may continue to work alleviating the need to have a separate study leave period.

**Considering the future for distance learning**

Distance learning and eLearning is here to stay and grow. The traditional institution for higher and further education, in terms of cost, is gradually becoming an increasingly difficult to sustain entity. eLearning can accommodate far more numbers of students and at lesser cost than traditional instruction methods.
Students expectations of learning has also changed. They don’t want to sit in a class for hours through the day. They are far more satisfied with social and electronic digital media. The trend is study anything, anywhere at any time. Not possible with the traditional methods of instruction.

Other important considerations when considering the future of any distance or eLearning courses are:

**Validity**
This is where accreditation and recognition are very important. A course leading to the issue of a certificate that is not recognised is not worth the paper its printed on. To be of value to the student the course must be accredited by a recognised national or international agency. This is very important to the student to study to improve qualification levels or specialise. This boosts employment opportunities.

**Flexibility**
Compared to on-campus fixed schedule courses, distance learning offers the student far more options in terms of study what you can, when you can, where you can. This also allows the student to continue full time employment during the study period.

**Costs**
Distance learning can offer the student direct savings in terms of daily travel and accommodation if required. Being able to continue working allows for income earnings, not putting work or life on hold, avoiding unpaid study leave periods. eLearning can offer savings in terms of costs of materials such as text books. If the institution is not required to have large classroom facilities then indirectly savings can be made by not having to work those costs into the tuition fees.

**Online learning**
eLearning has been the source of much debate regarding the ability to learn from online sources. The fact is that we have been watching theatre forever, listening to radio programs since man learned to transmit radio messages, watching cinema and television in all forms and more recently used computers and the WWW to distribute knowledge. Distance learning has been around for ages.

**Concepts**
Not everybody responds the same way in given situations. Similar with the notion of distance learning or eLearning. Everybody has their own unique way of learning best for themselves. eLearning along with various technologies and the variety of learning methods possible can respond to different needs of different people.
eLearning can offer significant time reductions for research and locating of information. Availability of online resources offers a significantly broader experience by use of emails, social networking using chat rooms and forums, online collaboration, news and periodicals, databases and the rest the WWW has to offer in terms of supplementary and mostly free material resources online.

**Best practices**

Knowledge that a student gains via online learning depends on the course materials offered, the methods used to present the course materials as well as the environment in which the learning takes place. The tone of the course material, its look and feel, the level of interactive activities and use of multimedia all go towards making the course exciting and successful.

Courses can be divided into one of two categories: information based courses or performance based courses. Information based courses do not specifically have clearly defined outcomes although there is an expectation the student will have gained some new knowledge from the shared information. With performance based courses an expectation of knowledge gained with purpose towards a skill or objective exists and as such must have clearly defined outcomes and expectations.

For successful training to occur the content must be relevant and satisfy specific goals. These goals must be clearly outlined in the introduction to the course. Having clearly defined outcomes allows for measurement of success towards the outcome. Formative assessment methods may be used to gauge on-going progress, give the student guidance on weak areas and allow for more targeted support. Final assessments, a summative assessment, can be used to round off the assessment phase. The desire for assessments to be useful and successful is to get the student to demonstrate their understanding and skills gained from completing the course.

As with the outcomes, the course contents must also be clearly presented and easily accessed on different platforms. The contents must, by its use, progress the student towards achieving the course outcomes. Learning materials can be presented in a multitude of ways stimulating the learning process and maintaining the students attention. Knowing the outcomes expected will help the student to plan their eLearning experience around their own situation. The key to success is preparedness; the key to preparedness is planning.

Well defined communication methods, preferred methods and alternative methods must also be identified to avoid confusion and lost communications. Using direct and indirect communications allows for specific communications and general information transmission. The student must never feel left out and on their own. A supportive eLearning community encourages students online to participate and interact with each other and their instructors.
Synchronous vs Asynchronous

The eLearning environment can support both synchronous as well as asynchronous learning experiences. With the use of technology synchronous learning can be facilitated online to large numbers of students. This can be particularly useful when a difficult topic is under discussion or a more teacher led scenario needs to be followed. Student have the opportunity to discuss items of relevance with the teacher or hear and participate in the other students discussions. Forms of synchronous learning are in real-time online chat rooms using instant messaging and video or teleconferencing.

Synchronous learning is not always useful to all participants when one considers the time zones and specific meeting times. Asynchronous learning would require the student to practice more self-discipline and time management on their own however giving the student the freedom to research on their own. Asynchronous learning can also be teacher led using discussion forums, emails and message boards. The student would reference these items in their own time and also have the opportunity to leave messages or ask questions via the same methods for others to access and respond to when they are able to do so.

Technologies supporting online eLearning

eLearning can make use of many technologies that are commercially or freely available. Some technologies are dedicated towards facilitating eLearning while other technologies compliment the eLearning process. Internet connectivity is improving constantly with mobile technologies and access points opening up the internet to more than just a fixed connection.

Communication technologies such as emails, instant messaging, blogs and video conferencing facilities can also be widely used to facilitate eLearning. Self-study resources for conducting internet based research as well as collaboration resources such chat rooms, forums and social media sites allow for a diverse online learning environment. eLearning materials can be stored in the cloud for retrieval any time the student needs to access them.

Technologies supporting offline eLearning

With ever improving personal technology such as smart phones, tablets and small portable computers, eLearning is made offline possible. Offline eLearning can be facilitated by the use of traditional electronic data distribution methods such as cd’s or memory sticks. Students can also make use of downloading materials when an internet connection is available for later viewing.

Students may also use more traditional methods of research like text books and manufacturers manuals. Completed assignments and assessments may be submitted via the same methods previously mentioned.
Technologies supporting management of eLearning

Commercial and open source software is numerous and easily available for this task. These technologies can be hosted by the eLearning provider or remotely using a data centre service provider. Management of eLearning falls into actual student management, course management, course content management and course authoring categories.

These technologies provide for management of data such as student records, course schedules and course content. This would include access, manipulation and storage of data. The producing of reports, tracking of progress as well as adding or removing data would also fall into the function of eLearning management technologies.

Rapid eLearning

This is the term used to describe a type of learning which allows for a faster pace of progress by the student. Learning following the rapid eLearning approach is a trending concept accepted by many eLearning providers internationally.

Using the idea of a student having limited time for study purposes and wanting to maximise this time with effective eLearning methods is very important. Recognising that modern day students have a fast paced life, have short attention spans, like multimedia and are mobile and internet savvy the learning materials need to be developed to not only fit into this life style but also take advantage of this lifestyle.

Taking the above into consideration as well as understanding cognitive load limits and memory limits the instructional designer needs to take the learning materials break it down from lengthy documents into more manageable chunks of learning. These smaller chunks of learning can then be further made to focus on what the student needs to know to do the job successfully. Instead of reading pages and pages of learning materials the instructor can use their preferred method of summarising and presenting a smaller chunk of learning.

Micro learning

There are many forms or methods used to present these smaller focused chunks of learning. Short presentations, one page documents, news bulletins on the notice board, email articles, or audio podcast. Based on international trends the preferred way to present micro learning is by means of videos of either a narrated presentation or an actual video recording of the instructor presenting the information. Video lengths of no more than ten minutes with the norm of between 5 and 8 minutes seems to be popular.
Micro learning activities can be embedded into the students’ daily routines. These micro learning activities are also mobile platform friendly. They can be easily downloaded onto the mobile device and carried around until the student has a moment to view the piece of learning material. This can avoid long frustrating or boring learning sessions.

**Interactive activities**

In order to make the learning more interesting and enjoyable interactive learning activities have been used to gain the students attention and participation in a class. The term “gamification” is also gaining popularity in eLearning circles by taking elements of gaming and using game like activities to engage the student more fully into the learning experience. Modern course authoring softwares are providing the tools to include interactive activities into the learning materials as well as the assessment tasks. Interactive activities that engage the student fully are an important part of the rapid eLearning process.

**Feedback**

Tests and quizzes are very important for both instructor and student. They are a way of gauging progress and highlighting issues in training materials or identifying weak students that need some assistance. By using an array of automatic type assessment methods, instant grading, the student can benefit by receiving direct real-time feedback. This allows the student to take more responsibility for their own progress.

The benefit for the instructor is automatic record keeping of student progress reducing time needed for marking assessments, highlighting of weak students who require some individual attention. Modern LMS software allows for various types of assessment and grading methods to be used while also being able to produce reports from data collected.

**The process of blended learning**

The difference between learning and training needs to be understood to fully grasp the idea of blended learning. Learning requires the student to take the information and absorb it by whatever means they find most suitable. The desired outcomes of any learning depends largely on the quality of the learning materials given, whatever the method of presenting it is used and in all cases the interaction of the student with learning material is very important for success.

Training on the other hand is carried out in a face to face environment whether in a class room, workshop or on-the-job environment. A teacher imparts the information across to the student who listens and observes by means of speech and some form of visual demonstration. The teacher instructs the student. The desired outcomes of any training depends largely on the quality of the training given,
whatever method of instruction is used and in all cases the role of the trainer is very important for success.

Blended learning concepts
A blended learning scenario has both elements built into the course. The training is provided where required by the instructor via whatever means is most suitable and the learning is done by the student via whatever method they find suitable. This implies a certain period of instructor led training complimented by a certain period of student self-study learning.

Training imparts the knowledge and learning required to accomplish specific goals and equip the student with certain skills. Learning allows the student to take the knowledge and use it to broaden their skills set by being able to apply the knowledge learned to a different situation.

Social and collaborative learning
We are all learning every day by just observing and listening to what goes on around us. We learn from observing what others do, we learn from hearing what others say. Reading news articles, magazines or by viewing media on our various digital devices we learn all the time.

Social media is a very big part of our lives and has to be accepted as an eLearning medium in order to connect with the modern eLearning student. Collaborative learning takes place in work groups who participate in social media networks such as chat rooms or forums. Blended learning is taken to a higher level by making use of these forms of information sharing.

Summary – Blended Learning Program
This would take the classroom training scenario, the self-study learning scenario, the eLearning facilities both online and offline, single study, social study or collaborative study scenario’s and combine them into a blended learning program. The blended learning program would then be an LMS managed, instructor guided program where the student carries out the bulk of the learning via eLearning; online, offline, self-study, social, collaborative.

The student also attends classes at an institution where specific training is carried out. Formative assessment may be continually obtained from the student submitting assignments, completing assessment tasks and progress monitoring. Final assessment can then be carried out at an institution where the student can be assessed and moderated in person.
TECHNOLOGIES SUPPORTING DISTANCE LEARNING

Learning Management System
Student management, course management and course authoring software form the backbone of presenting eLearning. There are many LMS, CMS and CAT commercial and open source software’s available. Some are very limited in nature while others profess to cover the whole gambit of providing eLearning.

Some leading establishments have produced their own in-house software to manage their full time students, then progressed to managing part time students and then further progressed to managing eLearning. Those have tended to be facility or learning path specific and not always easily transferable into other institutions.

Some software is very extensive trying to offer a diverse range of capabilities tending towards overkill for smaller institutions that may never use the software to the level it was designed to, but get charged for the whole package anyway!

Learning management systems using open source or commercial software may be hosted onsite by the institution itself, hosted by a commercial learning management system provider or remotely hosted by the institution using a commercial data centre.

Course Management System?
Dedicated Course Management systems are used to coordinate courses, instructors, students and facilities. Actual course content may also be managed in terms of allocating learning resources to courses being scheduled. Course management is usually organised around a calendar schedule. Usually used by the administration office and teaching staff of a training institution. These systems may also include course related reporting, attendance register maintenance as well as course content manipulation facilities as well.

Content Authoring Tools
A Content Authoring Tool is any type of software used to produce learning materials. In its simplest form a word processing software package used to produce a written document all the way through to video capturing, editing and publishing software used to produce a high quality training video.

Content Authoring Tools are used to produce the learning materials that will be presented to the students who are participating in a particular course. Courses may contain any number of different types of content produced with any type of Content Authoring Tool.
The course content is then managed by the CMS to produce a course. The LMS is then used to manage
the students who enrol to complete the course. This may be both online and in-house at the learning
institute.

In order to work inside the CMS or LMS environment the course contents needs to be compatible
with the CMS or LMS software. To ensure compatibility some industry standards have been introduced
such as SCORM and TinCan.

There are also full LMS packages available that are available as open source or commercial software
that includes the course authoring tools to create course content within the LMS software package.

Compliance with accreditation requirements and auditing of the course
In order to move forward with presenting of distance learning, whether it be eLearning or blended
learning, the education and training needs to be valid and relevant. This requires recognition and
accreditation.

The governing body for maritime industry education in South Africa is the South African Maritime
Safety Authority (SAMSA). It goes without saying then that for any distance learning to be successful
to both the student and the institution providing the distance learning, SAMSA approval and more
importantly, SAMSA accreditation for the distance learning is required.

SAMTRA has identified some key areas where we can begin with presenting distance learning. As with
all our other accredited training, SAMTRA uses the SAMSA codes as a guideline:

- Master <500GT
- Officer of the Watch – Engineering Officer
- Able Seafarer – Engine
- GMDSS
- MARPOL

References:
In the process of learning about eLearning all my research has been online via eLearning related
websites, blogs, forums and multitudes of email articles far too numerous to list individually.

Many hours of research has gone into learning about the providing of eLearning, research and
comparisons of LMS platforms both commercial and open source, reading and digesting many articles
on the various blogs, actually completing some online courses from eLearning providers, actually using
some LMS and course authoring software packages, approaching a service provider for our chosen
LMS platform and undergoing training related to our chosen LMS platform.
The following being the main sources of research materials produced in this document:

**UNISA, www.unisa.ac.za**
Boasting to be the largest university in South Africa and the leading open distance learning provider in Africa. This website was used to research available online eLearning for the maritime industry. Nothing actually marine related however they provide mechanical engineering studies via online and distance learning.

**CPUT, www.cput.ac.za**
Technical university in Cape Town that provides maritime related studies for full time students. Has no distance learning or eLearning offerings. The university does boast an eLearning centre and an LMS called MyClassroom however this is used as an internal resource and online student support service tending towards blended learning rather than for the provision of online eLearning.

**Northlink College, www.northlink.co.za**
Falling into the FET range of education and training providers, this college based in Belleville, does not provide any maritime related education or training.

**Falsebay College, www.falsebaycollege.co.za**
Falling into the TVET range of education and training providers, this college based in Muizenberg, does not provide any maritime related education or training and only offers blended learning for engineering studies N1 to N3. Use Blackboard LMS.

**South Tyneside College, www.stc.ac.uk**
Maritime college in the UK providing both fulltime and part time education and training.

**Maritime Training Academy, www.maritimetrainingacademy.com**
Maritime related distance learning provider from the UK. Provides maritime related distance learning courses.

**Singapore Maritime Academy, www.sp.edu.sg**
Part of the Singapore Polytechnic, this maritime training provider does provide distance learning courses in the maritime industry. Partnered with the American Digital University (www.adu.us.com), online courses for maritime related education and training are provided.

**Distance Learning Portal, www.distancelearningportal.com**
An online resource providing information and links to internationally listed distance and eLearning providers the courses they provide.

**Udemy, www.udemy.com**
An online distance learning provider from the USA. Provide free and paid for online courses. I completed some of the available courses as part of my research into look and feel for online eLearning.

**Coursera, www.coursera.org**
An online distance learning provider from the USA having partnerships with universities and organizations from around the world. Provide free online courses.

**Open to Study, https://www.open2study.com/courses**
An online distance learning provider from Australia. This site includes Open Universities and Open Training Institute Australia.

**Seagull, www.seagull.no**
Commercial LMS platform service provider from Norway. Specializing in maritime training of short course using distance learning and CBT.

**Marine LMS, www.marinels.com**
Commercial LMS software aimed at the maritime industry.
Danfoss Learning, learning.danfoss.com
Online learning resource provider to the international HVAC and refrigeration industry. I completed some of the available courses as part of my research into look and feel for online eLearning.

Lumesse, www.lumesse.com
Commercial online LMS and content authoring software solution provider from the UK. Has a South African support centre. Was one of our possible choices for the development, hosting and providing of eLearning services for SAMTRA.

Bridgewater Learning, bridgewaterlearning.co.za
Commercial service provider in South Africa providing a managed LMS portal and course development service to the eLearning industry. Was one of our possible choices for the development, hosting and providing of eLearning services for SAMTRA.

Moodle, www.moodle.org
Open source software provider for the Moodle LMS platform from Australia. I was able to download the freeware, install and use this platform during my research on LMS platforms. Moodle.org also provides a very comprehensive online support and training website and community.

AOSIS iTUTA, showroom.ituta.net
Moodle partner in South Africa. Moodle website hosting, website and course development and training provider to the eLearning industry. Was one of our possible choices for the development, hosting and providing of eLearning services for SAMTRA.

ATUTOR LMS, http://atutor.ca/
Open source software provider for the ATUTOR LMS platform from Canada.

Talent LMS, www.talentlms.com
Commercial online cloud based LMS platform service provider from USA.

Articulate, www.articulate.com
Commercial course content authoring and publishing software provider from the USA. I was able to download the free-to-try software package, install and use this content authoring software to create and publish some online eLearning presentations and quizzes using the Studio 13 Professional package. SAMTRA has subsequently purchased the full package for me to continue to use for developing course resources.

Easygenerator, www.easygenerator.com
Commercial cloud based eLearning content authoring and publishing tools from Holland. Used this facility to research course content creation using completely online resources.

Barry Sampson web blog, barrysampson.com
Website and blog relating to technology and eLearning. Used this resource during my research about open source LMS and CAT software alternatives to the Moodle open source LMS platform.

eLearning Industry, elelearningindustry.com
A source of many articles from the largest online community of professionals involved in the eLearning industry, providing hours of eLearning related research and reading.

eLearning Heroes, community.articulate.com
A very extensive community support website for Articulate software users within the eLearning industry internationally. A source of many articles from the large online community of professionals involved in the eLearning industry, providing hours of eLearning related research and reading.

Blog and support for Marine LMS provider. A source of many articles providing hours of eLearning related research and reading.
Centre for learning and performance technologies, c4lpt.co.uk
A source of many articles providing hours of eLearning related research and reading.

Emerging Internet technologies for education, www.emergingedtech.com
A website promoting educational technology in the eLearning industry, a source of many articles providing hours of eLearning related research and reading from USA.

eLearning Brothers, http://elearningbrothers.com/
Commercial online website providing eLearning resources, blog and articles.
USING MULTIMEDIA TO UNDERSTAND SHIP DESIGN

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ABSTRACT

This paper demonstrates that multimedia is a highly effective tool to illustrate ship design. An interactive multimedia web based animation programme has been developed at Singapore Maritime Academy using 2D and 3D animation for CoC (Deck & Engine) students. The programme ‘Understanding Ship Design’ was developed to help students understand key ship design concepts using both 2D and 3D animation and enhanced graphics. The programme does this in a linear fashion by first explaining the basic ship design concepts and then illustrating design features of several ship types using both 2 and 3D animation.

Feedback obtained from Class (1) and (2) Deck students studying at the academy indicates that the ship design programme has been well designed and has therefore enhanced classroom teaching, thereby accelerating the learning process.

INTRODUCTION

The Singapore Maritime Academy (SMA) has been training students for Class 1, 2 & 3 Certificate of Competencies (Deck) for over 35 years. Most of the training is done either in the classroom or in a laboratory using traditional teaching methods and multimedia. The academy has a ship handling simulator.

PROBLEM DEFINITION

Traditional classroom teaching methods could be made more effective when combined with a web based multimedia presentation that has text, graphics & animation. This is especially so for topics where concepts are difficult to explain.

Ship design concepts are difficult to explain as most text books show ship profiles diagrams in 2D. A programme that allows the lecturer to zoom and revolve the ship profile will make learning easier. This is because the content of a multimedia programme will draw more attention than similar material presented in a traditional form (Gayeski 1993).
The programme presents the content in an uncluttered and organised manner illustrating key structural members of a vessel with easy to read labels. Using real ship profiles as is done for several mid-ship profiles of several ship designs gives the user an enriching experience. (Brandt 1988).

Moreover a web based application allows the user to learn at his own pace after he has attended the lecture. It also allows for a repetition of the concept over and over again until it is clearly understood. This is user dependent.

3D graphics of mid-ship sections of several ship design types that can be rotated and zoomed illustrating key structural members of a vessel allows for greater retention and provides a clearer understanding. This is evidenced through a survey conducted on students who have used the ship design application. Details of the survey findings are given at the end of this paper.

THE PROGRAMME

SMA has developed a programme on ‘Ship Design’ for marine engineering and nautical students, studying at the academy. The programme is designed taking into consideration what the teacher requires to teach in relation to a prescribed syllabus, as this is one of the most important concepts in developing a multimedia application for teaching. The program has been designed with the teacher in mind as the role of the teacher as a facilitator remains crucial in a learning process (Feith 2008).

The screen shot below captures the menu path that shows the mid-ship profiles of various ship design types that have been illustrated in the programme.
in a linear fashion. This is evidenced by the topics that make up the programme, namely, key connections, framing systems, deck construction, double bottom construction, fore and aft end structures and finally mid-ship profiles of several ship design types.

**Key Connections**
The programme starts with 3D graphics of key structural connections in ship construction. Connections illustrated include the connection between the frame and a beam, insert plates and the requirement of a faceplate at an opening on deck.

**Framing systems**
The three main ship framing systems are illustrated in this topic, namely the transverse framing system, the composite framing system and the longitudinal framing system.

**Deck and Bottom construction**
Constructional aspects of both the deck and bottom construction showing the key structural members of a ship’s deck and bottom are illustrated in this topic. Both longitudinally framed and transversely framed decks and double bottoms are shown.

**Fore and aft end structures**
The structural members of both a vessel’s fore and aft structures are clearly illustrated using 2 and 3D graphics.

**Mid-ship structures**
As there are several ship types, key features mid-ship structures of the key ship types are illustrated in this topic. The mid-ship section of the chemical tanker is illustrated below.

**Assessment**
An assessment is provided for at the end of the programme.
USER PROFILE

Users are seafarers (Singaporean and foreign) aspiring for the various certificates of competency issued by the Maritime and Port Authority of Singapore.

DEVELOPMENT TOOLS

Several programmes were used to develop the programme, and in this regard, 3D Studio Max was used for 3D Modelling and animation, Tetra4D was used to create 3D PDF files for interactive 3D viewing of Ship Models and Flash was used for Authoring.

Learning outcomes developed using Flash are suitable for uploading to the web. Programmes developed using ‘Flash’ can be used in a Client – Server network, where the client accesses the programme using a User ID and a password.

INTERFACE DESIGN

The user interfaces have been designed to make them user friendly. Navigational buttons are clear and a user need not be a computer expert to navigate through the programmes.

Help functions in the programmes will help the user to navigate through the programme. This will familiarise the user with the different User Interface Buttons and sections.
DEVELOPMENT METHOD
The development method was as follows,

<table>
<thead>
<tr>
<th>Collection of material</th>
<th>Storyboarding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material for the programmes collected</td>
<td>Storyboarding for instructional design was completed</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Interface development &amp; multimedia production</th>
<th>User testing and fixing of technical problems and details.</th>
</tr>
</thead>
</table>

SURVEY
A survey was conducted among Class 1 (deck) students to help gauge the programme developed. Results of the survey are as below:

1. To what extent do you feel that the ship design programme has improved the learning process in the classroom.

<table>
<thead>
<tr>
<th>Not at all</th>
<th>To A Little Extent</th>
<th>To Some Extent</th>
<th>To A Large Extent</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>4</td>
<td>16</td>
</tr>
</tbody>
</table>

2. How would you rate the programme developed in relation to the clarity of explaining concepts in ship design.

<table>
<thead>
<tr>
<th>Poor</th>
<th>Good</th>
<th>Very Good</th>
<th>Excellent</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>10</td>
<td>9</td>
</tr>
</tbody>
</table>
CONCLUSION

The ship design programme developed has used innovative solutions to help a learner grasp key ship design concepts. The learner can learn at his own pace and can view the various aspects of ship design using interactive 3D viewing.

Based on feedback received from users it is evident that helped student get a better grasp of ship design. Therefore it can be used to an advantage to help clarify difficult concepts in ship design which are not easy to explain in traditional classroom teaching.

Assessment’s provided help a learner assess his knowledge gained. This provides immediate feedback and is essential in any learning process. This is one of the key concepts in multimedia instruction as the users’ experience depends on the way the programme handles their responses to questions or options (Oblinger 1996).
Finally, the survey results so far, as documented in the previous section, are very positive in terms of the response of students to the programme. It is readily apparent that it has contributed significantly to the enhancement of important aspects of learning ship design.

REFERENCES


Innovative Manoeuvring Support by Simulation Augmented Methods - On-Board and from the Shore

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Abstract

On ships with high safety level and a high portion of manoeuvring activities within the ships operation the shipboard tasks and procedures have been changed to high back-up procedures as in airplanes. This opens up chances for the application of the new “Fast Time Manoeuvring Simulation Technology” (FTS) - It calculates within one second of computing time up to 1000 seconds of manoeuvring time by a very complex ship dynamic simulation model for rudder and engine /thruster manoeuvres. This allows for the prediction of all manoeuvres of the ship in parallel to the actions / commands of the conning officer. So it is easy for him and the monitoring officers to see whether the manoeuvring actions have at least the correct tendency, and even more the effectiveness of the manoeuvres can be improved.

This new type of support is called Simulation-Augmented Manoeuvring Design and Monitoring (SAMMON) – it allows not only overlooking the next manoeuvring segment ahead but also for the following or even for series of manoeuvring segments. Currently this technology is used within two new research projects:

• The Project COSINUS (Co-operative Ship Operation in Integrated Maritime Traffic Systems) sets out for implementing the FTS technology into integrated ship bridges and to also communicate the manoeuvre plans and display to VTS centres.
• Within the European project MUNIN (Maritime Unmanned Navigation through Intelligence in Networks) this technology will be used to investigate if it is possible to steer autonomous ships where the information for manoeuvring the ship will be delayed due to the communication links.

For practical application and testing the new technology was interfaced to the ship handling simulator at Maritime Simulation Centre Warnemuende. During the research activities it became obvious that the new FTS technology has also great potential for teaching and learning in the maritime education both for lecturing and for simulator training in briefing and debriefing sessions of exercises.
INTRODUCTION

During the previous TRANSNAV conference in 2013 a fast-time simulation tool box was introduced to simulate the ships motion with complex dynamic models and to display the ships track immediately for the intended or actual rudder or engine manoeuvre in the ECDIS (Benedict et al., 2013). These “Simulation-Augmented Manoeuvering Design and Monitoring” - SAMMON tool box will allow for a new type of design of a manouevring plan as enhancement exceeding the common pure way-point planning – and it will play an important role in future education and training in simulators for ship handling.

During the INSLC 17 conference new concepts were presented for innovative organizational structures specifically for bridge management (Hederstrom, 2102).

This paper presents the potential of the new method specifically for the support of manouevring of ships both for the new manning concept and even for shore-based support or moreover for autonomous ships. Manoeuvring of ships is and will be a human-centred process despite of expected further technological developments. Most important elements of this process are the human itself and the technical equipment to support its task. However, most of the work is to be done manually because even today nearly no automation support is available for complex manoeuvres. Up to now there was nearly no electronic tool to demonstrate maneouvring characteristics efficiently or moreover to design a manouevring plan effectively. However, due to the new demands there is a need to prepare harbour approaches with complete berth plans specifically in companies with high safety standards like cruise liners. These plans are necessary to agree on a concept within the bridge team and also for the discussion and briefing with the pilot.

For increasing the safety and efficiency for manouevring real ships, the method of Fast-Time Simulation will be used in future – even with standard computers it can be achieved to simulate in 1 second computing time a manoeuvre lasting about to 20 minutes using innovative simulation methods. These Fast-Time Simulation tools were initiated in research activities at the Maritime Simulation Centre Warnemuende (MSCW) which is part of the Department of Maritime Studies of Hochschule Wismar, University of Applied Sciences - Technology, Business and Design in Germany. They have been further developed by the start-up company Innovative Ship Simulation and Maritime Systems (ISSIMS GmbH)

A brief overview is given for the modules of the FTS tools and its potential application: SAMMON is the brand name of the innovative system for “Simulation Augmented Manoeuvering Design & Monitoring”. It is made for both:

– Application in maritime education and training to support lecturing for ship handling to demonstrate and explain more easily manouevring technology details and to prepare more specifically manouevring training in ship-handling simulators (SHS) environment and
– Application on-board to assist manoeuvring of real ships e.g. to prepare manoeuvring plans for challenging harbour approaches with complex manoeuvres up to the final berthing/unberthing of ships, to assist the steering by multiple prediction during the manoeuvring process and even to give support for analysing the result,

And SAMMON contains the following modules:

– Manoeuvring Design & Planning Module to design ships-manoeuvring concepts as “manoeuvring plan” for harbour approach and berthing manoeuvres (steered by virtual handles on screen by the mariner)

– Manoeuvring Monitoring & Multiple Dynamic-Prediction Module: monitoring of ships manoeuvres during simulator exercises or manoeuvres on a real ship using bridges handles, display of manoeuvring plan and predicted manoeuvres in parallel. It calculates various prediction tracks for full ships-dynamic simulation and simplified curved-headline presentation as look ahead for future ships motion.

– Manoeuvring Simulation Trial & Training Module: ship handling simulation on laptop display to check and train the manoeuvring concept (providing the same functions as monitoring tool; steered by virtual handles on screen)

SIMOPT is a simulation-optimiser software module based on FTS for optimising standard manoeuvres and modifying ship math model parameters both for simulator ships and for on board application of the SAMMON system.

SIMDAT is a software module for analysing simulation results both from simulations in SHS or SIMOPT and from real ship trials: the data for manoeuvring characteristics can be automatically retrieved and comfortable graphic tools are available for displaying, comparing and assessing the results.

The SIMOPT and SIMDAT modules were described in earlier papers (Benedict et. al: 2003, 2006) for tuning of simulator-ship model parameters. The modules for Multiple Dynamic Prediction & Control to be used on board as steering assistance tool and later the manoeuvring design and planning technology were described later (Benedict et.al: 2012, 2014). In this paper, the focus will be laid on the potential of the SAMMON software supporting ship operations in a collaborative way on-board and ashore.
FUNCTION-BASED BRIDGE ORGANISATION

Functional Positions

The concept of Function-Based Bridge Organisation was introduced by Hans Hederstrom at the INSLC Conference in 2012. Acknowledging that all humans may make errors, the function-based bridge organization introduces organizational countermeasures to detect and manage human error before it leads to any negative consequence. It can help to remove hierarchical barriers and enhance teamwork and communication, if a traditional rank-based system has been replaced by a function-based bridge organization. The function-based bridge organization does not diminish the authority of the Master. The Master assigns officers to the particular functions based on watch-keeper competence and experience with the upcoming operation, making it a very adaptable system.

The system builds on the airline concept by introducing Navigator and Co-Navigator functions. The Navigator who is conning the ship is required to communicate intentions and orders to the Co-Navigator. This means that no course changes or engine orders will be carried out without a confirmation from the Co-Navigator. These new protocols also require a double watch-keeping system with a minimum of two bridge officers on watch at all times the ship is at sea.

For ships with a single watch-keeping officer and a lookout on watch, the system may be somewhat more difficult to introduce. However, with trained and engaged lookouts there are definitely advantages to gain. When the Captain joins the bridge team, there is no problem to use the function based system. The best way to apply the system in this situation would be if the Captain takes on the function as Co-Navigator, leaving the watch officer to continue conning the ship. The following definitions were given and the following assigned tasks are included in these procedures (only extracted items specifically for manoeuvring aspects) in Figure 1:

**Operations Director:** Overview of the entire bridge operation, ensuring that it is, at all times, carried out in accordance with these procedures; Direct monitoring of both the Navigator and Co-Navigator, ensuring that safe passage is maintained and that no internal or external influences are permitted to distract them from their primary tasks; Monitors workload and transfers tasks between functions as circumstances dictate; Unless directed otherwise by the officer with the charge, will conduct the Pilot exchange briefing; If the Operations Director takes the conn, then the position of Operations Director must be re-established as soon as possible.

**Navigator:** Responsible for conning, navigating the ship following the approved passage plan and collision avoidance. Ensure that the bridge team (including the Pilot) is aware of planned actions and intentions by “Thinking Aloud”. If a pilot has the conn, the Navigator should ensure the Pilot’s intentions and planned actions are understood in advance by all bridge team members and agreed upon by the Navigator. If s/he has the charge, the Navigator is responsible for taking back the conn from the Pilot whenever s/he determines that doing so is necessary or appropriate for the safe navigation of the vessel.
**Co-Navigator:** Monitors and cross checks the actions of the Navigator. Supports, challenges, and recommends actions to the Navigator. Notifies the Master or Second in Command whenever s/he has reason to believe that the Navigator has taken or plans to take any action that violates the Master’s orders or is inconsistent with the safe navigation of the vessel. Monitors and cross checks the ship’s position against the passage plan using real time navigation methods. Monitors traffic and collision avoidance. Unless directed otherwise by the officer with the charge, is responsible for external VHF (may be delegated to the Pilot) and liaison with the ECR.

**Administrator:** Responsible for fixing the ship’s position when paper charts are in use. Responsible for alarm management and actions. Alarms to be identified as either urgent or non-urgent alarm. Responsible for internal communications as directed. Responsible for logbook entries, checklist management and status board. Ancillary tasks as assigned.

**Lookout:** Maintains all around lookout by sight and by hearing, reporting all sightings and/or sound signals to the Navigator, unless otherwise directed. Maintains awareness of planned intentions and reports any necessary clearances before an alteration of course. Must be able to give full attention to the keeping of a proper lookout, and no other duties shall be undertaken or assigned which could interfere with the task. Be available to interchange duties with the Helmsman. The duties of the Lookout and the Helmsman are separate. The Helmsman shall not be considered the Lookout while steering.

**Helmsman:** Acknowledge and execute steering orders given by the person with the conn. Advise the person with the conn of any steering concerns.

**The Captain as a Leader instead of an Operator**

It is up to the Captain to decide who should fulfil any of the four functions. A Risk Factors Table and a Risk Analysis and Bridge Manning Level Table have been developed to assist the Captain in deciding what manning level to set. Those manning levels are to be seen in Figure 1.

<table>
<thead>
<tr>
<th>Required Functions at Each Bridge Manning Level</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bridge Manning Level</strong></td>
</tr>
<tr>
<td>Green</td>
</tr>
<tr>
<td>Yellow</td>
</tr>
<tr>
<td>Red</td>
</tr>
</tbody>
</table>

Figure 1 Required Functions and Manning Concept for Functional Approach for Bridge Operation

The philosophy behind the system encourages the Captain to assume the role of Operations Director, acting as a leader while the team undertakes the operation.
By delegating the operational tasks, he demonstrates trust in his team. This has many positive effects, such as: enhanced learning; readiness to actively participate in problem solving; enthusiasm and motivation to work; and an engaged team directly leading to increased safety and efficiency.

As officers are allowed to conduct the vessel, they will be better prepared for their promotion when time comes. This will normally also increase job satisfaction, which facilitates officers’ retention rate.

Within this paper some elements are presented on how the communication with in the bridge team can be supported by the Fast Time Simulation Modules of the SAMMON System

**SIMULATION-AUGMENTED SUPPORT FOR MANOEUVRING PROCEDURES**

*Pre-planning with “Manoeuvre Planning & Design Module”*

As an example for creating a berth plan and briefing the navigational officer, a berthing scenario is chosen for a harbour area - the starting situation and the environmental conditions within this area on a sea chart is to be seen in Figure 2. The objective is to berth the ship with port side alongside Grasbrook Berth at Hamburg Port.

![Map showing wind and current conditions, and a berthing scenario with a ship named MV „AIDAblu“ berthing at Grasbrook Berth.](image)

**Figure 2** Exercise area and environmental conditions in Port of Hamburg for berthing scenario, divided into two sections for planning the manoeuvres

The respective harbour area is being divided into two manoeuvring sections following a specific aim:

- **Section 1:** At the end of this section the speed over ground (SOG) should be around 3 kn and the heading slightly towards southeast as preparation for section 2.
• Section 2: A state should be reached, where the ship can be held in the current at a position with constant heading and no speed. Then, the ship can then crab towards the berthing place mainly by means of thrusters. The current can be used as an additional supporting aid to go alongside.

In a conventional briefing only these rough indications of the manoeuvring status can be used to develop a potential strategy for berthing the ship. The manoeuvres and setting of engines, rudders and thrusters cannot be discussed in detail because no specific manoeuvring characteristics are available for the specific situations.

With the new fast-time simulation there is the chance for designing a manoeuvre plan as a detailed strategy with the specific settings at distinguished positions called the Manoeuvring Points (MP). In the following, the course of actions is described in a series of figures to make a full manoeuvring plan by means of the control actions at the manoeuvring points, MP. In Figure 3 the initial position is to be seen where the instructor has set the ship in the centre of the fairway. The prediction already shows that the ship would drift slightly to port side due to the set handle positions. It can be learned that therefore the rudders have to be put slightly to starboard at the very beginning in order to follow the straight track until the next MP 1. At MP 2 the rudders are set amidships again and both propulsion units are used to slow down and to steer the ship: the starboard engine is kept at 34 %, resp. 43 rpm to allow for a certain rudder effectiveness for steering control, whilst at MP 3 the portside engine is set backwards in order to achieve about 3 kn SOG at the end of section 1.

Figure 3 MP0 - Initial position: The prediction already shows that the ship would drift slightly to portside due to the set handle positions

In Figure 4 (below), the ship is stopped at MP4: The vessel’s heading is chosen in that way, that all handles can be set in zero position, holding the ship with a minimum speed almost at the same position.
At this moment, bow and stern thrusters can be applied to bring the ship safely to its berth. In the bottom figure the ship is already brought to the berth. The crabbing by means of bow and stern thrusters needs a further MP5 in order to reduce the transversal speed shortly before berthing at MP6.

The complete manoeuvring plan can be saved to be used for the training or to be loaded again for editing the plan for an optimisation to achieve a better performance e.g. to do the whole manoeuvre in less time. For an in-depth discussion at the separate manoeuvring points and sections, there is the possibility to save the specific conditions as situation files. These situation files can be useful for discussing strategies during the planning at different places where new challenges will come up as well as for the debriefing sessions. In Figure 4 at the right bottom corner the time is to be seen for the complete series of segments: the total manoeuvre time is about 17.5 minutes for this version of the plan.

Figure 4 Final part of the manoeuvring plan: At MP4 the vessel is stopped and the heading is chosen in that way, that all handles can be set in zero position (Top); at MP5 / MP6 the ship is already brought to the berth (Bottom)

Berthing making use of Simulation-augmented support in SHS and with SAMMON Monitoring Module and Training Tool

During the exercise it is possible to take advantage from the multiple predictions for the manoeuvres. In Figure 5 an example is shown for the On-line manoeuvre prediction (dotted ship contours) starting from current position (black ship contours) at the end of black past track. On the ship bridge the prediction is controlled by the handles on the manoeuvring controls. For training and test purposes the manoeuvre can also be tested in the SAMMON Trail & Training Tool – in this software the controls are used to be seen in the Monitoring & Control Interface of the Training Tool presented on the right side in this figure.

For comparing the effectiveness of the simulation-augmented support tools a simulator test was made with trainees who have no support and trainees who have parts or even the full support of the
SAMMON. During the exercise it is possible to take advantage from the multiple predictions for the manoeuvres. The students can bring their own laptop onto the simulator bridge (where he has already developed the manoeuvring plan), the prediction is controlled via the bridge handles, and another laptop with the monitoring tool can also be placed at the instructor station.

Figure 5 Example for overlay of a pre-planned manoeuvre plan (MP) as manoeuvring basis (blue) and manoeuvre prediction (dotted ship contours) starting from current position (black ship contours) at the end of black past track with her engines ordered in opposite direction presented in Monitoring & Control Interface of the Training Tool (right)

In Figure 6 a comparison is made between the two simulator results of the trainees with different level of preparation and the manoeuvring plan of the second trainee. The achievements of the better prepared trainee are obvious – the planned manoeuvre is very close to the executed track and the actions of the controls has been done also nearly in accordance with the planned procedures. It is obvious that there is not just a reduction of manoeuvring time when applying the Fast-Time Simulation tool in briefing and training; the thruster diagrams show also that a well prepared manoeuvre can minimize the use of propulsion units and therefore be more efficient.

The benefit of using the FTS is to be seen for several purposes:

- The multiple dynamic predictions are always a great help for the Navigator steering the ship: They have a better overview on the current situation and the chances for the potential success of an action can immediately be seen; also for the Co-Navigator there is the chance to see both the manoeuvres and the success – this is a great situation because they can both share a better situation overview.

- Multiple dynamic predictions may be used to see both the current state of motion by the static path prediction and the future development of the ship motion caused by the current handle
settings – it is expected that the static prediction changes into the dynamically predicted track, in this case the prediction is correct. If not then the handle settings can be slightly adjusted to correct for the tendency of the potential impact of environmental effect which might not have been considered by the dynamic prediction, e.g. a non-detected current.

Figure 6 Results from two manoeuvring exercises in SIMDAT interface with ships track and time history of thruster activities. (Blue: run of the trainee without support by Fast-Time Simulation; Green: run of the trainee with full support by pre-planning with Design and Planning Module; Red: comparison to the prepared manoeuvring plan with manoeuvring points)
The goal of the project COSINUS ("cooperative operation of ships for nautical safety through integration of traffic safety systems) is to achieve the integration of maritime traffic safety systems on board and on shore. Therefore, novel concepts are investigated regarding the presentation of enhanced data to the operator and operation of new tools and services as well as decentralized data capturing, processing and storage. Processed data of land-based information systems will be visualized in such a way that a complete overview over the traffic and environmental situation is given in order to support the navigational operation of the vessel. This includes e.g. the representation of a shared route and manoeuvring plan, the operational interface to the VTS operator, and the depiction of weather-data along the voyage or at the destination port. The goal is to establish a cooperative picture which offers a dynamically enhanced view for the bridge crew going beyond traditional ship-based sensor information like own ship RADAR or AIS. This will improve the safety particularly in heavy traffic situations. A great deal of work will be carried out concerning the definition and establishment of new standards for the ship based navigation in cooperation with higher level traffic management systems. The main areas of work are the following:

- Visualization concept for representation of land-based information on ship bridges
- The proposal and the validation of modules and interfaces for autonomous communication between VTS and INS
- Combination of ECDIS representation of navigational data and VTS data to an integrated navigational and traffic picture
- Concept for cooperative route- and manoeuvre planning
- Investigation of communication channels and interfaces for exchange between VTS and INS

Specifically for the integration of the Simulation-Augmented Manoeuvring Support by SAMMON the new functions have to be interfaced:

- The results of the manoeuvre planning have to be made available into the Integrated Bridge System and
-Also the data transfer from ship data into the Monitoring and Control Module have to be adjusted.
- The data transfer from ship to shore into the VTS centre has to be established.
The concept for sharing the information between ship and shore is to be seen in Figure 7—both on the bridge and in the VTS the same display elements for planned routes and manoeuvres can be observed on all screens in the same way. In Figure 8 a first result is to be seen for a ship station to display the manoeuvring plan together with a route plan of another vessel.

Figure 7 Project COSINUS – shared information on manoeuvring plans and multiple prediction in ECDIS between bridge and VTS

Figure 8 Project COSINUS results: Display of manoeuvring plan (green) of own ship together with route plan of another vessel (blue) presented in Integrated Navigation System of project partner Raytheon-Anschütz transmitted from VTS station from SIGNALIS
RESEARCH PROJECT MUNIN - SUPPORT FOR AUTONOMOUS SHIPS

Introduction & Objectives

Maritime Unmanned Navigation through Intelligence in Networks (MUNIN) is a collaborative research project of eight partners from five European countries co-founded by the European Commission. MUNIN’s aim is the development of an autonomous-ship concept and its simulation-augmented feasibility study. MUNIN Project coordinator is the Fraunhofer Center for Maritime Logistics and Services (CML) in Hamburg, Germany.

The Department of Maritime Studies at Hochschule Wismar (HSW), University of Technology, Business and Design in Rostock-Warnemünde, Germany, is involved in both parts of ship operation the navigational and technical systems.

- The ship-engineering department at HSW is responsible for the analysis and conceptual redesign of current engine-related tasks as well as for repair and maintenance optimisation for unmanned operation during the sea passage.
- The Institute for Innovative Ship Simulation and Maritime Systems (ISSIMS) at HSW develops a simulation augmented manoeuvring support systems for remote-controlled navigation in near coastal waters.
- The Maritime Training Centre Warnemünde at HSW serves with its simulation environment and partner’s prototype integration for the feasibility study within the proof of concept.

The main idea behind the MUNIN concept is the autonomous sea passage of an unmanned vessel. Nevertheless, before the ship can be set to autonomous operation it has to put out at sea in the traditional way with a crew on board. For the unmanned voyage part the vessel is monitored by a Shore-Control Centre. When in autonomous mode, the vessel solves appearing problems with regard to weather and traffic situation by autonomous algorithms and follows its pre-defined voyage plan. If necessary, the operator takes over automatic control by commanding the vessel’s true heading and speed-over-ground. Furthermore, when exact manoeuvring is required, the operator enables a mock-up bridge to manually control the vessel’s manoeuvring systems like rudder and engine from a situation room within the Shore-Control Centre. Assuming that the connection fails, the vessel has to drift or, if possible, drop the anchor to maintain its position.

Remote Manoeuvring Support System –On-line Prediction and presentation of operational limits

The Remote Manoeuvring Support System envisages the improvement of the mental model of experienced ship officers on board sea-going vessels to a Shore-Control Centre. Since for the shore-based operators the feeling of the ship’s motion is missing, a way must be found to transmit the impression and feeling of the ship’s actual and future motion to the operators. The problem is: there is no scope for the conventional “trial and error corrections” or “touch and feel experiences” for vessels fully controlled by shore-side operators.
The remote manœuvreing support system’s aim is to allow safe and efficient remote- controlled navigation in near-coastal waters. The innovative value of the Fast-Time Simulation technology is the look-ahead function of ship’s motion by dynamic-prediction methods, so that a ship’s officer or shore-side operator can foresee the vessels future path.

The Remote Manoeuvring Support System prototype contains three different modules
- all based on Fast-Time Simulation und dynamic-prediction methods:
  - Monitoring tool with visualisation of future ship track by means of dynamic-prediction methods
  - Pre-planning tool to design safe and efficient manoeuvre plans for the upcoming manoeuvring
  - Prediction of the operational limits visualising the required room to manoeuvre. Not only for collision avoidance but also for navigation in narrow waters it is from high importance for a shore-side operator to know the operational limits of the vessels under his surveillance. The problem is that the manœuvrability depends on many hard-to-estimate factors. High speed in shallow water e.g. causes squat effects, and the speed-through-the-water to speed-over-ground ratio increases/decreases rudder effective-ness as well as waves and gales affect the turning and stopping behaviour. The mariner aboard senses this and directly interprets the effect by the above named factors. He can feel and observe a squat effect way easier as an operator sitting in a control centre ashore in front his screens. He has trained his mental model of ship’s motion by years of experience at sea.

To support the shore based operator by information on ship’s motion dynamics, the Remote Manoeuvring Support System supplies the operator (and the collision avoidance system on board) with vessel data regarding its operational manœuvring limits.

![Figure 9 Sample for presentation of dynamic-manoeuvring prediction of actual manoeuvring track (black-dotted contours) and additional manoeuvring tracks for hard-to-STB (green) and PT (red) as well as for crash stop (black) from actual motion parameters - the ship has applied rudder amidships the contours of actual control are ahead of the ships position.](image)
Figure 9 shows the monitoring concept with the prediction of the manoeuvring limits. All four manoeuvre predictions will be supplied in a 1 Hz update rate. This figure shows a situation for a collision threat: the own ship is the stand-on vessel and the ship on its port side is expected to do a course change to avoid a collision according to COLREG rule 15. In case the ship as not acting in proper time, the own ship is obliged to do an evasive manoeuvre according to COLREG rule 17. From the figure it is to be seen that a stopping manoeuvre would not help anymore but a turning circle to starboard would help.

The most important support is necessary if there is a time delay in the communication between the autonomous ship and the shore control centre during the remote manoeuvring status: in Fig. 10 a sample is given for explanation of the effect of time delay in ship-shore communication and the advantage of prediction for filtering and remote manoeuvring action by the shore-based controller.

- The message for the measured position was received at 10:00:30 with time delay of 10 sec, i.e. the message was sent 10:00:20.
- This position was filtered (yellow star, as for the previous measured positions before).
- From this filtered position the current position was calculated by prediction on the Predicted track (blue broken line) with control settings from 10:00:20. In the same way the position at 10:00:30 was found which the initial point for the new prediction is.
- From the assumed/predicted position at 10:00:30 the new prediction for new settings from 10:00:30 will take effect after another delay of 10 sec at the position at 10:00:40 – from there the red dotted contours and track are shown for the new predicted track.

It is obvious that it is very difficult to steer the ship if the time delay is increasing. Within the project it is planned to do some investigations into the maximum delay allowed to secure a safe control of the vessel from shore.

Figure 10 Sample for explanation of the effect of time delay in ship-shore-communication and the advantage of prediction for filtering and remote manoeuvring at time point 10:00:30
ACKNOWLEDGEMENTS

The research results presented in this paper were partly achieved in research projects COSINUS and Maritime Unmanned Navigation through Intelligence in Networks (MU- NIN) funded by EU, by the German Federal Ministry of Economics and Technology (BMWi), surveyed by Research Centre Juelich PTJ and DLR. Additionally it has to be mentioned that the professional version of the SAMMON software tools has been further developed by the start-up company Innovative Ship Simulation and Maritime Systems GmbH (ISSIMS GmbH; www.issims-gmbh.com).

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The 3D Simulation of Collision Response between Ships in Navigational Simulator

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ABSTRACT
Navigational Simulator has been widely used in the crew training and evaluation. But its emergency control simulation is not yet perfect, especially the ship collision simulation. To solve this issue, this paper raises a three-dimensional (3D) ship collision response technology based on OSG and Bullet in Navigational Simulator. After getting the parameters of contact points based on OSG and Bullet separately, calculate the parameters of ship after collision with iterative algorithm of Projected Gauss-Seidel and update the 3D scene by building the dynamics model of ship collision based on the physical dynamics theory, the law of conservation of energy and the dynamics model of rigid body in Bullet. And then the collision response of real-time scratch drawing and explosion is realized. At last, the method is finally proved to produce good rendering effect by analyzing the frame rate of collision response.

Keywords: Navigational Simulator, Open Scene Graph(OSG), Collision Detection, Collision Response, Bullet Physics Engine

Introduction
Navigational Simulator is an efficient measure to train and assess the crew and especially plays an important role in the situation of emergency operation[1]. The emergency control when ship collision occurs is one of the crucial evaluations. However, the technology of ship collision response shows is lack of physical reality. Focusing on this issue, this paper hereby raises its research priority, which is probing into the technology of 3D collision response in Navigational Simulator. After calculating the parameters of contact points of ship collision based on OSG and Bullet, then building the dynamics model of ship collision, the parameters after collision can be calculated according to iterative algorithm of Projected Gauss-Seidel. Meanwhile, the collision response of real-time scratch drawing and explosion is also realized. After analyzing the frame rate of collision response, the method is finally proved to run well.

Key technologies
Three-dimensional rendering engine-OpenSceneGraph (OSG)
OSG is always used to manage scene and optimize graphics rendering when developing graphic apps[2]. Due to its outstanding multi-function, across-platform and portability, the Open Source Software of OSG becomes the preferred 3D rendering engine. The extended modules of OSG make it more abundant. For example, OsgEarth is efficient to generate terrain in real time. Meanwhile it also has
many functions, such as vector graphics rendering, height measuring, distance querying and so on. OsgOcean, the extended ocean module of OSG, is used commonly. When simulating a large area of water, its rendering effect is quite vivid. Although Vega Prime has been used in several kinds of Navigational Simulators, this rendering engine is commercial, which means costing a lot of money to buy license for more functions. Therefore, OSG was selected as the rendering engine to develop the Navigational Simulator.

Three-dimensional physics engine-Bullet
In real world, each rigid and soft body has some physical properties. Their movement, rotation and collision all follow the law of nature. In order to simulate these properties, the physics engine technology emerges as the time require\[3\]. The common physics engine includes Havok, PhysX, Bullet, ODE and so on. Each engine has its own characteristic. Havok is one of the earliest physical engines which do physical calculation with CPU and applies in the host and PC platform. PhysX calculates with GPU which has higher execution efficiency, but it is only applied to the PC platform. Meanwhile, it is a kind of commercial engine which needs more money to do the flowing development. ODE is applied to simulate hinge constraint, but has less extended functions\[4\]. Bullet is not only an easy extended dynamic database, but also has good operational speed and stability. The developer can self-design the simulation process\[5\]. In order to save the development cost, the physical engine of Bullet was selected in this paper.

Collision response
Collision dynamic model of ship
This article assumes that\[6\]: when ship collides with others, taking the directions of swaying, surging, yawing and rolling movements into account; the areas of collision and deformation are extremely small and the collision is plastic; at the moment of impact, the force is transmitted synchronously between ships; suppose the ship as a rigid body and ignore the structural properties of parts without collision.

Build coordinate system
Build coordinate system as Figure 1 to analyze the 3D collision dynamic model of ship. In this figure, the active and passive impact ship are named as “Ship A” and “Ship B” respectively. The coordinate system of “xyz” is the global coordinate system. At the initial time, x-axis is on the vertical section of the active impact ship and the plane of “yoz” is on the cross section. The coordinate system of “xyz” is also set like this. The z’ -axis and w’ –axis is through the center of gravity of the two ships and paralleled to z -axis and w –axis. Point P is the contact point, and is set as the origin of coordinates.
The tangential and normal of Point P is $\eta$ -axis and $\xi$ –axis. The included angle between x-axis and $\eta$ – axis is noted as angle $\alpha$, while the included angle between x-axis and $\xi$–axis is noted as angle $\theta$. Suppose the speed of advance and transverse of the active and passive impact ship is $V_{ax}$, $V_{ay}$, $V_{bx}$, $V_{by}$.

![Figure 1 Coordinate system of 3D ship](image)

**Ship’s velocity after collision finished**

To the active impact ship, set the abscissa of its center of mass as $x_a$; the coordinate of contact point as $(x_c, y_c, h_c)$; the mass as $M_a$; the mass coefficients of surging and swaying motion as $m_{ax}$ and $m_{ay}$; the additional inertia coefficient rotating about x-axis and $z'$-axis as $j_{ax}$ and $j_{az'}$; the radius of inertia rotating about x-axis and $z'$-axis as $R_{ax}$ and $R_{az'}$; the linear acceleration along x-axis and y-axis as $V_{ax}$ and $V_{ay}$; the impact impulse of normal and tangential of the contact point as $I_\xi$ and $I_\eta$. The parameters of passive impact ship are set similarly. Based on the theories of rigid body dynamics, contact and collision dynamics and law of conservation of energy, the ship’s velocity after collision can be calculated.

1) **The active impact ship**

\[
v_{ax} = V_{ax} - \frac{I_\xi \sin \alpha + I_\eta \cos \alpha}{M_a (1 + m_{ax})}
\]

\[
v_{ay} = V_{ay} - \frac{I_\xi \cos \alpha - I_\eta \sin \alpha}{M_a (1 + m_{ay})}
\]

\[
\omega_{ax} = -\frac{I_\xi \left[ y_c \sin \alpha - (x_c - x_a) \cos \alpha \right] + I_\eta \left[ y_c \cos \alpha + (x_c - x_a) \sin \alpha \right]}{M_a R_{ax}^2 \left(1 + j_{az'}\right)}
\]

\[
\omega_{ay} = \frac{I_\xi h_c \cos \alpha - I_\eta h_c \sin \alpha}{M_a R_{az'}^2 \left(1 + j_{az'}\right)}
\]
2) The passive impact ship

\[ v_{bu} = V_{bu} - \frac{I_y \sin (\beta - \alpha) - I_z \cos (\beta - \alpha)}{M_b (1 + m_{bu})} \]

\[ v_{bv} = V_{bv} + \frac{I_z \cos (\beta - \alpha) + I_y \sin (\beta - \alpha)}{M_b (1 + m_{bv})} \]

\[ \omega_{bu} = \frac{I_y (y_c - y_b) \sin \alpha - (x_c - x_b) \cos \alpha + I_z ((y_c - y_b) \cos \alpha + (x_c - x_b) \sin \alpha)}{M_b R_{bu}^2 (1 + j_{bu})} \tag{2} \]

\[ \omega_{bv} = \frac{I_z h_c \cos (\beta - \alpha) + I_y h_b \sin (\beta - \alpha)}{M_b R_{bv}^2 (1 + j_{bv})} \]

Collision response algorithm of ship

1 Establish a dynamics world

The flow chart of dynamics world is shown as follows:

![Flow chart of dynamics world](image)

In Figure 2, the words beginning with the letters of “osg” and “bt” are names of classes in OSG and Bullet. “ShipMT” is the matrix of ship model. The numbers from ① to ⑦ are: ① Build the motion state matrix in dynamics world according to the ship model; ② Build the world matrix of the motion state matrix according to the position matrix; ③ Build the collision shape for ship in dynamics world; ④ Calculate the inertia of moving ship from its mass; ⑤ Set physical properties of the ship according to its mass, inertia, collision shape and motion state matrix; ⑥ Build the dynamical model of ship with its physical properties; ⑦ Set the linear velocity and angular velocity of the dynamical model of ship and then add it to the dynamics world.
Dynamic constraint of rigid body

1) Equation of motion

All bodies’ motion can be described as Newton-Euler equations\(^7\). (The dot-notation means the time derivative \(d/dt\), and is used to ease readability):

\[
\begin{align*}
\ddot{\mathbf{r}}_i &= \mathbf{v}_i \\
\dot{\mathbf{q}}_i &= \frac{1}{2} \dot{\mathbf{\omega}}_i \mathbf{q}_i \\
\dot{\mathbf{v}}_i &= m_i^{-1} \sum_{k=1}^{n} \mathbf{f}_k - m_i^{-1} \sum_{k=1}^{n} \mathbf{f}_k' + m_i^{-1} \mathbf{f}_i' \\
\dot{\mathbf{\omega}}_i &= I_i^{-1} \sum_{k=1}^{n} \mathbf{r}_{k,i} \times \mathbf{f}_k - I_i^{-1} \sum_{k=1}^{n} \mathbf{r}_{k,i} \times \mathbf{f}_k' + I_i^{-1} \mathbf{f}_i' + I_i^{-1} \mathbf{r}_i'
\end{align*}
\]

(3)

For the \(i\)th body, \(m_i\), \(l_i\), \(\mathbf{r}_i\), \(\mathbf{v}_i\), \(\mathbf{\omega}_i\), \(\mathbf{q}_i\), \(\mathbf{f}_k\), \(\mathbf{f}_k'\) and \(\mathbf{r}_i'\) denotes its mass, inertia tensor, location, linear velocity, angular velocity, orientation, the contact force at the \(k\)'th contact, all external forces and the total torque. \(\mathbf{P}_i\) is the vector of the \(k\)'th contact point. Then the vector of the \(k\)'th contact point of the \(i\)th model can be denoted as:

\[
\mathbf{r}_{k,i} = \mathbf{P}_k - \mathbf{r}_i
\]

(4)

Suppose \(\mathbf{s}\) and \(\mathbf{u}\) as:

\[
\begin{align*}
\mathbf{s} &= \begin{bmatrix} \mathbf{r}_1, \mathbf{q}_1, \mathbf{r}_2, \mathbf{q}_2, \ldots, \mathbf{r}_n, \mathbf{q}_n \end{bmatrix}^T \\
\mathbf{u} &= \begin{bmatrix} \mathbf{v}_1, \mathbf{\omega}_1, \mathbf{v}_2, \mathbf{\omega}_2, \ldots, \mathbf{v}_n, \mathbf{\omega}_n \end{bmatrix}^T
\end{align*}
\]

(5)

All the rotations can be concatenated into a matrix as \(\mathbf{S}\). All the models’ mass can be described as \(\mathbf{M}\). All the matrix of contact conditions is \(\mathbf{C}\). The entire friction coefficient can be concatenated into a single vector \(\mathbf{f}'\). The external forces, torques, and velocity dependent forces can also be concatenated into a vector \(\dot{\mathbf{f}}\). So the Newton-Euler equations can now be written as:

\[
\begin{align*}
\dot{\mathbf{s}} &= \mathbf{S}\dot{\mathbf{u}} \\
\dot{\mathbf{u}} &= \mathbf{M}^{-1} \left( \mathbf{C}\mathbf{f}' + \dot{\mathbf{f}} \right)
\end{align*}
\]

(6)
2) Contact conditions

The projection matrix $P_k \in \mathbb{R}^{3 \times 3}$ can be used for further analysis of the $k$'th contact point. It is defined as:

$$P_k^T = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}, \cdots, \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}, \cdots, \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$ (7)

That is, the $k$'th 3×3 sub matrix is set to the identity matrix. The normal component of the relative contact velocity of the $k$'th contact point is given by:

$$\mathbf{n}_k^T P_k^T \mathbf{C}^T \mathbf{u} = \mathbf{n}_k^T \left( \dot{\mathbf{v}}_k + \mathbf{\omega}_k \times \mathbf{r}_{k_i,i} \right) - \mathbf{n}_k^T \left( \dot{\mathbf{v}}_k + \mathbf{\omega}_k \times \mathbf{r}_{k_i,i} \right)$$ (8)

At time $t$, two models' contact point is denoted as $\mathbf{P}_k$. If one of their contact conditions is nonzero while the other is nonpositive, or the potential contact point is not collided at time $t$, velocity needs to be compensated to make sure $f_i \geq 0$.

3) Contact constraint

Contact constraint can be described as Jacobian matrix $J_c$. The contact Jacobian has $1+\eta$ constraints, so it is a $(1+\eta)$-by-12 dimensional matrix.

$$J_c = \begin{bmatrix} J_i' & J_a' & J_i' & J_a' \end{bmatrix}$$ (9)

$$J_i' = \begin{bmatrix} -\mathbf{n}_i^T \\ -\mathbf{D}_i^c \end{bmatrix}, J_a' = \begin{bmatrix} \mathbf{n}_i^T \\ \mathbf{D}_i^c \end{bmatrix}, J_i' = \begin{bmatrix} -\mathbf{r}_i \mathbf{n}_i^T \\ -\mathbf{r}_i \mathbf{D}_i^c \end{bmatrix}, J_a' = \begin{bmatrix} \mathbf{r}_i \mathbf{n}_i^T \\ \mathbf{r}_i \mathbf{D}_i^c \end{bmatrix}$$ (10)

$\mathbf{D}_i$ is the matrix of friction, $\mathbf{D}_i = [\mathbf{d}_i, \ldots, \mathbf{d}_i]$. $\mathbf{r}_i^{\mathbf{n}}$, $\mathbf{r}_j^{\mathbf{n}}$ are the augmented matrix of $\mathbf{r}_i^{\mathbf{n}}$ and $\mathbf{r}_j^{\mathbf{n}}$. $\mathbf{r}^{\mathbf{n}}$ is the matrix of the location of the mass of rigid body.

**Iterative algorithm of collision response**

1) Gauss-Seidel iterative algorithm

In the process of simulation, many n-dimensional sparse matrix equations like $A\mathbf{x} = \mathbf{b}$. Because the order of matrix $A$ and its zero elements are bigger, iterative algorithm is usually used to calculate.

When Gauss-Seidel iterative algorithm is used to solve the equations, if the initial value is $x_0$, the values of $x_1^{(k+1)}$, $x_2^{(k+1)}$, $\cdots$, $x_{n-1}^{(k+1)}$ are calculated in the $(k+1)$'th iteration. The value of $x_i^{(k+1)}$ can be computed by the obtained values of $x_1^{(k+1)}$, $x_2^{(k+1)}$, $\cdots$, $x_{n-1}^{(k+1)}$. The convergent result of the method is ideal. For simplicity, we use a fixed number of iterations. Its algorithm is shown in Figure 4a).
**Projected Gauss-Seidel iterative algorithm**

The PGS algorithm extends the basic Gauss-Seidel algorithm to handle bounds on the unknowns. By modifying the linear algebra of $Ax=b$, the sparsity of $J$ and $B$ are exploited ($B = M^{-1}J^T$). This is crucial for improving performance and reducing memory requirements. Figure 4b) shows the Projected Gauss-Seidel method of solving the equation of $J\lambda = \eta$ ($\lambda = \lambda^b$). Note that the elements of $J$, $B$, $\eta$, and $a$ are stored as 6-vectors. Each time an increment to $\lambda_i$ is computed, and $\lambda_i$ is clamped to its bounds and the actual increment is determined. Then the vector $a$ is updated so that it remains equal to $B\lambda$. The PGS algorithm has $O(s)$ running time and $O(s+n)$ storage requirements. And convergence is guaranteed if $J\lambda$ is positive definite.

**Complementarity**

Constrained dynamics problem can be considered as a Mixed Linear Complementarity Problem (MLCP):

$$w = JB\lambda - \eta$$

$$\lambda^- \leq \lambda \leq \lambda^+$$

$$w_i = 0 \iff \lambda_i^- \leq \lambda_i \leq \lambda_i^+, \forall i \quad (11)$$

$$\lambda_i = \lambda^- \iff w_i > 0, \forall i$$

$$\lambda_i = \lambda^+ \iff w_i < 0, \forall i$$

where $w$ is the constraint velocity. The last three lines are the Complementarity Conditions.
Simulation of ship collision response

1) Ships’ six-DOF posture change

Ship collision response can be simulated based on the collision model of rigid body and 3D collision dynamics theory of ships. In simulation, the parameters of own ship and target ship are shown as Table 1. The velocity and six-DOF parameters of own ship and target ship before and after collision in 3D scene system are shown in Table 2. 3D location parameters of ship is \((x, y, z)\), heading is \(h\), rolling is \(r\), pitching is \(p\), linear velocity is \((v_x, v_y, v_z)\), angular velocity is \((w_x, w_y, w_z)\). The simulation result of 3D collision response in Navigational Simulator is shown as Figure 5.

Table 1 Parameters of own ship and target ship

<table>
<thead>
<tr>
<th>Type</th>
<th>Name</th>
<th>Length(m)</th>
<th>Width(m)</th>
<th>Draught(m)</th>
<th>DWT(t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Own ship</td>
<td>170000t Bulk carrier</td>
<td>288.1</td>
<td>44</td>
<td>10.5</td>
<td>170162</td>
</tr>
<tr>
<td>Target ship</td>
<td>3000TEU &quot;Xin Chongqing&quot;</td>
<td>263.2</td>
<td>32.2</td>
<td>8.5</td>
<td>22000</td>
</tr>
</tbody>
</table>

Table 2 Parameters of own and target ship before and after collision in 3D scene system

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Own ship Before collision</th>
<th>Target ship Before collision</th>
<th>Ownship After collision</th>
<th>Target ship After collision</th>
</tr>
</thead>
<tbody>
<tr>
<td>(x)</td>
<td>343.2120</td>
<td>438.6740</td>
<td>356.0430</td>
<td>448.0250</td>
</tr>
<tr>
<td>(y)</td>
<td>86.6614</td>
<td>227.0860</td>
<td>102.4450</td>
<td>244.7020</td>
</tr>
<tr>
<td>(z)</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.1573</td>
<td>-1.2110</td>
</tr>
<tr>
<td>(h)</td>
<td>0.2908</td>
<td>-0.0872</td>
<td>0.2827</td>
<td>-0.1138</td>
</tr>
<tr>
<td>(p)</td>
<td>-0.0073</td>
<td>0.0034</td>
<td>-0.0112</td>
<td>-0.0081</td>
</tr>
<tr>
<td>(r)</td>
<td>0.0014</td>
<td>0.0048</td>
<td>0.0093</td>
<td>-0.1417</td>
</tr>
<tr>
<td>(v)</td>
<td>-2.8282</td>
<td>0.4467</td>
<td>-2.4997</td>
<td>-2.0830</td>
</tr>
<tr>
<td>(v_y)</td>
<td>4.2215</td>
<td>2.5331</td>
<td>4.0865</td>
<td>3.5730</td>
</tr>
<tr>
<td>(v_z)</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0392</td>
<td>-0.3018</td>
</tr>
<tr>
<td>(w)</td>
<td>-0.0009</td>
<td>0.0000</td>
<td>-0.0023</td>
<td>-0.0083</td>
</tr>
<tr>
<td>(w_y)</td>
<td>-0.0013</td>
<td>0.0000</td>
<td>0.0027</td>
<td>-0.0529</td>
</tr>
<tr>
<td>(w_z)</td>
<td>0.0000</td>
<td>0.0000</td>
<td>-0.0037</td>
<td>-0.0121</td>
</tr>
</tbody>
</table>
Real-time scratch drawing

According to the location parameters of contact points got from the collision detection period, contact points can be connected one by one. Then the real-time scratch drawing can be realized. When the second contact point of continuous collision $p_2$ is detected, start to draw scratch. If the current contact point is $p_i$, and the former one is $p_{i-1}$, connect $p_{i-1}$ and $p_i$. As soon as a new contact point occurred, a new line segment can be drawn. When contact point does not appeared in the next detection period, this line segment can be finished drawing. If get another new contact point, start to draw a new line segment. The result is shown as Figure 6a).

Each scratch is a polyline connected by several line segments in turn. In order to make it smooth, the frequency of collision detection must be increased.

Explosion response

The explosion response is realized based on the system of osgParticle in OSG, which can be used to simulate explosion effect, fire effect, smoke effect and so on. Explosion response is occurred at the location of the first contact point of each continues collision period\(^8\).
Analysis of collision response effect

![Frame rate trend of collision response effect](image)

Figure 7 Frame rate trend of collision response effect

The frame rate trend of collision response effect of Six-DOF, scratch drawing, explosion realized separately and simultaneously in 3D visual system are shown in Figure 7. At the time of the eighth second, the first contact point is detected. At this moment, each frame rate is fallen rapidly and then after a few seconds recovered to the original level. During the period of lower frame rate, the fluency of the 3D scene is influenced. However, due to it's a very short time period, there is so less impact on the whole collision response affect of 3D scene system that it can be ignored. If the configuration of video card is higher, the frame rate will become more stable and the response effect will become smoother.

**Conclusion**

In order to realize ship collision response, the method is put forward to optimize the performance of Navigational Simulator and improve its sense of reality. The solution of collision response by optimizing the built dynamics world based on Bullet is purposed. On the basis of physical dynamics theory, the law of conservation of energy and the dynamics model of rigid body in Bullet, the method of ship collision response by optimizing the dynamics world in Bullet is solved, which is also applied to establish the dynamics model of ship. With the parameters of location, posture and velocity before collision, those after collision can be solved by using the iterative algorithm of Projected Gauss-Seidel. Then the 3D scene can be updated. In addition, the real-time scratch drawing and explosion are added to rich effect of the collision response. At last, after analyzing the frame rate during the collision response, it turned out that the collision response result can satisfy the visual system in Navigational Simulator.
References


APPLICATION OF MARINE SIMULATORS TO BRIDGE
THE GAP BETWEEN THEORY AND PRACTICE IN BRM
TEACHING

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ABBSTRACT
Students, majoring in navigation technology, studying in a maritime college or university in china, only
acquire some basic nautical theoretical knowledge but lack on-board experience. So, they can’t make
full use of the knowledge to the practical ship-operation job. Considering the advantage of marine
simulators in maritime teaching, the bridge resource management teaching was taken as an example to
develop marine simulators in designing sailing environment for training. Under these environments,
students need to use acquired nautical theoretical knowledge like maritime instruments, regulations
for preventing collisions, regulations for communication while sailing, emergency measures taken while
facing problems and teamwork to finish navigation task. They would understand these theoretical
knowledge better after training. Maritime education institutions should apply modern technologies
such as marine simulators to develop maritime teaching and bridge the gap between theory and
practice. Students could master seafaring skills better to meet the requirements of on-board job in
future.

Key words: marine simulators; bridge resource management; comprehensive training; maritime
education;

Introduction
With the accelerating process of global economic integration and the progress of science and
technology, the ships become much larger, higher-speed, professional and digital. The extensive
application of new technologies including information technology, the rapid development of the
shipping industry and the tough requirements of marine environmental protection, are raising standards
on crew training[1]. During the process of formulating teaching syllabus, maritime colleges in China
develop the electronic navigation theory and apply modern maritime teaching methods including
marine simulators to finish daily teaching work. Under this atmosphere, students, lacking of on-board
experience, could understand and master nautical theoretical knowledge easily and would do better in
the future job.
The job promotion rules and training ways for crews in China

1) The job promotion rules in China

The recent rules for the competency examination and certification of seafarers serving in seagoing ships, or simply 11 rules, moved through China’s transport ministry on the 12th ministerial meetings in 2011, and had become effective since March 1, 2012. Based on 04 rules, 11 rules adapt to the development of shipping industry and navigation technology, perform manila amendments to the international convention on standard of training, certification and watch keeping for seafarers (or STCW), and guide the crew training. Figure 1 shows process of crews’ job promotion in China, and covers training-serving-training-serving mode, adopted by career crews in China. After mastering basic knowledge necessary to navigation and passing examination, freshman could get the white-paper certificate and he needs a period of serving in seagoing ship to earn the corresponding certificate. After holding the corresponding position some time (12 months to 18 months), the crew needs to receive marine training for job promotion, and he may earn the white-paper certificate if he passes the examination. Every crew goes through the process constantly, until he or she hold the position of captain or chief engineer.

Figure 1 process of crews’ job promotion written in 11 rules in China

[Diagram showing the process of crews' job promotion in China.]
2) The training mode in colleges or universities

According to the 11 rules, most of students majoring in navigation need to grasp some basic marine knowledge to earn the third-officer or fourth-engineer white paper certificate, but cannot understand some theoretical knowledge because of lack of on-board experience. This paper mainly discusses how students from the oceangoing ship manoeuvring, finish maritime training. Maritime colleges or universities in China, based on 11 rules, adjust teaching syllabus of oceangoing ship manoeuvring major. These syllabuses cover the courses in operational level and management level, including ship manoeuvring, ship’s duty & anti-collision, bridge resources management, maritime search and rescue, passage planning, nautical navigation, GMDSS, etc. Most of graduates need to grasp the basic knowledge about cargo ship, maritime law and ocean shipping management, and know how to use and maintain navigation instruments; some better may grasp the basic method of literature search and data query. And they would serve in seagoing ships, engage in shipping management or research work in future.

The bridge resource management

1) The development situation of bridge resource management in China

Navigational instruments or driving equipment faults, low intensity in ship hull strength, human factors or natural disasters (such as storms, heavy waves), etc, may lead to the maritime traffic accidents\[^{iii}\]. Shipping companies and maritime authorities investigated on these accidents, and found that the human factors are the main causes of traffic accidents at sea\[^{iv}\]. Ship sailors under high-pressure environment during voyage may be too nervous to take appropriate measures because of some accident events like equipment faults, oil spilling, fire accident, ship collision, man overboard, etc. So the sailors’ team on duty needs to relieve stress legitimately, and obtain useful information aiding to navigation from navigation instruments, to finish navigation task efficiently and safely. The bridge resource management (or simply BRM) training could exactly help trainees understand and grasp some useful knowledge and method about managing bridge resource wisely, and upon it help trainees promote skills in ship safety management\[^{v}\].

STCW convention focuses different priorities about BRM during different times. 1995 revision to STCW convention writes the guide to BRM and highlights the importance of cooperation between sailors’ team on duty in part 3-1 of B-VIII/2 section. Among that part, STCW convention suggests shipping company to give constant guide for captain and senior sailors in charge of a navigational watch, about talent deployment\[^{vi}\], and describes how team work plays an important role during safety voyage\[^{vii}\]. Manila amendments to STCW convention, taken effect in 2012, put the competency of managing bridge resource into the option about the competence of maintaining a safe navigational watch on A-II/1 section of II chapter (Mandatory minimum requirements for certification of officers), and proposes mandatory requirements about how to dispose and manage bridge resource, especially...
on human resources arrangement and communication, on part 3 of A-VIII/2 section (Watchkeeping arrangements and principles to be observed) in VIII chapter.[viii]

Syllabus, textbooks and teaching methods
In accordance with the mandatory provisions about BRM in Manila amendments to STCW, maritime administration, maritime training institutions and shipping companies in China, give prominent attention to BRM training for sailors and set BRM as compulsory course. Textbooks mainly consists of the Bridge Resource Management and the Ship Bridge Resource Management, and both writers (professor Hu and Professor Fang) are from Shanghai maritime university. These two textbooks adopt human-ship-environment-management approach and combine with marine traffic case to explain knowledge. Figure 2 shows the chapter arrangements on the two textbooks. These textbooks focus on the theory of management and need for on-board experience for readers to understand. So the ordinary students in campus would become confused and lost, only by reading textbooks or attending lectures to acquire BRM knowledge.

The BRM course consists of theory teaching and practical operation in China. Theory teaching is always held in classroom, while practical operation is mostly in navigation environment designed by the marine simulator. Both theory teachers and practical coaches hold the senior officers’ position on board. Taking BRM course held in Shanghai maritime university as an example, the BRM course in navigation technology specialty needs 54 periods in all, and the 27-period BRM theory teaching starts on the second half of the 3rd year while the 27-period BRM practical operation is held on the first half of the 4th year. All these teachers hold captain or first mate position. After the course is over, the examination consists of both theory and practical operation certification. Theory test asks students to complete test papers within the fixed time, and it needs students understanding the concept and principle clearly; while practical operation need students playing navigation roles in realistic bridge designed by simulator to finish simulated navigation task. The invigilators for examination and certification come from maritime safety administration and colleges in China.
The advantage and influence of applying marine simulators to BRM teaching

1) Applying marine simulators to marine teaching

Since the first shiphandling simulator was developed on the world 30 years ago the modern marine simulator has developed from single to complex. So far, marine simulator could offer realistic environment for maritime training and is widely applied in maritime education. In some level, marine simulator has been one of the most important indicators for maritime education in college. Its extensive application could improve crews’ capacity significantly, which may reduce the probability of ship driving accidents, and even make the maritime education keep pace with the high development of the shipping industry. Applying marine simulator to maritime practical operation could easily meet some training such as vessel types, channel range and hydrology and meteorology, while traditional maritime teaching could not, like ship manoeuvring, ship’s duty & anti-collision, bridge resources management, maritime search and rescue, passage planning, nautical navigation, etc. Figure 3 shows students practice operating on ship handling simulator.
2) Applying marine simulators to BRM teaching

The purpose of BRM teaching is to make students grasp knowledge and skills about manoeuvring ship, anti-collision rules and managing bridge resource so that they can meet the proposals of manila amendments to STCW and 11 rules. Considering the special situation of the students in campus, the training environment designed by marine simulator should be suitable for 2 to 4 students as a team to practice. Every student could take a role among captain, officer on watch, sailor and barrel man, and every team needs to be assigned one coach. Figure 4 shows the training that a team filled of 2 to 4 students listening to the coach. The trainee could understand rules of anti-collision and how to behave in special channel or area by practicing in different maritime training environments. The specific knowledge includes judging how ships encounter and taking measures to avoid collision, following navigation rules in special area or when the visibility is poor, using marine radio to communicate and taking apposite emergency measures, etc.

3) The influence of applying marine simulators to BRM teaching

Maritime education institutions should take different perspectives to launch BRM course, and students need to use different methods to grasp the knowledge about managing bridge resource, because of different focus existing in theory teaching and practical operation. Applying marine simulator to design navigation training environment, on which students practice shiphanding, could improve the situation that teacher only teaches by textbooks. Students could access navigation instruments in simulated bridge beforehand, and would do a better on-board job in future.
4) Applying marine simulator to design BRM training environment

BRM course includes navigation instruments using, team cooperation between sailors, officers, pilots and dock workers, helpful information acquiring from ECDIS, AIS and other publications. So, marine simulator should simulate realistic navigation and achieve satisfactory results in physical realism, behavioral realism and operating environmental realism.

**Hardware and software**

The technology of building marine simulator over world has been developing and maturing. So far, the continuous improvement of ECDIS, the rapid development in visual modeling technology, virtual environment simulation technology and multimedia technology make it possible to design a vivid scene for crews’ training. The marine simulator, applied to design BRM practical operation, should meet the standards about BRM training, recommended by STCW convention and Maritime Safety Administration of the People’s Republic of China. Figure 5 shows the widely used SMU-V marine simulator.

![Figure 5 SMU-V marine simulator](image)

**Types of vessel**

Considering the convenience for on-board job seeking and the popularity of container ship and cargo vessel, take the 5000TEU container ship or the 10000-ton cargo vessel as the training owner ship. Table 1 shows the essential parameters of training ships.

<table>
<thead>
<tr>
<th>Types</th>
<th>Length meter</th>
<th>Width meter</th>
<th>Draft meter</th>
<th>Capacity ton</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>5551TEU container ship</td>
<td>274.7</td>
<td>40</td>
<td>14</td>
<td>68615</td>
<td></td>
</tr>
<tr>
<td>10000-ton cargo vessel</td>
<td>148</td>
<td>27</td>
<td>8</td>
<td>12000</td>
<td></td>
</tr>
</tbody>
</table>
**The designed training**

The training channel

Students need to finish voyage in the designed training channel with safe speed in a limited time (usually 45-60 minutes), and they spend some time in taking some measures to solve emergency situation. So, the length of training channel should be suitable, which if too long would cost too much time and if too short may be unnatural for students to navigate. Figure 6 shows Shanghai Beicao channel for out-port training, and the training owner ship is near the D8 light with heading of 085 degree and speed of 10kn. Within a course hour, the training owner ship sails to the north across the lightship in the estuary of Yangtze River.

![Figure 6 Shanghai Beicao channel for out-port training](image)

**The points of training**

During the practical operation, students need making full use of management skills to set sailing plan, divide the work, operate navigation instruments and solve accident events to finish the voyage. Sailing in the training channel showed in figure 6, many target ships would connect with the owner ship, and students need to judge the encountering situation and take measures to avoid collision. When the visibility is poor, students should obey anti-collision rules to handle the ship. If some emergency arises like man overboard, oil spilling, stranding or collision, students should immediately take measure to reduce the loss and avoid accident expanding. The basic shiphandling skills, such as steadying the heading under the influence of external force, also need lots of practicing in realistic bridge.

**The process of training**

Figure 7 shows the specific process to hold BRM practical operation training. The coach initializes the parameters including channel information, types of target ships and owner ship, and the state of every ship for designing training environment at first. Then, 2~4 students, as a trained team in bridge, start the preparation work, like being familiar with instruments, dividing the work, drawing the route, etc. After that, the particular operation begins, every student takes a role of crew on watch and cooperate with others. The role changing exists during the whole operation. When the owner ship has reached
the destination and the operation training is over, the coach summarizes the result with the team. During summarizing, every student could speak out his and others strengths and weaknesses, and the coach summarizes everyone's behavior. Finally, the whole BRM practical operation training is over.

![Diagram of BRM practical operation training process]

Figure 7 the specific process to hold BRM practical operation training

**Points of knowledge in practical operation training**

Table 2 describes some points of knowledge in BRM practical operation training for third officer. During the training, the officer should take a suitable speed and effect measures to avoid collision. In some special navigation area, the officer should obey the general rules and local rules, and could use communication equipment like VHF to communicate with VTS or other ships. When some accident events happen, the whole students should sober to take effective response to the emergency.
<table>
<thead>
<tr>
<th>Practicing item</th>
<th>Points of knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 navigation on plan route</td>
<td>1. Draw planned route</td>
</tr>
<tr>
<td></td>
<td>2. Record course, distance and waypoints</td>
</tr>
<tr>
<td></td>
<td>3. Perfect the route after changing course</td>
</tr>
<tr>
<td>2 navigation in narrow channel</td>
<td>1. Control the heading direction</td>
</tr>
<tr>
<td></td>
<td>2. Control the speed (sometimes limit)</td>
</tr>
<tr>
<td></td>
<td>3. Steady the position</td>
</tr>
<tr>
<td></td>
<td>4. Estimate influence of external force from wind and water</td>
</tr>
<tr>
<td></td>
<td>5. Judge encountered situation</td>
</tr>
<tr>
<td></td>
<td>6. Take suitable measures</td>
</tr>
<tr>
<td></td>
<td>7. Avoid collision</td>
</tr>
<tr>
<td>3 navigation in poor visibility</td>
<td>1. Report to caption</td>
</tr>
<tr>
<td></td>
<td>2. Report to the engine</td>
</tr>
<tr>
<td></td>
<td>3. Arrange more sailors on watch and standby anchor</td>
</tr>
<tr>
<td></td>
<td>4. Take suitable speed</td>
</tr>
<tr>
<td></td>
<td>5. Change rudder from auto to manual</td>
</tr>
<tr>
<td></td>
<td>6. Light navigation lights</td>
</tr>
<tr>
<td></td>
<td>7. Communicate with other ships</td>
</tr>
<tr>
<td></td>
<td>8. Pull foghorn</td>
</tr>
<tr>
<td></td>
<td>9. Report to VTS</td>
</tr>
<tr>
<td>4 man over board (MOB)</td>
<td>1. Hard a starboard/port to MOB and sound the alarm</td>
</tr>
<tr>
<td></td>
<td>2. Slow down engine and throw lifebelt</td>
</tr>
<tr>
<td></td>
<td>3. Report to caption and the engine</td>
</tr>
<tr>
<td></td>
<td>4. Announce to ships around</td>
</tr>
<tr>
<td></td>
<td>5. Report to VTS</td>
</tr>
<tr>
<td></td>
<td>6. Single turn to the MOB</td>
</tr>
</tbody>
</table>
The training effect
It needs lots of practicing to grasp skills of steering rudder, being familiar with navigation instruments, charting work, and marine communication. Although some accident events like man overboard, oil spilling, stranding, collision or fire, unusually happened on daily work and mostly unwanted, lots of practicing is necessary to grasp some necessary emergency. Applying marine simulator to hold BRM practical operation makes all these training easy, the cost and the risk are within acceptable limits. Students’ training results are significant and their behaviors would be welcome in future work.

Conclusions
Maritime education is the foundation of shipping industry, and even plays the overall function in some level. Since Manila amendment to STCW took effect on 2012, almost 300000 senior crews in China have finished BRM training in the environment designed by marine simulator. Maritime colleges and universities in China have made the BRM course as a compulsory major course since 2013, and applied marine simulator to BRM practical operation training. Maritime Safety Administration of the People’s Republic of China has also held some didactical and academic exchanges especially on BRM teaching method and standard. The high development of science and technology affects almost every aspect of life in modern society, applying modern technologies to maritime teaching can undoubtedly make up the shortfall existed in traditional maritime education. Applying marine simulator to BRM practical operation training is not a bad choice.

References


DEVELOPING MARITIME THEORETICAL EDUCATION TOOLS TO COMPENSATE FOR A LACK OF SEAGOING EXPOSURE ON THE PART OF MARINE ENGINEERING STUDENTS AT CPUT.

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Abstract
It has been found that a positive correlation exists between seagoing experience and student outcomes in terms of assessments 1 at the Cape Peninsula University of Technology (CPUT) in Cape Town, South Africa. As part of a study currently being undertaken at the World Maritime University in Malmö Sweden, digital learning tools are currently being developed at CPUT to try and compensate for a lack of industry exposure on the part of the students. The aim is to provide the students with different forms of digital imagery specifically designed to complement the theoretical text component of their studies. The intention is to review the outcomes of their use to ascertain to what degree (if any) classroom technology in the form of a computer based training (CBT) model can make up for a lack of prior industry exposure.

Introduction
One of the challenges currently facing the South African maritime industry in terms of seafarer higher education, is the inability of the industry to find placement for students at sea in order to gain seagoing exposure, before or after their initial round of studies. This is primarily due to the relatively small size of the South African maritime sector, and the subsequent limited number of available cadet berths that can be offered by the shipping companies.

As a result of this, many marine engineering students who complete their studies at the cadet level are placed in the management classes of Second and Chief Engineering Officer directly afterwards, without having accrued any sea time at the operations level. This is done in order to allow them to continue their studies, rather than wait around for employment within the industry, or in hope of a possible placement on board a vessel. While sea time is a requirement for certificates of competency, there is no prior practical requirement for admission to the academic studies programme for maritime students. This semester, 60% of the students admitted to the Second Engineering Officer class at CPUT have never been to sea before, a position that places these students at a distinct disadvantage in comparison to the remaining 40% of the class.

Research conducted at CPUT2 has shown that a positive correlation exists between the level of a student’s seagoing experience and their academic outcomes, in terms of assessment results.
the syllabus content, as well as the prescribed assessments focus on the practical shipboard activities and procedures that are required of marine engineers. One obvious method of creating a visual mental image of shipboard systems is through the use of simulation. However, whilst simulators have a very valid practical contribution to make in terms of seafarer familiarisation, they have limited impact in terms of being used as a classroom academic theory tool. Additionally, with the class student numbers growing annually, coupled with having a fairly limited timeframe available in which to offer the course, the use of simulation technology becomes problematic in terms of timeframes for completion of the theoretical study component.

A PhD study currently being undertaken at the World Maritime University in Malmö, Sweden is focusing on developing and testing maritime education tools for South African seafarers. The aim of this study (and the developed computer based training model) is to ascertain to what degree a visual software addition to the course can compensate for many of the students never having seen any of the equipment that they are studying. Software has been developed as part of this study, with the aim of providing students with different forms of digital imagery and animated media to supplement the theoretical text component of their studies. This software has been on trial for the past two semesters.

**Institutional Needs Analysis**

As CPUT accommodates students from diverse backgrounds throughout Southern Africa, an initial institutional needs analysis was conducted. Profiles were created of the student body in order to obtain an overall picture of the student dynamics for the development of the course. This was done in to obtain the correct attributes with the design, in order to ensure proficiency in terms of outcomes (Singh & Reed, 2001).

From these initial findings, it was decided to develop a resident-based model (where each student loads the syllabi onto their own laptop computer). This was primarily to compensate for (a) those students’ who do not have access to the internet after-hours, (b) to avoid prohibitive online data transmission costs associated with a media intensive course and (c) to accommodate for the low data-transmission restrictions often imposed by companies on their seagoing staff. Having the system loaded on the students laptops at the start of the semester, prevents the requirement for the transfer of large files via satellite transmission. This choice aligns itself to the thinking that the choice of software model needs to be developed in accordance with the needs of the students, and the facilities that are available to the vast majority of the students (Erasmus, 2010).

In order that the CBT model developed remain in sync with the students’ and university’s priorities, particularly from cost, hardware and software perspectives, (Muirhead, 2002), preference was given to developing an open-source concept-mapping platform originally introduced at the Singapore
Maritime Academy (Chatterjea & Nakazawa, 2008). Although certain similarities exist between the two institutions, it had to be specifically adapted to work around the identified logistical constraints encountered by many of the South African students. The university initiative concept-mapping open-source software package CmapTools was chosen after consideration was given to other open source models (such as Moodle) and proprietary software options (such as Blackboard). This was done both from the perspective of being able to offer the visual drill-down functionality offered from within a concept-mapping design, and from a perspective of there being less exacting requirements with regards to the hardware and software knowledge management components (Machado & Tao, 2007).

**World Economic Forum annual assessment of education (2014-2015).**

The study poses an interesting question, namely: Could the Singaporean model that was introduced for use by experienced engineers in a developed country, with one of the best education systems in the world be used in a developing country with limited experience levels and having one of the weakest performing academic systems globally? The model developed for use at CPUT has been formulated to accommodate the identifiable restrictions (as determined through surveys conducted) placed on both the institution and the student.

The starting point for any CBT system is the provision of information, with the CBT technology serving to transform that information into meaningful knowledge (Georgouli et al., 2008). However, it is important when creating a CBT system to keep in mind Felder & Silverman’s (1988) research findings that most learners prefer deductive methods of classroom tuition (i.e. just tell me what I need to know for the test, not one word more or less), and thus avoid information overload scenarios.

The developed CBT model using CmapTools is able to present the material in both text form (for the academic component) alongside various accompanying visual formats (for explanatory purposes). Furthermore, the syllabi compilation within the model allows for blended-learning practices, along with a built-in digital file transfer process to transfer information between the student and the lecturer. This function allows for students who are studying to periodically spend time at sea (as is sometimes required by their companies) without losing touch with what happens in the classroom.

**CBT Course Design**

The initial design data-collection process started with the gathering of information that would be useful for the development and population of the CmapTools program. One part of the survey assessed the English language capability of the students, to ascertain whether or not language assistance was required as part of the overall system development.
A total of 74 initial samples (representing the 2014 January intake) were obtained as part of this initial fact-finding process. Students were required to read a page of text from one of the leading marine engineering textbooks, and circle any words they were unfamiliar with. These results were then categorised into two sections: words that were purely English language related (English language problem: 0, 16% of the sample) and those that represented purely either maritime or technical words (unfamiliarity problem 0, 53% of the sample). Once calculated, it became apparent that whilst there was an element of English language ambiguity, the greater challenge lay with a lack of shipping exposure hence the focus of the study reverted to addressing the experience related deficiencies.

The second consideration was to look at the experience levels among the students, to determine the degree of development and detail that would be required. The experience portion of the survey rated the students on a quantitative scale depending on their exposure to different types of ships, and various different types of shipboard equipment. Results obtained from this section of the survey were beneficial for determining the need to introduce various learning theories as complementary practical learning tools for trial in the 3rd phase of the study.

**CBT Development**

Chatterjea & Nakazawa (1998), who researched the Singaporean model for an engineering conversion course at the Singapore Maritime Academy, refer to the term 'mountain top view' with regards to the drill-down functionality of the concept-mapping platform. This apt description describes the information-grouping nature that can be designed into the building of the software, so that each particular facet of the topic can be accessible from a single page, inclusive of all the information required up to Chief Engineer’s level. In addition to providing a platform for students to access countless digital files from a single source, navigation between chapters and subjects is possible through every page of the programme, without the need for opening and closing files.

As marine engineering systems on board change at a rapid pace due to updated technologies, it became a requirement to retain as much fluidity as possible, thereby allowing for students to participate and submit updated media they have obtained, for inclusion into the course material. In doing so, the students are assisting to build a modern, relevant syllabus for future student intakes. This design element also accommodates for the fact that while the seagoing students are exposed to modern engineering practices onboard ship, many MET lecturers leave sea to take up full time positions ashore, seldom returning to sea. As a result of this, they can lose touch with modern practices as they no longer find themselves at the cutting edge of the new technologies that get introduced in modern shipping practice.
Less freedom has been afforded the students at CPUT in comparison with those at SMA when it comes to the formulation of the concept map assignments, adopting a more rigid, structured framework for the students to work within at the expense of experimentation. This is primarily due to the fact that the lesser experience levels encountered at CPUT, the possibility for students to wonder off topic would become greater. After each lecture, assignment maps are required to be completed by the students after classroom hours, based on the days’ work, and submitted to the lecturer as an email attachment for review.

In order that the CBT model does not become just a static supplementary addition to the text, participative assignments are required to be completed by the students after each section of the work has been covered. A facility for the exporting of completed assignments in the form of a PDF attachment for emailing to the lecturer was created to enforce participation. Additionally, a system of receiving digital files in various formats was implemented for importing into the computer program as and when required to keep the information relevant and updated. The ideology behind this design, originated from the way that shipboard planned maintenance systems work with respect to the importing and exporting of knowledge to build on the information source.

The required assignments adopt various forms, namely:

- **Research based maps:** These skeletal maps require the students to reference textbooks, e-mailed handouts or the course material to compile the concept map to reflect their own understanding.

- **Procedure-based:** The students are required to complete the maps that portray the steps how certain shipboard procedures would be carried out (i.e. list the steps that are required to carry out a set of crankshaft deflections).

- **Sequence-based:** With these assignments, the students are required to complete the steps that would explain how onboard systems work (i.e. signal transmission from bridge to the steering gear, and feedback after the command has been carried out).
• Cause and correction maps: The final design of expert skeletal maps was intended to illustrate a chain of events that can be the cause of a certain condition forming, which then leads to a second map section representing the correction or avoidance process to negate the causation. Design elements are complemented with both case-based and problem-based scaffold assignments, and the introduction of group-work to assist those students with lesser English language skills.

Data Analysis to Date

2013-2014 Student Proficiency Rates (left) and Case-Based Assignment Example (right)

Outcomes of this study are assessed through both quantitative means (proficiency models, student grades, Blooms revised taxonomy analysis) and qualitative means (student follow up surveys). After two successive semesters, analysis shows that the more senior students utilise the software more than the lesser-experienced students, who prefer deductive paper-focused methods of study. This has possibly been a result of these students trying to reduce the amount of information that needs to be processed. Starting in July of 2015, the syllabi incorporate case-based learning methods (as illustrated by the example below), to further bridge the divide between the theoretical component of the course and the practicalities that the job onboard the ship entails.

Factoring in the confounding variables associated with the different student groups at each intake, the Chief Engineering students have as a group, performed better academically with a CBT model of education than was the case with a purely paper-based syllabus. However, at this stage there seems to be little impact noted at the Second Engineering student level, with outcomes as a group being marginally lower than was the case with a paper-focused syllabus.

Summary

Chatterjea & Nakazawa (2008) recommended a longitudinal study be conducted of this tuition method, in order to ascertain the true value of concept-mapping as an educational tool for maritime use. While this study is not longitudinal in nature, it attempts to further add to the body of knowledge by trialing
a system originally developed for use at one end of the spectrum (Singapore) in a developing region (South Africa), with all the associated variables that make South Africa unique.

It is the author’s belief that certain of these variables need addressing at a decision-making level in terms of an education model for MET in South Africa, before a system of this nature can show its true worth in a South African context.

References


Abstract
When I am in command on board as a shipmaster or when assisting masters in the safe operation of ships as a marine supervisor, what is always on my mind is safe vessel operations and accident prevention.

Here, from the viewpoint of a person who has served both as a ship master and a marine supervisor, I would like to express my thoughts concerning the relationship between 'men and accidents' in view of safe operation and accident prevention, and ask for your precious advice as experts in the education of seafarers.

Keywords: Human factor; motivation; mission; team management.

Failures experienced during the performance of jobs on board vessels
First I would like to tell some of my experiences during my life at sea.

1) A case resulting from a lack of adequate consideration for safety measures
When we loaded mutton at a certain port, the shipper came on board and he directly gave instructions for cargo loading. In a 40m-long and 20m-wide cargo space, stevedores manually stowed, one by one, cartons containing the mutton meat. Manual loading tends to create void spaces. We normally use air bags—an easy method of dunnaging—because there is a danger of such cargo collapsing as a result of the creation of gaps.

The shipper told the stevedores that there was no need to provide dunnaging because of an insufficient time allowance for loading. However, I told the shipper that we would not permit the omission of...
the operation—because there was a possibility of the cargo being displaced, which fact would be revealed at the discharging port—before receiving a letter saying “The ship may not be held responsible for any damage as a result of the stowage.” However, as the shipper insisted that he would come on board the vessel on her arrival at the discharge port and attend the cargo discharging work, and that he would not hold the vessel responsible even in the case of an actual cargo collapse. As the shipper maintained that it was ‘a gentlemen’s agreement’, I agreed at last to the omission of the use of air bags as a way to shorten the cargo-loading time.

When the hold was opened at the discharge port, it was found that the cargo was displaced and had collapsed as expected. As it was a frozen cargo, the cargo itself did not sustain extensive damage. However, this fact adversely affected the time to discharge the cargo.

An encounter with heavy seas during the voyage could have resulted in a considerable reduction of the ship’s stability. Furthermore, the shipper did not come on board to attend the cargo work upon the ship’s arrival at the port, and ‘the gentleman’s agreement’ turned out to be completely meaningless.

2) **A case of poor motivation for safety**

When the vessel was engaged in the carriage of coal from Canada to Japan, we were not able to inspect the inside of ballast tanks on both outward and homeward voyages because of rough weather. When we checked, after departure from the load port, the presence of water inside ballast tanks by taking soundings—because heavy weather prevented us from carrying out internal tank inspections—we found an accumulation of water of about 10 cm in one ballast tank, which must have been emptied almost completely during cargo loading operations.

I checked the matter with the master, but I was instinctively satisfied, without suspicion, with a feeble reasoning that sea water had found its way through gaps in a manhole on deck when the vessel shipped green sea during heavy weather. At other times I would have thought out more thoroughly from where the water had found its way into the tank. This may be attributable to the brain mechanism of human beings that shuts out, automatically, what they do not want to believe.

In fact, it was a voyage on which I was so involved in the operation to deal with the trouble of the No. 1 hatch cover of not opening at the loading port that my motivation for operations to check safety had dropped.

When we performed an internal inspection of the ballast tank at the discharge port, we found that the water level had increased to about 15 cm. There were no signs, such as the sound of water leaking into the tank, and, in addition, there was not sufficient time to make a further investigation. So we wrapped up the operation after roughly scanning the entire space.
During the following ballast voyage, there was no increase/decrease of water inside the ballast tank. At the load port we discharged ballast water completely. As I was worried about the water leak in the ballast tank, we took soundings on the day following the departure from the load port, which revealed some water increase. The weather was not so bad for the vessel to ship green water, a sea condition which excludes the possibility of sea water leaking into the hold through its manhole. We inspected the inside of the ballast tank once again when we found sea water entering through a crack in the shell plating at a location where a bilge keel was attached.

3 A case of failure caused under wrong impression

In 2010 I boarded a container vessel for the second time in the capacity of a shipmaster. She was a liner vessel which made port calls at Port Kelan, Singapore and, via the Torres Strait, Brisbane and five New Zealand ports.

In order to call at Singapore from Port Kelan, there is a need to cross the westbound lane. Initially the vessel was passing through the Singapore Strait while adjusting her arrival at the pilot boarding station at 1830 hours. However, when she was sailing at a point five miles short of the pilot station at about 1730 hours, we received a request by VHF from the pilot to come to the pilot station as early as possible since the pilot boarding time had been put 30 minutes ahead, with the pilot already waiting for boarding.

This is a place well-known for its large volume of traffic. Once a chance is lost, it is certain that a delay will be incurred. Fortunately, there was sufficient space between groups of vessels and we decided to cross at an acute angle, though an unusual way of sailing. With an adverse current of about three knots, it was possible to sail at a speed of only eight or nine knots on “standby full”. So we increased her speed to “navigation full”—with the condition that we could operate the engine at any moment—and sailed toward the pilot station at 11 knots.

After having almost crossed the westbound lane, we operated the telegraph to start the reduction of the ship’s speed at a position about 1 mile short of the pilot boarding station, while paying attention to a small non-fishing vessel and a fishing vessel, sailing in the same direction as ours, about two miles away.

When I ordered the reduction of the engine speed to “half ahead”, I received a report from the chief mate to the effect that the vessel speed had not dropped at all. In fact, the engine speed was still “navigation full” and no speed reduction had taken effect. I was so distracted by vessels around us that the engine speed did not come to my notice at all.
Thanks to the chief officer who noticed the aberration and reported it to me, we had still time and space to respond to the situation before its potential development into a serious accident.

**Human factors greatly contributing to accidents**

In recent years, various accident-prevention measures have been taken, such as the more extensive use of checklists, development of new devices incorporating functions to prevent accidents, and the establishment of management systems including BRM (bridge resource management) and ERM (engine room resource management).

However, as exemplified in the three cases taken up above, there are still many cases attributable to human errors which arise from human factors such as emotional instability, poor motivation, inattentiveness and fatigue.

**Measures to cope with human factors contributing to accidents**

1) **Motivation**

If we disregard the difference of capability among individuals, the most important quality of a seafarer from the aspect of accident prevention is the level of motivation.

It is the willingness of people working on the front line brimming with motivation that constitutes the greatest drive force for the prevention of accidents. If people involved in a project seriously desire to discharge their respective responsibilities, such project will naturally become more detailed and specific for the prevention of accidents.

2) **Sense of mission**

In the event of a marine accident, it would affect not only crewmembers actually involved but also society in general, depending on the scale of the accident. No one, either shipping companies or shippers, wants the occurrence of an accident.

It is true that the prevention of accidents is one of the important duties of seafarers. In order to carry out this important responsibility, it is necessary to have mental pillars of support for overcoming human factors which may cause accidents. One of such pillars, I think, is a sense of mission to perform his duties.

Human factors in the mechanism for accident prevention. There is a possibility of accidents occurring even when human factors are fully functional.
As can be seen from the cases cited above, you can point out support extended from other persons as one of the factors which worked to avoid accidents. In the case mentioned in 1.3, the chief officer played an important role in the prevention of the situation developing into an accident.

That is, if we can sever the chain of errors by solidarity (or teamwork), we may be able to stop the process leading to an accident.

**Solidarity**

However well you are prepared with a detailed and specific plan, you may not be able to perform it without the force of solidarity. The essence of solidarity is mutual trust between the leader and his followers.

The key to achieve the objective of eliminating accidents through solidarity cultivated by mutual trust seems to be whether the master of a ship can at all times be considerate for the crewmembers who are on the front line of the organization.

In an organization which, on the surface, appears to unite with solidarity, you often encounter cases in which operations performed only through strong leadership may easily fail.

The leader may indicate the direction of an operation, but no one other than the members of the organization can actually perform it. Each individual of the organization has his strengths and weaknesses.

The leader should carefully observe the ability of each individual member and, in order to fulfill the mission of safe vessel operations, pay attention to the assignment of jobs in which each member can use his strong points and shine. That is to say that the most important thing is that each individual of an organization can find value in his position. The joy of a person who has acquired such a mission by himself is immeasurable. Furthermore, it is most fortunate to encounter a leader who can give him a proper mission, focusing light on the field he is good and capable. It is essential to build up an organization that takes action toward the mission of “safe operation and no accident”, on the basis of solidarity of persons united with mutual trust.

It is said that ‘there is no ‘I’ in a team’ (which means that there should not be ‘I’ (personal opinion, etc.) in a team), but I disagree. Each individual with different characters gathers, forming a team. It is in there that the strength of a team exists.

This can be said to be the creation of value toward no accidents.
Activities based on ‘volition’ and ‘symbiosis’, necessary for safety management of the next-generation

Here I would like to consider “What should be done in order to generate morale, a sense of mission, and solidarity?”

1) ‘Soft power’ and ‘hard power’
When Doctor Ikeda, the founder of Soka University, who has been constantly giving support and encouragement for our photograph exhibition “Beyond Ocean Waves” since 1991, gave a speech in Harvard University, he touched upon ‘soft power’ and ‘hard power’. He defined ‘soft power’ as volition and argued that the keywords for the 21st century are ‘volition’ and ‘symbiosis’.

2) Practice of volition
While systems depending on hard power have succeeded by using the established tool of coercion to move people toward certain goals, the success of soft power is based on volition. It is an internally generated energy of will created through consensus and understanding among people. The processes of soft power unleash the inner energies of the individual.

It is true that the prevention of marine accidents is one of the duties placed on the shoulders of us, seamen. However, in order to achieve the goal of the so-called ‘mission’, something philosophical sounding, I consider that, from the stage of the training of seafarers, volitional approaches, to be taken up below, are necessary:

- Expansion and improvement of integrated learning of liberal arts, including culture and art, other than specific disciplines;
- Practical training to enhance change from a mere accumulation of knowledge to wisdom; and
- Intercultural exchange through social action programs.

I am of the opinion that we are now at a point in time at which we should review the education of seafarers to cultivate rich mentality in each individual.

3) Practice of symbiosis
In order to build up mutual trust between a leader and his followers (team members) and improve the function of accident prevention through the symbiosis of crewmembers, there is a need to make communication smoother, not of a hierarchical relationship but through equal-to-equal dialogs.

Recently I served on board a vessel with a Japanese third mate freshly graduated from school.

It is natural that his knowledge and experience were limited and, therefore, his work performance was much inferior as compared with his predecessor, a Filipino third mate. Partly because of the
regulations of the Maritime Labor Convention, we had to have him work as third officer on the container ship, which made frequent port calls.

Unfortunately, in our company, Japanese seafarers are forced to work ashore sooner or later, thus making the period of their sea life shorter than otherwise. To compensate for the shortened period, they have to learn many things more quickly. However, on the actual site of work, it is impossible for the master to provide him instruction from A to Z. No one will help a newcomer out unless he himself maintains a high level of motivation and learn actively.

Having said that, we did not, by all means, want him to incur an accident. Therefore, I may have said discouraging things to the Japanese newcomer. Nonetheless, he said, when he left the vessel after finishing his employment on board, that he had enjoyed a seafaring life with the cooperation and assistance provided by his foreign colleagues and would continue his work, although, I presume, he was not able to sufficiently enjoy shore leave while engaged on board. I really felt refreshed by seeing a young man who was looking for adventure with his dreams in mind.

This is what you, who are involved in the activities of the International Maritime Lecturers Association (IMLA), feel, at ordinary times, as “the joy of watching the growth of students”.

Furthermore, I think this ‘symbiosis’ shares the same direction of thinking in which futurist, Hazel Anderson, expressed in her book “Building a Win-win World”. That is to say, I believe, if no other person wins, you cannot gain a victory, either.

This can be easily understood if you think of a closed society as there is on board a ship. A failure of a crewmember immediately means the master’s and, furthermore, may in the worst scenario affect the entire crewmembers. If a master can leave his vessel after finishing his service on board, without experiencing any serious accident, it is thanks to every crewmember’s efforts.

4) **Function of maritime education**

A teacher once said “what are necessary after entering the world of work are creativity and problem-solving ability, and education should exist to foster such abilities”.

Young students who are going to lead a seafaring life have various worries and hopes. They face numerous problems—how to overcome tough facts of life by themselves is one, another is whether they can continue their work and find happiness in their own job and life.

The essential key for safe operation lies in the improvement of morale and the presence of the sense of mission of each individual as described earlier. For that purpose, too, I believe, the importance of
education in which each young man and woman creates value by adopting the approaches taken up in 4.2, will grow more and more.

**Conclusion**

In recent years, the speed of distribution of commodity and information has increased dramatically, causing various changes, such as the growing density of vessel traffic and vessel size. Although the environment for eliminating accidents has improved greatly, with the dramatically better performance of nautical instruments and the introduction of new facilities and systems, we are still plagued with accidents.

In spite of various views from those actually involved, it is, I believe, a truth that the more and more rigorous enforcement of port state control and regulations by flag states, is generally making contributions to the reduction of accidents. However, those who use such hardware and take action by correctly recognizing information are seafarers. In addition, whether they can respond, as occasion demands, to various difficulties beyond imagination, thereby to prevent them from developing into accidents, will greatly depend on the human factors of the crewmembers of the vessel.

I have used up to here some words and phrases such as ‘morale’, ‘a sense of mission’, ‘solidarity’, and, in addition, ‘creativity’ and ‘problem-solving ability’. I wanted to express my strong hope to adhere to ‘safe operation/no accident’, and I used such words as a consequence. I would like to enumerate, once again, ‘volition’ and ‘symbiosis’ as all-inclusive keywords.

I conclude that seamanship full of ‘volition’ and ‘symbiosis’ is the most essential element for seafarers who are working hard, without being noticed, for the logistics of the world while preserving the global environment. Now, I would like to have comments from you, who are engaged in the education of seafarers.

**Reference material**

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Moving From Training to Practice – A Comparison of the Maritime and Aviation Industry Crew Resource Management Education Programs

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ABSTRACT
During the evolution of the maritime industry and its personnel over the past generation, there has been an exponential increase in the use of a systemic approach to identifying goals, developing processes to achieve them, and utilizing metrics to benchmark progress. This approach has simultaneously been developed and implemented in a number of industries where there is high risk of catastrophic failure from human element causal factors. Most notably is the aviation industry where the concept of crew, or “bridge” resource management was founded and from which the maritime equivalent is modelled after.

This paper will examine and compare the history of crew resource education development in both the maritime and aviation industries. It will also look at shipboard and shore based personnel relationships. Especially the demands encountered when diverging priorities cause stress in the resource management principles sought to be implemented. Lastly, the discussion will look into expectations from industry that may or may not be realistically met by desiring a “one stop fix” to curing the casualties from human causal factors decades after this type of training was implemented in both sectors. Tragically, there have been a number of recent accidents in the maritime sector which indicates that perhaps although the intent of crew resource training is sound, there may be opportunities for improving the delivery of these principles to those who need to use them.

The divergence of goals extends to the expectations of the training and education institutions who must try and tailor a powerful and uniquely meaningful delivery of the valuable training concepts under the constraints of a globally standardized module format designed to be that very one stop fix.

The challenge thus develops to articulately identify this dilemma and its potential to negatively affect a safe and efficient maritime operation. Once identified the challenge progresses to identify the solution in a systemic way and capture the intention of this type of training into a format that leaves a student with the impression of fully understanding their personal responsibility. In order to start developing a corollary between industries, an update of marine casualty facts would be appropriate.

Shipping losses have continued a 10-year downward trend, which began in 2005, according to the third annual Safety and Shipping Review for 2015 issued by German marine insurer Allianz Global Corporate & Specialty (AGCS) which is undeniably good news. 2014 saw only 75 shipping losses of over 100
gross tons recorded worldwide, which marks a 32-percent decrease from the previous year and a significant departure from the 10-year loss average of 127 per year.

Sinking was the most frequent cause of casualties during 2014, which accounted for 65 percent of total losses (49 ships). Groundings followed (13 ships), and fires and/or explosions were next with four ships. More than 50 percent of the 2,773 shipping casualties reported last year were on cargo and fishing vessels.

In 2014, one-third of ship losses were in Southeast Asia, South China Sea, Indo China, Indonesia and the Philippines, which reported 17 ships lost, and Japan, Korea and North China had 12 ships lost. The AGCS Review noted that during the last decade the British Isles, the North Sea, English Channel and Bay of Biscay had 465 casualties. +

Passenger vessels accounted for 10 percent of losses during 2014, which raised concerns about training and emergency preparedness. The AGCS notes smaller crews could be an issue. Recent casualties such as Sewol and Norman Atlantic have once again raised significant concerns over training and emergency preparedness on passenger ships three years after the Costa Concordia disaster, states the AGCS report.

Concerns over ever-increasing ship sizes have also been raised. The MSC Oscar, the world’s largest container ship, was introduced in January 2015 and is 19,224 TEU, and vessels as large as 22,000 TEU are anticipated to be in service in the near future. Further risk challenges noted in the 2015 Safety and Shipping Review include overreliance on electronic navigation, rise in geopolitical uncertainty and piracy risks in Africa to Asia present huge concerns to the industry as well. (1)

These facts serve to quantify in a compact manner the events we see throughout the multinational media that affect our industry. Similarly, our standard of addressing recognized trends in safety and training rests within the various functions of the International Maritime Organization (IMO). Addressing the issues of training, and human error causal factors, there are multitude of initiatives and resolutions from the IMO that are intended to mitigate risk, however the specifics are beyond the scope of this paper. The example below serves as additional data to where the maritime industry currently finds itself.

AGCS cites another report: Human Error and Marine Safety by Dr. Anita M. Rothblum of the U.S. Coast Guard Research & Development Center. Rothblum states that studies have shown that human error contributes to:
• 84-88 percent of tanker accidents • 79 percent of towing vessel groundings • 89-96 percent of collisions • 75 percent of allisions (collisions involving one moving and one stationary object) • 75 percent of fires and explosions

Across the civil aviation and commercial maritime industries, there have been parallel approaches to developing a program to address these human error statistics. Additionally the impetus for developing an international solution was derived from a consensus formed after witnessing tragic accidents. The maritime industry developed its International Safety Management (ISM) Code issued by the IMO in large part due to the infamous Herald of Free Enterprise tragedy in 1987. Similarly, the commercial aviation industry through the International Civil Aviation Organization (ICAO) began the development of Cockpit Resource Management (CRM) after a number of high profile accidents including the tragic disaster at Tenerife in 1977 where due to entirely to human error factors, two 747 aircraft collided on the runway resulting in a very large loss of life.

The roots of Aviation Crew Resource Management training in the United States are usually traced back to a workshop, Resource Management on the Flight Deck sponsored by the National Aeronautics and Space Administration in 1979 (Cooper, White, & Lauber, 1980). This conference was the outgrowth of NASA research into the causes of air transport accidents. The research presented at this meeting identified the human error aspects of the majority of air crashes as failures of interpersonal communications, decision making, and leadership. At this meeting, the label Cockpit Resource Management (CRM) was applied to the process of training crews to reduce “pilot error” by making better use of the human resources on the flight deck. Many of the air carriers represented at this meeting left it committed to developing new training programs to enhance the interpersonal aspects of flight operations. Since that time CRM training programs have proliferated in the United States and around the world. Approaches to CRM have also evolved in the years since the NASA meeting. (2)

The premise for the aviation industry’s interest in promulgating this idea was ground breaking at the time where traditional crew interactions and management practices were generally not best described as interpersonal. Similarly these developments caught the attention of the maritime community which saw corresponding value in improving crew and management interactions, communications and operating practices.

As with the IMO, the ICAO is a United Nations sponsored organization that sets standards, develops regulations and serves as a central process area for issues affecting the global civil aviation industry. According to the web page, The International Civil Aviation Organization (ICAO) is a UN specialized agency, created in 1944 upon the signing of the Convention on International Civil Aviation (Chicago Convention).
ICAO works with the Convention’s 191 Member States and global aviation organizations to develop international Standards and Recommended Practices (SARPs) which States reference when developing their legally-enforceable national civil aviation regulations.

There are currently over 10,000 SARPs reflected in the 19 Annexes to the Chicago Convention which ICAO oversees, and it is through these provisions – as well as ICAO’s complementary policy, auditing and capacity-building efforts – that today’s global air transport network is able to operate close to 100,000 daily flights, safely, efficiently and securely in every region of the world. (3)

Regarding the crew resource topic, the differences between the two industries begin to emerge with the way the standards and regulations are implemented and enforced.

In an excellent paper The Evolution of Crew Resource Management Training in Commercial Aviation by Robert L. Helmreich, Ashleigh C. Merritt & John A. Wilhelm, the stages of CRM development are clear and well-articulated. In summary he concludes the multiple “generations” of aviation CRM have arrived at a realization. That of recognizing the improvement of operating crews and education of personnel in understanding human error risk depends on the habitual reinforcing of concepts and lessons learned from failures. In addition, that the institutionalization of CRM training will devolve the benefits gained to a point that the original concepts will be lost.

CRM is not and never will be the mechanism to eliminate error and assure safety in a high risk endeavor such as aviation. Error is an inevitable result of the natural limitations of human performance and the function of complex systems. CRM is one of an array of tools that organizations can use to manage error.

The safety of operations is influenced by professional, organizational, and national cultures and safety requires focusing each of these toward an organizational safety culture that deals with errors non-punitively and proactively (Helmreich & Merritt, in press). When CRM is viewed in the context of the aviation system, its contributions and limitations can be understood. What we do know is that the rationale for human factors training is as strong now as it was when the term CRM was first coined. (4)

The defined concepts of crew or bridge resource management have been around long enough to question how effective has the program been? Without defining and exhibiting metrics to answer the question, the perception is that there is still a lot of work to do. While recent aviation tragedies such as the Mayalsia Airways and Asiana Airways accidents galvanize media attention, and typically overshadow the maritime sector, recent maritime tragedies such as the Costa Concordia, Sewol, and Norman Atlantic have gained visibility and with that the questions of how the human element contributed to either the accident itself or the response to it.
As is well known in our industry, the IMO developed the Bridge Resource Management program as a once in a career module supporting the STCW initiative. While the relevance of the course material is good, and the intention of the standardization is also good, there is an opportunity for asking about how well the approach to implementing the best practices of BRM works in developing the cultural shift it hopes to influence. The attempt to include engineering disciplines in this discussion is met by duplicating the BRM principles in an Engine Resource Management course and also included in Manila 2010 is the development of the Leadership and Management Skills modules. Unfortunately the one time standardized, or institutionalized methods of imparting changes in interpersonal skills leaves a bit to be desired.

One issue is the concept of moving from compliance to commitment. Taken in its most literal meaning, it suggests that the well intentioned and justifiably successful regulatory framework as it currently stands for maritime operators has unintentionally resulted in a situation where shipboard personnel view these regulations as merely a requirement without a necessary appreciation for why they exist. Thus, it appears that a sea going officer potentially views his or her role in performing these functions as solely an act of “compliance”. In other words, just making sure the paperwork is satisfactory so the attending port state control, vetting auditor, or port captain can confirm the “check in the box” of completion and compliance.

It also suggests that a sea going officer should be more aware of the benefits of “commitment” where they have a deeper understanding of why these procedures need to be fully developed and understood. Essentially, be committed to the intent of the regulatory framework instead of determining it satisfactory to merely comply with it.

So where do we begin? As educators we have a front row seat in the development game for future members of our industry. Therefore with this advantage, we can think about how to identify potential risks that could develop as a result of isolating maritime students into a method of learning from their initial exposure to maritime education and thus habitually gauging their development against formalized metrics. In other words, will the maritime student learn that continuing development in their career is to be obtained by “checking the box” on a pre-established criteria or doing so alongside with the need to develop and practice analytical skills that promote creative process to solving problems (that ultimately exist in the most inopportune moments)?

Instead of proposing an all or nothing approach supporting a position, the debate hopefully generated through this paper is to suggest creating a “parallel lane” of learning that helps a student develop a fluid ability to think empirically using critical and analytical thinking. Curriculum could be developed with the idea that practicing critical analysis in a maritime environment is a way to help promote
creativity and problem solving ability. Aside from the accepted benefit that assessment based learning emphasis brings to a technical industry like ours, the ability to creatively and independently think and solve problems is tantamount to a successful future of global maritime education and enterprise.

As mentioned earlier the BRM training of maritime crew members exists in the module based STCW framework where it is received once in a career. For academy trained officers that is at the beginning of their career before there is a full appreciation for the reality of the potential consequences of accidents. As the mariner advances in experience the lessons learned component of resource management is captured in the ISM defined Safety Management Systems (SMS) administered by shipping companies and audited by class. Still the quality of the continuing education from SMS audits, or Event Tracking Systems is broad and limited to specific events, near misses or casualties and the “commitment” to original fundamentals of Crew Resource Management in many cases are buried into the “compliance” aspect of the exercise.

What can we learn from the way the commercial aviation sector responds to the same issues? First the comparison of how the two industries are similar relate to the development and implementation of regulations and standards. We see international organizations ICAO and IMO cognizing and promulgating standards. We see recognized national authorities representing re member states, or “flag states”. Within the states are regulatory bodies charged with enforcing the standards and regulations of safety management and training.

In the United States it is the Federal Aviation Authority (FAA) and the United States Coast Guard (USCG). Here is where industry differences start to take effect. For example, the FAA in the United States is the regulatory body which licenses aviators and audits airline safety management systems. They also identify safety issues in crew performance and airframe manufacture with the legal authority to ground aircraft in accordance with the Aviation Directive (AD) program. (5)

The USCG also maintains the authority to license mariners and address vessel and crew deficiencies with the Port State Control process. However, safety issues with crew performance are left to the auditing function of classification societies that are employed by shipping companies to provide approval of the vessel SMS. As a result, the findings of the audits, lessons learned and best practices become proprietary to the company. Thus get placed in a silo preventing the broad industry wide acknowledgment of these findings as a means to capture a learning moment for operating crews and companies. This is the model commercial aviation employs with marked success. Data is collected by the regulating body, not the contracted classification society and therefore vetting of critical findings for distribution becomes a public safety initiative rather than a protected private data base.
Once data is collected by a national civil aviation authority, the auditing process of each authority is subject to further auditing by the ICAO. This is not the process with the maritime industry and the IMO. The goal of the ICAO process is to ensure the most transparency possible when promoting safety. Specifically, the program at the ICAO is called the Universal Safety Oversight Audit Program (USAOP). It says each member state (the equivalent to a “flag state” to the IMO) shall establish a State Safety Program to encompass all airlines within the state that will be subject to audit by ICAO. This represents a tremendous difference from what the maritime world is used to. Imagine if the IMO told the Panamanian Maritime Authority that they must establish a flag based auditing program of all Panamanian flag vessels and that the IMO will be authorized through treaty ratification to audit and enforce findings against those audits!

Ok so the reality of this happening and that the IMO will begin auditing a flag states audit program is slim to none. So as a maritime community we must go to the next line of defence. That is to go directly to the mariners and look at the way we train our crews over the course of their career to pay an increased amount of attention to learning about human error causal factors and the root elements of crew resource management in a way that engages the mariner across nationalities, gender, and generation. Just like the civil aviation industry does. For example, just for CRM, the guidelines from the ICAO detailing initial and recurrent CRM training requirements are spelled out below.

**Initial CRM training (Indoctrination/Awareness.)**

Initial CRM training shall be completed before commencing unsupervised line flying unless the crewmember has previously completed an initial operator’s CRM course. Initial CRM training addresses the nature of the operations of the company concerned, as well as the associated procedures and the culture of the company. This will include areas of operations, which produce particular difficulties or involve adverse climatic conditions and any unusual hazards.

When a flight crewmember has not previously completed an Operator’s Initial CRM training (either new employees or existing staff), then the flight crewmember shall complete an initial CRM training course. The Initial CRM Training should be completed within a specified period of time after a new employee joins the operator. If the flight crew member has not previously been trained in Human Factors then a theoretical course, based on the human performance and limitations program for the Airline Transport Pilot License (ATPL) (see the requirements applicable to the issue of Flight Crew Licenses) shall be completed before the initial Operator’s CRM training or combined with the initial Operator’s CRM training.
RECURRENT CRM TRAINING
CRM training must be included as a regular part of the recurrent training requirement. Recurrent CRM training should include modular classroom or briefing room CRM training to review and amplify CRM components, followed by practice and feedback exercises. All major topics of CRM training shall be covered over a period not exceeding 3 years.

Topics:
(1) Human error and reliability, error chain, error prevention and detection;
(2) Company safety culture, SOPs, organizational factors;
(3) Stress, stress management, fatigue and vigilance;
(4) Information acquisition and processing, situational awareness, workload management;
(5) Decision making;
(6) Communication and coordination inside and outside the cockpit;
(7) Leadership and team behaviour, synergy;
(8) Automation and philosophy of the use of Automation (if relevant to the type);
(9) Checklist and Briefing
(10) Specific type-related differences;
(11) Case based studies; and
(12) Additional areas which warrant extra attention, as identified by the accident prevention and flight safety program.

CRM elements should be integrated into all the phases of the recurrent training – by all the personnel conducting recurrent training. The operator shall ensure that all personnel conducting recurrent training are suitably qualified to integrate elements of CRM into this training.

ACQUIRING A NEW AIRCRAFT TYPE RATING
If a pilot acquires a new aircraft type rating, elements of CRM training are integrated into the conversion training. In planning training on airplanes with a flight crew of two or more, particular emphasis should be placed on the practice of Line Orientated Flying Training (LOFT) with emphasis on Crew Resource Management (CRM). Training involving communications and the use of automation can be developed for crews operating aircraft with advanced technology cockpits, or for crews transitioning into them. Line Operational Simulation (LOS) which incorporates CRM skills can be substituted for CRM training.

UPGRADE TRAINING
Training for upgrading to captain provides an opportunity that deals with the human factors aspects of command. Such training can be incorporated in the upgrade process.
CONCLUSION

Hopefully, the elements of Human Resource Management as a discipline studying human factors and errors during casualties have been shown to be remarkably similar in both the civil aviation and commercial maritime industry worldwide. Additionally, the point at which the two industries differ in their approaches to implementing these concepts should also be as clear. It should not be the role of maritime educators to assimilate training methods and education strategies from dissimilar industries in an “apples to apples” manner. However we should certainly think of ways that common principles which are proven to be sound may be adapted in a meaningful way to improve their impact on the mariners we are charged with educating.

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THE CONDITIONAL EFFECT OF MARITIME STUDENTS’ DEMOGRAPHIC CHARACTERISTICS ON CAREER COMMITMENT AT DIFFERENT LEVELS OF CAREER MOTIVATION

SHAUN RUGGUNANĀ AND HERBERT KANENGONIß

Abstract

Several challenges have been cited in recent reports on human resource development in South African maritime sector and these include but not limited to policy neglect and attracting very little attention to create jobs, grow the economy and make effective interventions in society as well as persisted lack of awareness about the sector. Moreover, most recent global reports cited decline in number of seafarers due to increased concentration on in land professions. Against this background, this study investigated the moderating influence of career motivation on relations between selected demographic variables and career commitment amongst undergraduate maritime students (n= 108, females=36%) from a South African University. The study sought, first, to determine whether a relationship exist between demographic characteristics, motivation and career commitment; and second, we investigated the influence students’ motivation on commitment after controlling for demographics. Lastly, we investigated the moderating effect of career motivation on the demographics-commitment relationship amongst prospective seafarers; and finally Participants completed a variety of instruments of motivation viz; Career identity scale (CIS) and Career Planning Scale (CPS) as well the Career Commitment Scale (CCS). Data analysis consisted of Spearman’s rank-order correlations, hierarchical regressions to predict career commitment from the biographical variables and career motivation; and also to determine the moderating effect of motivation on the relationship between demographic variables and career commitment. Recommendations for researchers and organisations in maritime industry regarding the management and retention of the future crop of seafarers in South Africa to offset any possible and anticipated disparities are provided.

Introduction

To understand the root factors and of seafarer shortage in South Africa the current research endeavors to satisfy the following objectives:

- To determine whether a relationship exist between demographic characteristics, motivation and career commitment of student seafarers’ at a South African University;
- To assess the influence of students’ career motivation on career commitment after controlling for demographic characteristics;
- To investigate the moderating effect of career motivation on the demographics-commitment relationship amongst prospective seafarers;
- To give recommendations on best attraction and retention interventions for seafarers
What will follow
In the following section the research design is discussed followed by presentation and interpretation of results. Thereafter, the findings are discussed and conclusions and recommendations are provided and finally limitations of the study and directions for future research.

Materials and methods
Method
We employed a cross-sectional survey using a self-developed questionnaire to provide an insight into the biographical details of student cadets at a South African University. Some items included in the data collection instrument were quasi-adopted from similar studies carried out in Brazil (Lobrigo & Pawlik, 2012) and; Greece and China (Pallis & Ng, 2011). The study sought to elicit information; apart from the demographics profiles, about the prospective cadets’ sources of funding for their studies, the importance of funding for their eventual graduation, the awareness levels of their chosen careers and likelihood of them remaining in their chosen careers at sea after graduation.

Participants and Setting
The study conveniently and purposefully profiled a population of 120 undergraduate cadets and 108 usable questionnaires were obtained recording a 90% response rate. The majority of the respondents were male (63.9%) while females constituted 36.1% of the population with about 20% already in employ as seafarers (16 male and 6 females). In addition, the majority of the participants were in their first year of study (53.7%) and only 13.9% of the sampled students were in their final year (see Table 4). Most of the participants were black Africans (86.1%) followed by mixed race and Indian students who constituted smaller percentages. Of the roughly 20% who are already working in the maritime sector, only 2 students had relatives employed in the related career as compared to the 6 indicated by those who were not yet practising as seafarers. The majority, specifically 80 out of the 86 respondents who were not already in employ as seafarers indicated that they were the first in their families to pursue a maritime career with the majority of the population citing family (20.4%), the media (19.4%), friends (19.4%) and their high school teachers (14.8%) as their main sources of the maritime career awareness. The mean age of the sample with this study was 21.81 years. Most importantly, Table 1 also shows the registered student cadets’ track aspirations.
Table 1: Demographic Characteristics of the participants (N=120; n=108)

<table>
<thead>
<tr>
<th>Race</th>
<th>Male (Frequency)</th>
<th>Female (Frequency)</th>
<th>Total Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. African</td>
<td>56</td>
<td>37</td>
<td>93</td>
</tr>
<tr>
<td>White</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Mixed Race</td>
<td>4</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Indian</td>
<td>6</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>CurrPractice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>16</td>
<td>6</td>
<td>22</td>
</tr>
<tr>
<td>No</td>
<td>53</td>
<td>33</td>
<td>86</td>
</tr>
<tr>
<td>TIMEinPractice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n/a</td>
<td>53</td>
<td>33</td>
<td>86</td>
</tr>
<tr>
<td>less than a year</td>
<td>4</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>1 to 3yrs</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>more than 3yrs</td>
<td>11</td>
<td>4</td>
<td>15</td>
</tr>
<tr>
<td>Study Track</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deck Officer</td>
<td>23</td>
<td>14</td>
<td>37</td>
</tr>
<tr>
<td>Seafaring Cadet</td>
<td>8</td>
<td>7</td>
<td>15</td>
</tr>
<tr>
<td>Navigator</td>
<td>15</td>
<td>7</td>
<td>22</td>
</tr>
<tr>
<td>Marine Pilot</td>
<td>12</td>
<td>7</td>
<td>19</td>
</tr>
<tr>
<td>officer of the watch</td>
<td>3</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Master</td>
<td>3</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Marine Surveyor</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Missing</td>
<td>4</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>69</td>
<td>39</td>
<td>108</td>
</tr>
</tbody>
</table>

Mean Age: 21.81
Median Age: 20
Stan. Deviation: 4.73
Range: 32
Minimum: 17
Maximum: 49

Data Collection Instruments

Career Motivation Scale [CMS: Noe et al., 1990; London, 1993] is a quasi-adopted and modified 19-item measure which emphasise feelings and attitudes related to work and career. A sample item is: ‘I can adequately handle work problems that come my way.’ Noe et al.’s (1990) items focus on behaviours. A sample item is: ‘To what extent do you spend your free time on activities that will help your job?’ Reasonably high convergent validity has been found between London’s (1993) and Noe et al.’s (1990) scales suggesting that the two measure the same construct (London & Noe, 1997). We combine the two measures in order to investigate both attitudes and behaviours of CM. Previous studies reported a Chronbach’s coefficient α of 0.84 for this scale (Day & Allen, 2004). The Chronbach’s alpha coefficient for the overall CMS and subscales with this study sample was ranged from 0.61 to 0.74.

Career Commitment Scale [CCS: Meyer, Allen & Smith, 1993] is an 18-item measure of affective, continuance and normative occupational commitment (six items in each scale). Five items were negatively phrased, and were reversed scored. The items were modified to apply to the seafaring profession. Responses to these items were on 5-point scales ranging from 1(strongly disagree) to 5
(strongly agree). Meyer et al.’s (1993) reported coefficient alphas ranging from .73 to .87 for these scales. In this study, only the overall CCS was adopted because it had an acceptable level of reliability (α<0.70).

Data Analysis
Statistical analysis was carried out using the Statistical Package for the Social Sciences programme (SPSS version 22). The initial examination of data were conducted in the form of descriptive statistics which uses the most fundamental techniques; and the construction of frequency distributions or measures of variability such as standard deviation, skewness and mean. Exploratory Factor Analysis (EFA), specifically principal component factor analysis via oblimin rotation suppressing absolute values below 0.4 was employed to confirm the unidimensionality of the of the CMS and the CCS. The Spearman’s correlation coefficient rho was used to indicate relations between the independent and dependent variables. The Spearman’s rank-order correlation coefficient is used because some of these variables are ordinal not interval and violated parametric assumptions and/or the distributional assumptions (Field, 2013; Pallant, 2013). Regression analyses were conducted to determine whether career motivation predict commitment of seafarer students. A PROCESS Procedure for SPSS release 2.13 (Hayes, 2013) was used to test if motivation moderated the relationship between age (predictor) and commitment (outcome). Age was chosen because it is a continuous variable which is likely to change with time as people learn new things or progress with their studies (Xiao et. al., 2014).

Results
Preliminary Analysis
Subjected to the principal component analysis, 18 items of the career commitment scale revealed that three factors emerged from the data. The Keizer-Meyer-Olkin value exceeded the recommended threshold value of 0.6 and the Bartlett’s test of Sphericity was significant. A forced three-component solution explained a total of 34.54% of the variance in commitment. An oblimin rotated solution with Keiser Normalisation revealed strong loadings fall all items. However except 3 items were removed from the analysis because they did not reach the threshold point of 0.4 and these include: 1 from the affective commitment scale “I don’t feel emotionally attached to the seafarer career” and two items from the normative commitment scale i.e. item 15 “I will only consider taking a break from a career at sea if I obtain funding for campus-based further studies” and item 17 “I believe this career is likely to take me to work in other fields beyond this one”.

Items from the career motivation scale loaded perfectly loaded onto two distinct factors which retained their names as conceptualised in career motivation literature and explained 36.51% of the variance in motivation. Three items from the career planning scale viz; “I am afraid global competition from seafarers of other nationalities will affect my future seafaring career”, “My family played a big role in influencing me to pursue this career” and “Once I qualify, I will first consider a non-maritime career in corporate sector” as well as item 8 from the career identity scale “I am aware of the work of the International
Transport Federation" were not included in further analysis. The overall career motivation scale reported a Keizer-Meyer-Olkin value of 0.72 and the Bartlett’s test of Sphericity showed a statistical significance.

**Reliability statistics and Spearman’s rank-order correlations**

Table 2: *Reliability statistics and Spearman’s correlations coefficients for scales and factors*

<table>
<thead>
<tr>
<th>Variable</th>
<th>α</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Career Commitment</td>
<td>0.70</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Career Motivation</td>
<td>0.74</td>
<td>0.312^{**}</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Career Planning</td>
<td>0.61</td>
<td>0.240^{*}</td>
<td>0.772^{***}</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4. Career Identity</td>
<td>0.71</td>
<td>0.242^{*}</td>
<td>0.812^{***}</td>
<td>0.286^{**}</td>
<td>1</td>
</tr>
<tr>
<td>5. Race</td>
<td>-</td>
<td>-0.235^{*}</td>
<td>-0.233^{*}</td>
<td>-0.211^{*}</td>
<td>-0.187</td>
</tr>
</tbody>
</table>

To determine the relationships between demographic characteristics, motivation and career commitment, a Spearman’s correlation coefficient (rho) analysis was conducted. As illustrated in Table 2, a positive and practically significant relationship existed between commitment and motivation, \[ r (108) = 0.312, p<0.01 \] (moderate effect). From all the demographics variables considered (both dichotomous and non-parametric variable), only race was significantly related (small effect) to both career commitment and motivation and its sub dimensions, all at \( p<0.05 \).

**Regression Analyses**

**Predicting student seafarer cadets’ commitment from career motivation after controlling for race**

Table 3: *Standardised regression coefficients student seafarer cadets’ commitment from career motivation*

<table>
<thead>
<tr>
<th>Model</th>
<th>B</th>
<th>S.E</th>
<th>( \beta )</th>
<th>T</th>
<th>p</th>
<th>( R )</th>
<th>( R^2 )</th>
<th>( \Delta R^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Career Commitment from career motivation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (Constant)</td>
<td>50.17</td>
<td>.924</td>
<td>54.306</td>
<td>.000</td>
<td>6.466</td>
<td>0.240</td>
<td>0.057</td>
<td>0.049</td>
</tr>
<tr>
<td>Race</td>
<td>-1.434</td>
<td>.564</td>
<td>-2.543</td>
<td>.012</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 (Constant)</td>
<td>35.39</td>
<td>4.66</td>
<td>7.595</td>
<td>.000</td>
<td>8.738</td>
<td>0.378</td>
<td>0.143</td>
<td>0.126</td>
</tr>
<tr>
<td>Race</td>
<td>-1.066</td>
<td>.552</td>
<td>-1.930</td>
<td>.056</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motivation</td>
<td>.251</td>
<td>.078</td>
<td>.298</td>
<td>3.230</td>
<td>.002</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As illustrated in Table 3, a hierarchical multiple regression analysis was conducted to assess whether career motivation predicted career commitment as measured by various instruments, whilst controlling for the selected significant explanatory variable, race. First, the demographic variables were entered in Step 1, explaining only 5.7% of the variance in career commitment. In Step 2, the predictor variable (motivation) was added to the model and the total variance explained by the model as a whole...
was (14.3%, $F = 6.466$, $p = 0.012$). This means motivation explained an additional 12.6% of the variance in commitment after the influence of race was removed, ($R^2$ change = 0.126, $F$ change= 8.738, $p = 0.002$). The final model revealed that, although the effect was very small and not practically significant, motivation somehow predicted commitment, ($\beta = 0.298$, $p < 0.01$).

**The effect of demographics on commitment when there is high and low motivation**

**Table 4:** Linear model of age as a predictor of career commitment moderated by career motivation

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>SE</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>48.188</td>
<td>0.053</td>
<td>95.80</td>
<td>0.000</td>
</tr>
<tr>
<td>[47.190, 49.185]</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motivation (centered)</td>
<td>0.306</td>
<td>0.101</td>
<td>3.017</td>
<td>0.003</td>
</tr>
<tr>
<td>[0.015, 0.507]</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (centered)</td>
<td>-0.236</td>
<td>0.135</td>
<td>-1.758</td>
<td>0.082</td>
</tr>
<tr>
<td>[-0.503, 0.030]</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motivation X Age</td>
<td>0.011</td>
<td>0.050</td>
<td>0.227</td>
<td>0.821</td>
</tr>
<tr>
<td>[-0.087, 0.110]</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$R^2 = 0.15$

Level of confidence for all confidence intervals in output: 95.00,

The following variables were mean centered prior to analysis: Psychological Contract breach, I-deals
All standard errors for continuous outcome models are based on the HC3 estimator
A PROCESS Procedure for SPSS release 2.13 (Hayes, 2013) was used to test if motivation moderated the relationship between psychological contract (predictor) and well-being (outcome) as well as the simple slopes regression equation that show the moderation effect. Table 4 shows the b-value for each predictor and the associated standard errors, adjusted for heteroscedasticity as well as the confidence intervals for b. With this study sample, output showed that motivation does not moderate the relationship between seafarers’ age and their commitment to career at sea, because the interaction effect was non-significant, $b= 0.01$, 95% CI [-0.09, 0.11], $t = 0.23$, $p > 0.05$. No further plotting simple slopes regression equations was done because moderation is shown by a significant interaction effect and in this case the outcome shows a non-significant interaction effect.

**Discussion**

**Relationships between variables**
Results from the Spearman’s rank-order correlation tests showed that students’ motivation, as measured by the career identity and career planning scales is practically (medium effect) and significantly related to career commitment. The relationship between these measures could indicate that students who have a more positive attitude towards their future as seafarers and identify with the profession are more likely to be more committed than those who don’t. In other words, students who scored high in planning for achieving realistic career goals, who reflect an idea of where their seafaring career is going or take extra courses related to the programme, stay abreast with developments in area of specialisation or volunteer in career related assignments are more likely to
be committed to their career when they start working as seafarers. Interesting to note is that, all the personal characteristics included in this study except race were did not show any significant relationship to either motivation or commitment in the Spearman’s correlational analysis. Therefore, influential as it was, race was controlled for in further analyses. Our study outcome confirms the findings from a related South African study by Bagraim (2003) who found demographics characteristics not related to professional commitment amongst actuaries. However, this contradicts other previous studies to found the opposite (e.g Colarelli & Bishop, 1990; Kaldenberg, Becker, & Zvonkovic, 1995).

**Predicting commitment from career motivation**

Hierarchical multiple regression analysis was conducted to assess whether career motivation predicted career commitment whilst controlling for the selected significant explanatory variable. Motivation explained 12.6% of the variance in commitment after the influence of confounding variable was removed. Although the effect was very small and not practically significant, motivation somehow predicted commitment, ($\beta = 0.298$, $p < 0.01$). The outcome with this study the respondents in this study may not be surprising. Seafaring careers (as it encompasses tracks such as engineering cadets, chief mate & master, engineer officer in charge of watch as well as second and chief engineer officer) can fall under classic professions by virtue of their long history of independent practice and collegiate control (Gunz & Gunz, 1994). This means it can afford members considerable influence over their employment relationship and engender a powerful sense of loyalty to the statutory professional body (Gunz & Gunz, 1994). These factors could influenced the outcome of our study due to the fact that students’ motivation attributes were assessed using a cross sectional survey. Prior studies (Gunz & Gunz, 1994) show that the motivation factors significantly change over the course of an academic year or level. Second, the level of guidance and structure typical for each level of study limits the depth and variability of students’ cognitive and metacognitive processes which may be revealed in their responses. Furthermore, the low explanation of variance in commitment may have been because we included two attributes of motivation (career planning, and career identity). These do not adequately encompass other factors that contribute to student motivation, such as career resilience (London, 1993), or extrinsic factors such as those related to future employment or compensation (Cahoon & Haugstetter, 2008).

**The effect of demographics on commitment when there is high and low motivation**

The regression for age as a predictor of commitment (1) when motivation is low; (2) at the mean value of motivation (because motivation was centered, its mean value is zero); and (3) when the value of motivation is high, showed a non-significant interaction effect on the relationship between motivation and commitment. This is unique as the revelation supports some finding and recommendations from, for instance Fei and Lu (2015) who propose that in traditional maritime nations, seafaring was and still is a “calling” due to the long history and tradition of sailing, the pride and promise associated with it,
and the lifestyle it represents. The reasoning is that ‘calling’ and ‘a sense of purpose’, rooted on the notion of career identity and planning can come to the fore in trying to explain why motivation at all levels failed to moderate the age – commitment relationship. However we argue that in South Africa, most determinants of career choice behaviour and motivation and commitment are mostly rooted on socio economic needs which can be in form of tangible monetary and non-monetary rewards. These rewards can be employed from the undergraduate in the form of bursaries, scholarships and readily available training berths for students among others. Since we used mostly self-reports on the intrinsic dimensions of motivation in our study, they may have not been able to capture the construct of motivation in its totality. In countries like South Africa which are not traditional maritime nations, a sense of calling may be weaker and the choice of seafaring or working in general is more associated with socioeconomic factors. Therefore, organisations in the maritime sector as well as universities should join forces in providing and tracking student progress and giving as much support as possible to lessen dropout as well risking losing the students to landside jobs not related to the field soon after graduation or after a short service into the career. To maintain a balance between male and female cadets more attention can be given to female cadets (74% indicated that they are likely to leave their careers at sea) as they are likely to leave work at sea for in land jobs as early as around 30 years of age.

Conclusions and future research direction

The findings in this study contribute to a growing body of research that illustrates the appropriateness of a multidimensional approach to the study of commitment. Of course the study is limited in that it used a cross-sectional design and relied on self-reports from a small, highly select group of professionals. This study seeks to help both practice and academia understand factors contributing to prospective seafarers’ motivation and commitment specifically in the maritime sector, and to examine correlations between these factors and students’ cognitive processes. We hope that this will address the challenges facing the seafaring industry as well as preparing students and organisations for a future of rapid changes in the industry. We plan to collect additional data from the other institutions providing the same courses, to further explore the connections between student seafarer’s commitment and motivation.

The ultimate goal is to profile and gather updated information about student’s seafarers throughout the undergraduate experience as well as to identify factors that make seafaring unattractive and also applying qualitative techniques for an in-depth study of the factors that impact on the decision of people prior to becoming seafarers will be helpful in South African situations. The findings with this study sample, if considered might help direct more in-depth qualitative research into student motivation, which will be followed by studies of how students with different motivational attributes commit themselves in contexts they have not seen before. The findings with current should be adopted
with caution should need be, because they are based on a small sample drawn from one institution and across different level of study. Therefore, further studies are required which may also include employers and people already in employ, before any recommendations can be made regarding the importance of personal characteristics in understanding professional commitment.

Acknowledgement
The Authors wish to thank the National Research Foundation (NRF) South Africa for funding this project.

References


Towards a career capital approach in explaining career development patterns amongst female seafarers in Durban.

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ABSTRACT

The aim of this paper is to assess the value of career capital theory in explaining career development patterns for women in the maritime industry. The paper specifically looks at female seafarers in Durban and how the constituent factors of career capital help us better understand both the position of female seafarers in the labour market as well as the initial choices made by women to pursue careers at sea or at shore. Whilst psychological theories of careers focus on individual traits, personalities and functionalist understandings of human behaviours, a career capital approach is more sociological in approach. As a sociological approach to understanding careers, career capital draws on Bourdieu’s idea of different types of capital. For Bourdieu (1977, 2001) career capital is made up of economic capital (income and generational wealth), social capital (relationships of mutual benefit and social networks. Social capital also enhances the effects of other forms of capital.), cultural capital (education, generational patterns of occupational choices and educational choices) and symbolic capital (prestige and status attached to the chosen career and occupation). Through preliminary interpretivist paradigm and engaging in qualitative in-depth interviews we ascertain the extent to which a career capital view explains the current position of female seafarers in the KwaZulu-Natal labour market.

Introduction

The concept of career capital was proposed by DeFillippi and Arthur (1996) and can for all intents and proposes be described as the value created through ongoing improvement in career position and recognition in the competitive external labour market (inter organization recruitment) as well as the internal labour market (intra –organisation staffing) (Gundeson , 2001). This concept points to be the heightened importance and the challenge for the women seafarers to focus on building relevant and recognizable career capital in the maritime sector in Durban (Baruch, 2006). In addition, women seafarers accumulate career capital in different ways and these needs to be understood in greater detail. For this study, Career capital is embedded in the woman seafarers set of skills, abilities and competencies hence the need to extract and emphasize the specific components to gain deeper insights into what is valuable for progression for today’s women career development in the maritime sector. As Drucker (1994) explains the nature of global competition drives the need for individuals to capitalize on knowledge and drive the transference of this knowledge within and across the organisations. This acquisition and transference of knowledge, contributes to career capital, career
mobility and the formation of tradable assets in the external labour market (Baruch, 2006). In effect, the dynamic interplay between global economy, the woman seafarer and the organization, shapes the accumulation of career capital. This has led to the need for a clear definition of what contextually relevant, recognizable and relevant career capital comprises.

According to Super (1953) states that people intentionally choose vocations and designs career path that would best fulfill their personal interest, abilities and self-concepts. Miller and Former (1951) point out that the concept of the career pattern emerged from the analysis of sequences of careers that developed in industrial sociology. This concept was used in summarizing the number, duration, and sequences of positions in work history (Savickas, 2001; Super, 1957).

In connection with its origins in sociology, career patterns tend to be utilized to disclose occupational mobility. Within this tradition, there are approximately three schemes used to describe occupational careers: orderliness (orderly vs disorderly), denoting whether the adjacent occupational changes follow certain orders (Wilensky); direction (vertical vs. horizontal), denoting whether people stay at the same or upgrade their job levels in their occupational career history (Miller & Form, 1951); and stability (stable vs. changing), describing whether people change their occupational field (Jepsen & Choudhuri, 2001).

The developmental view of career came into being as a sharp contrast to the trait–factor view of career which held that vocational choice was made only once in a lifetime and that individuals committed themselves to just one occupation or employer over their working lives. He stressed that vocational choice is a long process and therefore advocated a shift of focus, dismissing the notion that vocational choice occurred at a point in time in favour of the study, i.e., the sequence of jobs or positions engaged in over a life span. According to Super (1953, 1957, 1980), career development is determined by individuals personal agency, including one’s preferences, values, interests and aspiration, their environmental constraints and opportunities and their life context. Vondracek, Lerner and Schulenberg (1983, 1986) argue that career development could never be fully understood without referring to the social and cultural contexts in which people live and communicate with each other. Since half a century ago, the influences of family of origin on career has been documented in individual’s different life stages (Blau & Duncan’s 1967; Winston & Keller, 2004).

Family influences can be divided into two main aspects: family structure variables (e.g., parents’ occupations) and family process variables (e.g., relations to parents) (Schulenberg, Vondracek, Crouter (1984). It has been found that the occupations of the parents play an important role in the occupational choices that children make (Bell, Allen, Hauser & O’Connor, 1996; Mortimer, 1974, 1976; Owens, 1992) as children tend to choose similar occupations as their parents. By serving as an important
model of achievement, the presence of a working mother has been observed to an important factor for a daughter’s career development (Betz & Fitzgerald, 1987; Crawford & Unger, 2000). Both daughters and sons of working mothers tend to hold less gender stereotypic occupational aspiration (Barber & Eccles, 1992). Another type of context is the individual’s own life background. Savickas’ (2002a) career construction theory posits that people differ in their preferences for different roles. People make career choices in accordance with their life stages and the fabric of different roles.

The Aim of the paper

The aim of this paper is to access the value of career capital theory in explaining career development patterns for women in the maritime industry. The paper specifically looks at female seafarers in Durban and how the constituent factors of career capital help us better understand both the position of female seafarers in the labour market as well as the initial choices made by woman to pursue careers at sea or at shore. Whilst psychological theories of careers focus on individual traits, personalities and functionalist understanding of human behaviors, a career capital approach is more sociological in approach. As a sociological approach to understanding careers, career capital draws on Bourdieu’s idea of different types of capital. For Bourdieu (1977, 2001) career capital is made up on economic capital (income and generational wealth) social capital (relationships of mutual benefit and social networks. Social capital enhances the effects of other forms of capital), cultural capital (education, generational patterns of occupational choices and educational choices) and symbolic capital (prestige and status attached to the chosen career and occupation).

Through preliminary interpretivist paradigm and engaging in qualitative in depth interviews we ascertain the extent to which a career capital view explains the current position of female seafarers in the KwaZulu – Natal labour market.

Career Capital Theory

The aim of this paper is to access the value of career capital theory in explaining career development patterns for women in the maritime industry. The paper specifically looks at female seafarers in Durban and how the constituent factors of career capital help us better understand both the position of female seafarers in the labour market as well as the initial choices made by woman to pursue careers at sea or at shore. The career capital approach incorporates four dimensions which are: economic capital, social capital, cultural (information capital) proposed by Bourdieu (1977, 2001) and lastly symbolic capital which is further developed in the writings of Gardner (2005).
Table 1: Lelliatchitch, Mayrhofer and Meyer (2003) define capitals in a different way in the work of Bourdieu (1977, 2001) in explaining four dimensions in which women seafarers in Durban are motivated to choose careers in the maritime industry which are illustrated in the following table below:

<table>
<thead>
<tr>
<th>Economic capital</th>
<th>Social Capital</th>
<th>Cultural Capital</th>
<th>Symbolic Capital</th>
</tr>
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<tbody>
<tr>
<td>Relates to the financial components (income) of a career that is to say the price of the component of career capital. Economic capital can be converted into cultural, social and symbolic.</td>
<td>Relates to the relationships, social connections and acts of exchange which can be used to strengthen economic and cultural capital.</td>
<td>Relates to the attainment of education as result of accumulated efforts in the learning (education, social and technical skills, diplomas etc) and cultural context.</td>
<td>Relates to the prestige or the status acquired in the organisation.</td>
</tr>
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</table>

For Bourdieu (1977, 2001) career capital is made up on economic capital (income and generational wealth) social capital (relationships of mutual benefit and social networks. Social capital enhances the effects of other forms of capital), cultural capital (education, generational patterns of occupational choices and educational choices) and symbolic capital (prestige and status attached to the chosen career and occupation. Career Capital theory has been extended by DeFillipi and Arthur (1996). They contend that the different forms of capital can also be understood as different forms of knowing. For example, the accumulated experience that the female seafarer gained over the span of their career includes individual, organizational and industry learning, known as three levels: namely knowing how, knowing why and knowing whom proposed by DeFillipi and Arthur (1996) as a framework for understanding the approach and elements of career capital. This framework builds on literature around career capital and starts with the social field which is described as the “social contexts within which practice takes place”

The habitus is essentially the individual’s frame of reference and mind-set (Lelliatchitch et al, 2003). The habitus may constrain the individuals internalizes in their job role and career. Together, the habitus and social fields work together as the individual aims to develop capital that is most relevant and beneficial to the particular field in which they operate (Lelliatchitch et al, 2003). The combination of the fields and the individuals’ habitus are strongly connected to the interplay

To further understand the three ways of knowing, DeFillippi and Arthur (1996) describe the career competencies as follows:

- **Knowing why** – Relates to career motivation and personal meaning. Baruch (2006) and Inkson and Arthur (2001) would describe this as intrinsic motivation and seeking personal learning and growth experiences. Dickman and Harris (2005) concur with the work of DeFillippi and Arthur (1996) and explain the knowing why competency as the identities, value
and interests which are developed by woman seafarers through coaching and conversations. They would argue that knowing why gains importance as the lifespan of the career extends.

- **Knowing – how (culture or information capital):** This career competency incorporates job specific, tacit and explicit knowledge and skills. This career competency is portable, transferable and flexible as well as applicable in the global context.

- **Knowing whom (social capital):** This component relates to career particular networks of people, both in the community and the organisation. Alternatively described by Dickman and Harris (2005) as the social and professional relations both within the organisations in an industry.

**Summary of the categorization of career patterns for women**

- **Hakim’s categorization:** Hakim (2000) divided women into three groups according to their choice between paid work and family work. Based on data from Britain and USA, Hakim (2000) found that home centered women and (paid) work centered women each constituted one fifth of the population. The remaining sixty percent of the women were adaptive who engaged in gainful employment and family life in various ways.

- **Super’s categorization:** Super (1957) proposed seven life career patterns for women that are also based on the extent of participation in homemaking and paid work. Two of the patterns include homemaking as the predominant form of work: the stable homemaking pattern and the conventional pattern (describing women who only work until they are married). The stable working pattern is one that is comprised of women who have work continuously. Four of the patterns involve participation in double careers consisting of work and homemaking, including double, track, interrupted, unstable and multiple trail careers. Vetter (1973) provided estimates of Super’s patterns in a cross-sectional sample of American women Table 2.

- **Gerson’s categorization:** Gerson’s (1985) study of life career patterns among women from different socioeconomic groups and Lee’s (1994) study of professional women were both concerned with the sustaining of orientation towards family and work. Gerson’s (1985) categorization is based on the comparison of early aspiration and later choice. Lee’s (1994) categorization of professional women was built on the basis of three dimensions: timing of childbirth, involvement in childcare and family, and involvement in paid work. The six patterns she delineated encompass the sustaining or changing of early career orientation, as well as different ways of combining career and family involvement.

- **Zytowski’s categorization:** Zytowski (1969) categorized occupational participation patterns for women according to age of entry, length of participation, and degree of participation in nontraditional versus traditional occupations. Three patterns emerged (Table 2). Wolfson (1976) and Betz(1984) have subsequently elaborated Zytowski’s classification.
Table 2: Summary of the categorization of career patterns for women

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<tr>
<td><strong>Home centered (10 -30%)</strong></td>
<td>Stable homemaking, (no significant work experience work experience,22% Conventional (worked until marriage), 27%</td>
<td>Mild pattern (short span, lower degree of participation)</td>
<td>Never worked</td>
<td>Never worked; 1.4%</td>
<td>Early family orientation sustained</td>
<td></td>
</tr>
<tr>
<td><strong>Work centered (10 -30%)</strong></td>
<td>Stable working pattern (worked continuously, career orientated), 3%</td>
<td>Unusual pattern (early entry, long duration, high degree of participation)</td>
<td>Unusual pattern</td>
<td>High commitment in pioneer occupations, 23.5%</td>
<td>Early career orientation sustained</td>
<td>Early career orientation sustained</td>
</tr>
<tr>
<td><strong>Adaptive women (40 -80%)</strong></td>
<td>Double – track (involved in double careers of working and homworking), 1.4% Interrupted career (breaks in the middle of work career to fulfill homemaking irregularly), 18% Multiple - trial career job moves)</td>
<td>Moderate pattern (early entry, long duration, low degree of participation)</td>
<td>Moderate pattern</td>
<td>Moderate commitment in traditional occupations, 21.7%</td>
<td>Early career orientation modified</td>
<td>Early career orientation modified</td>
</tr>
</tbody>
</table>

Note: Patterns sharing similar features are in the same row

**Preliminary literature study and reasons for choosing the topic**

Accordingly, Seafarers Rights International Centre for advancing the legal protection of seafarers approximates that 1.5 million seafarers daily serve on a worldwide fleet of over 100,000 ships that transport over 90% of world trade. While International Labour Organisation (ILO) considers that more than 1.2 million seafarers operate ships (http://www.itfseafarer.org/ITF-women-seaferes.cfm). In these figures, seafarer women represent a very small percentage current statistics of International Transport Workers Federation show that women make up only estimated 2% of the world’s maritime workforce.

South Africa has been a democratic country for more than two decades but still there has been prevalent gender, race and ethnicity stratification especially in the shipping industry which is well known to be a physically demanding, white and male dominated sector that runs deep and long.
In order to exterminate the gender inequalities in the maritime sector, intervention have been put in place to allow equal opportunity through fair, equal South Africa labour regulation. The first gender equity policy is Employment Equity Act of 1998; charted by the Affirmative Action, and lastly the Skills Development Act of 1998. However despite legislating for greater gender inequality, gendered imbalances continue to exist. Career capital theory may help explain why this is the case despite progressive legislation aimed at achieving greater gender equity in the South African labour market. The seafaring profession tends to be horizontally segregated even today, because approximately 98% of the seafaring labour force is male (Drewey, ILO & ITF, 2009). According to ILO, in the cruise line sector, women represent 17 -18% of the workforce. 94% (Ninety four percent of women are employed on passenger ships. (68% on ferries and 26% on cruise ships) and 6% are employed on cargo vessels [i.e. container ships, oil tankers etc. As for jobs, there are women ship masters and chief engineers, as well as other officers, However, generally, women are working as hotel staff on passenger ships (World of Work Magazine, 2003). Of this latter group, 51.2% of women at sea come from OECD countries,23.6% from Eastern Europe,98% from Latin America and Africa,13% from the Far East ,and 1.7% from South Asia and the Middle East.

According to the BIMCO (Baltic and International Maritime Council) and ISF (International Shipping Federation) 2010 study of the worldwide supply and demand for seafarers, the current worldwide demand for seafarers is 637 000 officers and 747,000 ratings that represent an overall shortage of officers of about 2% (BIMCO and ITF , 2005).

**Research Methodology**

The researcher has identified that a qualitative approach will be used and the research design will be a case study. Data collection will consist of interviews and analysis of secondary data. Interviews will be designed to tap into the various components of career capital. Women seafarers, their training managers and men and women who are in management will be interviewed. Interviews with the seafarers will give insights into the ways in which career capital influenced them at an individual level, whilst interviews with managers will give insights into how these womens’ careers are influenced more structurally through career capital components.. Secondary data that will be analysed includes relevant labour legislations, policy documents and HR and equity reports from the relevant companies. Data will be thematically analysed. Numerous procedures will be applied to make sure reliable, trustworthiness and steadiness of the data. Authorization to the study locations has at present being secured.
Bibliography


WELLNESS AT SEA

Johan Smith
Sailors Society

Introduction
Seamanship is a trade rooted in ancient times and yet today it forms an integral and essential part of how we as humans survive and flourish. At the very heart of this industry are human beings, sailing ships across our oceans in often arduous and sometimes agonizing circumstances. The global shipping industry of the 21st century is confronting seafarers with unique challenges such as multi-national crews, the Internet, quick turnaround times and the world as a small global village. On the other hand, the challenges seafarers are faced with are as old as the industry itself.

Carl Rogers, in his theory of person-centeredness, explains that a person responds to his or her world as an organized whole (Rogers, 1987:486). This suggests that a person acts as a holistic, multi-dimensional human being to every experience. Rogers also suggests that the response to the phenomenal field is unique to every person because of their ideas, feelings, behaviour, needs, values and physical attributes (Swanepoel & De Beer, 2009:27).

How a seafarer experiences life at sea, how he or she reacts to an incident, or how he or she steers a ship are thus related to him or her as an organized whole, a multi-dimensional human being.

Training of seafarers has, in the opinion of the author, traditionally been one-dimensional, focusing merely on the ‘occupational’ aspect of who seafarers are. Competent seafarers have always been defined as people who have good navigational or engineering skills. However, evidence presented highlights that these skills are often lacking in dealing with the realities and complexities of life at sea.

The author argues that a new holistic, multi-dimensional conceptual framework is needed to assist seafarers in coping within the ‘total institution’ (Simonds, 2013:63) of a ship. The author, while acknowledging the twenty-first century challenges seafarers face, argues that this gap in preparation and training is as old as the industry itself.

The author proposes a conceptual framework in which the occupational, emotional, physical, social, intellectual and spiritual aspects are acknowledged and championed as an integral part of being a seafarer and are subsequently incorporated in training.

This paper attempts to better understand life at sea by acknowledging seafarers as holistic, multi-dimensional and unique human beings. It investigates the correlation between a better life at sea and the training of seafarers as holistic human beings. It also offers a hypothesis that holistic training will not only lead to better lives for seafarers, but will increase profit for companies.
The sea as a social space

There seems to be incongruent and irreconcilable differences in the way life at sea versus life on land is understood. Even sociology in its efforts to understand social constructs rarely admits to the sea being a social space. Cocco (2013:5) points out the fascination sociology has with land as though social relations would only occur on land and not on the waters. He explains that social scientists usually consider whatever happens “at sea” and “on board” as something spaced out and unrelated to what happens on land, or, in the best of cases, as a preparatory phase for the real life that takes place on land.

To a certain extent this is also true about how the maritime industry sees seafarers. Training of seafarers’ bears testimony to this as it is only concerned with the technical side of seafaring as if life at sea is separated and removed from the emotions, ideas, feelings, behaviour, needs and values land-based people experience. The inability to recognise the sea as a social space is the root of the ever expanding divide between seafarers and the recognition that they are human beings.

Coco (2013:9) makes a case that the sea is not only a medium but a social space, which could not be merely ‘used by society’ but rather represent ‘a space of society’.

This social space is complex in nature, not only because of relationships with fellow crewmembers from different backgrounds, religions, ethnicity and social standing, but also because this social space is filled with relationships that span across the globe and connects them to families, friends and communities in an often constrained and misconfigured way.

As a first step in working towards a new conceptual framework for the training of seafarers, it must be acknowledged that this framework, as well as the shipping industry as a whole, is set within a social space that is unique, but in the same breath shares the emotions, ideas, feelings, behaviour, needs and values of land based people.

This may seem too obvious a statement, yet there is painfully little evidence of addressing the human side of seafaring in the curriculums of maritime institutions and the operations of shipping companies across the globe. The neglect of the human side comes at a hefty price. Not only do companies run massive financial losses, but through ignorance of the human factor the most valuable asset in the shipping world is a neglected – human beings themselves.

The uniqueness of the social space - the ship as a ‘total institution’

The uniqueness of the working environment of seafarers is commonly known. Jensen, Latza & Baur (2009:96) confirm this based on research done on German seafarers by stating that seafaring is associated with special mental, psychosocial and physical stressors unlike any land-based job and that
it is characterized by long-time separation from family and home for months, growing economic pressure as well as considerable and partly extreme psychosocial problems.

Simonds (2013:63) points out the correlation between life on board a ship and the theory of ‘total institutions’ developed by Erving Goffman.

Goffman (1961:11) offers this definition of a total institution: ‘A total institution may be defined as a place of residence and work where a large number of like-situated individuals, cut off from the wider society for an appreciable period of time, together lead an enclosed, formally administered round of life.’ This is in many cases true about seafarers and the environment they operate in. Cut off from the wider society and confined to the steel structure of their ship, for many life at sea happens within a total institution. In his earlier work, Goffman (1959:54) comments that a total institution encompasses a person’s whole being. It undercuts the individuality and subjects the individual to a regimented pattern of life that is inescapable. It would, however, be inaccurate not to acknowledge positive experiences of seafarers. Life at sea, for many seafarers, is a positive and valuable experience.

In formulating a new conceptual framework for training, a thorough understanding of this unique environment is needed. Research already exists through numerous studies done in maritime sociology, the maritime welfare sector and by shipping companies, all emphasizing the uniqueness of the social space. Yet, it seems that very little has been done in practice to implement change processes and coping mechanisms to address the issues unique to this environment.

A new conceptual framework will thus take two things into consideration. Firstly, that this social space is highly unique and, secondly, that this social space does not stand in isolation from land-based social spaces. Essentially, a human being is not able to survive at sea. We are inseparably attached to the shore for our every need. The framework is thus dualistic in nature, both taking into consideration that seafarers suffer from isolation, yet they are not isolated in their experiences, feelings, emotions and ideas. While seafarers’ unique environment separates them from others, the common humanity we as people share unites them. Thus not only will the uniqueness of their environment influence a new conceptual framework, but also the everyday humanness of them having ideas, feelings, emotions, needs and values.

**Person-centeredness**

Carl Rogers in his theory of person-centeredness explains that a person responds to his or her world as an organized whole (Rogers, 1987:486). This suggests that a person acts as a holistic, multidimensional human being to every experience. Rogers also suggest that the response to the phenomenal field is unique to every person because of their ideas, feelings, behaviour, needs, values and physical attributes (Swanepoel & De Beer, 2009:27)
How a seafarer experiences life at sea, how he or she reacts to an incident, or how he or she steers a ship, are thus related to him or her as an organized whole, multi-dimensional human being. Interrelatedness is something that cannot be escaped but is part of us as human beings and therefore also plays a telling role in the maritime industry.

Seafarers react to the social space of the sea and to the total institution of the ship as holistic human beings, suggesting that to be the best seafarer you can possibly be, you need to be holistically well. Holistic wellness is a multidimensional state of being, describing the existence of positive health in an individual as exemplified by quality of life and a sense of well being (Corbin & Pangrazi, 2001:3). The multidimensional nature of holistic wellness suggests that there are different aspects that all need to be in balance to, ultimately, ensure positive health, quality of life and wellness.

Training, taking the holistic person into consideration, will thus include the physical, social, intellectual, emotional (mental) and spiritual and not just the occupational as is presently the case.

The different aspects of Wellness

Social Wellness

Socially, seafaring presents many challenges. Crewmembers not only work with each other but, when they complete their work, they have to live in the same social environment as their work-mates (Shea, 2005:29).

There seem to be many rules, regulations and conventions in place in an effort to govern the social space. Communication is, for example, governed by conventions such as the STCW, the MLC and ISM code, but if you, however, look at incident reports, it is evident that it is the interpersonal skills and interpersonal communication that fail seafarers. Inadequate communication is listed as one of the three main factors in shipping accidents (Rothblum, 2000:8) The solution is thus not more regulation but, instead, a stronger focus on relational skills. Chirea-Ungureanu & Rosenhave (2012:528) remark that good communication isn't created by efficiency or influence, but instead it is created by connection, interaction, balance and understanding. A renewed effort to learn to communicate through connecting with fellow crewmembers, and having a greater understanding of one another, would significantly improve life on board.

You can’t talk about communication and not recognize the difficulties seafarers face in communicating properly with family back home and in maintaining these relationships. Jensen et al (2009:96) measured seafaring stressors aboard German Flagged vessels. Seamen rated the individual stress level of 23 different stressors aboard, with separation from their family ranked as the highest of all. This statistic demands a reconsideration of how training can assist seafarers to better function within their family structures while separated from loved ones back home.
Further to this there is the issue of culture, with the maritime industry probably being one of the most diverse working environments in the world. Seafarers are confronted with cultural diversity through different languages, customs, religions and rituals on a daily basis. Understanding a fellow crewmember involves much more than the ability to understand language but, instead, asks for cultural competence to be able to function optimally in the work and social space on board. Chirea-Ungureanu & Rosenhave (2012:527) state that even when evidence is found where cultural competence is incorporated into curriculums of training schools, ‘the institutional culture of maritime education systematically tends to foster static and essentialist conceptions of “culture” as applied to seafarers’. They go further by saying that education should aim to gradually build the needed intercultural competence, with an aim to train seafarers objectivity in dealing with other cultures and their representatives.

Further to this, feedback from companies suggests that crew changes because of conflict between seafarers are common and that this comes at a huge financial cost. In a study done on Thai seafarers, around 9% of seafarers that changed their ship, changed it because of conflict with workmates or the captain (Rojnkureesatien & Jampaklay, 2006:14). In extreme cases such as the recent case of the MV Qing May, where two Chinese men were stabbed to death and another injured in violence among crewmembers of the cargo ship, the price of this conflict comes at an extreme price (philstar.com, 2015).

How is it then that with so much evidence of the social challenges seafarers face, and the influence these have on the operations of ships, that the training of seafarers does not portray this? At heart, the social aspect must deal with how we maintain relationships with those back home and with those on board. The social aspect is as much part of the shipping industry as is the navigation of a ship or the operating of an engine.

**Emotional Wellness**

Shea (2005:129) quotes studies where the strong correlation between prolonged periods away from supportive social structures and poor mental health is proven. It also shows a strong correlation with an increase in the frequency of occurrence of accidents. Shea (2005:53) in his discussion of seafarers’ mental health, uses seven independent studies suggesting that seafarers seemed to be more affected by mental illnesses than any other ailment, with officers being more prone than ratings. These studies also suggest a strong correlation between psychiatric illnesses and a decreased ability of the seafarer to cope with job expectations and a negative impact on the safety culture of a ship.

In a recent ITF research report, studies revealed that cross regional, 66% of seafarers know someone working with them who is depressed, while in the Philippines a staggering 75% of seafarers responded saying that they know a workmate who is depressed (ITF, 2015:15).
No wonder then that in research done by Roberts, Jaremin, & Lloyd (2013:1235) under UK seafarers it shows that seafarers have the second highest suicide rate of any occupation, second only to coalminers.

Again, if research repeatedly suggests that the emotional health is of such importance, it must be questioned why training to deal with these matters does not fall within the realm of compulsory training.

**Physical Wellness**

Traditional training is obsessed with safety procedures and standards to keep accidents from happening. The human side of accidents comes at a hefty cost to both seafarers and companies taking into consideration the costs of search and rescue efforts, injuries, loss of income, diversions, hospital care and rehabilitation. A death at sea could implicate any one of the costs listed above adding up colossal losses in revenue. This being said, a case could surely be made to defend the arduous and rigorous obsession with safety within the industry.

It is a common misconception that ship casualties are largely because of accidents. Yet, more seafarers die because of illness. In a study on UK seafarers by the Hong Kong Department of Shipping and Transport Logistics and the Hong Kong Polytechnic University (Li & Shiping, 2002:3-4), mortalities were divided into four categories, namely ship casualties, personal accidents, homicides and suicides and diseases. The study reveals 5,389 mortality cases to UK seafarers in a 27-year period. The first category 'ship casualties' accounted for 572 cases (10.61%), while the second category 'personal accidents' accounted for 1,749 or 33% of all mortality cases. 348 Suicide cases were listed under category three while the fourth category (mortality from diseases) accounted for 2,640 or 49% of the total mortality.

Hansen & Pedersen (1996:1238) confirm this in a study done on the mortality of Danish Seafarers listing 264 deaths in the sample group of 24,132 seafarers. Of these 264 deaths 188 were health related.

A natural death or illness on board often incurs the same financial implications as a safety incident, yet there is little evidence of programs rigorously building awareness around physical health issues. In further research of the causes of the main diseases contributing to seafarer mortality rates, it is evident that better awareness and lifestyle choices may influence these numbers significantly.

There seems to be an assumption that knowledge regarding physical health is general knowledge. HIV serves as a perfect example. The recent ITF HIV and Wellbeing report (2015:15) found that many myths about the transmission of HIV/AIDS still remain. In one labour supplying country only 17% of
respondents believed condoms are effective in preventing it, and 46% believed it can be spread through food and drink. It is reckoned that in high HIV/AIDS prevalence countries the labour force will be between 10% and 30% smaller by 2020 (ITF, 2014:61).

The HIV and Wellbeing report further revealed that half of respondents were worried about their weight, while almost 60% experience back/joint pain at work.

The challenges of mobility and the uniqueness of seafarers’ working environment ask for a training approach that would take into consideration the physical side of seafaring by building awareness campaigns and encouraging positive health choices. It is evident from mortality rates and the costs associated with mortality on board that this would not only benefit seafarers, but also companies.

**Intellectual Wellness**

Intellectual wellness is how one engages in creative and stimulating activities and the use of resources to expand knowledge and focus on the acquisition, development, application, and articulation of critical thinking (Foster & Keller, 2007:13).

Intellectual wellness in seafaring implies more than current knowledge application, but extends to knowledge that falls outside of the traditional realm of knowledge thought to be relevant to seafaring. This among other includes knowledge about seafarers’ rights, piracy and finances.

A survey done by Seafarers Rights International revealed that 8.27% of seafarers in the survey had faced criminal charges; 3.94% had been witnesses in criminal prosecutions; 32.77% knew of colleagues who had faced criminal charges. 44.28% of vessels were searched; 63.75% of cabins were searched without warrants and 43.55% of seafarers were bodily searched (SRI, 2013:12-28). Dimitrova (2010:77) states that one of the reasons seafarers are unable to enforce their rights, is their lack of knowledge of legal systems. Enhanced knowledge would ensure better mediation of day-to-day rights incidents by negotiating incidents with confidence and adequate comprehension. Not only would companies benefit, but, the severe stress factor associated with rights abuses will be reduced.

In the case of piracy, there seem to be many contradicting views on the occurrence and regularity of incidents. Official data, however, suggests that piracy is at a five year low (Statista, 2015). Yet, in discussions with seafarers it seems as though the fear of being attacked is just as real and that this psychological factor influences their day to day being. Initiatives such as the Maritime Piracy Humanitarian Response Programmes’ (MPHRP) pre-departure piracy training, evidently shows how accurate knowledge about piracy can be a positive step to curb these fears.

A UK report, researching how to better support seafarers and their families, endeavoured to quantify the challenges seafarers face. The research revealed that financial problems, including access to
benefits, advice on money matters and debt were cited as one of the main concerns of seafarers (Maritime Charities Funding Group, 2007:16). In an online discussion between seafarers about financial matters, lump sum income and big spending habits are pointed out as the main reasons why seafarers are notoriously bad at financial management (Mylifeatsea.blogspot.com:2015).

There is a wealth of research that justifies broadening the intellectual scope of training. Once again a broadening of the traditional realm of training will not only benefit individuals, but also companies.

**Spiritual Wellness**

Mynna (2007:259), in a study of religiosity of Filipino seafarers found that in general, migration impact the religiousness of seafarers. At the same time, their religiousness and faith practice mitigate difficult situations during their migration. It seems that spirituality operates as a contextual framework that orients an individual in interpretation, comprehension, and reaction to life experiences (Gall, Charbonneau, Clarke, Grant, Joseph, & Shouldice, 2005:88). According to Koenig, Levin and Chatters (in Gall et al. 2005:88) beliefs facilitate an active attitude toward coping and a strengthening of social support in response to stress. Spirituality also operates as a mediating factor in stress coping processes.

It is not proposed that seafarers’ now specialise in religious or spiritual studies. Instead, training should create an awareness of one’s own beliefs and how it influences responses and actions. A safe reflective space could, for example, be created where seafarers can focus on identification of potential spiritual coping mediators as part of a strategy to understand and prepare for life at sea.

**The cost of poor Wellness**

A culture change where person-centred holistic wellness takes priority in the training approach of seafarers is not merely an altruistic exercise in the sense that it champions personal wellbeing. Instead, it is argued that a holistic approach will save the industry millions of Dollars through increased awareness and better wellbeing.

Henny, Hartington, Scott, Tveiten and Canals (2013:132) give useful statistics on ship diversions. From the 420,000 seafarers that formed part of their sample 3,230 or 7% will be evacuated per year. Their calculation uses an average use of about 100 tons of fuel per day for an average vessel at a cost of about Euro 525 per ton. The average rerouting time is 1.5 days. Thus average rerouting costs per year per ship are as follows:

- Euro 78,750 for fuel +
- Euro 25,000 for the helicopter +
- Euro 60,000 indirect cost
- For a total cost of Euro 163,750 on average per ship per year.
Henny et al. (2013:132) states that in researching several shipping companies it is estimated that 1 in 5 ships will be forced to divert course for medical reasons per year. Thus, the average statistical annual cost per vessel to the ship owners would be $163,750/5 = Euro 32,750 per diversion per ship. The high probability of a ship being diverted emphases the immense importance of preventing diversions in order to lower costs and increase profit.

The maritime system is a people system, and human errors figure prominently in casualty situations. About 75-96% of marine casualties are caused, at least in part, by some form of human error (Rothblum, 2000:1). The ultimate question is thus how these costs could be reduced. The logical answer must surely be holistic health. If research continuously exposes the human element as the one common factor, then surely the time has come to address this more comprehensively in order to reduce costs.

This being said, in a real person-centred approach, financial gains can never be the ultimate prize but, instead, a better life for every human being at sea should be the incentive.

**Theory in practice**

In 2010 the Seafarers’ Wellness Programme was developed in South Africa in partnership with the ITF Seafarers Trust and the Cape Peninsula University of Technology (CPUT). The programme introduces a new holistic, multi-dimensional and person-centred approach to training in the maritime industry. The programme is now implemented in the curriculum of CPUT and all maritime students receive the training before going to sea.

With significant financial support from Seafarers UK, the programme was also implemented in the Seychelles and Mauritius. The programme reached out to both seafarers and fishermen. In the case of the Seychelles for instance, the involvement and endorsement of a wide range of partners, including the Seychelles Maritime School, Government, the Seychelles Port Authorities, the Seychelles Fishing Authorities and Seychelles Petroleum Company guaranteed success. With the continuous support and goodwill of Seafarers UK the programme is still progressing and working towards making the programme regulation in these countries.

In 2014, an industry-led advisory group met with Sailors’ Society to discuss crew attrition rates and the complex problem of maintaining wellness on board. The discussion highlighted the need for a dedicated programme to help prevent such situations arising. Sailors Society was enthused by the close parallels between the South African born Seafarers Wellness Programme and the Society’s vision for a seafarer wellness programme. As a result the Society adopted the programme in December 2014 under the title Wellness at Sea. The Society has since worked relentlessly to further develop the programme and is initiating a further roll-out in 2015 in China, India, the Philippines, Namibia and South Africa.
Sailors’ Society’s Wellness at Sea programme is now also being implemented in companies such as Wallem, Wah Kwong, Pacifc Basin and Univan. It is hoped that these companies pioneering this initiative will serve as a catalyst to a culture change within industry. Although these companies will reap the financial benefits of the programme they are genuinely interested in and concerned with the welfare of the seafarers.

Currently the programme curriculum deals with the following:

**Social Wellness**
- Communication
- Conflict
- Diversity
- Family Relationships

**Emotional Wellness**
- Mental Health

**Physical Wellness**
- General Seafarers’ Health
- HIV/AIDS

**Intellectual Wellness**
- Piracy
- Seafarers’ Rights
- Welfare Organisations
- What my family should know
- Money Matters

**Spiritual Wellness**
- My spirituality

**Conclusion:**
A seafarer acts as an organised whole, which includes their interrelated emotional, spiritual, physical, social, intellectual and occupational being within the context of a ship, which is set in the social space of the sea. This organised whole stands in an interactive relation to the remote, micro, macro and the direct and indirect task environment. Training will be focused on the mediation of the relationship between the whole person and his perceptual environment and on all factors influencing the seafarers’ ability to be holistically well.

On 2nd December 1946, Maersk founder A.P. Møller wrote a letter of advice to his son: “My old saying: ‘No loss should hit us which can be avoided with constant care’ this must be a watchword throughout the entire organization.” (Hornby, 1988:2).

Holistic wellness will curb many losses. The need for the human factor, more than ever before, not only to be acknowledged, but also to be actively pursued through strategies and planning, are evident in hundreds of contributions made by researchers over the last two decades. The human element can no longer be merely added to the training of seafarers as an afterthought but should instead be engraved in the DNA of seafarer training. The human element is, after all, engraved in the DNA of every seafarer.
Towards a new framework for training

The ship as total institution influence every aspect of life and must influence training.

A seafarer responds to the social space of the sea as a holistic person. Training is thus nseperable from the social space.

The whole person is in constant interaction with the remote, micro, macro and task environment.

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Seafarers need strong coping mechanisms to deal with the normal everyday work at sea. We need to ask the question of how well are future seafarers prepared for life at sea.

Factors, which are emphasised in past and current maritime newspapers; electronic journals; electronic articles; research maritime books; maritime websites; and Facebook-focus groups all indicate that there is a reason to be concerned about seafarers’ mental and physical health.

These factors include: Intolerance towards seafarers from different nationalities and racial affiliation; Fatigue, which can lead to burnout and can lead to work related accidents; Lack of social interaction amongst crew; Physical illnesses, which can stem from work and home related stressors; Lack of, or limited shore leave, which deprive seafarers from socializing and relaxing away from the work environment; Discrimination, on the grounds of culture; language; and gender; Poor communication with loved ones at home, Home sickness; Isolation, due to inability to integrate into the ships culture. Stress is the result of the affiliation of the seafarer’s work environment when the demands exceed the available coping mechanisms. People who have a strong support system, be it at home or work, are more likely to have a strong ability to cope with stressors encountered at sea. It is imperative that students are taught that stressors of human nature at sea exist; what the root cause are of these stressors; how to combat these stressors; and what and where help is available when they are emotionally overwhelmed at sea.

**Key words:** Seafarers; Coping mechanisms; Intolerance; Fatigue; Social Interaction; Physical Illness; Discrimination; Home sickness; Communication; Isolation,

**Introduction**

Life at sea is cited as one of the most stressful industry in the world (Carotenuto, Molino, Fasanaro, & Amenta, 2012; Dickinson, 2011). Stressful circumstances in the merchant navy have several root causes and it needs to be addressed at maritime schools. Horck (2006) highlights that maritime training institutes concentrate mainly on theoretical training of future seafarers, but often neglect to address the human factors which they will encounter at sea, such as, cultural, language, and gender diversity. Maritime students might carry theoretical knowledge when they start their career in the merchant navy, but often without the understanding of how important multicultural familiarity is for a fulfilling
seagoing career (Horck, 2006, 2008). Diverse cultures, cultural languages, and gender can all be ingredients for intolerance, conflict, bullying, and harassment and in rare cases, violence (Dickinson, 2011; Horck, 2006, 2008; Vikkelsø, n.d.). These factors can manifest itself in seafarers feeling isolated, depressed, physical and mental illness, and the feeling that they do not have support amongst their co-workers (Dickinson, 2011). When a seafarer or the ship is at risk the Pan-Pan-Pan signal indicates that there is an urgent need for help. (Blue Seas, 2015).

The focus of this paper will be on the “person”, in this case the seafarer is in distress. And, it will be broken down into two main categories, firstly answers the question of what can cause seafarers to become distressed whilst working offshore. The emphasis will be on culture, cultural language, and gender diversity. Secondly, this paper is going to look the symptoms of stress that manifest itself into distress. Distress symptoms include: isolation, depression, loneliness, mental and physical illnasses.

Methodology
The data was collect by using multiple resources such as; maritime newspapers and bulletins such as: Alertxiv, Anchorxiv, Seahealthxiv, and The Telegraphxiv. Using the Netography methodxiv to gain access to participants using social media, such as Facebook; and through interviewing seafarers working in the merchant navy.

Distress in the Merchant Navy
Distress is defined as an occurrence when a person is exposed to a stressor of physical, or environmental nature for a long period that makes it difficult to cope with, and the stress is the catalysts for seafarers to become dysfunctional (Carotenuto et al., 2012). Seafarers are vulnerable in that their working environment is physically and emotionally demanding (Carotenuto et al., 2012). Ship owners and management often misconstrue stress as the seafarer’s inability to cope with the work, and they fail to look at the problems causing the stressors holistically.

Coping Mechanisms of Seafarers
Coping or the lack of coping in the merchant navy has only been researched and taken seriously in recent years (Carotenuto et al., 2012; Diederichsen, n.d.; Herwadkar, 2014a; Horck, 2006, 2008; IMO, 2006; ITF, 1999, 2002, 2003; Kristiansen, n.d; Nautilus, 2009b, 2010, 2013c; Vikkelsø, n.d.). S. Folkman, Lazarus, Gruen, and DeLongis (1986) defines coping as “the individuals attempt to manage the psychological demands” presented to them in their environment; they further argue that the lack of coping occurs when the demands placed on them exceeds the person’s resources to cope. The ability to cope can only occur if one can “regulate stressful emotions and regulate the environment causing the stress” (Folkman & Lazarus, 1980, 1985). Seafaring environment is unique in that seafarers not only having to share confined living spaces with co-workers, from diverse cultures, cultural languages,
and genders, they also have to work and socialise within these confinements of a ship (Borovnik, 2005). Since the merchant navy employs a multicultural crew, working and socialising have its benefits and own set of challenges for the seafarers (Horck, 2006). It is these challenges which will be addressed in this paper.

**Multicultural Crew**

Employing multicultural crew allows companies to cut costs to increase their profit; to achieve higher profit maritime companies employs a crew from different continents and pay them lower wages (Horck, 2006, 2008). Larsen (n.d.) argues that “Many vessels now commonly have many nationalities aboard. This puts an extra strain on communication and understanding of differences”. The lack of understanding diversity on board of ships have far reaching consequences. Horck (2006), wrote intensively on multiculturalism in the merchant navy; he specifically highlighted the importance of including cultural awareness training in maritime colleges. The lack of cultural understanding often leads to conflict and ultimately distress amongst seafarers (Horck, 2006). He continues by saying that it is necessary to teach students to respect “the unique identities of each individual,” regardless of their culture, cultural language, and gender (Horck, 2006). Furthermore, students must be taught to respect individual activities, practices, and each individual’s worldview (Horck, 2006). Intolerance towards culture, language, and gender can lead to conflict within the merchant navy (Horck, 2006).

**Sites of Stressors the Merchant Marine Cultural Difference**

Intolerance occurs on different levels in the merchant navy:

“With a multinational ship crew comes differences in language, lifestyles, religion and culture. It is therefore not difficult to imagine that interpersonal conflicts due to above differences can create innumerable problems on board. Such conflicts are also one of the main reasons for stress among seafarers on ships.”. (Capt. Bhargava, 2013)

Not all ships experience problems, as most seafarers with a multicultural crew are very professional (Capt. Bhargava, 2013). However, professionalism does not mean that the crew has a cultural understanding, and the result of the lack of cultural understanding leads to the failure to communicate efficiently (Capt. Bhargava, 2013). When working with crew with different cultural backgrounds is that the dominant cultural group wants the ‘other’ groups to approach the work according to their specifications. (Askehave, 2014). The attitude of: “Other people have to learn from my skills and conform to my solutions” is found to be non-conducive to a healthy work environment (Askehave, 2014; Larsen, n.d.). Different cultures have different ways of seeing and doing a job, by not taking this into consideration can lead to conflict amongst crew members (Larsen, n.d.).
Language and Cultural Language Differences

When addressing language in the maritime context, it must be highlighted that, other than English, there are other languages spoken on board the ship (Chirea-Ungureanu & Visan, 2011; Horck, 2006; SeaHealth, 2013). Interestingly enough is that the STCW 2010 (amended) stipulates that for an officer to receive his Certificate of Competence, he/she must be able to read, write and speak English (Sekimizu, 2010). However, the ratings are not required to be able to read and write English well, but, must be able to understand the commands given to them (Sekimizu, 2010). This creates a possible communication gap between Officers and Ratings. Furthermore, when you add second language English speakers to cultural diversity then miscommunication could increase (Rashed & Kamal, 2010). Second language speakers can be misunderstood by their accents and pronunciation of English words (Chirea-Ungureanu & Visan, 2011). Nevertheless, having a good command of English does not mean that cultural awareness is present (Horck, 2006; Visan & Georgescu, 2012).

Seafarers who cannot sufficiently communicate in English are often alienated from social life on board the merchant navy ships (Chirea-Ungureanu & Visan, 2011). Interaction between first language English speakers and second language English speakers often leads to impatience and annoyance (Hetherington, Flin, & Mearns, 2005).

Gender Diversity Can lead to Intolerance

Both male and female seafarers can become distressed when faced with gender discrimination (Fajardo, 2011). Intolerance towards female seafarers can lead to a hostile working environment, which make female seafarer’s workplace very stressful (Horck, 2008). The South African seafarers working in the merchant marine are not immune against gender abuse and intolerance. The infamous incident of the female seafarer cadet, Akhona Geveza, who allegedly committed suicide after reporting that she allegedly was raped by an officer. Her death opened a ‘can of worms’ in South African merchant navy training and maritime government institutions.

Africa (2010), a reporter for the newspaper Sunday Times, stated that male and female seafarers of Akhona Ceveza’s cohort shared the following information with her: “Two male cadets were raped by senior officials while at sea”; “A female cadet terminated two pregnancies that followed her rape at sea”; “Three female trainees were pregnant at the end of their 12-month training stint”; “A male cadet was sent home a month before finishing his program because he refused to have sex with a senior official”; and A female cadet has a child with a married South African Maritime Safety Agency executive after he forced himself on her and threatened to cancel her contract if she told anyone”.

A former female cadet said:

“When we arrived on the vessel, there were 10 women, and we were told that the captain is our god; he can marry you, baptise you and even bury you without anybody’s permission. We were told that the sea is no man’s land and that’s what happens at sea, stays at sea.”. (Africa, 2010)
Sexual harassment is not only aimed at female seafarers, some male seafarers become vulnerable when they do not fit into the hegemonic male category (Fajardo, 2011). During an interview a Filipino seafarer shared his feelings of being snubbed by male seafarers. He stated that he is reserved in nature and avoid conflict amongst his fellow crew members. His demure nature lead to him being labelled as ‘gay’ and he was snubbed socially. Similarly, intolerance towards female seafarers can lead to a hostile work environment. This is evident through long discussions on Facebook with female seafarers. A female officer joined a particular female seafarers’ social media group and wrote about her ordeal as a junior officer

I reported to my crewing manager on my first trip to sea that the Bosun was trying to do things to me and he said “it serves you right for being a woman at sea, if I was your father I would never have let you go to sea”

Captain Babs Beuse, a social media participant said that there are three types of men working on board a ship:

1. Those who tell you at the first chance that they have no problem with women on ships - they DO have a problem with this. They will push and mob you as much as they can, but always argue it had nothing to do with the fact that you are a women - only you not able to do your job.
2. Those who tell you that in their opinion women should not work on ships. It will take some time to convince them that you are not one of those girly-girls, but when they see that you are a good worker they will finally accept you.
3. Those who do not make any remarks towards your sex. They ignore the fact that you are female (no matter what they secretly think) and behave professionally and treat you like everybody else. Unfortunately, there are only a few of them around.

In an environment where you work, live and socialise with coworkers from many different cultures, language, and genders do not allow you some reprieve from a situation where you are taxed emotionally and physically (Raunek, 2012a).

The Lack of Social Interaction Leads to Loneliness and Isolation.

A lengthy separation from loved ones, the reduction of crew, and fast turnover times in harbours leave seafarers with a little or no time to go ashore to unwind and to cultivate a social life away from work (Carotenuto et al., 2012; ITF, 2002). On board the ship “the seafarer becomes both physically and mentally isolated”; “Physically, by the limitations of the ship and mentality, by the little contact to the outside world”(Jensen, 2002). Companies who value, the wellbeing of their crew installed TV, DVD players and internet access in the cabins. As seafaring becomes more comfortable with the internet, TV and video in the cabins, they retreat to their cabins after their shifts rather than socialising with the other crew members (Kristiansen, n.d.). Officers are at high risk to become lonely and isolated as they are subjected to the pressures of owners, port operators and other authorities and the
perception that you do not socialise with the ‘boss’ (Carter, 2005). A seafarer relayed to me the time that a fishing trip was organised for the seafarers. The agent rented three fishing boats, but only 12 seafarers showed interest to go out. That meant that they were four men per boat. However, nobody wanted to share the boat with the Captain, so the seafarer went with the Captain and the Agent, the fourth person decided to join one of the other boats, rather than spending time with the Captain. The seafarers avoided spending time socially with the Captain, thus isolating him from any social interaction with the other officers. Herwadkar (2014d) discussed the pro and cons of having social media on the ship. When ships became ‘dry’, by implementing zero alcohol policies, socialising at the bar was obviated (Herwadkar, 2014d). Social interaction was further reduced with internet access, as seafarers retreated into their cabins rather than socialising (Herwadkar, 2014d). Conflict also increased when the bandwidth became overloaded by too many seafarers using Skype or downloaded movies (Herwadkar, 2014d). Although communication with family become easier, family conflict, crises at home and the constant need to cyber manage family also put strain on the seafarers (Kristiansen, n.d). Frequent communication does not substitute physical presences needed when homebound problems arise (Carotenuto et al., 2012). Homesickness and loneliness are still present regardless of internet access (Carotenuto et al., 2012).

**Missing Family and Friends**

One of the challenges seafarers face is being away from their family and friends for long periods at a time (Raunek, 2014). Seafarers at sea often miss their loved ones birthdays, family events, weddings, Christmas, funerals, and milestones achieved by their children (Raunek, 2014). Raunek (2013a), speaks about how homebound stress influences a seafarer’s work “One cannot stay focused at work when bothered by family or personal issues”. The inability to attend to the family crises at home, induces stress and worry, which can affect the quality of the work of the seafarer “it is extremely difficult to work when you are physically on the ship, but mentally back home” (Raunek, 2013a). Home stressors can lead to frustration, anxiety, and insomnia (Raunek, 2013a).

Herwadkar (2014a), shared his experience of family tragedy whilst working at sea:

My father passed away while I was sailing… I still remember that dreadful email from my brother. … Needless to say, I was devastated... The port was still a good nine days off. … The initial feeling of sorrow was soon overcome by an intense feeling of frustration at being so helpless. What could one do from such a distance? … The reassurance of your physical presence simply cannot be substituted by a phone call.

Rev. Von Dreele (2010) states that seafaring is unique, in the sense that seafarers live in the same environment he/she works in. After a long day ‘at work’ seafarers do not have the luxury to return home and spend time with his/her family (Rev. Von Dreele, 2010). In an environment where you work
12 hours a day for seven days a week, for the duration of your contract, there are no weekends to enable you to distress and relax with your loved ones (Rev. Von Dreele, 2010).

This social media participant sent me this heartfelt message, on a question I asked about how one copes when a loved one died when you are at sea. xiv

I guess I have managed to carry on and use work to control the emotions, but in time the sleepless [ness] and the never ending flow of thoughts and misery it is hard. Self-harm or dark thoughts, loneliness, frustration take their toll, but if you are lucky enough to have kids, grandkids and family etc. Who is part of your life, it is possible to negate the negative and remain positive, but it is hard work. Fortunately, I have been able to hold myself together but unfortunately many friends and fellow seafarers haven’t been so lucky. Being able to reach out for help is not easy but is essential, on a good job where your shipmates are your friends it’s not as hard. When I have had to help my shipmates in similar circumstances, it is hard not to walk away as memories start to haunt but the feelings that I had when I have been helping overcome that.

Home bound stressors can influence sleep patterns whilst at sea, if seafarers work stress are added to the conundrum fatigue becomes problematic (Carotenuto et al., 2012). Fatigue can lead to emotional distress

Fatigue is sited in most merchant marine literature as not only as the main cause of maritime accidents, but also the main cause for the decline of the emotional wellbeing of seafarers (Carotenuto et al., 2012). Despite of STCW policies, this is still a great concern that needs to be addressed at entry level training of seafarers. Fatigue not only threatens the safety of the ship, but also the mental safety of the seafarer (Captain Ottosen, 2012; Carter, 2005; ITF, 2012g; Raunek, 2012a). ITF (2012g) listed symptoms of fatigue, which affects seafarers physically and mentally; inability to stay awake; clumsiness; headaches and giddiness; loss of appetite; insomnia; moodiness; needless worrying; poor judgements; slow responses; and difficulty concentrating. When asked in an online surveyxiv the question ‘As a seafarer, what single thing would improve your quality of life at sea?’ the participant replied: “I would have to say shorter shifts - I find exhaustion is a real problem after a couple of weeks at sea”.

Consequences of Long Term Distress

Raunek (2012e) listed some of the symptoms of distress in the merchant marine: Lack of interest in work; Lack of motivation; Short temper; Careless mistakes while doing work; Tendency to take short cuts to finish work; Frustration; Lack of seriousness towards one’s duties and on board safety; Tendency to blame juniors or colleagues for mistakes. “Alcohol and drug abuse; and reactive mental health problems”, all can lead depression, anxiety and somatisation, these symptoms are common reactions to distress (Carter, 2005). There are cases where distress leads to suicide in the merchant
Suicide in the merchant marine is the second highest in high risk occupations (Shettar, 2015). Suicide amongst seafarers are linked to “an extreme lack of social interaction among the crew, with ‘silent’ mealtimes used purely for ‘refuelling’ before crew members disappeared into their cabins”. Suicides are often linked to “marital problems and other family problems, work related problems, confusion, psychiatric or physical illness, social isolation, and other personal problems” (Stephen E. Roberts, Jaremin, Chalasani, & Rodgers, 2009; S. E. Roberts & Marlow, 2005).

**Conclusion**

This paper only touches on a few causes and results of distress in the merchant marine. Aspects such as the effects of how the fear of piracy, the impact accidents, deaths, suicide, shore leave, and so forth has on seafarers has been omitted from this paper, but worthy of a follow up paper.

Distress that is caused by working with a multicultural crew that can distend by cultural, language, cultural language, and gender diversity. This, in turn, often leads to the decline of social interaction. The ripple effect of the lack of social interaction is the feeling of isolation and loneliness. Missing family and friends, family crises and fatigue do not improve the stress levels of crew members. Horck (2006) stresses that cultural awareness training should start at the maritime colleges, as prevention takes the fore seat, than trying to manage seafarers in distress.

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PURSUING A CAREER AT SEA: AN EMPIRICAL PROFILE OF SOUTH AFRICAN CADETS AND IMPLICATIONS FOR CAREER AWARENESS

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Abstract
Sustainable job creation continues to remain a challenge in South Africa. The State has drawn up a National Development Plan (NDP), a key aim of which is to increase employment opportunities of South African youth. The maritime industry is suggested as a growth sector in which jobs can be created. However little is empirically known about the current student profile of cadets thus making human resource development policy difficult to formulate. The research design was a cross-sectional survey using a self-developed questionnaire. The population of cadets was 120 and a census sampling was attempted with 108 respondents completing the questionnaire. Descriptive and inferential statistics are used to report the results. The findings provide an insight into the biographical details of cadets, the sources of funding for their studies, the importance of funding for their eventual graduation, the awareness levels of their chosen careers and likelihood of them remaining in their chosen careers at sea. Findings of our study, no doubt shows that seafaring has the potential to create thousands of jobs, yet there is no support to reach the desired levels. To full contribute to the skills development revolution, the maritime sector need for transforming the industry image through raising awareness, increasing sponsorship, curriculum restructuring as well as involvement by all stakeholders.

Introduction
This paper is the first attempt in the South African literature to profile a cohort of students that are studying towards becoming officers in the merchant navy. The empirical profile provides information about biographical details of cadets, the sources of funding for their studies, the importance of funding for their eventual graduation, the awareness levels of their chosen careers and likelihood of them remaining in their chosen careers at sea. This has useful empirical value for labour market and career development policy and also contributes to the literature on career development. As such our three research questions are:

RQ1. What are the demographics of seafaring cadets at DUT?
RQ2. How are cadets’ studies funded and what factors are the most impactful on cadets successfully completing their studies?
RQ3. How did cadets become aware of sea-based careers?
The labour market for South African seafarers

The shipping industry and its attendant labour markets are the most global in the world. The industry is both a producer of globalising processes as well as one that is shaped by globalising processes. As an industry it is responsible for transporting more than 90% of the world’s trade (Bloor et al, 2013). A substantive amount of the capital of the industry is literally mobile in the form of ships and these ships are crewed by multinational crews. Whilst shipping has historically been global even in pre modern times, the large scale adoption of flag of convenience (FOC) practices sets it apart in the post 1970s era (Sampson, 2013; Ruggunan, 2015). FOC shipping legally divorces the relationship between the state in which a ship is owned and the national flag that a ship flies. It is the flag that the ship flies that determines how the ship owner is taxed and which labour regulations the shipping company has to abide by (ILO Report, 2001). Ship owners therefore resist registering their ships on national registers that are fiscally prohibitive as well as avoid national registers of countries that have highly regulated labour markets. Instead, ships are registered in countries (some of which are tiny island states or landlocked countries) that have more flexible labour legislation and more attractive fiscal policies. This allows shipping companies to crew their vessels with multinational, often non-unionised crew members and pay cheaper wage rates. For example a ship may be owned in the United Kingdom, but be flagged in Liberia. Hence the ship owner is obligated by Liberian fiscal and labour laws rather than legislation of the United Kingdom. There are a number of successful attempts by global organised labour to circumvent a race to the bottom in terms of working conditions and wages as a result of FOC practices, but these strategies are not the focus of this paper.

Another marker of the global nature of the labour market in the shipping industry is the segmented nature of the labour market. Ratings are one occupational category and are viewed as the “working class of the seas”. Ratings occupations include cooks and able bodied seamen. The career path to become a rating is not as onerous or ‘academic’ as that required to become officers. Officers occupy the highest points of the career hierarchy on board ships. They are often in possession of an undergraduate or postgraduate degrees and work as engineers, navigators and captains on vessels. The segmentation of crew between ratings and officers is important because each segment requires different career pathing strategies. Further Ratings tend to be sourced from developing countries such as the Philippines and other south East Asian countries and Eastern Europe. Officers on the other hand are sourced from industrialised countries of the West. Officers are better paid, with tax free salaries paid in US dollars. Whilst officers are able to join unions, their unions tend not to be as militant as the global labour federations such as the ITF that service ratings globally.

Global Shortage of Officers

The Drewry (2012) labour market report of 2012 demonstrates that there is a current and projected shortage of officers globally and an oversupply of ratings in the global labour market.
If shipping is to continue to be a key driver of globalisation processes then strategic planning is required to locate and tap new labour supply countries for officers to service the global industry. The traditional maritime nations of Europe and Asia (Korea, Japan) have ageing workforces combined with fewer younger people entering the profession in these countries. Despite labour market and human resource development interventions by Australia, United Kingdom, Ireland, Germany, Singapore and Japan to recruit and retain young people into cadetships, attrition and recruitment rates remain high. Future projections of ship owners from these countries look bleak in terms of recruitment and retention of cadets directly impacting on ship operations. South Africa, along with other developing countries such as the Philippines are well placed to service this shortage provided the appropriate recruitment and retention strategies are implemented as part of a national integrated human resources development strategy. South Africa already has a competitive advantage in key respects. These are:

1. Cadets are all trained to globally regulated STCW compliance at two accredited institutions. Therefore qualifications are globally recognised and valued.
2. English is the lingua franca of multinational crews and South African cadets are all English speaking.
3. Historically and currently South African officers enjoy high reputational branding in the global labour market and are seen as a tried and tested labour supply country.

However there are challenges that remain before South Africa can situate itself as global labour supply country. These include:

1. A lack of awareness of at sea careers amongst secondary and post-secondary students.
2. An extremely limited intake of cadets nationally. At full capacity the country can only accommodate 120 cadets per annum. This is not a sufficient number to obtain a critical mass to supply a global labour market.
3. Lack of sufficient training berths to provide compulsory experiential training to complete the officer qualification. This consists of 12 months of experiential training at sea on an appropriate working or raining vessel. Therefore even though a cadet may complete their theoretical training, they can only be certified to work as an officer once the experiential training is complete.
4. There is a lack of sufficient data about cadet demographics, their career choices and intentions to remain in their selected careers.

It is with respect to point number four that this paper hopes to make an intervention.

**Method**

We employed a cross-sectional survey using a self-developed questionnaire to provide an insight into the biographical details of student cadets at a South African University. Some items included in the data collection instrument were quasi-adopted from similar studies carried out in Brazil (Lobrigo &
Pawlik, 2012) and; Greece and China (Pallis & Ng, 2011). The study sought to elicit information; apart from the demographics profiles, about the prospective cadets’ sources of funding for their studies, the importance of funding for their eventual graduation, the awareness levels of their chosen careers and likelihood of them remaining in their chosen careers at sea after graduation.

**Participants and Setting**

The study conveniently and purposefully profiled a population of 120 undergraduate cadets and 108 usable questionnaires were obtained recording a 90% response rate. The majority of the respondents were male (63.9%) while females constituted 36.1% of the population with about 20% already in employ as seafarers (16 male and 6 females). In addition, the majority of the participants were in their first year of study (53.7%) and only 13.9% of the sampled students were in their final year (see Table 4). Most of the participants were black Africans (86.1%) followed by mixed race and Indian students who constituted smaller percentages. Of the roughly 20% who are already working in the maritime sector, only 2 students had relatives employed in the related career as compared to the 6 indicated by those who were not yet working as seafarers (see Table 2).

As indicated in the table, the majority, specifically 80 out of the 86 respondents who were not already in employ as seafarers indicated that they were the first in their families to pursue a maritime career with the majority of the population citing family (20.4%), the media (19.4%), friends (19.4%) and their high school teachers (14.8%) as their main sources of the maritime career awareness. The job summits/career exhibitions, shipping companies and other sources recorded 8.3% respectively; however none of the 108 respondents cited the university career counsellor as the source of the information on the career at sea. The mean age of the sample with this study was 21.81 years. Most importantly, as illustrated in Table 1, the majority (34.3%) of the registered student cadets at the selected University are aspiring to work as Deck officers, 13.9% as seafaring cadets; 20.4% as seafaring cadets, 17.6% as Navigators, 4.6% as Masters and; only 3.7% and 1.9% pursuing the Officer of the Watch and Marine surveyor tracks respectively.
Table 1: Demographic Characteristics of the participants (N=120; n=108)

<table>
<thead>
<tr>
<th>Gender</th>
<th>Male (Frequency)</th>
<th>Female (Frequency)</th>
<th>Total Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. African</td>
<td>56</td>
<td>37</td>
<td>93</td>
</tr>
<tr>
<td>White</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Mixed Race</td>
<td>4</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Indian</td>
<td>6</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>CurrPractice</td>
<td>Yes</td>
<td>16</td>
<td>6</td>
</tr>
<tr>
<td>No</td>
<td>53</td>
<td>33</td>
<td>86</td>
</tr>
<tr>
<td>Time in Practice</td>
<td>n/a</td>
<td>53</td>
<td>33</td>
</tr>
<tr>
<td>&lt; 1 year</td>
<td>4</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>1 ≤ y &lt; 3 years</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>&lt; 3 years</td>
<td>11</td>
<td>4</td>
<td>15</td>
</tr>
<tr>
<td>Study Track</td>
<td>Deck Officer</td>
<td>23</td>
<td>14</td>
</tr>
<tr>
<td>Seafaring Cadet</td>
<td>8</td>
<td>7</td>
<td>15</td>
</tr>
<tr>
<td>Navigator</td>
<td>15</td>
<td>7</td>
<td>22</td>
</tr>
<tr>
<td>Marine Pilot</td>
<td>12</td>
<td>7</td>
<td>19</td>
</tr>
<tr>
<td>Officer of the watch</td>
<td>3</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Master</td>
<td>3</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Marine Surveyor</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Missing</td>
<td>4</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>69</td>
<td>39</td>
<td>108</td>
</tr>
</tbody>
</table>

Mean Age | Median Age | Standard Deviation |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>21.81</td>
<td>20</td>
<td>4.73</td>
</tr>
</tbody>
</table>

Data Analysis

Statistical analysis was carried out using the Statistical Package for the Social Sciences programme (SPSS version 22). Specifically, descriptive statistics were used to report the results. Furthermore, automatic linear modelling was employed to ascertain the predictor importance of some indicated factors in influencing the students anticipated tenure in the maritime world.

Table 2: Family members with maritime sailing experience

<table>
<thead>
<tr>
<th>Current Practice</th>
<th>First Person to pursue Seafaring Career</th>
<th>Relative with seafaring experience</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>n/a brother father Other relative</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>No</td>
<td>No</td>
<td>0</td>
<td>6</td>
</tr>
</tbody>
</table>
Results

Source of Career Awareness

The students were requested to indicate how they became aware of the maritime programme which they pursue. As illustrated in Table 3, the most cited sources were Family (20.4%) as well as media and friends which both had 19.4%. The findings also indicate that High School teachers also play an important role in providing information about the programme. Interestingly, as shown in Table 3 shipping companies were reported a passive in raising awareness about the programme.

Table 3: Source of Career Awareness

<table>
<thead>
<tr>
<th>Career Awareness</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family</td>
<td>22</td>
<td>20.4</td>
</tr>
<tr>
<td>Media</td>
<td>21</td>
<td>19.4</td>
</tr>
<tr>
<td>Friends</td>
<td>21</td>
<td>19.4</td>
</tr>
<tr>
<td>Career Councillor/High School Teacher</td>
<td>16</td>
<td>14.8</td>
</tr>
<tr>
<td>Job Summits/Career Exhibitions</td>
<td>9</td>
<td>8.3</td>
</tr>
<tr>
<td>Shipping companies</td>
<td>9</td>
<td>8.3</td>
</tr>
<tr>
<td>Other</td>
<td>9</td>
<td>8.3</td>
</tr>
<tr>
<td>Career Counsellor at University</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Missing System</td>
<td>1</td>
<td>0.9</td>
</tr>
<tr>
<td>Total</td>
<td>108</td>
<td>100</td>
</tr>
</tbody>
</table>

Anticipated Career Span

The next question requested the participants to indicate how long they expected to remain in seafaring employ. From Table 4, it is clear that most females do not intend to pursue career at sea for more than 10 years unlike a majority their male counterparts who plan to stay beyond 10 years. Considering the mean and median age which is around 20 years, the revelation is worrying and not encouraging for the maritime sector because it shows that the majority of prospective seafarer with the study sample intends to leave the sector before their retirement ages more specifically about 74% of the females contemplating on leaving the career during their early thirties. This revelation is quite strange given the egalitarian labour legislation targeted at addressing gender disparities in the labour market. The reasons need to be probed further to discover what the qualitative issues are that result in such high attrition rates of female seafarers. The findings further indicate that only first years were
anticipating staying in employ as seafarers for a longer a period than second and third years, although
the majority indicated not for longer than 20 years.

Table 4: Anticipated Career Span in Seafaring before considering a shore based career

<table>
<thead>
<tr>
<th>Anticipated Career Span (Years)</th>
<th>1-5</th>
<th>6-10</th>
<th>11-15</th>
<th>16-20</th>
<th>21-25</th>
<th>26+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>10</td>
<td>19</td>
<td>21</td>
<td>11</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Female</td>
<td>11</td>
<td>18</td>
<td>5</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Study</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st Year</td>
<td>7</td>
<td>23</td>
<td>18</td>
<td>4</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>2nd Year</td>
<td>10</td>
<td>11</td>
<td>4</td>
<td>7</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>3rd Year</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Study</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deck Officer</td>
<td>7</td>
<td>16</td>
<td>5</td>
<td>5</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Seafaring Cadet</td>
<td>1</td>
<td>6</td>
<td>4</td>
<td>1</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Navigator</td>
<td>4</td>
<td>6</td>
<td>7</td>
<td>3</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Marine Pilot</td>
<td>7</td>
<td>4</td>
<td>8</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Officer of the watch</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Master</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Marine Surveyor</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>21(19</td>
<td>37(34</td>
<td>26(24.</td>
<td>12(11.</td>
<td>3(2.8%</td>
<td>9(8.3%</td>
</tr>
<tr>
<td>.4%)</td>
<td>.3%</td>
<td>1%</td>
<td>1%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sources of Financial Support

We also sought to established the major sources of financial support for students pursuing seafaring
careers. A shocking revelation is the role being playing by the shipping companies in funding the
prospective seafarers despite the shortage of skilled workforce with certification in the industry. The
results shows that the majority of students rely either on the sponsorship from government or are
being sponsored by family/friends. Shipping companies closely follow the non-shipping companies in
not being active players in uplifting the prospective seafarers through sponsorship. For non-shipping
companies, the results are surprising considering that they will be sponsoring prospective job
candidates in their sectors. However the findings support findings from the global literature that
indicates a general withdrawal of shipping companies from sponsoring training of cadets.
Important Factors for Successful completion of Studies

The study also sought to establish the factors which the participants considered as crucial for them to complete their studies. Our study results in Fig 4 indicate that students rank guaranteed funding for their studies the highest and most important factor for their completion of their programme. Second rated, is the availability of high quality of academic learning environment. Guaranteed funding whether from government, family or shipping companies allows the students to learn without a peace of mind. Overall ratings indicated that guaranteed training berth availability and more experiential learning were also viewed as key towards successful completion of studies. Though they were ranked behind financial support. Family support other than funding was not ranked as top priority for the students to complete their studies.
Motivation to Select a Seafaring Career

In as far as the motivation to select the maritime study programme and seafaring career, Fig 5 shows that there was a general consensus among the students that personal interest, potential salary earnings and potential job security are considered the most substantial, respectively, ranked between one and three by 67.8%, 64.3% and 37% of respondents. Personal interest was cited as the most significant motivation factor with 61.1%, 11.1% and 5.6% of responses, respectively. In other words the students generally agree that staying in seafaring employ depends more on whether one views it as a calling and that other factors are significant but not as a calling. The results further shows a general agreement among prospective seafarers that they are highly motivated by a firm offer of employment by a crewing company; secondly, firm offer of employment by a shipping company and finally just like Brazilian students (Lobrigo & Pawlik, 2013), chances to secure scholarship to study maritime studies.
Motivation to Select a Seafaring Career

Factors considered as motivation to continue working as Seafaring officer

On the factors that motivate individuals to continue working as seafarer officers, the students ranked between and three, salary and benefits (81.5%) followed by personal interest (54.6%). The motivating powers of these factors has been highlighted for luring students to the programme and are also highlighted as motivators to keep the students in employ as seafarers. It is also important to note that working conditions and promotion prospects to the next rank have been cited as powerful motivators as well for the prospective workforce to stay long before considering a shore based career.

Figure 6: Factors considered as motivation to continue working as Seafaring officer

Motivation to remain at sea

<table>
<thead>
<tr>
<th>Motivation to remain at sea</th>
<th>No opinion</th>
<th>Highest motivator</th>
<th>2nd</th>
<th>3rd</th>
<th>4th</th>
<th>5th</th>
<th>lowest motivator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working Conditions</td>
<td>5.6</td>
<td>7.4</td>
<td>13.9</td>
<td>11.1</td>
<td>11.1</td>
<td>25.9</td>
<td>25</td>
</tr>
<tr>
<td>Personal interest</td>
<td>37</td>
<td>33.3</td>
<td>9.3</td>
<td>12</td>
<td>17.6</td>
<td>12</td>
<td>11.1</td>
</tr>
<tr>
<td>Further E&amp;T paid for by employer</td>
<td>9.3</td>
<td>5.6</td>
<td>9.3</td>
<td>16.7</td>
<td>16.7</td>
<td>21.3</td>
<td>21.3</td>
</tr>
<tr>
<td>Promotion prospects to next rank</td>
<td>37</td>
<td>17.6</td>
<td>20.4</td>
<td>14.8</td>
<td>27.8</td>
<td>11.1</td>
<td>4.6</td>
</tr>
<tr>
<td>Job security</td>
<td>7.4</td>
<td>5.6</td>
<td>18.5</td>
<td>19.4</td>
<td>12</td>
<td>15.7</td>
<td>21.3</td>
</tr>
<tr>
<td>Salary and Benefits</td>
<td>19</td>
<td>31.5</td>
<td>26.9</td>
<td>23.1</td>
<td>6.5</td>
<td>5.6</td>
<td>4.6</td>
</tr>
</tbody>
</table>
We also used automatic linear modelling to determine which factors largely influenced the students in order for them to work in maritime and related maritime organisations for longer periods of time. As illustrated in Fig 7, individuals are likely to stay longer in the maritime industry if one’s family member is in seafaring, this is likely due to the fact that people tend learn the challenges and opportunities of the job before they themselves are employed and eventually develop personal interest in the career at sea. This is how personal interest develops which have been cited as an important factor by the students with the study sample. Maritime organisations can capitalise on the people already working in the maritime sector to spread the message to interested parties in their respective communities as they are in positions to give realistic job previews than other sources. This is also shown by the indication by the study sample that most of them learnt about the programme from family and friends more likely because of their ability to give realistic previews about the challenges and opportunities.

In that instance people will join the sector already have a clear idea about the career and specifically pushed by personal interest rather than external factors. Potential salary and benefits, and working conditions have also been flagged in the model as important predictors of the time the students will stay in seafaring before considering a show based career. It should be remembered that most of these predictors can be controlled and/or manipulated by policy makers for the benefit of the sector and to maintain a sustainable workforce in the maritime industry.

**Figure 7: Predictor importance for anticipated career span in Seafaring before considering a shore based career**
Discussion

We profiled students pursuing maritime studies at South African University to learn about their demographics composition, their sources of funding for their studies, the importance of funding for their eventual graduation, the awareness levels of their chosen careers and likelihood of them remaining in their chosen careers at sea after graduation.

Family, friends, media and teachers at high schools proved as the most effective ways in which information about the career in seafaring. The results concurs with the findings from a joint Greek and Chinese study which reported an absence of any active role of the maritime industries, whether companies or interest groups and associations representing them, in ‘pushing’ young people to pursue maritime studies (Pallis & Ng, 2011). They further reported that Maritime companies rely on the tertiary institutions to attract potential candidates, whereas the institutions do not market themselves by any obvious means, at least from the perspective of students. This also is shown by our current findings with all the respondents reporting not to have obtained information from a university representative and very few indicating having been made aware of the profession by shipping companies themselves. This alone signals the passiveness of the maritime sector in South Africa in mobilising interest and attention as a sector which can create jobs and adopt a transformational stance in its development focus (Mokhele, 2013). However, our results should be applied and generalised with some caution because they reflect the information from one of the two International Maritime Organisation STCW accredited education institutions (Ndebele, 2011) leading to seafarer certification. This is surprising that despite the International Maritime Organisations (IMO) reporting an availability of 200 000 jobs available for prospective seafarer, (cited by Ndebele, 2011) and local seafaring workforce disparities of 891 deck officers and nearly 600 engineering officers (further confirmed by Mokhele, 2013), the local maritime education and training providers have not taken advantage of this to raise awareness of the programme.

First years contemplated on staying longer in seafaring employ than senior students. The explanation could be that senior students may have received considerable exposure about the realities and opportunities presented by the programme and the sector and decided to pursue the career for a short time or career interests may have changed as the individuals develop. This then calls for the policy makers and maritime organisations to establish very attractive retention strategies in order to curb the workforce disparities or further exodus by prospective seafarers or those already pursuing careers at sea. The findings further reveal that majority of individuals in each study track do not intend to spend more than 10 years working at sea. The noteworthy revelation is also is the fact that a large number of students at the selected university are prospective deck officers and deck cadets and small numbers for individual intending to work in the marine pilot, officer of the watch and chief master tracks which were also identified as critical skills (Mokhele, 2013). A report by Ndebele (2011) (the
then Minister in the maritime sector) showed that these tracks are exclusively indicated as being offered at a university other than the one with the current study sample.

This confirms findings from a recent maritime study (Mokhele, 2013) presented to SAMSA which found shipping companies to be passive in relying on universities in marketing and supporting prospective employees in the sector. Our study reveals, although the Government plays a part in providing sponsorship to the students, still a large number of students indicated family and friends as first and second sources of income followed by the government and lastly non-shipping companies. In light of the above, the maritime skills development should at least, be spearheaded by organisations from the sector but the results shows otherwise.

This is not surprising as funding and quality learning environment are the considered as the important aspect for a favourable learning climate. We agree with the sentiments from a recent study (Pallis & Ng, 2011) that students believe that the existence of well-qualified staff offering various teaching methods are the key attributes in transmitting job-related skills to students and enhancing their knowledge about the maritime industries. In addition to that Mokhele (2013) advocated for the topping up salaries for the lecturers for maritime studies in order to attract quality teaching staff which is one way of retaining teaching staff especially at the two universities offering seafaring maritime studies in South Africa. In order to make sure that the students pursuing the programme are kept in the sector, cadetship programmes can be an option that can be used by both the public and private sector in retaining the prospective candidates. This does not only provide the much needed funding opportunities for prospective work force but also provide confidence and guaranteed employment opportunities for the students after completing their studies.

**Reflection on progress on Skills development in the Maritime Sector**

Despite, the findings from the current study and those of previous related studies (e.g Mokhele, 2013); Table 5 shows a snapshot of the statistics and major disparities in the sector. It is surprising that despite the overwhelming evidence about the shortages in the sector, the major stakeholders (i.e. shipping companies) in the maritime industries are still rated as passive in mobilising awareness and lagging behind government and family/friends in funding the studies for prospective seafarers. Data in Table 5 reveals a worsening trend in the relations between demand and supply. The data shows that in 2010, the reported shortage of seafarers was at close to 1500, however due to the expansion and increase in trade and opportunities for shipping companies, the shortage has increased to a demand of between 3000 and 4500 seafarers annually. This trends seems not be matched by the supply of seafarers from limited education and training providers in South Africa.
Table 5: A snapshot of statistics from previous studies

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Deck officers</strong></td>
<td>2851</td>
<td>• 1 seafaring job has a multiplier factor of 8 to 10 jobs ashore</td>
</tr>
<tr>
<td><strong>Engineering officers</strong></td>
<td>2558</td>
<td>• South Africa needs to be training about 3,000 to 4,500 seafarers annually to reach the target, however, with no coherent Human Resource Development Strategy, Programme and Plan to capture a share of those jobs unemployment in South Africa will persist</td>
</tr>
</tbody>
</table>

Source: SAMSA Database cited by the then Minister Ndebele (2011) Adapted from the TETA scarce skills list (Ndebele, 2011)

Source: Mokhele (2013)

Note: Number of officers completing theoretical training per year
*Deck cadets (accelerated programme) = 49, *Deck cadets (S1/S2) = 72, *Engineering Cadets (accelerated programme) = 65, *Engineer Cadets = 58 (Ndebele, 2011)

*Current study sample Totals [First years = 58, Second years = 35, Third years = 15).

Concluding Remarks

The literature and findings of our study, no doubt shows that seafaring has the potential to create thousands of jobs, yet there is no support to reach the desired levels. Due to the current lack of awareness and poor industry image, it might take time before the industry attains a competitive position in contributing to the skills shortage for certified seafarers in South African maritime sector and globally. Second, the curriculum can be structured in such a way that graduates can work both on and offshore so that the career paths are versatile for the people in the sector to allow flexibility and retain the experienced individuals who for any reasons may not be in positions to work of vessels. We urge the responsible stakeholders to raise awareness about maritime careers allow a climate where shipping companies and training institutions work together to boost image of the sector by raising public awareness through the media, high school, company and university representatives.

References


BIMCO (Baltic and International Maritime Council) 2010. The worldwide demand for and supply of seafarers. Warwick: UK Institute for Employment Research, University of Warwick.


SOME OBSERVATIONS REGARDING COURSES FOR SHIP PERSONNEL WITH DESIGNATED SECURITY DUTIES

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*Corresponding author. E-mail: valter.suban@fpp.uni-lj.si

Abstract

On 1st January 2014, STCW Convention regulation VI/6 took effect. It pertains to seafarers on vessels to which the ISPS Code applies. This regulation requires all seafarers on ships subject to the ISPS Code to have undergone security related training and instruction relevant to their assigned duties on board. The provisions regarding security related training are contained in STCW Regulation VI/6, Section A-VI/6 and Section B-VI/6, which cover among other things, security training for seafarers with designated security duties. Our institution, the Faculty of Maritime Studies and Transportation, has begun to teach all required security courses: Security Awareness (SA), Designated Security Duties (DSD) and Ship Security Officer (SSO). The courses are prepared in accordance with recommended IMO model courses. SA and SSO courses commenced without any problems, but already during the first DSD course we were faced with an issue – who on board has designated security duties? The difficulty lies in the fact that there is no unified interpretation of the range of duties of crew members with DSD, as they are different from company to company, recognized organizations (RSO) and flags. Also, duties specified in ship security plans are not unified and vary between ships. Some duties treated on one ship as normal are, on another ship, treated as designated duties. We found ourselves faced with various course candidates from experienced chief engineers with 40 years’ experience to future seafarers who plan to embark on a ship for the first time. In this paper, the authors will analyse in detail the first 15 months of the courses, underline problems and suggest some possible solutions.

Introduction

It is customary in the Introduction section of an article for the authors to present a literature review. After examining major web platforms such as Science Direct, Scopus, or Web of Science, which include most of the analyses carried out up to now, we have found that there are no articles that deal directly with the issues highlighted by this article. Although many authors write about the concepts of security and risk control at sea and on board, these articles tend to be related to general security problems such as piracy, stowaways, maritime terrorism, risks connected with the freight transportation, etc. The lack of available literature and studies has led the authors to contact several flag states and through interviews, investigate the current situation. Unfortunately, we received a rather typical clerical response from almost everyone we spoke to, something to the effect that the “designation of specific security duties within SSP is the responsibility of RSOs”. Usually they also provided their regulations which are almost completely the same as IMO regulations and guidelines.
Due to security reasons, the authors were unable to access the IMO database to see the papers that are the basis for the entrance to the Certificate of Proficiency for personnel with designated security duties into STCW Convention, and actual eventual contributions about the courses’ organization, motivations and effects.

It is therefore the aim of this paper to define the particularities of this certificate and present the current state regarding the success of the new certificate introduction in Slovenia.

Which are designated security duties?
According to the SOLAS convention, Chapter XI-2 and the further ISPS Code, each ship shall carry on board a Ship Security Plan (SSP) approved by the Administration. In the plan shall be, among the other things, the »duties of shipboard personnel assigned security responsibilities and of other shipboard personnel on security aspects« (see, ISPS A-9.4.7)

The organization and performance of ship security duties in the SSP are defined in paragraphs B-9.7. and B-9.8., where it is stated that in the SSP, the following which relates to all security levels should be established (B-9.7.):

- the duties and responsibilities of all shipboard personnel with a security role;
- the procedures or safeguards necessary to allow such continuous communications to be maintained at all times; the procedures needed to assess the continuing effectiveness of security procedures and any security and surveillance equipment and systems, including procedures for identifying and responding to equipment or systems failure or malfunction;
- the procedures and practices to protect security sensitive information held in paper or electronic format; the type and maintenance requirements of security and surveillance equipment and systems, if any; the procedures to ensure the timely submission and assessment of reports relating to possible breaches of security or security concerns; and
- procedures to establish, maintain and up-date an inventory of any dangerous goods or hazardous substances carried on board, including their location.

All these measures should cover:
- access to the ship by ship personnel, passengers, visitors, etc;
- restricted areas on the ship;
- handling of cargo;
- delivery of the ship’s stores;
- handling unaccompanied baggage; and
- monitoring the security of the ship.
In the SSP, all security duties should be well defined in advance. Of course, to avoid any security incident, it is necessary to ensure the continuous performance of all ship security duties (see, ISPS A-7.2.1.).

As far as we could determine, there are only general guidelines regarding duties. From the point of view of the legislator everything is clear; however, the question remains, what exactly are the special security duties that require having seafarers with designated security duties on board?

In practice, everything depends on the shipping company and the Recognized Security Organization (RSO). Over the course of the last year, the authors have had many discussions with active seafarers about this matter. We have discovered that many security duties are treated as special security duties on some ships while on others they are not.

Some of those duties are:

- Controlling access on the gangway
- Security patrols
- Various searches (stowaways, drugs, bombs…)
- Controlling of the ship’s stores etc…

**Who are the personnel with designated security duties?**

As stated in the previous section, there are special security duties that are performed by personnel with designated security duties addressed in SSP. This results in the same, previously mentioned question – why are those duties treated differently on different ships? Of course, normal security duties can be performed by any of the ship’s crewmembers, while special security duties can be performed only by the personnel with designated security duties. Here, it is assumed that in both cases personnel have received security-related training and instruction according to STCW A-VI/6 “Standard of competence for security-related familiarization training”.

For example, let us examine some cases where the same duties are performed by any crewmember on the same ship, while on other ships, the same job must be done only by the DSD certified crewmember:

- Persons who control access on the gangway
- Members of security patrols

Personnel engaged in various searches (metal detector handling, searching for stowaways, drugs, bombs…)

Crewmembers who are in charge of the control of loaded ship’s stores etc…
Qualifications of personnel with designated security duties
Since the ISPS Code was introduced in 2004, ships have been required to have personnel who will be able to ensure the performance of all ship security duties. The qualifications of these persons have not been precisely detailed. In the ISPS (A-13.3 and B-13.3) it is stated that personnel with DSD shall understand their responsibilities as per ship security, as described in the ship security plan and shall have sufficient knowledge and ability to perform their assigned duties, taking into account the guidelines given in part B of this Code.

The Manila Amendments of STCW Convention extends the requirements for security training: additional training and appropriate certification is required for those seafarers who have designated security duties in accordance with the Ship Security Plan.

In table STCW A-VI/6-2 we can find a specification of the minimum standard of competence for seafarers with designated security duties. It is clearly defined in the table how to demonstrate competence to undertake the tasks, duties and responsibilities to perform security duties and the level of knowledge sufficient to enable every candidate to perform on board designated security duties.

Security training for seafarers with designated security duties
In the Republic of Slovenia, only authorized institutions are able to provide such training. Those institutions are the University of Ljubljana, Faculty of Maritime Studies and Transport and GEPŠ – Maritime College. The course is based on the IMO model course 3.26 “Security training for seafarers with designated security duties”, 2012 edition. The entry requirement is having completed the course entitled “Security awareness training for all seafarers”.

On completion of this training course, a seafarer is at least be able to (see, STCW table A-VI/6):

- Maintain the conditions set out in a ship security plan;
- Recognize security risk and threats;
- Undertake regular security inspections; and
- Properly use security equipment and systems

The structure of trainees in Slovenia
In Slovenia, like in many other countries, the DSD courses began in January 2014. Before that day, most Slovenian seafarers obtained their Certificate of Proficiency according to the transitional provisions of STCW convention chapter A-VI/6. This means that they have approved seagoing service as shipboard personnel with designated security duties, for a period of at least six months in total during the preceding three years or having performed security functions considered to be the equivalent of seagoing service.
After the 1st January 2014, every crewmember with designated security duties was obligated to fulfill requirements stated in STCW A-VI/6 paragraphs 6. to 8.

During the 15 month period between January 2014 and March 2015, 109 candidates attended the Designated Security Duties training courses in Slovenia. The differences in structure between them noteworthy. In the first 5 month period, experienced seafarers made up 95% of the total course attendants, while in the last 5 month period, only about 30% of the total course attendants were experienced seafarers as opposed to the 70% who were just planning to join a ship for the first time. All cadets were attending the course in last two periods. The reason for this is obvious since the school year ends in summer. The total relationship between current and new seafarers and are shown in Figure 1.

Figure 1: Relations between current and new seafarers.

Let us first examine the structure of the trainees related to their position on the ship. Only Chief engineers were treated individually, while other crew positions are grouped. The groups are followed:

- Engineers (2nd, 3rd, 4th)
- Electronic (Electronic officers and electricians)
- E/R ratings (mechanics, oilers, wipers)
- Deck ratings (boatswain, AB, OS)
- Cook /steward
- Cadets (Deck/ER)
- Passenger ship non-maritime personnel
As is seen from the graph, the greatest percentage is represented by Engineers. Most of them were Chief Engineers who, of course, have a very important role within SSP. Also personnel dealing with the maintenance of electronic security instruments have special duties in most Ship Security Plans. We observed that on all ships, engineers and electronic officers are treated as personnel with designated security duties. But within other crewmember positions we could see the differences between different ships/companies/flags/RSO.

We also found the DSD status on passenger ships very interesting. Some shipping companies required this certificate for every employee while others required this only for some. In some companies there are also cooks and stewards treated as DSD, since they have to control the ship’s stores.

None of the deck officers have attended the course; the reason is probably that almost every deck officer, immediately after obtaining the Certificate of competency, takes the Ship Security officer course.

Also we observed a significant gender difference. Only three female trainees have attended the course. They work on cruise ships as shop managers and have, according to the SSP special duties related to security, and were therefore required to attend the course.

**Authors’ observations**

Immediately after the new rules came into force in January 2014, we saw an increased demand for training courses. Candidates were experienced seafarers, mostly engineers, who were for various reasons unable to arrange their Certificate of proficiency in accordance with the transitional provisions of STCW convention chapter A-VI/6. Nearly all the participants found the course very boring and their comments were not particularly positive. Mostly they complained about the fact that they were
obligated to pay for a course that covered material they have been doing for decades. Later on, in the following courses, the classroom hours were made more discursive, allowing participants to debate on the relevant issues and highlight their points of view and concerns. The added value of such discussion was an exchange of good and bad security practices on different ships.

![Figure 3: Number of participants divided in the five month periods.](image)

In the next period the number of courses declined in accordance with the demand. The ratio between experienced and non-experienced seafarers has become variable without a specific rule. And here arises the problem which authors want to address in this paper: how does one lead a course which will be comprehensible for new seafarers and not boring / repetitive for experienced seafarers? The compromise found was a combination between classic lessons and discursive ones regarding the existing system on ships where the experienced seaman have sailed till now.

Over the last 5 month period the demand has dropped. The structure of the trainees on the last 2 courses is about 80-20% in favor of new seafarers. Of course, the lessons are now customized for the participants.

The main problem for the inexperienced seaman is a lack of knowledge regarding their future working environment. With appropriate pictures and videos, the lesson quality could be improved, but we currently believe that the course content is too difficult for the inexperienced. This problem becomes even much harder when we take into consideration the structure of the trainees. About half of the trainees were non-seafaring personnel on passenger ships. Even among these we found very different professions such as merchants, hairdressers, barmen, DJs etc. The priority in their designated duties is normally how to recognize suspicious persons, crowd management, specific security equipment etc. On the other hand, seafarers who will join cargo ships have to know how to deal with a completely different security threat, such as pirates, stowaways etc.
At the end of the course, participants reach the minimum standards required to satisfy table A-VI/6, but they are a long way from being able to understand their duties immediately after their first embarkment.

In future courses, we are expecting a ration of almost 100% new seafarers. We are waiting for the feedback from the deck cadets who have attended this course. It is most likely that all of them will come back to the SSO course after one year of sea experience. We will take that opportunity to do a survey regarding how suitable the DSD course was for them.

The opinion of the authors is that the course as it is presently structured is unnecessary. The reason is the lack of experience of the candidates. The course will be much more effective if the course attendees would be required to have some ship experience (for the sake of argument, let us say at least 3 months). We also are leaning towards the idea of training for specific designated duties (E.g.: anti-piracy, security crowd management …).

**Conclusion**

This paper analyses the present experience relating to the “Courses for the personnel with designated security duties” after 15 months of the course being provided in Slovenia. The course was successfully introduced into the STCW certification system in accord with international standards. At the end of the course trainees received the same competencies as others worldwide. We did find some weaknesses in the design of the courses. As far as it is known to the authors, there are currently no studies which have analysed whether or not this form of Certificate of Proficiency is absolutely necessary and if it takes into consideration the difference between the experience and knowledge of the various participants. Even IMO member states, recognised security organizations or training providers just verify that all requirements of the STCW Convention are achieved and do not investigate above-mentioned issues. The authors are not currently able to say if this certificate of proficiency is really required, since the current study is insufficient. Therefore, we hope that this presentation is a starting point to define what exactly the special security duties are, who are those personnel with designated security duties and what kind of training is suitable for them. Moreover, it is our contention that it is improper to prepare a course in the same manner for marine security officers who combat pirates, and staff dedicated to the welfare of guests on a passenger ship, whose maximum security duty is to maintain a peaceful atmosphere in the ship’s areas dedicated to entertainment.

**References:**


STUDY ON SHORTAGE OF LNG SEAFARERS

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Abstract
Due to the increase in public awareness on environment, many countries have gradually changed the
traditional energy consumption pattern. Natural gas, with relatively lower carbon emission, became
one of primary energy sources. Within the next few years, the LNG trade is thus set to increase.
However, the training of the personnel engaged in LNG industry, especially LNG seafarers, has not
kept up with the need of the industry, and the shortage of the LNG seafarers is more obvious than
before. This paper analyses the reasons of the shortage of LNG seafarers, the challenges of LNG
seafarers training, and the education status of LNG seafarers throughout the world, and gives some
measures for solving the problem.

Key Words: Shortage of LNG seafarers; LNG trade; Competency Standards

The rapid increase of LNG trade to new economies
Since a series of studies showed that greenhouse gas emission from shale gas are similar to those of
conventional natural gas, and are usually about half those from coal, the United States increased the
development of domestic shale gas and as of 2012, became the world’s largest gas producer surpassing
Russia. By 2012, thirteen companies in the U.S. had filed applications with the Energy Department to
export more than 17 billion cubic feet of natural gas per day (Hannah Northey 2012). At least ten
LNG export projects have been approved so far. According to Key World Energy Statics (IEA, 2014),
Russia produced 671 billion cubic meters natural gas(19.3% of world total ) in 2013, took second place
after United States (689 bcm, 19.8% of world total) of the world, and is still one of largest natural gas
producer. Totally, 31.4% of the trade of natural gas of the world was finished by LNG mode (LNG-
325.3bcm, Pipeline-710.6bcm) (BP Statistics 2014 ).
According to the annual report LNG Trade & Transport (Clarkson 2014), The share of global trade transported by LNG ships stood at 31%, a level it has maintained in the last four years and an increase on the 26% in 2000 and 24%in 1990. By the end of 2013, 17 countries were exporting LNG, and 29 countries imported LNG. The Asia Pacific region is by far the leading market for LNG, accounting for 61% of total imports (BP Statistics 2014)and 75% of global seaborne LNG imports in 2013(Clarkson 2014). Since 2013, China has become third largest importer of LNG in the world following Japan and Korea. Together, these three countries imported 197.7 billion m3 of LNG by ship in 2013, three-fifths of the world’s total. As predicted, China will increase the imports of LNG up to 100 billion m3 in 2015. India has been unable to produce an adequate supply of domestic natural gas since 2004 and now still unable to create sufficient natural gas pipeline infrastructure on a national level. Also, India needs to weaken the risk of its high energy dependency on foreign oil, and has begun to turn its look on multiple foreign resources. Although India is not currently ranked as a main world’s importers of LNG, it could probably move up the ladder due to its dynamic economic growth and modernization.

Table.1 Main World’s LNG Importer 2012 and 2013
(Billion Cubic Meters, Source: BP Statistics 2014)

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>Japan</td>
<td>118.8</td>
<td>119</td>
<td>(6)</td>
<td>France</td>
<td>10.3</td>
<td>8.7</td>
</tr>
<tr>
<td>(2)</td>
<td>South Korea</td>
<td>49.1</td>
<td>54.2</td>
<td>(7)</td>
<td>Mexico</td>
<td>4.8</td>
<td>7.8</td>
</tr>
<tr>
<td>(3)</td>
<td>China</td>
<td>20</td>
<td>24.5</td>
<td>(8)</td>
<td>Turkey</td>
<td>7.7</td>
<td>6.1</td>
</tr>
<tr>
<td>(4)</td>
<td>Spain</td>
<td>20.4</td>
<td>14.9</td>
<td>(9)</td>
<td>Italy</td>
<td>7.1</td>
<td>5.5</td>
</tr>
<tr>
<td>(5)</td>
<td>United Kingdom</td>
<td>13.7</td>
<td>9.3</td>
<td>(10)</td>
<td>US</td>
<td>4.9</td>
<td>2.7</td>
</tr>
</tbody>
</table>

The expansion of LNG ships
As rise the LNG trade in the coming years, shipping companies have to speed up the shipbuilding program to match it. Over the ten years to the start of 2014, the LNG fleet grew at a compound annual growth rate (CAGR) of 11.0%. At the start of July 2014, the LNG fleet stood at 397 ships of a
combined 57.3 m³ (and by the start of November, had reached a total of 407 vessels of a combined 59.0 m³), and has 124 ships of 18.7 m³ of capacity on order book (Clarkson 2014).

Driven by the domestic demand on natural gas, some shipyards in China had made preparation for building LNG ships for years. On April 4, 2008, LNG ship “DAPENGHAO” was delivered by Hudong-Zhonghua Shipbuilding Company. It was the first LNG ship built in China. Since then China speeded up the progress of building LNG ships. Hudong-Zhonghua Shipbuilding Company has delivered six LNG ships so far and at least holds 10 ones on order book. In May of 2014, Dalian Shipbuilding Industry Company signed letter of intent with Tianjin Main for building 4 LNG ships, and had been second shipbuilding company in China which is capable of building LNG ships. By the end of May 2013, GTT had licensed and approved 23 shipyards for the use of membrane Containment System, and 7 of them locate in China. South Korea almost lost its top position of ship building in the world because of the depressed shipping economy during last few years, and successfully defended by taking the opportunity of building LNG ships. After the exploration of shale gas in United States, the shipyards in Japan have also moved back to the building of LNG ship.

The competency standards of LNG seafarers

Competency Standards of STCW Code and SIGTTO

STCW Code and the Annex include the standards of minimum requirements for the Deck seafarers (Chapter II) and Engine seafarers (Chapter III) of different levels (support, operational and management). Chapter V provides additional requirements for seafarers working on special types of ship. These include oil tankers, chemical tankers, liquefied gas tankers and passenger / ro-ro vessels. Additional training described in Chapter V is confirmed by separate certificates that can be obtained. In June 2010 in Manila, a separate section on gas tankers (A-V/1-2) entered into force as amendment of SCTW Code. In the separate section the training requirements for gas tanker personnel were modified and updated, and had entered into force since then.

In excess of IMO requirements, the Society of Gas Tanker and Terminal Operators (SIGTTO) has developed voluntary competency standards for various senior officer ranks on LNG ships (LNG Shipping Suggested Competency Standards), and has published minimum accepted experience levels for such ranks. For the basic consideration of the safety of LNG shipping, many maritime training academies throughout the world would rather provide the training meeting the requirements of SIGTTO competency standards.

New Challenge

After the emergence of LNG-powered vessels that are not LNG carriers, the bunkering of those ships will introduce a large number of people to this new working field, and also bring new challenge to the seafarer training. IMO has developed the new international code of safety for ships using gases or
other low-flash point fuels (IGF Code). Both the draft IGF Code and SOLAS amendments had been approved by the MSC on 94th session, 17-21 November 2014, and will be adopted on MSC 95th in June 2015(http://www.imo.org). Subject to the IGF Code, the minimum requirements for the training and qualifications of masters, officers, ratings and other personnel on ships will be mandatory.

**Shortage of LNG seafarers**

Tab.2 Projected additional officer requirements, end 2013-2018
(Source: BP Statistical Review of World Energy June 2014)

<table>
<thead>
<tr>
<th>Sector</th>
<th>Fleet No. Net Change End 2013 - End 2018</th>
<th>Additional Officers Required - No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemicals</td>
<td>266</td>
<td>4,786</td>
</tr>
<tr>
<td>Containers</td>
<td>182</td>
<td>4013</td>
</tr>
<tr>
<td>Dry Bulk</td>
<td>694</td>
<td>10279</td>
</tr>
<tr>
<td>LNG</td>
<td>122</td>
<td>2079</td>
</tr>
<tr>
<td>LPG</td>
<td>-17</td>
<td>341</td>
</tr>
<tr>
<td>Oil Tankers</td>
<td>2</td>
<td>1,100</td>
</tr>
<tr>
<td>Other</td>
<td>998</td>
<td>15897</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2247</strong></td>
<td><strong>38,495</strong></td>
</tr>
</tbody>
</table>

According to the Manning 2014 Annual Report published by Drewry Maritime Research, the current officer supply is around 610,000, leaving a shortfall of 19,000 personnel. The shortfall is predicted to grow to 21,700 by 2018 since an additional 38,500 officers will be needed by then (Drewry Manning Report 2014). The shortage of senior engineering ranks of LNG ships is more obvious than that of other types (Nigel Gardiner 2014). In January of 2015, China Shipping (Group) Company started the program of recruitment of 500 LNG seafarers for the meeting the gap of about 10 LNG ships on its shipbuilding plan (Matouwang 2014).

**Measures of present LNG seafarers training**

LNG shipment is a tight part of the whole LNG industry, and needs well-trained seafarers, advanced ship-building technologies, and high-quality management. For over 45 years, LNG shipment has not encountered a major accident, and keeps a good safety record. The present shortage of LNG seafarers is putting the pressure on the safety of LNG shipment.

On a short-term basis, shipping companies can re-train and employ the crew from the oil tanker, LPG tankers or Chemical Tankers. Some shipping companies have started this program when finding experienced and certificated seafarers not available. Those seafarers have obtained sufficient experience on ship handling or engine operations. Then, more targeted training can be carried out to those seafarers. For example, the seafarers from LPG ships are used to handling the ships smaller in size, and familiar with the characteristics of limited dangerous gases. Then, the training can be developed to meet the gap.
On a long-term basis, shipping company will pursue to secure a stable supply of LNG seafarers. From this perspective, it will be an effective way to encourage the cooperation between shipping companies and maritime colleges. Shipping company can totally be involved in the MET of the maritime students. Shipping company can select the individuals with the intention to work onboard LNG ships from the college students new enrolled in college, and sign a long-term employment agreement with them. To secure the engagement with these individuals, shipping companies can then cover their tuition and basic living expenses, provide professional training opportunities for them, and totally engage their career development plan with the job promotion system onboard. Meanwhile, maritime colleges should send young teachers onboard LNG ships to learn professional knowledge, or alternatively, provide sufficient teaching positions for those LNG shipmasters or senior officers/engineers with rich experience in LNG shipping practice. Also, maritime colleges should systematically develop the training program and examination standards for the students engaged, and even make necessary adjustment of present training and education system to ensure the in-time supply of qualified LNG seafarers.

Conclusion

Although LNG ship is more attractive for seafarers’ ship preference, much more can still be done to strengthen this occupational attractiveness, for example, through the improvement of job satisfaction and working conditions, the increase of wage, and the obtainment of social status. No matter how long it will take to obtain the stable supply of sufficient LNG seafarers, safety is always the primary issue of LNG shipment, especially for the rapidly developed LNG shipping industry in China.

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Training of Navigation close to Offshore Windfarms

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Abstract

Development and establishment of offshore windfarms as a renewable energy source is in a fast progress worldwide. In European waters more than 5000 wind turbines will be mounted in the next years in. These waters are well known to be one of the most crowded shipping areas with the highest traffic density. Offshore wind parks impede navigation and are limiting the navigable traffic area and increasing risk of collisions. Limited passing and turning spaces, reduced visibility and radar obstructions due to turbine piles and less emergency timeframes for vessels not under command drifting towards offshore wind parks are just few new impacts and problems navigators are confronted with and have to be trained for. This special training is developed in the Maritime Centre of the Flensburg University of Applied Sciences in Germany using realistic traffic scenarios and environments in a specially prepared and programmed modern full mission simulator (see picture no. 1).

Picture 1: Simulation scenario for navigation training close to offshore windfarms

Potential risks and expected problems

Shipping in close proximity of navigational hazards like terminals, platforms, narrow fairways, locks and other pestilent objects is a well-known situation for navigational crew onboard of merchant vessels. Ships navigating in these regions like river passages, harbor manoeuvres and lock entrances are operating on enhanced attention and with different procedures (for example engine room in
manoeuvring mode). Therefore special and additional resources like pilots, shore based radar assistance and particular bridge equipment is used. All these circumstances occur in the beginning and in the end of each voyage from port to port.

In the next years several coastal areas will be used for energy extraction using windfarms. These wind turbines, floating or fixed, are not comparable with single oil or gas rigs/platforms mostly positioned in secluded areas with a rather small shipping safety area around. Windfarms with more than 100 wind turbines will occupy a enormous water area with a imminent impact on shipping and navigation due to the position of these windfarms: Because of maintenance-, service- and cabling costs and reasons the windfarms will be located close to coastlines of well industrially developed countries. This concludes a competitive relationship between windfarm areas and navigable waters for the shipping industries. Shipping lanes and vessel traffic separation schemes are positioned close to windfarms with mostly less than 500m distance between the lane and the wind turbine (according to §7 COLREG a ship safety zone of 500m will be established around the windfarm). So the above mentioned “close proximity navigation” situation will be omnipresent, not just at the beginning and at the end of a voyage.

To exemplify this new problem faced by mariners the German Bight is considered as a basis for further investigation concerning the issue of navigational risks when sailing in vicinity of windfarms. The “Bundesamt für Seeschifffahrt und Hydrographie” (BSH - Federal Maritime and Hydrographic Agency) is responsible for the approval of each windfarm installation. In this regard the BSH ensures the correct, efficient and safe marine spatial planning in the German Bight. The latter is one of the most dense shipping traffic areas worldwide with rather small water depths and predominant bad weather conditions in comparison with other navigational waters close to the equator. So, weighing the needs and requirements of the energy windfarm industry and the shipping market is a strong effort mostly accompanied by compromises on both sides. The following picture no. 2 represents the actual planning and operational status of the windfarms in the German exclusive economic zone,
Picture Error! Main Document Only.: Considered shipping lanes (blue color) between offshore windfarms (red color)

Picture no. 3 symbolizes the considered shipping lanes and picture no. 4 shows the AIS traffic between offshore windfarms recorded over a period of one year. This picture illustrates the fact that not all of the existing traffic is incorporated in the new shipping lanes in between the offshore windfarms. From this it follows that a lot of vessels have to modify their routes and are forced to use the new shipping lanes. The outcome is another additional increase of traffic density between offshore windfarms. Another huge problem in this context is the juridical aspect of the “shipping lanes” which are not classified as an official compulsory route to be used by ships like traffic separation schemes or fairways. From a superordinate point of view the even the guaranteed freedom of navigation is constrained. These issues will not be discussed in this paper.
Navigational risk is increased while manoeuvring close to offshore windfarms, this was proved in risk analysis studies. Two major risks and restrictions were identified and pointed out:

- **Radar shadowing:** Windturbines will affect the radar detection quality of vessels passing windfarms due to shadowing and indirect echo failure effects. This was analyzed using a test vessel (MV Morven) operating close to Kentish Flats offshore windfarm (picture no. 5) and simulation technologies (picture no. 6). The participants of the special offshore navigation training course are confronted with these radar phenomena. The radar equipment is one of the most important tools for collision avoidance on a bridge of a ship. Limited and restricted functionality, for example “invisible” vessels behind offshore windfarms on a collision course, is a major impact on navigational safety.

Picture 4.: AIS traffic between planned offshore windfarms recorded over one year
Collision risk with vessels not under command: Vessels sailing on the highly frequented traffic separation schemes “Terschelling German Bight” and “German Bight.”

Picture 5.: Investigation of Technical and Operational Effects on Marine Radar Close to Kentish Flats Offshore Wind Farm.

Picture 6.: Radar shadowing effect close to offshore windfarms analyzed using simulator technologies.
Western Approach” and encountering technical problems of any kind are running into high risk of a collision with an offshore windfarm. This is the result of a quantitative risk analysis study considering the (1) amount of traffic in this area, (2) the ship types, (3) the predominant wind, swell, wave and current direction and (4) all shipping routes. The formula represents the collision frequency calculation including the consideration of a probability to conduct a successful repair of the main engine or an emergency anchorage manoeuvre.

\[
\Omega_d = \sum_{\text{routes}} \sum_{\text{wind directions}} \sum_{\text{wind forces}} \sum_{\text{wave height}} \sum_{\text{ship types}} p_{\text{navi}}(m) \cdot p_{\text{Met}}(j,k,l) \cdot p_{\text{anchor}}(i,k,l) \cdot N_{\text{amount ships}}(i,m)
\]

The following picture provides the result of the collision risk calculation symbolized by high risk in red color and low risk in green color for ships operating on the two traffic separation schemes.

The quantitative results are: One collision every 33 years on a cumulative consideration (all offshore windfarms considered). In regard of special see area surveillance operations like guard vessels and additional emergency tugs et cetera this value is reduced up to one collision in 130 years.

**Training concept and scenarios**

The training concept is based on different complex traffic constellations at distinctive crossing positions in the German Bight which are predicted to be the most challenging points to be managed by the navigator. Radar pictures and different common ship types are simulated as well. Continuous trainings and numerous simulations are necessary to generate the necessary risk and situation.
awareness for the bridge personnel. Picture no. 8 symbolizes one of the simulation scenario outlines with a own ship (“Eigenschiff”) sailing on the traffic route (“Weg 10”) and heading towards a crossing course situation with a car carrier approaching from starboard. Additionally the manoeuvring space to portside is limited by a containership (“Großcontainerschiff”). This simulation was conducted several times with different bridge personnel. The results are summarized in picture no. 9. It is clearly visible that most of the manoeuvres necessary to give way and follow the COLREG rules lead to a very close passing distance to the offshore windfarm. The safety margin for similar manoeuvres which probably are not conducted with care is reduced enormously. To emphasize on and underline the critical situation:

The own ship is forced to follow the COLREG rules, at present there is no traffic separation scheme planned in this area. This would help to coordinate the number of crossing points and reduce the amount of giving-way manoeuvres close to windfarms. Furthermore another critical manoeuvre has to be investigated: The full circle turn which is necessary in case of emergency of any reason.

According CESMA (Confederation of European Shipmasters’ Associations) this turn requires a minimum space of six ships length\textsuperscript{iv} to both sides which is not guaranteed in the present planning stadium of the marine spatial planning in the German Bight.

![Diagram of simulation scenario used in offshore windfarm navigation training](image)

Picture 8.: Example of simulation scenario used in offshore windfarm navigation training
Conclusion

The actual marine spatial planning rules and procedures and not prepared and applicable for the new tasks and problems in context of offshore windfarms in close proximity to highly frequented shipping traffic lanes. Mariners will be confronted with extremely reduced and limited navigational areas and manoeuvring possibilities to navigate in compliance with COLREG’s. Additional problems like radar shadowing and high collision risks in case of vessel’s not under command will be faced. Currently available electronic identification and navigation systems like AIS are not sufficient to compensate.
The ship’s bridge personnel needs the “full picture” of the traffic situation, including inside and outside the windfarm.

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SAFE MANAGEMENT OF SHIPS – AVOIDING ACCIDENTS RELATED TO AUTOMATION FAILURES

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Abstract
The people are well aware of the application of the information technologies in the management in particular Management Information Systems which facilitate operation of the organizations. The automation applied to the control of the vehicles such as ships and aircrafts is also important. The ships are the largest vehicles ever created by humans. Any failure in the propulsion, communication and command control systems may cause serious even fatal accidents. Nowadays ship management systems are almost fully automated and any automation failure may cause unacceptable accidents with damage to the human life, ship, environment, port and the goods transported.

Automated systems are very capable to facilitate ship management and are comparably better than manual systems, but they do not have common sense. What this means is that automation systems must be controlled by the human element at all times. These systems are products of high technology and users should be aware of the working principals, limitations and specifications of them in order to be able to avoid any accidents in case of failure in the system. Automation systems failures are significantly important for the ships sailing in dense traffic conditions. Any failure on navigation system may cause the total loss of a ship or ships in the vicinity.

This study gives a background to existing studies on the development of accident avoidance systems and calls other parties for cooperation to achieve a common solution to overcome problems. In the light of the existing studies and findings of discussion, some solutions are proposed.

Key Words: Safe Management of Ships, Automation Failures, Ship Automation, Human Element versus Automation.

INTRODUCTION
The automation systems play a significant role in the management systems of the operational units such as factories, ports, terminals, ships, aircraft even road transportation systems. In order to reduce the required time and manpower and to ensure the quality of the work and safe operation, approximately all big facilities and vehicles are equipped with the automated systems. At the beginning automation applications have been accepted as a purely technical issue, but later it is clearly understood that also management related issues exist.
There has been a revolution in the design of ships and highly improved technologies have been applied to navigation, communications, command control, propulsion and cargo handling systems on board. The use of automation both for navigation and machinery systems has been enhanced and automation equipment has started to control the ship on behalf of the crew. The role of the human element has been reduced to supervision of the highly automated systems. This development makes the ship crew extremely dependent on such systems on board.

Although automation has made life easier for the crew, it has also introduced new problems. Automation failures which arise unexpectedly may bring about serious results and even casualties. These results may endanger not only the ship herself but also other ships and facilities in the vicinity, and cause damage to the environment as well.

Automated systems are more capable than humans for handling management systems but they lack of common sense. To fill this gap related to foresight (judgement), we still need the human element for the supervision of automated systems.

THE RESEARCH METHOD
The aim of this study to review the previous studies and research activities on the automation failure related accidents at sea and to propose solutions which may prevent the accidents and/or reduce the number of the accidents.

The research is conducted in three phases. The first phase is intended to understand the specifications and requirements of the automation era. The second phase is an investigation based on the existing studies on the accidents that happened due to failures of automated systems. And the final phase will cover a deep study to formulate possible and feasible solutions to overcome automation related problems, which directly affect the safe management of ships.

THE AUTOMATION ERA
We are living in an era in which automation affects our modus operandi in many services as well as in the maritime sector. So we should accept this reality and take necessary actions to reduce the negative impacts of automation.

At the beginning the main aim of automation was to reduce the manpower requirements and provide standardization in the industry. This aim was mostly achieved and it made life easier for everybody in the business. Airline pilots and ship masters are very happy to have automated navigation and communications systems on board and marine engineers are now very comfortable in their engine control rooms instead of being in hot and noisy engine rooms.
The “rapid reaction” and “just on time” concepts have also become very important in the new world order. Automation has also helped industrial and business activities to meet the requirements of these emerging concepts. The banking, logistics, transportation and government sectors have adapted automation systems to their management systems. But this improvement has also introduced many negative impacts/side effects because of the complex design aspects of the highly sophisticated state of art systems in the business and industry. Today, you do not have to go to the bank for your banking needs. You just go online to get them done. However, if the systems collapse or are locked, there is no way out except applying manual techniques.

Failures in automated systems on board ships may be more serious and even result in fatalities. If you are unable to use your rudder system due to automation failure during close manoeuvres, that is likely to cause serious damage or even the loss of the ship and lives. The loss of surface picture during a live fire exercise may cause loss of the target ship. In the navy the loss of sub-surface picture in combat actions may due to common and control system failure cause loss of a highly valuable warship and her crew.

Because automated systems are not fully reliable, the regulations ban the use of automated navigation systems in the confined waters. As a good example use of automated pilot systems cannot be used in restricted waters as stated in the Bridge Procedure Guide (2007) which is a fundamental guide for the mariners. Nowadays the modern ship engine rooms are fully controlled by automated systems, but it is still compulsory to have an engineer officer on the watch (STCW, 2010).

We are very happy with automated systems on board in both the merchant fleet and naval ships, but we are also well aware of the fact that we are playing with a very dangerous tool which may suddenly cause serious problems for us. So, we should conduct studies to overcome these problems and find solutions to reduce the negative impacts of automation failures.

THE MAIN REASONS FOR INCIDENTS DUE TO AUTOMATION FAILURE

Many surveys, studies and research activities have been conducted by many respective authorities and institutions to investigate the main reasons for incidents due to automation failures in the maritime sector. This studies and projects will be discussed in this part. The role of the human element in case of automation failure will also be considered.

1. Surveys and Studies

The most enhanced and comprehensive study was published by the United Kingdom Maritime and Coast Guard Agency (MCA) in 2007 (MCA, 2007). Many studies on these subjects have benefited from this study.
**The resume of the main MCA findings are as follows:**

The over-reliance on automation by crews

Ship crews are often overconfident in the data presented to them by automated control systems rather than the data provided by other manual methods, which is considered more time consuming.

There is often a lack of understanding by ships’ crews of automated control systems and any inherent weaknesses they may have. Automated ship-borne maritime systems do not always have optimal ergonomic design considerations.

Maintenance and calibration errors when setting up automatic control systems can lead to catastrophic consequences.

Man machine interface in particular on some screen-based automatic control systems, the human-computer interface can be very confusing to the user.

Some current automated systems do not adequately support the system operators in developing and maintaining situation awareness which is highly important to handle a vessel.

The crew are overloaded with information provided by automated systems which is not easy to comprehend by human perception.

Any careless maintenance and calibration may create improper operation of the system which cause misconception.

Additionally there are some other factors which have been reflected in the other studies:

**These are:**

The existing education and training systems do not sufficiently cover the main principles, limitations and weaknesses of automation systems and the students are not capable of understanding this critical knowledge when they meet automated systems on board.

There are not a sufficient training courses and supporting tools to introduce trainees better understanding the emergency operation procedures and required actions in case of such failures (IMO MSC, 2001).

The automation equipment is mostly based on electronic/electric systems and used by navigation and marine engineering officers and ratings. But the existing education programmes for deck and engine officers do not cover these subjects sufficiently to make them fully understand automated systems.
There is not an internationally recognized or recommended special training model course related to crew training on automation failures (Ziarati and Ziarati, 2010). Many studies on sea accident investigations prove that 60% of accidents are due to human error, 19% structure/mechanical failure and 10% equipment failure (Figure 1). Another fact is that sometimes it is not easy to clearly define the reasons of accidents because of the complexity of highly advanced systems on board. Although we do not have a reliable study on accidents related to automation failures, we can assume that the reasons of this kind of accidents are distributed in the human error, structure/mechanical failure and equipment failures. So studying on automation failure will be a good solution to reduce the number of accidents.

These studies should not only be focused on the technical solutions but management issues should also be carefully investigated. There is a significant man-machine interface issue which should be evaluated as a part of management studies including organization, manning and training aspects.

![Figure 1: Reasons for Accidents (Source: Ziarati, 2011)](image)

All these studies on the merchant fleet are open to the maritime community. We believe that the navies of different countries have also done similar studies but these are not accessible due to security considerations.

2. A related Project- SURPASS
The SURPASS (Short Course Programme in Automated Systems in Shipping) is a European project to provide special training to seafarers for them to understand the automation systems and enable them to realize the weaknesses and limitations of such systems. The project also gives support to industries so that they realize human-related problems when they require or design and produce automated systems (www.surpass.pro).
The course can be delivered in a classroom environment but also using e-learning systems. The assessment of the course can be conducted in both dimensions. These two types of delivery method facilitate the delivery of the course to crews working on board as well.

The project has been completed as a result of two years of study in six countries. The course programme has been created in four steps:

- Over 300 accident report synopsis were reviewed
- Questionnaires were developed and results were reviewed
- 6 accidents were chosen for scenario development
- Scenarios were developed to use in full-mission simulators

The initial part of the course covers the introduction of the main principals of automation systems and continues with the weaknesses and limitations of them. The second part is based on generic scenarios which facilitate the understanding of the operation of automated systems. The project also makes a place for users to improve their own scenarios to support special requirements. Further information is available on the SURPASS website (www.surpass.pro).

3. Human Element

Although the automated systems facilitates the ship operation, they are not so reliable as most users believe pending upon their experiment on board. An automation failure may cause serious damages even with fatal results if it happens in a critical condition. But if user is well aware of the limitation of the system, he/she may find a quick solution to this unexpected situation using common sense. So the training based on the automated systems including system operation philosophy and limitations will be a perfect solution to avoid accidents.

The user is in a position to follow both real life situation and the tendency of the automated system. That requires application of a high degree of awareness. As soon as user is aware of the difference between real situation and situation introduced by automated system, he/she should make a quick assessment to define the real picture. To make a successful evaluation the user needs a clear understanding on the limitations and algorithm of the automated system and should be capable to realize the real condition from other sources of information. Following this assessment, the user should start a decision make process to find solution to overcome the problem by him/her. There could be many courses of action and user should be capable to choose the best action using his knowledge, experiment and common sense (See Figure 3).
The human attitude is the key element to avoid an accident related to the automation failure. So we should take necessary measures to ensure that the user will make the correct decision in that case. One of the best solutions is to train the users about the automation systems and apply simulator training based on accident case studies. These types of trainings are essential to refrain accident at sea which are mostly caused as a result of human error. The STCW covers many types of safety trainings considering different type crucial conditions at sea. It is strongly believed that the trainings based on the automation failure related accidents should be included into the STCW.

Due to excessive use of the automated systems the crew losses their ability to do their tasks manually and this reduces their reactiveness in case of automation failure. Some additional training should be planned and conducted as if there is no automated system on board and users should have an experiment to achieve his tasks manually. This kind of training and drills will provide maintaining their manual skills.

**CONSIDERATIONS**

In the light of the above mentioned facts the following considerations which ensure the safe management of ships are found. These considerations are open to discussion and need further studies. Firstly we need to improve scenarios in the light of the existing accident investigation reports related to automation failure, and then we should select the most applicable ones for training purposes. Based on these selected scenarios we should study risk assessments. Working on the risk assessments we
can improve our risk management plans which will help us to create our standing checklists before accident happens and “to do” list in case of an incident (Klimczak, 2007).

Secondly we must decide on the aim, objectives and learning outcomes for our training which will help us to decide on the content of the programme based on the scenarios. This programme should also cover the introductory subjects’ related basic working principals, capabilities, weaknesses and limitations of the selected automation system. The main part of the training should be constructed on a real time scenario and case studies.

These kind of realistic trainings should be included in the education and training programmes of maritime education institutions for both cadet officers (midshipman) and crews. Such an application will strengthen the existing maritime vocational education and training systems and achieve more realistic in-school training.

The electro-technique courses in the operational and management level Marine Engineering programmes (IMO Model Course 7.04 and 7.02) provide basic information to the cadets to understand main feature of the automation systems and it is strongly recommended that this course should be added also to Navigation Engineering programmes (IMO Model Course 7.03 and 7.01) to have a similar background. The managerial level officer courses are based on ship management related problems and in particular in case of emergency situations. And it is fairly important inclusion of automation related courses in these programmes. The academic programme of the most of the naval academy is in line with the STCW requirements to provide their midshipman also seafaring officers’ qualifications and this issue should also be considered for them.

The STCW introduced two new job specifications in the engineering department which are ETO (Electro Technical Officer) and ETR (Electro Technical Rating) both are closely related to the automation systems on board. Following these improvements it is evident that ships will have special training programmes and drills on automation failures. This training will also cover other officers and ratings who are the end users of these systems.

The close cooperation between user side and industry will be very helpful for producers to solve ergonomic problems at the design and production phases of ship-borne automated systems. Additionally short courses for crews on newly introduced automated systems by producer, before or during mounting phase will provide better understanding of the system features by users. It will also help the producers to realize problems at the user side and to improve solutions to them.
CONCLUSION

Unfortunately the shipping industry still suffers from accidents related to automation failures. This situation enforces us to take necessary measures and actions to reduce such accidents which may create serious even fatal results. The better education on these systems is one of the solutions which may be applied in the short term. But we should also consider additional measures and actions.

It is approved that there is a need to improve new techniques, methods and procedures including management aspects to overcome accidents related to automation failure. All these studies should be reflected to the officers and crew education and training programmes. Considering the working conditions of seafarers, different types of delivery methods for education in particular distance learning should be considered. The SURPASS project will be a good example for future activities from which we will benefit greatly.

The cooperation between users and producers of automated systems will create synergy and platform for transfer of knowledge, experience and innovations. This will also eliminate man-machine interface problems and feedback from end-users provides valuable information for the system designers.

Because of the nature of operations at sea, not only merchant fleets but also navies experience the same problems. Most of the systems developed for merchant and war ships are very similar and they are usually produced by the same companies. This facilitates cooperation between navy and merchant fleet sides as well as producers. To sum up, we should look for new cooperation opportunities in the new world order.

Acknowledgement

I thank to all contributors of the EU Leonardo Projects “SURPASS” for opening me a new horizon to start a study concerning improvement a new manner for avoidance automation related ship failures.

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MIGRATION FROM DIPLOMAS TO DEGREES: CPUT CONTEXT

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Introduction
In the South African context maritime education and training (MET) provision is, not limited to,
• in-house training facilities for the various shipping companies,
• private training providers and
• public (state subsidized) institutions.

These MET providers are located mainly in the Western Cape (Cape Town) and Kwazulu-Natal (Durban) regions (Appendix 1). It is envisaged to roll out MET to the Eastern Cape region in the near future.

The type of MET covers a broad spectrum of teaching and learning and incorporates, among others, qualifications aligned to the international Convention governing the Standards of Training, Certification and Watchkeeping for Seafarers 1978, as amended in Manila in 2010 (STCW), and non-STCW type qualifications.

South African Higher Education Qualifications Sub-framework (HEQSF) and newly proposed maritime qualifications

In terms of the newly promulgated HEQSF (Appendix 2), it is the intention of the department of Maritime Studies (DMS) of the Cape Peninsula University of Technology (CPUT) to offer the following programmes as from January 2018, viz.

1 Bachelor's Degree in Nautical Science (to replace the existing ND: Maritime Studies). This programme has been approved by CPUT’s Academic Planning Committee (APC), Senate and the Department of Higher Education and Training (DHET) and awaits clearance from the Council on Higher Education (CHE) and the South African Qualifications Authority (SAQA). DHET approval was also granted for the Higher Certificate and Advanced Certificates in Maritime Studies.

2 Bachelor's Degree in Marine Engineering (to replace the existing ND: Engineering: Mechanical: Marine). This programme has been approved by CPUT’s Academic Planning Committee (APC) and Senate and awaits approval from DHET and clearance from CHE and SAQA. APC and Senate approval was also granted for the Higher Certificate and Advanced Certificates in Marine Engineering.
Challenges in the diploma system

The content of the ND was aligned to the requirements contained in STCW, as amended in 2010 (Appendix 2).

Without the requisite work integrated learning (WIL) component (appropriate sea-service or industry experience), students cannot qualify due to the sandwich modality (2 years academic + 1 year WIL) of the existing ND system.

This scenario has created a number of challenges, not limited to,

- a poor throughput rate. Approximately 15% of students complete their qualification in minimum time (It takes, on average, approximately 10 years to complete the ND because of the sea-service requirement). This renders DMS non-viable as a large component of the Government subsidy (60%) is deferred.
- Shipowners are becoming increasingly reluctant to promote cadets to watchkeeping officers with a Deck or Engineer Officer of the Watch certificate of competence (CoC) at the ‘tender’ age of 21 years. They deem these young officers to be inexperienced and under-prepared (12 months minimum sea service requirement) to safely man their billion-dollar investments.
- Gaps in learning. The phased-learning approach (refer Appendix 2) creates gaps in learning, rendering South African nationals non-competitive globally.
- The sandwich modality of the ND system dictates that shipowners have to release their employees, at great cost and disruption to their operations, to continue their studies (Chief Mate, Master, 2nd Engineer, Chief Engineer) ashore.
- With only two STCW compliant vessels (SA Agulhas I and SA Agulhas II) on our South African (RSA) Register, cadet berths are at a premium. We have to go cap-in-hand to broker cadet berths with non-RSA flagged owners. This scenario is fraught with its own challenges in terms of mentorship during the cadet phase.
- Students cannot access finance until they qualify with a ND at age 28. The risk for financial institutions to fund a person without a recognized qualification registered on our NQF is allegedly too great.
- There is no articulation possibility into post-graduate, MET studies. MET post-graduate qualifications, for seafarers, are only offered by universities abroad.

Why the degree route?

Degrees develop higher levels of theoretical (cognitive) and technical knowledge (refer to Bloom’s Taxonomy: Knowledge, Comprehension, Application, Analysis, Synthesis & Evaluation).
There are currently no MET under-graduate degree programmes catering for the needs of the South African seafaring community. As a consequence, South Africans are forced to obtain their post-graduate MET degrees, at great cost to the RSA tax payer, at institutions abroad, e.g. World Maritime University, Malmo, Sweden.

We live in an era, in the South African context, where a university education is perceived to be essential for an individual’s progress. In addition it is argued, in some circles, that a qualification which incorporates work integrated learning (WIL), e.g. the current National Diplomas, is less worthy than one where a university degree is earned.

There is a perception that STCW78, as amended, qualifications, e.g. Master and Chief Engineer (Class I) certificates of competency (CoC) do not have the status of a degree. As a consequence, young South Africans (and perhaps their parents who are ambitious for them to complete a recognized qualification) will turn their back on a sea-going career. To exacerbate the challenge, South African universities (lecturing staff) and our financial institutions (bonds, loans, hire-purchase agreements, etc.), among others, do not understand CoC’s and its value. To add to our dilemma, CoC’s are not currently registered on the National Qualifications Framework (NQF). Our Administration, the South African Maritime Safety Authority (SAMSA) has put a process in place to register CoC’s on the NQF at the appropriate level. It is the intention of the newly legislated professional body, the Institute for Professional South African Mariners (IPSAM), to assist in this regard.

Aligning and packaging the content of our seafaring qualifications into a degree programme may go a long way to the reverse current thinking. It has been a long, arduous journey (square peg in round hole) trying to persuade many, both inside of and outside CPUT, on the merits of degree programmes for our industry. At an Industry Advisory Committee (IAC) workshop held on 10 April 2015 SAMSA, among other stakeholders, endorsed the newly proposed degree programmes.

**Advantages of the degree route**

- Once implemented, it is envisaged that shipowners shall benefit from more mature, well educated, English speaking graduates to safely man their billion-dollar investments.
- South African graduates may become more lucrative in the eyes of the international shipowner as they do not have to be released for additional training, once employed.
- Armed with a degree, graduates may be more readily absorbed into employment opportunities ashore.
- It is the intention of the undergraduate degrees (B Naut Sc & B Mar Eng), the first in the history of South Africa, to articulate into post graduate (B Hons, Masters & Doctoral) studies. Candidates with a ND and a Master or Chief Engineer CoC may articulate to a cognate
Bachelor Honours degree upon completing a Senate approved bridging course or via the university’s Recognition of Prior Learning (RPL) vehicle.

- The advent of the degree programmes will unlock a myriad of post-graduate research opportunities in the cognate discipline.

**Staff development**

The imminent implementation of the degree programmes necessitated staff to be further developed with post-graduate qualifications, the minimum requirement being a Masters degree. To achieve this objective, DMS have obtained scholarships to send their lecturing staff for further studies in Germany (*Jade*), Slovenia (*Ljubljana*) and Sweden (*World Maritime*).

**Conclusion**

Some of the challenges facing MET in South Africa are, among others,

- the paucity of suitable cadet berths
  and
- the inability of DMS to attract suitably qualified lecturing staff (Master or Chief Engineer CoC + a Masters degree).

In January 2011, the SAMSA National Cadet training project was initiated. The project aims to fully sponsor the experiential (work integrated learning) component of cadet training. This shall, in particular, include the costs incurred for training berths that may encourage third-party shipping companies to come aboard.

A SAMSA subvention of salaries was brokered in 2011. The aim of the SAMSA subvention is to top-up the salaries of current and aspirant lecturing staff to the same levels of a SAMSA surveyor (*holders of a Master and Chief Engineer CoC*). This shall, in all probability, make it more attractive for appropriately qualified and experienced sea-going personnel to take up the challenge of a lecturing position ashore.

In a bid to address the aging demographics in shipping, we need to devise innovative ways of attracting large numbers of high quality candidates to officer ships in the future. Additionally, we need to be mindful of the fact that talented individuals are in demand, in the maritime support industries, ashore.

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PROFESSIONALIZATION & DIVERSIFICATION: MEETING THE NEEDS OF INDUSTRY

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Abstract

The IMO has regulatory oversight of international shipping and through instruments including STCW strives globally to ensure valid and consistent training. However the stereotypical seafaring career has evolved into a multi-faceted, multi-dimensional collection of professions. A global cookie-cutter approach of educating and training seafarers will no longer satisfy the modern industries of today. The oil and gas industry values traditional marine skills but with profuse and requisite supplemental skills and training. Supply vessels no longer just supply, but are a platform for rescue, rig shifts, dive support, and other specialized duties. The polar region is experiencing commercial vessel transit, with potential impact on the environment. These examples signify the need for evolutionary learning of the professional mariner in order to meet the ever-changing needs of industry. The challenge for MET will be to provide quality training in specialized areas with sophisticated new equipment, professional faculty, and through distance or blended learning methodology. MET institutions will develop their own areas of training specialty - it will not be possible for each to be a one-stop shop for all maritime education and training. Attracting and retaining staff will focus not just on the master mariner and chief engineer but include those with other areas of specialization. Regional experiences and demands will shape MET. Research and development will be a growth area for savvy institutes of higher learning. Collaboration both with industry and other MET institutions will be required to allow an efficient and effective provision of required training and research. This paper will explore these topics augmented with examples as experienced through the presenter’s Canadian experience.

Keywords: Collaboration, distance education, MET, research, STCW.

Introduction

The International Maritime Organization (IMO, 2015a) states that it is “the global standard-setting authority for the safety, security and environmental performance of international shipping. Its main role is to create a regulatory framework for the shipping industry that is fair and effective, universally adopted and universally implemented”. It further states that shipping is “a truly international industry, and it can only operate effectively if the regulations and standards are themselves agreed, adopted, and implemented on an international basis.”
While the statements are generally true there is no high-level recognition of the prevalence of specialized shipping, to the extent that the word ‘shipping’ in some cases may be a misnomer. The Manila Amendments (IMO, 2011a), through Chapter V, does give some recognition to specialized vessels, however this is limited to oil, chemical, and liquefied gas tankers, and to passenger ships. The IMO (2015a) also states that “International shipping transports about 90 per cent of global trade to peoples and communities all over the world.” While true, the statement no longer truly reflects the diverse nature of the industry and consequently the breadth of required training and even certification demanded by industry. The maritime industry of today focuses not only on transportation of goods but more and more on the provision of specialized services. Advances in technology have given rise to specialized shipping including those that are now able to delve farther into arctic regions. Maritime and education training institutions (MET) are challenged to provide services to this ever evolving industry. While new tools such as distance delivery are of increasing benefit, the evolving nature of the industry will create new challenges for MET but also open new opportunities particularly in the area of research. This paper will explore some of the challenges and opportunities for MET, particularly from the Canadian experience.

**The Canadian Oil and Gas Experience**

Seafaring is no longer the stereotypical career but rather a multi-faceted, multi-dimensional collection of professions. The oil and gas sector as found in Canada exemplifies this analogy. MET has traditionally focused on producing deck and engineering officers for industry. Graduates from these programs increasingly find that they need additional training for the higher-paying and specialized sub-industries. Graduates hone basic skills and gain experience in the traditional sectors but often with an eye on the more specialized and lucrative careers.

The offshore oil exploration, development, and production industry values traditional marine skills but with profuse and requisite supplemental skills and training. There are varying types of structures and vessels, some with command hierarchy and job titles and descriptions which are much different than in the traditional maritime arena. Senior management of offshore installations include the Offshore Installation Manager (OIM), Ballast Control Operator; and Barge Supervisor. The OIM is defined by IMO (1999) through Resolution A.891 (21) as the person in charge, who has complete and ultimate command of the unit and to whom all personnel on board are responsible. Frequently they have little marine expertise.

The Canadian Marine Personnel Regulations (MPR) includes a section for Mobile Offshore Unit Certificates (Transport Canada, 2014). Prerequisites are listed for the OIM and include qualifying service with mandatory experience in twenty cargo transfer operations with a supply vessel; relocation moves of an MODU; and assisting in helicopter landings. Qualifying service may be obtained in non-
traditional marine positions, such as barge supervisor, and tool-pusher. Training for the OIM is required but consists mostly of a number of short duration courses. In Canada, there is no formal program of training for these positions. However the industry does collaborate with MET to design and provide a number of the required courses. It avails of the marine expertise found within MET but it reciprocates by helping MET to gain experience and equipment to expand the breadth and depth of the type of training it can offer.

There are associated challenges. Oil exploration occurs hundreds of kilometers offshore in the North Atlantic. The impact of a catastrophic failure may exceed that experienced on the traditional ship. In Canada the loss, in 1982, of the drill rig Ocean Ranger with 84 persons is touted as Canada's worst tragedy at sea since the Second World War (CBC, 1982). The senior personnel were in drilling related positions with limited marine qualifications or experience.

Although training has been enhanced the required qualifications are still not marine-related. MODUs are globally transient, with crews of varying nationalities. It is difficult to verify qualifications and experience even as outlined in the Canadian MPR. Not all countries will have similar guidelines. In Canada marine safety inspectors typically have a traditional marine background, and it may be questioned if they have the necessary experience to audit persons for offshore qualifications, experience, and suitability.

The traditional offshore supply vessel has evolved into a highly technological platform with diverse capabilities, crewed by persons with an increasing set of skills. Crews conduct rig shifts, iceberg tows, remotely operated vehicle (ROV) operations, and provide dive support – all specialized activities. Crewmembers are trained to be rescue specialists and medical responders. This places increased demand on the seafarer and also on MET to provide the associated training.

The Canadian offshore industry is self-regulated for much of this specialized training. The Canadian Association of Petroleum Producers (CAPP, 2013) has produced the Standard Practice for the Training and Qualifications of Personnel (Standard Practice) that stipulates competencies. To be fair, the industry does take this oversight seriously. It has voluntarily struck a committee charged with oversight, and it is comprised of representatives from the operators, offshore workers; training providers, and Government regulators. This allows MET to have input into training requirements and be at the forefront in the development and provision of it.

A number of the courses are specifically related to the offshore but with a marine flavor. The five-day Basic Survival Training (BST) course - requisite prior to anyone working offshore - teaches basic skills for responding to fire emergencies, sea survival, and also Helicopter Underwater Escape Training
(HUET). Although not a standard marine course, industry has availed of the marine expertise of MET in order to build this training, and has partnered in the acquisition of specialized and costly equipment. Other jurisdictions have BST related and mandated training but with variations. As there is no one universal standard this too creates challenges for MET and industry, as workers are globally transient. Certification in one jurisdiction may not be fully recognized in another thus requiring further training to do the same job in that new location.

It is recognized that in the event of an emergency evacuation from an installation that a coxswain is required to take charge of the lifeboat and launch. The industry does mandate training to enable candidates to take control of the survival craft in an emergency situation. The prerequisites relate to medical fitness and a valid BST. There is no prerequisite of marine experience. The types of launching systems and equipment can vary and include the conventional davit launch, the free-fall lifeboat system, and the Preferred Orientation and Displacement System (PROD). This creates a challenge for training institutions, and trainees. So far MET has been up to the challenge. The infrastructure, and equipment is costly for both industry and for MET. Institutions will require specialized equipment including simulators in order to provide the training. In Canada this has resulted in industry and MET working closely to ensure the provision of equipment and training. However a real emergency will be the true test of the effectiveness of the training.

**The Polar Region**

Changing climate trends, better technology, and more robust and dedicated ships are now cited as reasons that the Polar Regions are experiencing an increase in commercial vessel transit. In response the IMO (2015b) has now developed the Polar Code, with an entry into force date of January 2017. The waters surrounding the poles are environmentally sensitive, with few resources to respond to any significant environmental or safety related incident. The Code is primarily dedicated to the prevention or mitigation of an incident but also recognizes search and rescue challenges. The design and construction of vessels, and equipment used to transit these areas will be significantly impacted. Polar Water Operational Manuals will detail the vessel’s operational capabilities and limitations.

Navigational challenges are recognized along with training concerns. It is expected, at least initially, there will be a dearth of mariners experienced in polar navigation and that are available or willing to instruct in this specialized area. This may be a particular challenge for countries that are not in close proximity to these regions but do train mariners for the global trade. Some MET institutions will seize the opportunity and become specialists in the provision of the related training.

The STCW amendments intend to meet this requirement through a training and certification process. According to Snider (2015) an initial certificate of proficiency is issued to deck officers after successful completion of an approved STCW basic course followed by the advanced certificate of proficiency after obtaining approved seagoing service within polar waters.
Snider is also pleased that the Polar Code is finally a mandatory requirement replacing a number of non-mandatory IMO guidelines for ships operating in Arctic and Antarctic waters and that have existed since the mid-Nineties. This will require some MET providers to step forward and provide the training expertise required by this Code. Industry will require this training and will demand that it is quickly in place.

**Distance Education**

The Manila Amendments are “aimed at ensuring that the necessary global standards will be in place to train and certify seafarers to operate technologically-advanced ships for some time to come” (IMO, 2011b).

MET will be challenged to provide quality trained seafarers to operate these technologically-advanced ships. The diversity of unconventional vessels, and geographical areas in which they operate will require sophisticated new training equipment, and a diverse, professional, specialized, and sometimes unique faculty. MET institutions will develop their own areas of training specialty and become global centres of excellence. Some institutions will specialize in the distance or blended learning methodology of training and education.

The Manila Amendments (IMO, 2011a) through Section B-I/6.6 recognizes the use of distance and e-learning, and allows Administrations to approve training providers to use it. Distance learning is required to be suitable for the objectives and tasks for that subject. However there is no substantive guidance given to this matter. For example the topic ‘chart-work’ may, by some, considered a subject that is not conducive to distance learning due to the amount of hands-on work and normal one-on-one time spent between instructor and student. However the Marine Institute (2015) has successfully taught this course to fishers via distance, in order that they may successfully sit the Transport Canada challenge exam for this subject.

The IMO guidance also stipulates that there must be clear and unambiguous instructions and a provision of learning outcomes; that the training be structured; that there is learner self-assessment and tutor marked assignments; that the learner is provided with appropriate assistance; and that the learning system is secure in order to prevent hacking.

Distance delivery is universally accepted, and increasingly sophisticated. A number of universities provide training entirely in this manner, as exampled by the Canadian Virtual University (2015), collaboratively offering hundreds of online degrees. The Marine Institute offers a number of degrees entirely in this fashion.

The offshore industry off the east coast of Canada also recognizes its value. Traditionally all workers proceeding offshore underwent face-to-face safety, security, environmental, and work related training.
The industry now avails of distance delivery so that employees can complete this training from anywhere in the world and prior to going offshore.

However distance delivery does create challenges. Faculty will need to specialize in design, and delivery of training. Staying current with the latest iteration of software, and hardware will be paramount. Skilled technicians will be required to maintain the systems. Clients will become increasingly demanding. The difference in time-zones of learner and instructor will not be an acceptable reason for delays in delivery or maintenance of the system.

Chong Chae (2011), in his research paper on the Manila Amendments and their impact on MET, states that a low percentage of countries in the far-east provide distance education. Although the percentage of usage in more developed countries may vary, it is expected that the reasons that some institutions are providing little or no distance education may be the same. He cites the lack of infrastructure and internet availability; insufficient funds to provide suitable systems and to develop programs; the lack of sufficiently trained instructors; and the lack of recognition and support from government agencies.

Administrations will also be impacted. They are tasked with approving, auditing, and monitoring training providers. With the advent of distance learning as a recognized means of delivery, they too will require staff that have qualifications and experience in this area. Training of current staff or the hiring of new people with this skill-set will take resources and time. It is suspected, that although the IMO has now approved distance education, Administrations will be loath to quickly embrace its use. C. Dutton (personal communications, April 8, 2015) the President of the Canadian Association of Marine Training Institutions states that Transport Canada, the Administration for that country, is open to distance education but will not proceed without formulating a standard. Further, they suggest that Canadian MET providers should take the lead on the development of such a standard.

**Research and Development**

Research and development will be a further growth area for savvy institutes of higher learning. Industry is increasingly aware that MET has a wealth of technical and academic experience and qualifications they can bring to bear on problems that are unique to the maritime related sectors.

In Canada governmental regulations require that a percentage of offshore revenue be earmarked for research and development. Consequently a number of industry and government sponsored funding agencies have been established to distribute these funds in order to facilitate collaborative research and development.

Funding agencies, in Canada and globally, are cumulatively responsible for distributing significant funds to academia. Agencies will have varying rules related to funding access. There is increased competition
for these funds. In Canada MET is only now starting to have some measure of success. The typical Canadian model of MET education has been dedicated to technical diplomas and short course training, with most having no direct link to the university model and hence no degree granting status and thus limited research ability or support.

The maritime sector is now coming of age. It is no longer just an industry of the stereotypical rusty vessel, sailing ship, and salty seadog. Today’s industry is a complex and technologically advanced one and of a diverse nature. Educational organizations in the marine sector have a plethora of required technical and simulation equipment that is used in training. Researchers are taking notice. The Marine Institute, as with other MET organizations, now has dozens of simulators supplemented with other sophisticated equipment. As in many countries, MET through sponsorship and taxation programs, has access to funding from industry. In Newfoundland researchers from other faculties within the university are envious of the stream of students engaged in training and view them as potential research subjects.

The Marine Institute’s Offshore Safety and Survival Centre (OSSC) conducts training for mariners and offshore workers using the Helicopter Underwater Escape Trainer (HUET), and has an annual throughput of thousands of students. Kinesiology, medicine, and engineering are just some of the faculties expressing keen interest in collaborative research in just this one area. One of the challenges for MET is to be seen at least as an equal partner and not just a provider of subjects and equipment.

The Marine Institute has had some measure of research success in the areas of evacuation, equipment testing, and human kinetics and is currently in pursuit of a number of research chairs, and expanding programs in the area of ocean safety and harsh environments and that will be integrated with ongoing research. Collaboration with both industry and other MET institutions will be required to allow an efficient and effective provision of required training and research.

Conclusion
It is both a challenging and exciting time for MET. The evolution of the seafaring career into a collection of professions, using sophisticated equipment and advanced technology, will require constant and diverse training for these professionals. Industry will increasingly collaborate with MET in the design of courses and the provision of equipment. Many institutions will become global centers of specialized excellence and be increasingly involved in research and development activities. Faculty will have diverse backgrounds. Web-based learning will be used for both distance education and blended learning. It will be a challenge for IMO to update and promulgate regulatory instruments to keep pace with this evolution of the industry. Are we collectively up to the challenge?
References


THE LONG RANGE IDENTIFICATION AND TRACKING OF STUDENTS

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INTRODUCTION

If a ship is lost at sea much is done to firstly, find it and secondly, determine the factors contributing to its loss with the aim of preventing similar incidents from occurring in future. In the interest of safety and security, ships are continuously monitored by using Long Range Identification and Tracking systems whereby ships transmit, in real time, information such as position, speed, course, etc. so that a ship owner knows at all times where his/her most important asset is. This begged the question: How does the Department of Maritime Studies (DMS) at the Cape Peninsula University of Technology (CPUT), track its most important asset, its students? Surely, a student-centred department should be interested to know what happens to its students when they leave the institution, how they are applied in industry as part of continuous improvement of any programme. We would like to think that most of our students are either at sea or within the maritime industry, but the reality is not all of them are, in fact, some have never been. The purpose of this paper is to firstly identify the gap for a similar Long Range Identification and Tracking system for current and potential South African seagoing maritime students and graduates and secondly, creating a platform through which these students can engage with the aim on mentorship, professional development and ultimately lifelong learning.

IDENTIFYING THE NEED

The National Diploma: Maritime Studies is a three year qualification consisting of two years of theory (education) and one year of sea-going practical training known as Work Integrated Learning (WIL). Ideally, the two years of theory should sandwich the practical component as the first year deals with the theoretical knowledge for the Officer of the Watch Operational Level and the second year with the Management Level.

Due to the lack of training berths it is not uncommon for students to continue to the second year of theory whilst waiting for a training berth.

Once they have completed their second year of theory, many of these students do not register for the practical component as they are uncertain about if and when they will find a berth.

When proof of the practical sea time and tasks completed has been submitted to the department, a certificate of completion is issued to the student and his or her name is placed on the graduation list on condition that he or she has also completed the academic component. Due to the uncertainty of finding berths, students who have completed the academic component are prone to only registering their practical sea time once they have completed the 12 months or sometimes 18 months sea time...
and are preparing for their first watch-keepers qualification. This means that students who would normally qualify for graduation after 12 months practical sea time do not graduate unless an administrator manually checks the number of subjects the student has completed and informs the student that he or she needs to submit the record of practical sea time completed.

Statistics from the above chart indicate that the Departments’ graduation rate of South Africans enrolling for the National Diploma: Maritime Studies for first time cohorts from 2005 until 2012 is 26% (106 of 401 students).

The percentage of graduates completing the qualification in minimum time dropped from 45% for the 2005 cohort to 3% for the 2011 cohort. This clearly emphasises the need to determine where our students are, how many of these students are at sea, or are waiting to go to sea or have decided to pursue another career. More importantly, the factors contributing to ND: Maritime Studies students not graduating need to be accurately identified before they can be addressed.

The graph below indicates that the cohorts of 2006 until 2009 have 25 more first Certificates of Competency (CoC’s) than National Diplomas. All 25 have indicated their intention to complete outstanding semesters/ subjects and graduate albeit 8 of them are currently unemployed and do not have funds to complete their studies; 6 are in a study leave queue at their various companies and 11 are currently registered in their final year of theory. The big gap between the number of enrolments and number of graduates is cause for concern as it means that whilst the graduation rate is 26% the department is running at a loss of 74% as government subsidy only get allocated once a student has graduated. The mismatch between available training berths and the yearly output of students who should be embarking on the WIL component further perpetuates the problem.
At a macro level, in the Council on Higher Educations’ (CHE) report (2013, 52) it states that “The current higher education system is not producing sufficient graduates to meet national needs in respect of economic and social development…” The report indicates that only 35% of students graduate within five years and an estimated 55% will never graduate. The departmental graduation rate of 26% necessitates the need to track its students.

**DATA COLLECTION PROCESS AND FINDINGS**

The information gathering process occurred from June 2013 until May 2015 and consisted of the following:

- A Student Tracking questionnaire\[xiv\] was completed by 172 students who had first year registrations from 2005 until 2014\[xiv\].
- An Academic Enhancement Questionnaire completed by 81 students who have been identified as ‘at risk’\[xiv\] as part of the departmental first year Early Warning System (EWS) introduced in 2012.
- Interviews with 18 currently registered senior students
- Administrative data.
- Register of Seafarers

A total of 172 students completed the Student Tracking Questionnaire and the findings were as follow:

- 16 students have indicated that they are no longer in the industry and do not have any intention of completing neither the sea time required for a CoC, nor their outstanding subjects for the diploma. Reasons for dropping out included wrong career choice, misleading expectations\[xiv\],
bad first trip experience, bursaries to study in another field, other job opportunities, some which came along whilst they were waiting on a training berth and family responsibility.

- 15 students have graduated and serve at sea as Mates or Masters.
- 17 students are currently registered in their final theoretical year (serving as 2nd Officers).
- 33 students have completed the first year of study and are qualified junior deck officers (8 of them unemployed).
- 11 students are repeating subjects from their first year whilst waiting on berths.
- 42 students are in their practical training at sea phase.
- 16 students are employed by the South African Maritime Safety Authority (SAMSA) whilst waiting on a berth and
- 22 are at home waiting and hoping on finding a berth.

2 As part of the departmental EWS introduced in 2012, all first year students who fail half or more of their registered courses or who fail one of their core subjects (Principles of Navigation, Marine Mathematics and Marine Science) after the first assessment period are considered to be ‘at risk’. These students complete an Academic Enhancement Questionnaire as a tool to identify factors impacting negatively on the student’s academic performance. The department then implements appropriate interventions for improvement or refer the students to Student Counselling for non-academic factors.

Common factors identified over the past four years are:

- Under-preparedness
- Lack of support from student services on the Granger Bay campus like Student Counselling, The Reading and Writing Centre, Fundani
- Accommodation and provisions in University hostels,
- Financial factors,
- Unhealthy eating and sleeping habits,
- Time and Stress management,
- Motivation factors,
- Being overwhelmed with the academic work load

The department responded to the academic issues raised by introducing interventions such as additional classes (over weekends), employing student assistants, hosting an Autumn school during the semester break and mandatory tutorials for ‘at risk’ students.

3 Interviews conducted with 18 of the current registered students ranged from mostly very excited and motivated first year students to concerned and even panicked second year students, 4 of whom have already been waiting at home for a berth for over a year. Of the 18 students 6 indicated that they had no prior knowledge of the course and 3 more stated that this was not their first or second choice of study. The following comments by students highlight some of their concerns:
First year student: ‘I am paying for my own studies, food and accommodation. If I don’t get a ship next year I’ll go back to Kensington (Eastern Cape) and wait it out there, hopefully get a job so that I can put some money away to come back to study in 2017.’

First year student: ‘I actually prefer finishing all the theory in one go. I’ve heard from guys next door that it’s a uphill battle if you’ve been at sea too long between S1 and S3, especially with the NavArch and Navigation’

Second year student: ‘I just hope I haven’t forgotten all the theory by the time I go to sea.’

Second year student: ‘Why do they always go on about more women at sea when there are no ship’s on the South African register and foreign ship owners say straight that they don’t employ women? They create this expectation and then it all falls flat after the cadetship. Does SAMSA even know how many seafaring women are still fariing at sea?’

Second year student: ‘So I passed all my subjects first time round, jumped through all the hoops of pre-sea training, was one of the firsts of the 2008 group to get my ticket in 2010, been at sea since then and now the company will only let me finish S3 this year. Then I must go back in line to finish S4 whenever, but I have enough sea time NOW for both my Mate’s and Masters. And you know what, they know how stupid it is but they don’t give a shmuck.......and it’s not even as if SAMSA is going to allow me to sit my Mate’s and Masters back to back, so whose time is getting wasted here?’

The last comment identifies with the statement made 10 years ago: ‘A recurring theme throughout the maritime industry is that of shipping companies training South Africans solely for their internal requirements, and doing so only reluctantly.’ (Rugganan, 2005)

4 Administrative data included class lists per cohort year, completed subjects, graduation lists, and institutional statistics were obtained from the Management Information System (MIS).

5 The South African Register of Seafarers has come a long way from being nonexistent in the late 1990’s to having 4833 registered STCW qualified watchkeeping officers on its roll currently. The only problem is that this figure includes individuals who are no longer active at sea or industry. In an attempt to address this, a Marine Notice was sent out in 2011 by SAMSA requesting the assistance of industry to update the Register, but, according to the Registrar, the response was extremely poor. The register provided a baseline, nonetheless, to begin the process of determining our student’s professional qualifications and it allowed for tracking some of the students who have only completed their first year of theory, gone to sea and is still at sea. Of the 401 South African students who registered for the ND: Maritime Studies from 2005 until 2012 at CPUT, 128 (32%) are on the register to date.
CHALLENGES FACING SOUTH AFRICAN ND: MARITIME STUDIES STUDENTS

The findings of the Academic Enhancement Questionnaire indicates that 90% of the factors affecting a students’ academic performance are non-academic e.g. finances or lack thereof, poor time management, homesickness, inability to adapt to university life, etc. A student’s transition from school to higher education, finding one’s identity and place within the new academic environment has been greatly researched (Briggs, Clark & Hall, 2012 and Bowles, Dobson, Fisher & McPhail, 2011 among others). As such, this paper only focusses on the 2 greatest challenges the students on the ND: Maritime Studies face.

Under-preparedness is the first challenge for first year DMS students, especially for the Maths and Science based subjects. The huge “gap” (Sappa & Bonica, 2008) that exists between leaving school and entering the first year of university is evident with each year’s cohort. The onus to address this gap lies on tertiary institutions as schools are not particularly interested with what happens after school as they are facing their own challenges (Jacobs 2010). In 2005 Higher Education South Africa (HESA) introduced the National Benchmark Test (NBT) to assess the academic readiness of first year students. Though many institutions use the NBT in addition to the National Senior Certificate (NSC) for either access or as a placement tool, at this stage, the Department of Maritime Studies solely relies on the NSC results for access.

The next challenge is the unavailability of cadet berths. As mentioned before, of the 172 students that completed the survey questionnaire, 49 do not have a training berth. Of the current (2015) first year intake, 32 are South African, 31 of which will be in need of a training berth by the end of the year. The National Cadet Training Project, a government funded initiative, was launched in 2011 with the aim to increase the number of South African seafarers. The SA Agulhas was acquired in 2012 as a dedicated training vessel to support the venture, however the project ran into funding difficulty and no intake of the 2014 (46 South African students) was made.

LRIT AND MENTORING

Of the 176 students who completed the survey questionnaire, 142 either disagreed or strongly disagreed with the statement ‘I received/am receiving sufficient mentoring during my cadetship’, 32 indicated their willingness to become a mentor and 122 strongly agreed or agreed with the statement ‘I would like to have a mentor’.

The willing ‘mentees’ were then allocated to the willing ‘mentors’ after which contact detail were exchanged in order to create a platform to interact. After the initial contact, a specific mentor and his/her mentees decided on how they would proceed. At this stage, after the initial novelty has worn off, 18 of 32 ‘mentors’ and 75 of 122 ‘mentees’ are actively participating in the process. Their method of contacting each other is mostly via email and/or social media. At this stage the process is very
informal and completely dependent on the active participation of the ‘mentors’ and ‘mentees’. Some groups or individuals are very active whilst others have a ‘once a week’ session whereby the mentor only responds to posts once a week. The department is currently engaged in the planning process for an E-tutoring system next year whereby registered students will have access to a formal online tutoring platform.

Below are the comments from some of the active participants on their ‘mentors’, ‘mentees’ and the process:

Mentee 1: ‘He’s (mentor) a nice guy, but sometimes he thinks he’s too clever. So, just to put him in his place I always do my homework, a lot of research, I ask all my contacts and even my lecturers + internet. Sometimes I actually catch him out…’

Mentee 2: ‘I’ve made a friend for life. She experienced what I still have to go through, I guess she gets it, which is cool’

Mentee 3: ‘Answers to questions is not always in time…..but at least it happens. It’s like someone cares, lol. And the discussions helped me a lot with my oral prep, especially since I failed the first time!’

Mentor 1: ‘They (mentees) can be irritating at times. But I don’t mind helping, in fact, sometimes I get asked about a topic which I’ve completely forgotten, then I have to brush up ;)’

Mentor 2: ‘I don’t see it as mentorship, just one guy helping out another….’

Mentor 3: ‘Some of these youngsters are just plain lazy! They want everything handed to them. I only help those who make an effort to find out for themselves, they’ve probably complained about me?? But two of my guys have qualified, so I must be doing SOMETHING RIGHT!’

The ultimate goal is to create a formal network/platform that will allow students to share knowledge and experiences, give advice, identify common trends and hopefully open up the door for postgraduate research and lifelong learning.

CONCLUSION

Tracking of students is important, not only for the purposes of improving graduation rates, inform curriculum development and quality assurance, but also to establish a sense of comradery among all South African officers that will support a proper system of mentorship. The challenges of under-preparedness and availability of training berths are not likely to change in the medium to long term and current South African officers are the best advertisement and information source for future ones. Of the estimated An effective LRIT system requires the buy in of all stakeholders, including tertiary institutions, training and placement agencies as well as SAMSA and the concession that not everyone can and want to be tracked must be made.
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DIFFERENT MEASURES: Standards of Education and Examination towards STCW Competency

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Abstract
Over the past ten years the authors have researched the use and effectiveness of assessment towards STCW competency, with the progressive findings presented and published extensively. There are other aspects of maritime education, including standards that are the subject of this paper. The STCW Convention sets standards for competence, implemented by Member States through regulation according to their national circumstance, providing the framework for maritime education, but not the detail about individual colleges, a concern for mariners, instructors, employers and other stakeholders, as well as colleges having to defend their educational practices in legal proceedings. The paper examines areas of difference and asks whether it is possible, or desirable, to have a common educational standard across colleges, considering the cultural, political, linguistic, and pedagogic diversities; or whether there are solutions providing more stakeholder confidence in graduate competence. Creation of a publically available database of maritime colleges is suggested.

Keywords: STCW examination: international standards: IMO White List: Model Courses.

INTRODUCTION
The authors’ research into the use and effectiveness of assessment towards STCW competency, particularly multiple choice (closed) questions (MCQ), is through a survey, three studies with over 1400 participants from 55 countries, together with reviews of the extensive academic literature. The authors’ survey, foundations and progressive qualitative survey and quantitative studies are described at IMLA-14 (France 2006), IMEC-19 (Netherlands 2007), IMEC-21 (Poland 2009), MHRS-4 (Canada 2010), IMLA-20 (Netherlands 2012), IMLA-21 (Canada 2013), IMEC-26 (Netherlands 2014) and IMLA 22 (Xiamen PRC 2014), as well as in three articles for Seaways, the Journal of the Nautical Institute. The research is original since there are no comparative studies of the relative merits of maritime assessment methods. The interest is with MCQ and its commonalities with other professions: namely use driven by economics and convenience, rather than effectiveness; assessment subject to unpredictable factors, and lack of formal training in question construction and evaluation. MCQ are controversial, as evidenced by the literature. Educational standards are another area of interest.
The STCW Convention sets out comprehensive standards for mariner competence, supported by IMO’s White List, Model Courses and other endeavours, which are implemented by Member States through regulation according to their national circumstance. In addition, maritime administrations and associations such as the International Chamber of Shipping describe their individual application of Convention through standards, usually in general terms and recognising alternatives exceeding basic requirements may be adopted. While these standards provide the framework for maritime education, none provide the detail enabling a considered opinion to be made regarding the characteristics of individual colleges or the competence of graduates, nor are they so intended. This situation, sometimes referenced in marine accident reports, is a concern to serving mariners, college instructors, maritime employers and other stakeholders. As well, in these litigious times there is evidence colleges should anticipate defending their educational practices in legal proceedings.

During the time of national fleets, as officers’ careers progressed they attended the same college, becoming familiar with its capabilities and instructors, and as senior officers had a reasonable expectation about new subordinates’ competencies. The shipping company, often represented on an advisory board, knew the quality of graduates, and cooperated in course development or customisation. These intimate relationships still exist on a domestic level. Now, when maritime employers are interviewing potential employees, or when senior officers are ‘getting the measure’ of new officers, they may have no knowledge about a particular college or its graduates. There is difficulty in obtaining data about training outcomes, where there seems little interest in sharing information about curriculum implementation and graduate feedback, where the standardisation of competence assessment and the problems and remedies are more openly discussed and questioned among seafarers and some academics than among maritime colleges.xiv

BACKGROUND
The International Shipping Industry
Studies on global governance, including a UN 1995 Commission, indicate that improving management of an integrated industry, such as shipping, lags behind national integration processes, being restricted by economics and local political and cultural practices. There is a possibility that regulation, unwelcome or believed inappropriate, may be passively resisted by developing apparently compliant sub-systems with no substantive change to an organisation’s modus operandi.xiv

The shipping industry is characterized by an outsourced, casualised labour pool from developed and developing countries, compared to a time when crew often followed their careers in one shipping company. Ship operators, in outsourcing, have lost control of the quality of the labour force and their influence in improving training standards. Maritime employers want immediate availability, at the same time complaining about poor quality and insufficient recruitment. Despite IMO’s White List and efforts
to standardise and regulate the training of seafarers, together with national audits, variations persist, with little evidence of improvement in training quality.\textsuperscript{xiv}

Shipping companies respond to internationalisation by mitigating negative impacts, such as a reduction in a reliably available, well-trained labour force. Nations seek to protect their domestic employment, for example in the UK under the tonnage tax rules, although here the companies are passing on their ‘training duties’ in a manner detrimental to training quality.\textsuperscript{xiv} Owners want experience, expertise and quality as cost effectively as possible, however shorter periods for training and sea time have resulted in lower quality, with not enough time to gain experience. Life at sea has become very stressful due to, amongst other things, fear of criminalisation.\textsuperscript{xiv}

**Stakeholders and Standards**

Maritime instructors need a standard that provides good guidelines and a proper measure of their teaching. Students need a standard where they can feel satisfaction in having graduated. Serving mariners need to know that new recruits and junior officers have certificates obtained through a demanding process. Maritime employment agencies need to be less concerned with administrations’ and devolved colleges’ differences in standards and consequent lack of trust in graduate quality. Ship owners and managers need the certainty that their employees’ certificates really reflect competence, particularly with frequently changing crews. Society also needs a high standard, considering the damage resulting from incompetence when ships pass by communities’ shores.

**Convention and Regulation**

IMO’s STCW was first to establish international requirements on training and certification, which before were set by individual governments, usually without reference to other countries’ practices. IMO recognises that a consistent level of training for competency is key to safety. As described by Koji Sekimizu, Secretary-General at the 2014 International Maritime Law Institute Graduation Ceremony, the IMO has adopted the “highest practicable standards” of maritime safety and security, efficiency of navigation and prevention of pollution, with treaty instruments that “do an excellent job of defining the rights and privileges and, at the same time, the duties, obligations and responsibilities of nations”. The Secretary-General said that states need to enact effective domestic legislation to reflect treaty provisions and provide a mechanism for implementation and enforcement. Arguably, STCW’s minimum levels for safe and environmentally responsible shipping are insufficient to cope with the increasing size and complexity of today’s ships.\textsuperscript{xiv}

**Assessment**

Maritime educational systems vary from country to country and even between devolved colleges in the same country, variations acknowledged as a result of culture, history and the generalised wording of Convention. There are very few examples of qualitative or quantitative research in the maritime
literature. One exception is the 2011 survey “Watertight or Sinking?” examining assessment practices in six seafarer labour supply countries. The survey found differing assessment methods, with employers believing that variations in standards will persist so long as assessment is diverse.xiv

Fraudulent Certificates
A UNESCO investigation found corruption in higher education generally present in both developed and developing countries, and suggested solutions that may be appropriate in maritime education.xiv For STCW certificates of competency, fraud (as corruption) could be a simple illegitimate document, or fraud in the sense of inadequate training and poor examination process, giving a false sense of a certificate’s value. Fraudulent certificates have concerned the IMO for some time, as expressed through the Maritime Safety Committee (MSC) and the Sub-Committees on Human Element, Training and Watchkeeping (HTW) and Standards of Training, and Watchkeeping (STW). STW 43 (2012) invited Members to report details and provide updated information, with timely response to requests for certificate verification, an invitation repeated in HTW 1 (2014) requesting prevention strategies. HTW 2 (2015) again noted the large number of fraudulent practices, summarised in the Secretariat’s reports.xiv The HTW 3 (2016) agenda includes reports on unlawful practices.

The 2010 Manila Amendments require Parties to the Convention to provide detailed information to IMO concerning administrative measures taken to ensure compliance. This is the first time that IMO has been called upon to act in relation to compliance and implementation, including improving prevention of fraudulent practices and strengthening compliance monitoring. However, there are still reports of bureaucratic corruption, even in countries with significant maritime education systems.xiv

Legal Considerations
The criminalisation of seafarers is increasing Masters’ liability without diminishing their responsibilities at a time when the maritime environment has changed and identifying parties liable is challenging. The proportionality of criminal accountability is perceived by mariners to be a disharmonised system worldwide.xiv The IMO strives for safety at sea, but safety cannot be improved by criminalising seafarers, especially if a company is absolved of responsibility by claiming crew negligence.

The contrasting outcomes from accidents involving the Costa Concordia (2012) and the Herald of Free Enterprise (1987), where 193 lives were lost, reflect changing times. The first, a jail sentence of 16 years; the second crew suspension from duty for one to three years. For the Herald, crew negligence was identified, but shore management was held equally blameworthy, although a charge of ‘corporate manslaughter’ was not then supported by law. The Herald disaster lead eventually to the UK’s Corporate Manslaughter and Corporate Homicide Act 2007 (Elizabeth II c.19), and development of the ISM Code, identifying company management as the cornerstone of a good safety culture. Flag State and Class
audit the Code, but cannot check if a safety mindset is integrated in the company’s culture, or enforce a safety mentality.\textsuperscript{xiv}

Shipping companies or their agents are responsible for employing certified personnel, although it is Masters and senior officers who are increasingly found liable in cases of mistake, and are subject to criminal prosecution. There is a trend by companies to distance themselves from their employees in the event of accident, looking for a breach of procedure, maintaining that the officer was incompetent.\textsuperscript{xiv} Officers may deny this on the basis that their certificates attest to proficiency, leading to questions about the competency of the issuing authority. In a climate of litigation devolved colleges, rather than administrations, can anticipate defending their assessment methods, instructor qualifications and teacher training. It may be insufficient to claim compliance with the convention’s ‘lowest common denominator’, remembering there is no prohibition in adopting alternatives exceeding basic requirements.

RANKINGS, STANDARDS AND INFORMATION

General Education

The concept of ranking education systems to provide information in standardised forms is not new, although not always popular with the institutions themselves. For example, the UK’s independent and impartial Office for Standards in Education, Children’s Services and Skills (OFSTED), reporting directly to Parliament, inspects and regulates education services in England, to maintain and improve standards and share best practice. In Europe, the EC’s Bologna Process focuses on strengthening quality assurance, easier recognition of qualifications, and increased compatibility between education systems. In the USA the Common Core State Standards (CCSS) detail what K-2 to K-12 (primary to secondary school) students should know, seeking to establish consistent educational standards.

The World University Rankings\textsuperscript{xiv} are performance tables judging world-class universities across their core missions - teaching, research, knowledge transfer and international outlook, based on indicators providing comprehensive comparisons, used by students, university leaders, industry and governments. Canada’s Maclean’s Magazine releases annual rankings of Canadian Universities, aiming to inform based on criteria such as classes, faculty, finances, library, and reputation.

The White List

At the 2015 World Maritime Day, IMO Secretary-General Koji Sekimizu said, “Effective standards of training remain the bedrock of a safe and secure shipping industry, which needs to preserve the quality, practical skills and competence of qualified human resources.” IMO’s White List is to give confidence to maritime stakeholders. Parties to STCW must be confirmed by the MSC “to have communicated information to the Secretary-General which demonstrates that full and complete effect is given to the relevant provisions of the Convention”.\textsuperscript{xiv} Parties may be added or removed, noting that not all countries provide a full range of seafarer training. Parties may accept certificates issued by or on behalf
of Parties White Listed, and Administrations may use the List for the issue of endorsements in compliance with STCW regulation I/10. As of May 2014 there were 127 countries White Listed, alphabetically from Albania to Vietnam.

The IMO requirements for White List inclusion are rigorous, as stated by MSC (2001) “... preparation of the submissions to the Secretary-General represents a demanding and challenging task requiring not only reporting on national laws, training requirements, standards and systems in place, but also ensuring that all of those elements met the revised Convention requirements and could pass the scrutiny of persons with detailed knowledge of those requirements”. Panels of experts, selected to give a geographical spread and a broad knowledge of STCW facets, assess the information presented. The experts have a considerable responsibility, since rejection can deny a nation’s access to external revenue. However, while moving nations to reach the minimum standard, the White List assessment is simply a documentation review, verifying that nothing conflicts with STCW.

Standards are internationally regulated in the sense of White List inclusion, as confirmed by the MSC, fortified by the STCW Manila Amendments. Nevertheless, although White Listed and complying with Convention, in practice maritime training still varies from country to country and amongst devolved colleges, even in the same country. Moreover, the MSC evidence is provided “in communication with” the Administration, which could vary from written communication with the Administration to a physical college site-visit. Details about these “communications” are not publically available. Until there is ‘full disclosure’ the relative quality of individual colleges remains speculative, leading to the present situation where serving mariners and companies rate schools by ‘word of mouth’, where certain schools in certain countries are considered better than others (the so-called ‘whiter than white list’) where reputations, good or bad, may not be merited, where evaluation is by perception not fact.

**National and Other Standards**

Maritime organisations specify training standards, usually in general terms. A European Directive sets rules on training and the standards of competence required by licensed personnel (officers) and certain categories of ratings serving on EU ships. DNV Classification requires training to be developed, planned, operated and evaluated by analysing the interrelation of educational elements, including purpose, objectives, contents and assessment.

The Australian Maritime Safety Agency (AMSA) requires STCW compliance to remain White Listed and ensure recognition of Australian unlimited certificates, backed by training audits as a condition of institution approval. Maritime New Zealand (MNZ) sets the competencies on the basis of international obligations, sector needs and statutory requirements, and is responsible for final assessment before issuing certificates. MNZ monitors training providers, and approves programs,
qualifications and standards. Training is provided by public and private providers who may employ maritime assessors if they have no academic relationship with the seafarer. The ICS/ISF Flag State Performance Tables summarise factual information in the public domain, and encourage shipowners and operators to examine a flag state’s substance, and pressure administrations for improvements in safety, environmental protection and working conditions.

**European Maritime Safety Agency**

Seafarers on EU registered ships may be nationals of EU Member States educated, trained and certified in Europe, or they may come from other countries. EU legislation specifies a procedure to assess compliance with STCW by non-EU countries to ensure EU recognition of their certificates. The target is to have accurate information on the number of seafarers available for EU registered vessels and information on the countries where they were trained and certified. The European Maritime Safety Agency (EMSA) has developed STCW-IS as a web-based system for finding reliable information on both national maritime administrations and training institutions. Over 80 countries are currently inspected, covering more than 90% of seafarers operating in EU waters, as well as others on EU registered ships. EMSA publishes dates of inspections with draft reports sent to the administration, and final reports sent to the EC and administration.

**DIFFERENCES**

**Mariner Competence**

There are many definitions of competence in the literature as well as different philosophical and cultural reflections, for example in the UK meaning the expectations of employment, focusing on work roles rather than on jobs; in the USA as a characteristic resulting in effective job performance.

The STCW definition: “Standard of Competence means the level of proficiency to be achieved for the proper performance of functions on board ship in accordance with the internationally agreed criteria as set forth herein and incorporating prescribed standards or levels of knowledge, understanding and demonstrated skill” (STCW A-I/1.1).

STCW standards are suggestive rather than mandatory and related to functions, allowing for competences to be developed as a basis for certification, while permitting different interpretations according to national circumstance. “Functions” presupposes a change from knowledge-based to competence-based learning (CBL) and evaluation. Although there are slight differences in philosophy or culture the literature agrees that CBL definitely is not the continuation of the traditional classroom theory teaching, hoping that students will transfer knowledge, skill or competence into action. CBL requires less classroom and more workshop, laboratory, training vessel or simulator practice and assessment.
CBL began in the 1990’s, primarily in nominally English speaking countries, from a need to match global industry demands for skilled workers with international standards of ability. CBL supporters say that those instructed and evaluated using CBL experience greater success with skill transference, while detractors believe the opposite as well as citing the incomprehensibility of educational jargon, rigidity and expense.xiv The application of CBL differs from college to college.

STCW (A-II/2.1) requires management competency. Senior officers need skill, diplomacy, and commercial shipping and legal knowledge, particularly operating safely and efficiently in a controlled and restricted environment.xiv A particular concern is with Bridge Team Management where, due to high power-distance ratios, junior team members are reluctant to express opinions lest they be criticized. Masters do not always embrace the concepts of challenge (advocacy) and response.xiv There is no overall data on the way management skills, and their cultural reflections, are taught in maritime colleges.

**Model Courses**

Seafarer training to STCW standards is the responsibility of training institutions (devolved colleges) authorised by national administrations. The IMO supports skills-based training and the sharing of technical knowledge, through national and regional Integrated Technical Cooperation Programme (ITCP) training events, providing up-grading courses, usually based on the IMO Model Courses.

Model Course development is described in IMO instruments, for example in STW 43 (2012) review and update following the 2010 Manila Amendments, and inviting Member Governments to submit review proposals to the MSC.xiv Model Course work continued in HTW 1 (2014), considering validation of courses for certain specialised operations, together with guidance for development, updating and validation, recognising concerns regarding lack of mandatory requirements and the difficulty in achieving consensus. HTW 1 refers to the Notification and circulation through the Global Integrated Shipping Information System (GISIS) for reporting information to fulfill obligations as Contracting Governments.xiv At HTW 2 (2015) the revised Maritime English Model Course was validated, and the IMLA delegation was invited to draft revised model courses 3.12 on Assessment, Examination and Certification of Seafarers, and 6.09 on the Training Course for Instructors.xiv

Model Courses are to provide guidance and should be inclusive and non-prescriptive, not to be considered as an official STCW interpretation.xiv Educational systems and cultural backgrounds vary. Model Courses identify basic requirements and target groups in universal terms, they are not rigid teaching packages to be followed blindly, nor do they substitute for an instructor’s material. Colleges are responsible for application according to STCW, industry need, cultural and pedagogic circumstances and current research, together with locally appropriate assessment strategies, all with regular curriculum review. Model Courses are not intended simply to demonstrate regulatory
compliance, however some short course industry certificates state that the course be in accordance with a Model that may not be responsive to curriculum change, new technology or revised practices.xiv

Teacher Training
Teacher training is not mandatory under STCW, where the only requirement, other than ‘appreciation’ and ‘understanding’, is for (maritime) ‘experience’. It is left to the employing institution to decide on appropriate qualifications, as monitored by the IMO Member States’ Administrations.xiv Consequently there are no international or even national standards. In Canada, maritime education is the responsibility of Transport Canada, with training delivery a provincial responsibility where post-secondary teacher training requirements vary according to provincial jurisdiction. For example some provinces have none while in Newfoundland teacher training is completed at Memorial University, where students can continue their studies to Bachelor, Master and Doctorate.

The need for maritime teacher training is well understood. In the Asia-Pacific region the 2014 Nautical Institute Manila Command Seminar recommended training through “universally agreed and defined competencies and performance criteria”, with “training packages designed for standardized learning and learning management”, and “clear descriptors according to STCW with clear instructions for assessments and particular emphasis on competency based education”. xiv Various maritime organisations specify standards for teacher training, usually in general terms. For example DNV Classification requires the provider to determine personnel competence, provide training and evaluate effectiveness, ensure awareness and keep training records.xiv

For perspective, Barnaby Lenon, the former Headmaster of Harrow and Chairman of England’s Independent Schools Council notes that English independent (secondary) private schools are recognised as being among the best in the world, their success lying in the quality and expertise of teachers many of whom do not have a teaching qualification. Lenon says the best teachers have 30% subject knowledge, 30% personality, 30% level of expectations, and 10% classroom skills (the only one needing teacher training). Lenon’s remarks may resonate with tertiary educators.xiv

Language
SOLAS allows any onboard working language understood by each crew member, and requires English for bridge-bridge-shore safety communications. STCW requires watchkeepers to have a good command of English, with other requirements for watch ratings and crew assisting passengers. The ISM Code implicitly refers to English in the context of management systems, requiring mariners to receive information in a working language, most likely English on a multi-cultural ship. The MSC urges that “ ... management recognize(s) the potential problems stemming from the employment of multinational crews on the same vessel, a practice that might result in language barriers and in social,
cultural and religious isolation, all of which may lead to safety problems”. The International Transport Workers Federation (ITWF) (2011) emphasises the importance of shared language.

There are less than 9% of English first language speakers worldwide, but 80% of nations use English as a second language in industry, numbers more illustrative than definitive. It is estimated that 80% of SOLAS vessels have multinational crews, with one third of maritime accidents having cultural and/or linguistic attributions, significantly on the Scandinavian Star (1990), the Costa Concordia (2012) and the CMA CGM Florida and Chou Shan (2013) reports critical of crews’ language proficiencies. The MSC noted that on Costa Concordia, “The presence of different backgrounds and basic training of crew members may also have played a role in the management of the emergency”.

The lack of English language proficiency is despite IMO’s 2001 Standard Marine Communication Phrases (SMCP), and the best efforts of colleges teaching “Maritime English” (ME), which over the past 25 years has accumulated fourteen different definitions, with no consensus on content and scope. ME is a mixture of nautical and communication English and there is controversy as to whether it is for specific purposes or simply a terminology. Neither do SOLAS or STCW provide definition as to the form of English. There are, however, international standards, such as the International English Language Testing Service (IELTS), or Test of English as a Foreign Language (TOEFL), or the General English Proficiency Test (GEPT). There are specific systems such as the International Shipping Federation (ISF) Marlins, or Maritime Tests of English Language (MarTEL).

The ME Model Course, initially developed for IMO by ISF and re-drafted following the 2010 Manila Amendments, provides a practical instrument to improve language proficiency. However, HTW 2 (2015) noted that the draft, intended primarily for non-native English speakers, did not accurately reflect the knowledge, understanding and proficiency as in STCW. Also, teaching hours were high and unreasonable and the course content for ratings was too advanced. The 2014 Nautical Institute Manila Command Seminar noted that maritime education uses spoken and written English widely, but clarity, homogeneity, harmony and understanding are often lacking, with meaning lost in cultural and political divides, with English instructional manuals grammatically unclear. The Seminar recommended the teaching of English needs to be globalized, standardised and simplified.

Colleges preparing students for international service provide English language instruction, usually ME. There are differences in first or second language in the classroom, and the debate whether to use one or the other, or both (bilingual), is not conclusive. Bilingual education helps mariners work together better, since crews will most likely work in English. Practice in China demonstrates that bilingual education can be appropriate for non-English-speaking seafarers, but requires more teaching resources, particularly for assessment, where a Chinese study indicated that selecting the correct response from MCQ options fails to measure actual reading ability. There are computer programs
where students read a native text with second language vocabulary and grammatical structures embedded,xiv with “self-study” techniques providing the flexibility needed to learn English.xiv The extent to which these techniques are used is unknown.xiv

Communicative competence is also required from English ‘native’ speakers, because ME is different from colloquial English learnt on mother's knee, where cultural context, clues and body-language are used to comprehend and convey meaning, without which there can be mutual unintelligibility between native and second language speakers.xiv Anecdotally, ME is not addressed in maritime schools where English is the first language: it should be a requirement in preparing for life on a multi-cultural ship.

Assessment
Sampson's 2011 researchxiv supports the authors’ 2006 survey of maritime instructors that found differences in assessment from country to country and college to college.xiv Instructors reported multi-dimensional methods, with varying combinations of written, practical, simulation and interview (oral), a diversity reflecting history, culture and language. There are no comparative studies of assessment regimes, and how colleges decide on the ‘mix’ of methods and determine validity and reliability. How ‘administrative convenience’ influences the choice is unknown. The authors’ studies indicate the increasing popularity of closed (multiple choice) questions (MCQ), offering an economic alternative to traditional constructed response (essay) questions, particularly where instructor resources are limited. MCQ are most frequently used to assess lower order cognitive skills (i.e. factual knowledge), and as such are unsuitable for testing mariner competence. However, complex and searching MCQ assessing higher order learning levels can be constructed but require significant instructor training, planning, research, testing and analytical effort. Without this effort MCQ are simply shallow short-term memory questions that are easy and cheap to set and assess, a situation already tacitly accepted by students, mariners, regulators, flag states and employers.

Diversity of assessment introduces variables in STCW examination, with possible differences in the level of competence measured. There are differences in assessment in a first or second language. The authors’ studies, supported by the literature, show that assessment using English as a second language is contingent on language comprehension and may not properly reflect students’ knowledge as evidenced by their classroom work. These differences lower confidence in certificate quality, as evidenced by present employer screening processes not reliant on the STCW certificate, where additional training is provided in areas where competency should previously have been assessed.

DISCUSSION: A SUGGESTED INTERNATIONAL MARITIME COLLEGE DATABASE
Different national education philosophies reflect culture, history and politics, and develop over decades. For example, differences in college education systems and teaching styles apparent in the 2010 exchange program between Shanghai Maritime University and Massachusetts Maritime
Academy. It is impractical, even undesirable, for nautical colleges to offer exactly the same program. For example, attempts to change from *laissez-faire* civilian-dress to uniformed semi-military cannot be considered, with compromise negating the advantages of both. An alternative is to provide information so stakeholders can compare and make their own judgements about colleges’ capabilities, with data going deeper than presently found in brochures and systems such as STCW-IS, and ideally including MSC’s “communications” respecting White List inclusion, not presently in the public domain.

A suggested International Maritime College Database (IMCD) uses STCW-IS as a model extended to all international colleges. IMCD incorporates the basic information about facilities, courses, quality systems presently contained in STCW-IS, plus the details that characterise colleges in a way mariners understand and can relate to, particularly about the most important constituent in any school – the instructors and students. Information in the following category examples would be known (or easily discovered) by mariners and other stakeholders in the days of national fleets. The categories include those presently found on university and community college websites. The example table is for Instructors and Students, similar matrices deal with other college characteristics.

<table>
<thead>
<tr>
<th>IMCD Categories – Instructor and Student Examples</th>
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<tbody>
<tr>
<td><strong>Instructors</strong></td>
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<tr>
<td>Number</td>
</tr>
<tr>
<td>Qualification</td>
</tr>
<tr>
<td>Experience</td>
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<tr>
<td>Publication</td>
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<tr>
<td>Teacher Training</td>
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<tr>
<td>Base Salary</td>
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<tr>
<td><strong>Students</strong></td>
</tr>
<tr>
<td>Number</td>
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<tr>
<td>Ethnicity</td>
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<tr>
<td>Instruction Language</td>
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<td>Assessment Language</td>
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<tr>
<td>Assessment Method</td>
</tr>
<tr>
<td>English Language</td>
</tr>
<tr>
<td>Graduates</td>
</tr>
</tbody>
</table>
In education generally there is nothing new about publically available information, usually voluntarily as it is with IMCD. If a college chose not to post any particular item or items, then a request for data results in “No information available” as is the case with the present STCW-IS.

**CONCLUSION**

The IMO develops and adopts international instruments (conventions) for safe and secure shipping on clean oceans, with implementation the responsibility of Member States. STCW provides the framework for maritime administrations to develop, regulate and implement standards of training and certification, tacitly allowing, within Convention, recognition of national differences in education philosophy, culture, and history. Differences in national applications of STCW amongst an IMO membership from 170 countries are to be expected, and the ideal of creating equally qualified seafarers regardless of their country of training is not yet realised.

Evaluating mariner competence requires ship owners, mariners, maritime labour employers and all stakeholders to be aware of these differences. The public perception of the marine industry should be as employing educated, professional, and competent seafarers; supported by credible, and verifiable data on competency assessment. Maritime colleges understand the influence of globalisation manifested in the multi-national crew, and recognise that it is in stakeholders’ interests to harmonise international training models by discussion and cooperation, supported by IMO’s Integrated Technical Cooperation Programme. The suggested IMCD may be helpful for comparison and evaluation.

**References**

Contact the authors if there is difficulty accessing references from the usual sources.


A TEXTBOOK’S RESPONSE TO THE GME AND SME OF MODEL COURSE 3.17, MARITIME ENGLISH

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Abstract

One vast difference between the first published version (2000) and the present to be discussed and published (201X) of the Model Course, 3.17, Maritime English is that the latter makes it very clear that there are two Core Sections in Maritime English known as the general maritime English (GME ) and specialized maritime English (SME ). In the authors’ textbook published in April, 2013, titled Contemporary Practical Maritime English for Deck Officers (Reading & Writing), there is a clear-cut line of demarcation in its exercise design. It is understood that maritime English competency will not occur without prior salted or marinated immersion in maritime general English. There are tons of materials in general maritime English which are not difficult to find, such as sea literature, sea magazines, salty humours as well as exercises to improve English proficiency in the form of pronunciation, vocabulary development, sentence drill complement, gap fillings. Meanwhile, SME is focused on in the Texts Parts and exercises designed to solidify students’ understanding in the form of picture matching, SME vocabulary development, passage gap fillings, technical terms translation, difficult sentences translation, model sentence drill completion, etc. In the present workshop, discussion will be made of what GME means, what part of English can be labeled as GME, what is the necessity and significance to GME in maritime English textbook compilation, what is the relationship between GME and SME, etc. Finally, exercises from the textbook will be discussed and debated to seek common ground in the understanding of GME and SME.

What is GME?

It is clearly stated in the third draft of the Model Course 3.17, Maritime English, that GME means that first stage of Maritime English instruction could be general. The word general here is not the word general in general English, but “salted” or “marinated” English in general metaphorically. It attaches great importance to the language itself, namely its pronunciation, intonation, vocabulary items, grammatical structures and discoursal organizations. The overall purpose of GME instruction is to teach the language for the language and sometimes literature perhaps through the application of maritime scenarios.

It should be noted that virtually all the non-native learners of English start their English unsalted or unmarinated. Before they start maritime English courses in the later stage of their maritime institution,
they do not have any exposure to maritime-related English readings and writings. Almost all students go to maritime English section directly without any preparations made in advance in the way of vocabulary, technical terms in particular, special syntax, linguistic and syntactic features peculiar to maritime English. As teaching hours are not unlimited, and what’s more, maritime English competency is ultimately responsible for the safety of working at sea, the importance of maritime English cannot be overestimated. If students of maritime specialty are exposed to or immersed in GME prior to their specialized maritime English stage, sufficiently salted and marinated, when it comes to the later stage of SGE, their maritime English competency will not fail to get improved.

**What is SME?**

It is also clearly stated in the third draft of the Model Course 3.17, Maritime English, that SME means that the second stage of the maritime English instruction could be maritime-specific. It reduces the central position of the language into a position as a medium: a way by which maritime specific purposes are realized. The overall purpose of SME instruction is to achieve the effective communication competences of maritime specific duties through the application of English language. SME section contained in this model course consists of six parts as per the different seafarer ranks or duties whose communication competences regarding English language are clearly required or recommended in the STCW Convention, 1978, as amended, as follows:

- Part 2.1: Specialized Maritime English for officers in charge of a navigational watch on ships of 500 gross tonnage or more
- Part 2.2: Specialized Maritime English for officers in charge of an engineering watch in a manned engine-room or designated duty engineers in a periodically unmanned engine-room
- Part 2.3: Specialized Maritime English for electro-technical officers (ETO)
- Part 2.4: Specialized Maritime English for ratings forming part of a navigational watch
- Part 2.5: Specialized Maritime English for GMDSS radio operators
- Part 2.6: Specialized Maritime English for personnel providing direct service to passengers in passenger spaces on passenger ships

Additionally, it is explicitly required of deck officers by 2010 Manila STCW Amendments:

*Officers of the navigational watch now require adequate knowledge of written and spoken English to understand charts, nautical publications, meteorological information and messages concerning the ship’s safety and operation. They also need to be able to communicate with other ships, coast stations and multilingual crew, and to use the IMO Standard Marine Communication Phrases (SMCP). GMDSS radio operators, which in practice now include most deck officers, require a knowledge of English, both written and spoken, for the communication of information relevant to the safety of life at sea.*
What is the relationship of GME and SME

It is further pointed out that the relation between GME and SME is one of the gradation and preparation: GME leading into SME, the former being the preparation for the latter. Therefore, Core section 1 is intended to prepare trainees for entry to Core section 2. However, it is possible for trainees to enter directly to Core section 2 without following Core section 1, provided that they can satisfy the entry requirements.

What exercises are in the Textbook?

Exercises related to GME

Pronunciation [s] [z] [iz]

If a word ends in the letter 's' (e.g. plural noun or verb in the third person), there are three ways to pronounce this 's' - /s/, /z/ and /iz/.

1. [s] words ended with letters t, f, k, p, th
   sheets notes receiptsmelts lists rates mates dates waits reefs
   roofs reliefs staffs stuffs peaks kicks flicks ticks decks docks tapes maps
   pipes scopes scrapes zips slips blips flips chips
   rocks baths berths mouths maths months froths moths oaths leaks

2. [z] ended with b, d, g, v, m, n, th and any vowels
   bulbs globes robs mobs grabs tabs sobs lids rods clogs
   flogs flaggs rags sags tags hogs bombs informs
   harms booms brooms blooms roams warns conns dons horns earns learns
   burns breathes wreathes lathes bathes clays rays glows anchors
   moors tours tows rows buoys rays pours wears cheers

As we know, topics like pronunciation problems and maritime safety, pronunciation and effective cross-cultural communication, ways and methods to overcome pronunciation-related intercourse barriers, pronunciation and accents, and so on and so forth are to be found in each and every International Maritime Lecturers Association (IMLA), particularly in the International Maritime English Conference (IMEC). As for the disaster which pronunciation problems may spell, Stephen Murrell wrote in the IMEC 22:

Pronunciation problems at sea can kill. Mariners across the world learn to say words in different ways. Non native speakers have problems (Arab speakers with 'p' and 'b' Germans with 'w' and 'v' Italians with 'h' etc) and different English native speakers say the same thing differently. Australians, Scots, Americans do say the same things differently. At sea this can kill. A misunderstanding about a position or instruction can kill.
Cross-cultural Notes

Cross-cultural Notes is intended to pass such a message that misunderstanding may still arise where the words spoken are literally understood but displeasure still occurs. The reason is that you lack the knowledge of cross-cultural communication. As we know, nowadays, multi-ethnic and multi-linguistic and multi-cultural seafarers are more common than ever on board international shipping vessels. To avoid misunderstanding and enhance working efficiency and promote teamwork, maritime English textbooks should give certain room to cross-cultural knowledge instruction. The 12 cultural notes from the Textbook covers the practical aspects of cross-cultural communication ranging from the basic concepts of multicultural approach, tips for effective cross-cultural communications, such as eye contact, personal space, how to greet appropriately, what to do when failure in cross-cultural communication arises, the dos and don'ts in different countries to the linguistic aspects such as listening, speaking speed and the ways to improve them so as to facilitate cross-cultural communication.

Sample 1.

How to Improve Cross-cultural Communication Effectively

The key to effective cross-cultural communication is knowledge. First, it is essential that people understand the potential problems of cross-cultural communication, and make a conscious effort to overcome these problems. Second, it is important to assume that one's efforts will not always be successful, and adjust one's behavior appropriately.

For example, one should always assume that there is a significant possibility that cultural differences are causing communication problems, and be willing to be patient and forgiving, rather than hostile and aggressive, if problems develop. One should respond slowly and carefully in cross-cultural exchanges, not jumping to the conclusion that you know what is being thought and said.

Should heated conflicts occur, the best way is to stop, listen, and think, move away or go to the deck when the situation gets tense. By this is meant that you withdraw from the situation, step back, and reflect on what is going on before you act. This helps in cross cultural communication as well. When things seem to be going badly, stop or slow down and think. What could be going on here? Is it possible I misinterpreted what they said, or they misinterpreted me? Often misinterpretation is the source of the problem.

Salty Humour

Salty humour or sea humour is the driving force to motivate language learners to go on with their language learning. Humour has a lot of linguistic and rhetoric features that are challenging, such as pun, metaphor, overstatement, understatement as well as phonetic aspects that require sharp sound differentiation ability which is focused on in the subsection Pronunciation of the textbook. There are dozens of salty humorous stories, riddles, parodies in the Textbook. Just read one of the samples.
PARROTS

A magician was working on a cruise ship in the Caribbean. The audience would be different each week, so the magician allowed himself to do the same tricks over and over again. There was only one problem: The captain’s parrot saw the shows each week and began to understand how the magician did every trick. Once he understood he started shouting in the middle of the show:
"Look, it's not the same hat."
"Look, he is hiding the flowers under the table."
"Hey, why are all the cards the Ace of Spades?"

The magician was furious but couldn't do anything; it was, after all, the captain’s parrot.

One day the ship had an accident and sank. The magician found himself adrift on a piece of wood in the middle of the ocean with the parrot, of course. They stared at each other with hate, but did not utter a word. This went on for a day, then another, and another. After a week the parrot said:
"OK, I give up. What'd you do with the ship?"

Maritime Magazine Digest

Rise of the Black Box (slightly adapted from safety of life at sea, April, 2012)

When Costa Concordia capsized and sank on 13 January, the big question was why the accident happened in the first place. In the weeks that followed, AIS information revealed the vessel’s track, and videos emerged of scenes in the passenger areas and on the bridge. These fragments of footage will be of great help to the investigators attempting to piece together a clear picture of the disaster and its aftermath, but the ship’s voyage data recorder (VDR) was a key focus of the investigators’ early work. Unfortunately, the capsule was faulty.

Sea Literature Appreciation

(Adapted from ON THE GULLS' ROAD)
BY WILLA CATHER

When any of the ship’s officers passed, they stopped for a word with my neighbor, and I heard the first mate address her as Mrs. Ebbling. When they spoke to her, she smiled appreciatively and answered in low, faltering Italian, but I fancied that she was glad when they passed on and left her to her fixed contemplation of the sea. Her eyes seemed to drink the color of it all day long, and after every interruption they went back to it. There was a kind of pleasure in watching her satisfaction, a kind of
excitement in wondering what the water made her remember or forget. She seemed not to wish to talk to anyone, but I knew I should like to hear whatever she might be thinking. One could catch some hint of her thoughts, I imagined, from the shadows that came and went across her lips, like the reflection of light clouds. She had a pile of books beside her, but she did not read, and neither could I. I gave up trying at last, and watched the sea, very conscious of her presence, almost of her thoughts. When the sun dropped low and shone in her face, I rose and asked if she would like me to move her chair. She smiled and thanked me, but said the sun was good for her. Her yellow-hazel eyes followed me for a moment and then went back to the sea.

Exercises related to SME
Let’s Speak SMCP

SAR communications
I require assistance.
MV Fairplayer is proceeding to your assistance.
What is your MMSI number?
What is your position?
What is your present course and speed?
Report number of persons / injured persons on board.
I will abandon vessel at 1300 hours UTC.
My EPIRB/SART is transmitting.
I transmitted a DSC alert.
How many lifeboats / liferafts will you launch?
What is the weather situation in your position?
Visibility in my position is good/moderate/poor.
Received MAYDAY from MV Fairplayer at 1330 hours UTC on VHF Channel.
ETA at distress position within 3 hours / at 1500 hours UTC.
I will act as On-scene Co-ordinator.
Initial course 210 degrees, search speed 15 knots.
Carry out radar search.
Alter course to 270 degrees
We resume search in position 130 N, 110 E.
Keep sharp lookout for lifeboats / liferafts / persons in water.

It should be noted that the importance of the IMO SMCP cannot be too overemphasized.

In 2000, IMO adopted the Standard Marine Communication Phrases (SMCP) to replace the Standard Marine Navigational Vocabulary (SMNV) developed in the 1970s.
Ability to use the SMCP, in particular Part A concerning external communication phrases and bridge operations, is now a mandatory requirement for deck officers through a cross reference in the STCW Convention.

The purpose of this SMCP is to prepare students with an impulse or instinctive response to repeat this selectively edited SMCP phrases or sentences as readily and frequently as they can because there are about over 200 such expressions from all the 12 Units covering most areas of shipping navigation such as ship handling, cargo work, meteorological warning, distress transmissions, fire-fighting and lifeboat drills, etc. It should also be fairly concluded the SMCP is merely a source bank of marine phrases often used in cases of emergency. Any phrases of the SMCP should be repeated readily and effortlessly. There is no such necessity or possibility to teach SMCP flexibly, creatively, smartly. Just speak it. So Let’s Speak SMCP.

Match LSA Terms in Column A with the pictures in Column B

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
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<tr>
<td>extinguisher</td>
<td>a</td>
</tr>
<tr>
<td>fire bucket</td>
<td></td>
</tr>
<tr>
<td>lifejacket</td>
<td>b</td>
</tr>
<tr>
<td>fire axe</td>
<td>c</td>
</tr>
<tr>
<td>immersion suit</td>
<td>d</td>
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<td></td>
<td>e</td>
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It is more than true that *A Picture Is Worth A Thousand Words!* Using and Creating Visuals in Maritime English Teaching as Heba Saber Elsayed presented his workshop in the IMEC 22. Imagine how to make a student coming from the mountainous area form a mental picture of what a dredger is with word description or term definition only. Perhaps you can make it but it takes time. In most cases, it is totally impossible, but if you show him a picture of a dredger, any word description may be superfluous. And what’s more, on board the ship there are lots of equipment and facilities with which most students who have never worked on board may be quite unfamiliar with as well as many a warning symbol and sign. All these can be photographed beforehand and incorporated into the textbook exercises. Throughout the whole book, there are about 150 pictures of varying sizes and pixels, exercises therein varying from merely matching to writing a definition or a warning as indicated by pictures.
Besides, there are Exercises or Writing section which are subdivided into two subsections, namely, Language Skill Development and Exercises Related to Texts. In the Language Skill Development subsection such exercises as VOCABULARY DEVELOPMENT, CLOZE or gap fillings are on offer. They are designed to develop global language skills focusing on practical aspects of maritime English. In the EXERCISES RELATED TO TEXTS sections technical terms translation, difficult sentences translation and sentence-writing completion are designed. All the materials are taken from the texts of the relevant Unit so as to reinforce the key language points as most textbooks do.

Conclusion
As early as in 2000, I submitted a paper titled China’s maritime English teaching problems and its strategies, I recommended in China all ME students of higher education should undertake the study of ME the moment they entered the universities, GME for the first two years and SME for the third and four years. It should be noted as most of them have already learned at least 9 years of general English, their word power reaching about 3000 words or above, and taking into consideration significant role in which Maritime English plays in sea safety, they should be treated differently, to be exact, unlike students of other specialities, they are not required to learn College English, just ME. Thus, all the four language skills will be sufficiently trained, writing will be taught in the third term.

Comparing the two versions of Model Course 3.17, Maritime English, the present draft has explicitly divided Maritime English into two core sections, that is, GME and SME. This is a decisive move in maritime English teaching. What follows should be given to the testing standard and format that shall be researched and implemented across the world.

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ON THE PRINCIPLE OF AUTHENTICITY AND ITS REFLECTION IN COMPILING TEXTBOOKS FOR MARITIME ENGLISH TEACHING

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Abstract:
The purpose of maritime English teaching is to equip the students with a language competence to get engaged in the professional and routine communication. Therefore, the textbooks for maritime English teaching should reflect the principle of authenticity. Widdowson categorized the “authenticity” into four situations, providing authentic articles for the students, having authentic understanding of the materials, authentic activities for language learning and authentic situations for communication in classroom teaching [1], while Tomlinson held that, “the textbooks should provide activities in which the students have contact with the live materials they are learning and application in the experience of that language [2].” To ensure that the compiling of maritime English textbooks will duly reflect the principle of authenticity, the compilers should conduct authentic needs analysis and compilation and reflect the principle of student-centeredness in the practice of maritime English teaching.

Key words: compilation of maritime English teaching textbooks, principle of authenticity, needs analysis, language materials, student-centeredness

Authenticity in needs analysis
It is often out of certain purpose when teachers decide to compile textbooks for the students, including the need for scientific and technological research, improvement on the present teaching materials or updating the teaching contents, etc. The most important step in compiling textbooks is not market investigation but students’ needs analysis. This is a complicated process, including the understanding and study of the teaching and examination syllabuses and investigation and research into the present teaching conditions and the status quo of the teachers. But what is more important is the examination and analysis of the students’ learning needs analysis. On account that the students bear various backgrounds, Dudley Evans and St. Johnson conducted a complete set of conclusion “on basis of the opinions and experience of the predecessors [3].” In accordance with their ideas, the information of the students that calls for investigation includes,

(1) the objective needs of the students. It is that part of English that the students use to get engaged in the onboard tasks and activities. The need target of the maritime institutions can be fixed on the second and third deck officers and third and fourth engine officers, including work and life. What ought to cause special attention is the language need balance between work and life;
(2) the subjective needs of the students, the learning status and ability level of the students in the past, present and in future, their learning methods, motives and objectives, etc;

(3) the language level of the students, the analysis on their present achievements, with the difficulty level of the new textbook a bit higher than the present and rising in a spiral manner to maintain their learning interest and motive;

(4) analysis on the students’ deficiency, the gap between the present knowledge and competence level and the teaching objectives to be attained, which is the focus for the implementation of teaching;

(5) the course needs of the students, the knowledge and skills for the students to achieve through the learning of the textbook, which is also the center of the new textbook;

(6) the learning needs of the students. It is necessary to make clear that a textbook is also a good medium to convey learning methods and this is also the main function of a textbook;

(7) the situational needs of the students. The new textbook should provide the situations in which the language is properly used, because a language produces its meaning and is always understood in relevant situations;

(8) emotional experience of the students. The new textbook should provide abundant emotional experience and reflect the joy for acquiring knowledge and skills and efficacy;

(9) the future needs of the students. A textbook is not only a medium for classroom teaching material, but also an information source for future career at sea and should be convenient for carrying and reference.

To reflect the authenticity of needs analysis of the students, the methods for investigation and analysis should also be carried out in the form of authenticity and the investigation should be based on rich and dependable materials. The method can include,

(1) interview survey. It is flexible and easy in operation, but may not reflect the authentic results;

(2) written survey. It is subjective with great coverage, but irresponsible people will make it “incomplete and therefore it is only a quantitative analysis or trend estimation and is sometimes an auxiliary means for investigation [4];”

(3) sample survey. It is to choose a certain amount of the students for investigation. It saves time and is easy for operation and therefore is extensively used, but the students chosen may not be representative and the results may not be accurate;

(4) there are also individual survey, general survey, typical survey, net survey, forecast and literature survey, etc, to mention just a few. The more complicated the methods and the more extensive the objects are investigated the more objective the results will be.

What is of greater importance is the analysis of the data collected. Normally a quantitative, qualitative methods and the combination of the two are used in the needs analysis. Quantitative analysis is to study the processes of existence, happening and development of the information to reveal the
relationship and investigate the phenomena of students’ learning, such as the vocabulary, reading ability, language structure and language competence, etc, while qualitative analysis is to conduct the quality analysis and find out the problems, form ideas, perform discussions, make examinations on basis of this, with the purpose to command the quality of the result, such as, the situations in which maritime English is used, special register and the professional usage, etc.

The needs analysis is an important prelude for the compilation of textbooks and its purpose is to maintain the authenticity of the need of learning. On basis of this, we can discuss the authenticity of language materials.

**Authenticity in language materials**

As Widdowson put it, the authentic language material is those that “are not purposefully compiled or recorded for foreign students, but the materials that are provided for the native speakers [5];” Heich believed that, “authentic materials are not those that are designed for the language learners, or even processed or simplified for the purpose of learning [6];” Anderson said that, “the authentic discourses are compiled for the native tongue speakers, who use the materials to communicate information and express ideas [7].” Therefore, the authentic maritime English teaching materials are,

1. those language application or communication materials that take place in realistic seafaring situations;
2. those not compiled or recorded for the learning of maritime English by Chinese students;
3. those not compiled in accordance with the order of vocabulary or grammar structures;
4. those without fixed objectives of teaching or learning, but their “center is the products or matters themselves without intentional use of the familiar vocabulary to take place of the unfamiliar words [8].”

The theoretical basis for using the authentic language materials in maritime English teaching includes,

1. cognitive learning theory. The theory holds that, the procedure of language learning is one of information processing and the students have contact with authentic materials, find out the language rules and learn to communicate with the language correctly in various situations;
2. constructive theory. The theory believes that, the process of language learning is one of the construction of meaning and authenticity provides the students with materials for use in realistic situations;
3. behavior theory. Skinner thinks that, “learning is to establish a combination of stimulus and reaction through enforcement and feedback so that the learners produce the expected behavior [9].” Therefore, the more contact the students have with the facts of maritime English, the closer they are to the teaching objectives and the award or punishment that they receive in the process of learning will further stimulate the students to improve their learning effect;
4. relevance theory. The theory believes that only the relevant language phenomena can be received and understood and the greater the relevance the better learning effect. The author of the article
believes that authentic seafaring situations will better provide the related compounds of language use for the students.

The authenticity of maritime English textbooks is,

(1) authenticity of objective. The teaching objective is to provide the language knowledge and skills for the students to command for the future work onboard, such as the description of and discussion on the present situation and operation of the equipment;

(2) authenticity of the discourse. The language learning materials should be adopted from the real seagoing business situation with professional characteristics, possibly the technical data and communication contents, to reflect the application of the technical words and language structure, such as those used in fire or life saving drills;

(3) authenticity of the tasks. The learning contents of maritime English should come from the real language communication activities that cover the seagoing profession from the routine life and work, such as PSC inspection, etc;

(4) authenticity of the situation. The textbooks should provide realistic situation of professional work for the students to participate in, think and experience and the students are real communicative partners and teachers will guide and assist them to complete the language communication tasks, such as bunkering and making out the repair lists, etc.

The research process of the project of the “Development of maritime English Audio-Visual Textbooks Based on Seagoing Production and Operation, COSCO (Group) (No. 2013-1-H-008)” being conducted by Associate Gao Song, etc, will clearly demonstrate how the authenticity is reflected in compiling maritime English textbooks.

The group members had carrier out several tasks before getting onboard for investigation. They investigated and analyzed the textbooks presently used in maritime institutions; studied the theories, rules, principles elements and contents for textbook compiling and received due training, made interviews of the teachers and students from the maritime institutions, received technical training in the manner and methods for recording, video making and note-taking. The preparatory also includes the investigation and analysis to the shipping companies, ports, on-job seafarers and undergraduates. On basis of these, the group members went onboard MV “COSCO France” and were separated to two divisions of deck and engine departments, sailing from Qingdao to Hamburg, Germany to conduct the whole-process shooting, recording and writing. The made the full use of the realistic audio, video and pictures to reflect the most basic and important processes of ship operation at sea, used the working language onboard, with reference from the requirements of the listening and speaking examination syllabuses of China Maritime Administration, IMO Model Course and SMCP, designed and compiled the authentic and lively maritime English listening and speaking textbooks. This is the first “authentic” maritime English textbook, with the contents including “Familiarization, Bridge, Engine
Room, Seafarer Duties, Berthing, Navigation, Ship Repair, Maintenance, Emergency and PSC Inspection,” etc.

What the research group is doing falls into coincident with that of the predecessors of American structural linguists Boas and Sapir, who, in protection of the Indian languages that were disappearing, spent years with recorders to record the language use and users in various situations and published the book, “Handbook of American Indian Languages.” The book was not influential as expected, but has started the language studies of descriptive linguistics and has become the model of today’s language studies.

With authentic materials at hand, the next thing to do is to establish the student-centered classroom to conduct the practical application of maritime English teaching in the manner of English for specific purposes.

**Authenticity of a student-centered classroom**

In compiling the textbooks, it is necessary to presuppose the use of teaching methods. Reviewing the teaching methods of maritime English in practice, what comes in mind is, register analysis (the seafaring operational situation determining the meaning of the language forms), discourse teaching (maritime discourses are composed of various sentence structures to produce meaning), stylistic analysis (the purpose of professional communication is achieved with the assistance of social, cultural and psycho-cognitive elements hiding behind the language), contrastive method (take the students to recognize the special characteristics of maritime English in vocabulary, semantics, syntax and stylistics, etc through comparison and contrast), action oriented method (student-centeredness with teaching evaluated by learning and “learning through doing [10]”), task based teaching method (finish the task and acquire the language in the process of solving professional problems), case method (understand the professional knowledge and enforce the language through the analysis of practical cases), project teaching method (turn the professional knowledge into projects and the students take part in the whole process in English), inductive teaching method (guide the students in independent learning with the help of the teaching materials), role playing method (students simulate the roles to experience the emotion and behavior of the profession), etc. The conspicuous characteristics of these teaching methods are that “they have changed the model in which the teachers teach and students listen in the whole process of teaching [11]” and become a trend in which the teacher’s guide the students to learn by doing and knowledge is conveyed in the process of teacher-student interaction, so that teaching becomes a process of skill building. They equally place stresses on:

1) Clear objective. The objective of the classroom activities is finish the predetermined tasks and all the activities and contents are designed round the completion of the tasks. They motivate the students’
participation ability and learning incentive, so that they use the language to complete the tasks and establish their own knowledge structure in the process;

2) Language use. The attention is no longer the external form of the language but the internal meaning. The simulated classroom communicative activities are closer to the realistic situations, with teachers and students caring more about whether the students are able to express clearly and finish the tasks successfully, instead of the accuracy of language use;

3) Authentic situation. These methods simulate the authentic situation of daily life and work, solve the authentic problems closely related to practical work, emphasize the language communication activities with clear objective in realistic situations and require the students to command the “practical and meaningful language components [12];”

4) Close to profession. For example, in the classroom activity on the topic of “PSC inspection,” the teacher is the master, who arranges for the students/staff members to conduct the inspection of the parts and equipment onboard and the crewmembers composed of the students take the orders to render inspection to the equipment and systems. Students not only learn about the names and functions of the equipment and systems in the process, but also practice the description of the operation of the equipment;

5) Student centeredness. These methods are practiced under the condition of teachers as the guides and students as the center and advocate the students’ personal participation, practice, experience, communication and cooperation to direct the students to know and learn the language in the process of finishing the tasks, raise, study and solve the problems. Every student will have the opportunity to play the role, discuss, debate, summarize, evaluate and report, not only master the language and practice the skills, but also experience the process of practice and improve the skills of application;

6) Acquisition priority. The students will easily find their inadequacy and problems in existence of the language knowledge and competence in the process of practice and thus acquire the high level of motive for language learning. Under the guidance of their teachers, they will actively find the opportunities for practicing their language learning with clear objective and motivation;

7) Mount challenges. These vivid and lively teaching methods provide higher requirements on the teachers in compiling textbooks and the results of their compiling activities are no longer tools for conveying knowledge, but “media for teacher-student interaction and guideline for classroom activities [13].” Teachers become the designers and organizers of classroom teaching activities and are able to profoundly experience the process of teaching practice so as to compile teaching materials centered on independent topics, provide authentic situations for language application and design the activities that suit the learning of the students.

In accordance with the analysis on the teaching methods and approaches provided by the serial works of IMO Model Course, the student-centered maritime English classroom teaching with authentic situation can adopt the following procedures.
1) Introduction of the background knowledge. Teachers introduce the contents, requirements, situations, purposes and roles of the activities and students will have preconceived psycho and material preparation, imaging the situation of the tasks and search for the language materials to be used. For example, “bulk cargo operation” will surely concern “liquid bulk cargo/crude oil/fuel oil/tankers/pipes/pump/loading port/shore pumps/discharging port/ship’s own pump/dry bulk cargo/grain/iron ore/coal and sugar/self trimming hold/bucket/conveyor belt system,” etc and the relevant description and expression and “navigation in ice” will concern the vocabulary and structures related to “temperature, lookout and communication,” etc;

2) Explanation of the technical terms. A well organized teacher will provide a set of vocabulary, structure, diagram or reference materials concerning the relevant topic for the students to choose and use in the process of the activities, or provide the comparison between general and special English, including the abbreviations, specification and standards, so that the students will understand whether the speeches they use fall in line with the situation of navigation and the register of shipping business. For example, “Main engine eased down owing to dense fog. Oil lighter getting alongside portside. As the piston moves about one fifth of the way up, it closes the inlet ports and the exhaust ports,” the equipment, medicine, situation, condition and operational regulations for basic emergency drills, etc;

3) Providing resources for use. Teachers can choose the forms and channels in providing the resources in accordance with the contents of the classroom activities, such as the drawings, tables, charts, models, discourses, videos and recordings, etc, or inform the students to make preparations before the class, such as the preparations, procedures, communication, process and results of “bunkering operation;”

4) Handling the materials for the activities. The teachers guide the students to study and handle the teaching materials, design the target authentic situations and make use of the old knowledge to connect the new knowledge and reflect the situation imagined or pictured to form a “complete knowledge structure in language, content and form [14].” Major activates can be segmented into smaller parts to require each group to finish one of the segments to form a whole integrity. For example, when preparing the checklist, the teachers can roughly group the task into deck and engine departments and then further classify them into firefighting, lifesaving, mechanical equipment and fuel oil system, etc;

5) Process for analyzing the problems. The teachers’ design and demonstration of the problems should be inclined for the students’ understanding of tasks, nature and requirements, with a clear mind of the procedures in completing the tasks. Teachers can use individual, multi and integrated questions, heuristic questions and group discussions to guide the students in finding the answers. For example, in basic first aid, what might be the possible causes for expiratory dyspnea? How will you handle various sorts of garbage at sea?
6) Students’ teamwork. The integrated classroom activities often call for the cooperation and efforts of many participants and this suits the characteristics of teamwork at sea. Determined by its nature, maritime English is better adaptable for collective learning, which not only saves classroom hours, improves the students’ participation, but also reduces the students’ anxiety and increases students’ confidence to establish “active and cooperative partnership and team spirit [15],” getting the passive and introverted students involved in the classroom activities. For example, cargo operation, abandoning exercise and sailing in narrow channels, etc., all call for close cooperation between the departments;

7) Report of the group representative. On completion of the activities, the groups should choose their representatives to make the reports. The choice can be random, volunteer, taking turns or elected and the form of reports can be either oral or written. This is an important process for language output in that the report calls for the team spirit and abilities of summarization, expression and correction and the abilities are not the results of learning but an important process of learning. All the forms of report test not only the language expression but also the completion of tasks. For example, the safety inspection onboard should include time, place, content, result, problem and corrective measures, being a comprehensive discourse;

8) Summary and evaluation by the teachers. On finish of each task, the teacher should give timely summary, evaluation and explanation, which benefits the improvement of the students’ activeness and the teaching quality. The evaluation can be oral, but should be brief and comprehensive and can be in the similar forms of checklist, including the description of the problems, solution plans, implementation situations, team cooperation, integrated expression and problems in existence, etc. Teachers can conduct evaluations on “completion of the tasks,” “expression of language” and “group activities,” etc.

Conclusion

In contrast with the teaching styles and methods of general English, the teaching of maritime English should better reflect the nature of “skill conveyance” and the textbooks should demonstrate the corresponding contents and requirements. A “knowledge conveyance” textbook apparently falls short of the essence of maritime English teaching. This requires that the compilers of maritime English textbooks should learn and analyze the needs of the students, provide the authentic teaching materials and presuppose the student-centered classroom teaching situations.

Reference books:


THE NECESSARY TRAINING FOR MARITIME ENGLISH TEACHER

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Abstract
Maritime English ability is an important skill for ocean seafarers. However, the result of maritime English teaching is not so satisfactory at some marine schools in China and Nonnative English speaking countries. One of the main reason is lack of Maritime English teachers. This paper analysis the necessary of arrangement of the English major teachers be trained on board and navigation majored teachers studying abroad or at other proper institute, based on this situation, make the maritime teachers become the inter-disciplinary talent. point out improve the teachers ability is the major premise to improve Maritime English, wish through this can benefit Nonnative English speaking countries Maritime English teaching.

Key words: Maritime English; Inter-disciplinary talent; training

General Background
The shipping industry involves many countries and departments, with international characters, and the maritime English is the working language in the shipping industry, and employees need to communicate with each other by English, so the seafarers in the shipping industry must grasp English ability as well as navigational knowledge. Currently no university have Maritime English major in China and Nonnative English speaking countries, Maritime English teachers are mainly from the English majored graduates and the others from retired seafarers or part time seafarers, but they are not so qualified for English teaching, the reason is English majored teacher do not know the ocean shipping industry, so they cannot give his students correct answer in ocean shipping way, and a navigation majored teacher is difficult for them to explain what is really means in the shipping industry with English. The maritime candidates need learning use English as a tool to contact with various department for various matters, express their idea with navigational manner clearly, so they need to combine English with navigational knowledge. Therefore ,the maritime English teachers not only need to grasp English skill, but also need to understand various navigational knowledge, while currently most of Maritime English teachers only skill in English or navigational knowledge, to some extent, that is the reason why they cannot meet requirement.

1. Need for the study
Different candidate from different schools receive various kind of education, so that they can grasp some skills to ensure they can fit for one kind of job. The kind of talent training depends on the social demand. The need of talent roughly divided into four categories: academic talents, engineering personnel, technical personnel, skilled talents. The first two talents in general, should be trained by
the general higher education, the last two talents should be trained by the occupation education. The occupation school should have distinct characteristics, occupation, directivity, applicability, adaptability. And compare to differences between occupation school and common school, the education cultural and quality of occupation school can be stick out a mile.

The English course for English curriculum school students occupation requirements and ordinary schools, both in the training target, training mode, type of education or in the types of talents with professional skills of course exist obvious differences. Therefore, English education such as our maritime occupation school should also have distinct characteristics, occupation, directivity, applicability, adaptability. It means we should train the inter-disciplinary English talents who possess the occupation, directional, applicability, adaptability characteristics.

2. Purpose of the study
Based on our researches and the investigations, we try to find out the best way on how to cultivate the inter-disciplinary talents of Maritime English. Based on this starting point, seize the main contradiction, targeted solution, do a good summary.

The navigation skills is a practical skill, development of navigation skills cannot achieve without a lot of practice, "skills" this word itself gives "practice" supreme academic status. Any lacks of “practice” skills are not qualified. But different scholars have different answers to how to "practice", academic circles regard as "good practice of the theory is the most useful" （nothing is more practical than a good theory） therefore, provide some directional questions and research achievements to foreign language teachers about the development of the professional occupation skills, many of these questions is the problem of how to cultivate the teachers to be a inter-disciplinary talents. Learners are asked to try all kinds of teaching methods, to solve the problem of the inter-disciplinary English talents training. In order to enhance the practical, this paper based on efforts to introduce the latest research findings on the list, much useful teaching practice case, through the study of these cases, the learners can put their feelings and get inspired used into practice of inter-disciplinary English talents training. Believe that the direction of this study can give navigation colleges and universities teaching progress brings the actual practical improvement.

3. Terms and definitions
English Inter-Disciplinary Talents for Maritime College should be defined as compound talents of Maritime English, refers to those who can use English freely, and be familiar with professional knowledge and skills in navigation very well. For example, mastering English skills, at the same time, they also are very familiar with maritime law, ocean shipping business knowledge and ship maneuvering
skills, the operation and management of the ship, even the ship design and construction and other related technologies and skills.

English teaching at maritime college should not only highlight the occupation, but also according to the diversity change of the talent market demand, strengthen the training of students' general ability, constitute the composite knowledge structure, strengthen the training of future post graduates of self adjustment, self adaptability. In short, the maritime college English teaching personnel training scheme, teaching mode and the employment rate of graduates should reflect the following Inter-Disciplinary characteristics: firstly, strong adaptability, the ability of fast running into the role, stable employment mentality; secondly, English professional knowledge, oral expression capability is strong, have very strong English communication and practical application ability; thirdly, attitude towards dedication and work is the key ability be a stroke above.

**Necessary for English training**

1. **Maritime English teacher**

In the marine schools maritime English teaching mainly has two kinds of teachers. English majored teachers, before participating in maritime English teaching, they pay more attention on language knowledge and skills, and act as the ordinary English teaching. Because of the need of teaching and the requirements of the situation, they turn to the maritime English teaching. Some teachers conduct a short time self-study, lectures, group training about ship’s knowledge, then at the beginning, they teach Maritime English basic listening and oral teaching, gradually shift to the reading course and the English competency test teaching and counselling, but because of the lack of maritime professional learning and practice, and the English teachers themselves do not belong to the sea professional discourse community members, has certain limitation to the navigational teaching, therefore, they neither understand the various needs of nautical English, nor being familiar with the professional content, lexical features and proficient in Nautical English structure and language genre, so that language teaching is inefficient, and even misleading.

The other maritime English teachers are navigation majored, they more or less have some experience in ocean shipping practice, their strength and advantage is familiar with the professional content, vocabulary and communication skills, but they are not be trained with regularity of language teachers, lacking in the implementation of the teaching specific, such as teachers' language proficiency, language teaching ability, teaching materials selection. With the design of classroom activities, arrangements, English teaching theory courses, also it caused great pity for Maritime English teaching.

All in all, on the basis of above explanation, the nowadays in China and non-native English speaking countries, maritime teachers' comprehensive ability need to be improved immediately, the key to conquer this challenges is making them become the inter-disciplinary talents.
2. Maritime school students

After consult with many maritime school students, we find that many students feel boring in English lessons, because there are less suitable teachers can encourage them with professional ways to face the nautical study. So they are not interested in nautical English, lack of learning enthusiasm and be wanting in initiative and motivation, resulting them in poor learning attitude, showing a lack of confidence in learning. The reason leading to this is the teachers ignoring the students as learning subject status, only make its produce to the English sense of exclusion, with long term going, it formed a kind of 'broken falls' attitude to study nautical English, they think that English is a can't not conquer subject forever. They did not know it will become a lifelong learning course. Since it is so, not to mention whether you are interested in, so some of the students even if they want to learn, just feel is empty.

This is why we are calling on we need to enhance to introduce the more inter-disciplinary maritime Talents teachers, they not only teach English, but set an example for the students, during the lessons, they can present and demonstrate what exactly happened on board and can tell the true knowledge to the students, they can inspire the students to make a career plan or give them a sea dream to them. In addition, they really need a professional teacher who belongs to the inter-disciplinary talents to guide them go back the right way which can lead them go through the bright tomorrow.

Method of training

From all the students' English learning process navigation class colleges, it is further clear that University English should be composed of basic English and professional English. University English equals to the combination of both Basic English and professional English, and should not be separated two kinds of English or in opposition, this idea is to help teachers and students smoothly running into the English studying by Basic English teaching. Students learn English language knowledge in Basic English stage, accumulate language application ability, through the use of language to obtain professional knowledge in the stage of professional stage to complete the university English learning. Therefore, maritime English learning is an important component of university English learning, i.e. Maritime English learning is the destination of the language learning.

1. Teacher training program

To strengthen the maritime English teaching, training of senior specialized talents composite type, application type under the system of market economy, must establish a stable team of teachers. There is a special skills required for the maritime English teacher, we will have the research, teaching material compilation of Maritime English teaching. We can be suggested that we should gradually make the maritime teacher training as follows,
2. International exchanges and cooperation

The domestic specialized educational institutions have different professional or different directions of short-term Maritime English teacher training is a matter of expediency to raise a current navigation present situation of teachers in English teaching.

In the background of the internationalization of higher education, international exchanges and cooperation has become an important measure to cultivate talents. Cultivating the compound talents of English major is to cultivate international type of Applied English talent, the introduction of international advanced education idea, so strengthen cooperation with the International Maritime English education and training institutions is a simple way. It can draw on the successful experience abroad, at the same time can be planned, step by step, periodically are engaged in or will soon engage in Maritime English teaching multi-transaction, sent young teachers to foreign educational institutions for training, so that they can quickly adapt to the maritime English teaching.

Due to the lack of lateral communication, set up a regular discussion between intercollegiate navigation class colleges and universities is also very necessary, such as the establishment of Maritime English Teachers Association, make a good use of the cold and summer vacation opportunities, call on regularly scheduled meetings with staff conference, will be a new concept, knowledge, experience, methods of study, the teacher will get together to improve together.

3. Cooperative teaching

Cooperative teaching: Maritime English teachers should actively cooperate with professional teachers, to undertake the task of teaching. Usually maritime English difficulties encountered by students both shorted at professional knowledge and skills lacking, we should make their each kind of ability become organically unifies and mastery. Therefore, English skills and professional knowledge are inseparable in Maritime English teaching. Experimental projects show that if we will carry out cooperation with professional teachers of English teaching by weekly teaching research, it proved the value of cooperative teaching. Maritime English-majored teachers, professional teachers and students constitute a triangle relationship, in which each party needs help and feedback the other two parties. Maritime English-majored teachers and professional teachers can adopt the following model of cooperation: joint analysis and determine the needs of the students; common design classroom teaching content; common exchange teaching ideas; common research the textbooks and teaching materials; mutual learning and familiar with the teaching outline; common organizes the student to carry on the discussion; to assist in the selection of textbooks and teaching materials; to assist the recording related video audio data. It will works if we insist to follow up.

4. Maritime English teachers' self-development
Teaching and research ability, maritime English teachers need to study. Descriptive linguistics, learning vocabulary and functional grammar, has the ability to describe and analysis of linguistic phenomena in various occasions and variant; the Social and psychological linguistics, have the ability to focus on language use social context, understanding and understanding the cognitive model of language learning; the Research methods in Applied Linguistics, has the capacity for language research, and organize the students to learn the language.

Carrying out action research, action research is the social context of participants in order to improve the understanding of the social and educational practice in the rational, reflective study for the deepening of practice activities and its background understanding; including English teachers' action research, discover problems; the preliminary thinking, to obtain the basic data; determining the strategy of action research method; the implementation steps, collecting detailed data and record every result; the analysis and write the final results; formulate next round plan.

5. Further study
In order to improve the English teaching level, maritime college school should cultivate students' interests in English learning, enhance students' English learning ability, and put forward the following opinions.

In recent years, the new idea of curriculum reform of basic education proposed is: teaching is the unity of teaching and learning, the essence of this unity is communication, interaction. Based on this, the new concept of teaching process is regarded as a communication between teachers and students, there should be positive interaction in the common development process. if there is no exchanges, no interaction exist or has not occurred in teaching, and those teaching without substantive exchanges, this kind of "teaching" are a false teaching. The interactive teaching approach is based on the theory of creation, this teaching activity really made bilateral activities optimized : reduced to taking the teacher as the leadership and increased to take the student as the main body.

Firstly, create proper atmosphere for learning English. Learning a language, atmosphere is very important, only to create such an environment, to dare to speak English students will not affect other students stare. At the same time, those who can't speak English students had to encourage themselves to speak English. the best way to learn Language is to make more and more exchanges, after long term practice, will Skill comes. In the classroom, especially oral English based curriculum must let all the students to speak English, not learn dumb English. Appropriate to encourage students, a method to enhance the self-confidence is to learn English well.
Secondly, English teaching should focus on interactive teaching. Interactive teaching is a main character of teachers and students in the teaching, the teachers and students should be interacted in mutual encouragement, the teacher’s timely inspiration to form this situation, the student active learning, and active participation in a teaching, the method of teaching makes the teachers and students in the dominant. Interactive teaching is a kind of communication between the teachers and the students, and the communication is very necessary, can make the teacher understand the student situation, so as to better regulate the course arrangement. In other words, teaching and learning should be combined with each other.

Finally, we think it is also very important to adopt various teaching methods. Diversification is called the coordination teaching in various ways, and the course based on this purpose is surely be better enjoyed by students who want to master English course, and finally they will achieved excellent results. While teaching methods also differ from man to man, different education to different students of different personality type, according to the characteristics of different guidance teachers.

Conclusion
Continually developing shipping industry bring new requirements for the seafarers, so the maritime school teachers really in need to increase their professional skills and knowledge as soon as possible. Improving maritime English teaching effects so as to improve the maritime candidate’s English level. The solution to this problem is maritime English teachers apply to navigation English teaching, optimizing to University English teaching and maritime professional English will become the inevitable trend of inter-disciplinary English talents training. In order to achieve the efficiency of maritime professional English teaching, navigation majored teacher and English majored teachers need multi-interaction knowledge. It becomes the most important content of maritime teacher development at present. With access to a even and balanced professional knowledge system, the maritime English teaching as a content based on comprehensive English teaching. We are surely believed that we will get there by making the professional knowledge and English skills in an optimum combination, and the Maritime English Teacher will be very successful in their own filed as long as they become interdisciplinary talents.

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ON MARITIME ENGLISH CORRESPONDENCE

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Abstract
Based on the requirements of the Maritime English correspondence, analyzed the language characteristics of the maritime English correspondence, discussed the key factors which will influence the written skills of the maritime English correspondence, point out the principles of “7C” including the courtesy, the consideration, the completeness, the conciseness, the clarity, the concreteness, and the correctness should be utilized in the written, wish through those points can enhance marine industry employee’s written capacity.

Keywords: Maritime English, Written English, Principles of “7C”, format requirements

Introduction
Every coast country has import and export business, and most of those business are transported at sea, they need exchange various information with different country and various departments, so shipping industry is of international characters, and the Maritime English is the only work language in the shipping industry, so each employee in the ocean shipping industry shall skilled in the Maritime English. The Maritime English ability includes spoken, reading, and written, but spoken and dialog are only available when both are meeting together or through voice communication, but in most cases, the concern parties do not have chance to meet together or talk frequently, even if they meet together the important things are usually be discussed or recorded by written form, in fact most parties engaging in the international shipping service usually live and work far apart from each other, and they seldom have chance to meet together, most of their communication are with Maritime English correspondence, so in most cases they start their new business by a Maritime English correspondence and the other party always judge his new business partner’s professional ability and service level by correspondence, and a serious and decent correspondence (from form to content) will give a good expression to his new partner, and it can pave the way for establishing the business relationship. In the ocean shipping industry, most businesses are valuable, but for the never met parties a worse correspondence would make the addressee doubt his ability, so it is difficult to image who is willing to negotiate with the person without the necessary Maritime English correspondence ability. Within the communication tools, the maritime English correspondence written plays a very important role in ocean shipping industry.

Currently China is the second largest imports and exports country in the world and the ocean shipment is the uppermost transportation mode. Simultaneously, China is the huge shipping country,
with about four thousand ocean going vessels trade in the world, many employees engage in the shipping industry or other relative industry, the Maritime English correspondence writing ability is an important ability for them, maritime majored students in the marine colleges learn and practice the written skills of the maritime English correspondence. However, many foreign ship-owners still complained Chinese seafarer's bad English ability, and many Chinese seafarers cannot communicate with foreign ship-owner effectively or cause many misunderstandings because of their bad English ability, so the employees in the shipping industry shall know the language characters and written requirements of the Maritime English correspondence, and hence written the Maritime correspondence with standard format and correct content.

Language characteristics of maritime English correspondence

Language is the carrier of culture, and the culture is only embodied by the language. The intention of maritime correspondence written is to exchange information, and let the other parties know what you expressed clearly and what you are needed, and quickly respond by simple expression and effective description. Through many years’ development, the maritime English correspondence has formed its own integral language system, with its special written requirements including courtesy, completeness, conciseness, concreteness, and correctness, clarity, consideration, which are called the principle of “7C” for short.

Courtesy

For courtesy, not only the polite vocabularies be selected in phrase, but also the polite and unobtrusive expression is also needed, and the phrase should clear express that you want to communicate with the other party, and let the him know you truly wish to cooperate with him, such as “your good cooperation” and “your esteemed manager”. At the same time, the format should comply with the polite requirement, and the content shall respect the other. For example, the sentence “Do you think you can send us correct stowage factor within today?” literally, the meaning of this sentence is correct, but it ignores that the sentence type of “Do you think you can” contain strong rhetorical question motion, and contains the meaning of unbelieving the addressee’s ability, so the addressee would feel strong “ironical” meaning, which is totally contrary to the polite requirements. But if we change this sentence as “Would you please advise us the correct stowage factor as soon as possible?” it will be a very hearty expression, and most probably the addressee will reply sooner.

Various occasions need its special requirements of courtesy, and shipping industry involves many countries and departments, different countries have his different cultural backgrounds and different behavior modes, so the mode of courtesy has national character. In the maritime English correspondence, employees are suggested to know the other’s history, evolvement, tradition, and expression forms, and adopt different courtesy forms for different addressee. For example, in Japanese, “SAN” is used for respective title, so for the Japanese addressee, “XXX SAN” are better than “Dear
XXX”. At the same time, the courtesy should consider both relationship, for example, “could/ would” is usually to denote very euphemistic and polite request between unfamiliar persons or those persons who first time to cooperate, but if both party is close friends or the parties has cooperated for many years already, “could/ would” will make the other party feel that he is just an outsider, and induce misunderstanding. Responding the other’s mail is another important part of courtesy, due to different working time or other reasons, sometime it is hard to reply with the addressee’s request in short time, but you can tell him that your correspondence has received, and the further detailed reply will be provided as soon as possible.

**Completeness**

A maritime correspondence should express the meaning and content completely, which could be simply measured by four “W” and one “H”, i.e. When, Where, What, Who, and How to do. Above proceedings should be expressed clearly, and the content in the maritime correspondence should be very clear, and those proceedings which will bring the addressee’s misunderstanding or disputes should be express in every detail. For example, one vessel received the ship-owner’s order “Proceed to Fremental after discharging” while the vessel is berthed at one Korea port, and the captain look up the “Guide to Port Entrance” and found the port “Fremental” is Australia port, so he command his vessel south bound after discharge completed, but actually the ship owner order this vessel proceed to the Canada port “Fremental”, the vessel shall north bound, neither the captain nor the ship owner further check this order. After three days’ sailing, the ship owner just found this misunderstanding, but it has caused three days’ sailing losses and six days’ oil consumption losses already, and the ship owner and the captain blame each other, and if the ship-owner could express the port “Fremental” with a note or a remark state this port is Canada Port, above losses can be totally avoided.

**Clarity**

In the maritime English correspondence, each sentences and words shall express real intention exactly, and simple and concise sentences and words would be more readable, so the double-meaningful and equivocal sentences and words shall be avoided, and at the same time, following aspects should be taken into consideration.

First, select the proper professional words and expression. After many years’ development, maritime English correspondence has its own integral language system; many professional words and expression have its special meanings in the maritime industry, and although these acronyms and professional glossaries are short, but they can exactly express the meanings. I.e., in the maritime English correspondence if the ship-owner wish to order fuels he would generally uses word “stem” and the ship-chandler see this word he will understand that he need fuels, but if the ship-owner use other
words such as “order”, “book”, “purchase”, and “buy” to buy fuels, the ship-chandler will easily think you want to buy other materials, not fuels.

Second, the relative positions of various words are also very important. Sometimes the position of the words change will cause the actual meaning change, so special care shall be paid to the relative position among words. For example, “Not all goods to be unloaded at this port” and “All cargoes not to be unloaded at this port” have same words, but only the positions of “not” is different, and two sentences express diametric meanings.

**Consideration**
In the maritime English correspondence the word “consideration” means you should consider the feeling of correspondence’s addressee, and express your meaning according to the correspondence addressee’s thinking mode and only in this way can make the communication become more effectively. Especially at the beginning of the communication, different parties with different point of view, it is hard to avoid that they have different requirement, and their opinions are different, the other party’s opinion should be understood and respected first, and you should first consider the correspondence addressee’s opinion, then give him your opinion, use relative proofs to prove your opinions, never blindly deny the addressee’s opinion, even if the addressee’s requirement is not reasonable or the condemnation is obvious unjust, the offensive language shall never be blindly used, otherwise you will put end to this communication, and you shall always express your lofty stance and use the words that the other party can accept to argue on the basis of reason, and fully explain your opinions, and eliminate the difference by the communication. For example, suppose the addressee proposes one solution which is very disadvantageous to you, and you can use “I don’t think your proposal will be accepted” is much better than “Your proposal were totally rejected”, although both expressions express same meaning, but the first expression indicates that both parties could further discuss and the possibility of cooperation still exists, and the second expression conceals the meaning that no necessary for further discuss is needed, and the possibility of further cooperation is not exist, so you should select euphemistic, implicit, and facetious expression to denote different opinions for avoiding embarrassed situation. The “consideration” also be embodied in the patience, and the employees in the maritime shipping company would disposal various things every day, and sometimes they forget to reply in time due to various reasons, so when the addressee could not give you a in time you should consider the addressee’s difficulty and wait patiently, and shall not assail the addressee blindly.

**Conciseness**
Conciseness means the correspondence, so far as practicable, use less words to express real meanings in the premise of integrity, concreteness, and courtesy, and the correspondence shall be simple, concise, and easy to understand. In the maritime English correspondence, holiday words can be omitted, and
the concise correspondence should come to the point straight, and let the addressee clearly know what you want to say, grasp your intention, so as to make the response in due time. One lengthy correspondence with discursive start will make the addressee feel bored, and not willing to reading the whole correspondence, the correspondence’s function will be discounted.

For conciseness, the words selected should be concise first, and the intention of correspondence is to exactly and effectively transfer your information to the addressee, so the complex, uncommon, and flowery words not only make the length of the correspondence be more tedious, but also bring trouble to addressee, so only the common words shall be selected and try to avoid uncommon and complex words. Such as the expression “We will endeavor utilize chemical to clean cargo holds on approximately March 15, so we place this order of chemical 5 drums” is not only obscure, but also misunderstanding, just because it uses several uncommon words, and “endeavor” can be replaced by “try”, “approximately” can be replaced by “about”, “utilize” can be replaced by “use”, and “place this order of” can be replaced by “order”, after the cords change, you will find the sentence will be more readable. In the same correspondence, same word should be used to express the similar meanings, for example, suppose in the front you write as “goods have been sent”, here “goods” has the same meaning of “cargo”, then in the next part only the “goods” shall be selected to denote the meaning of “cargo”, the other words such as “cargoes” and “commodity”, or else shall be avoided, because it can cause unnecessary misunderstandings to the addressee.

Second, the simple sentences are better than complex sentence. In maritime English correspondence, when some relative complex meanings are need to expressed, if we select too long or complex sentences, addressee cannot easy to understand or induce misunderstanding, but the short sentence is easily understand, and many words such as “and”, “but”, “however”, and “consequently” which can make the sentence become lengthy should be minimized, and every topic should be better disjoined, which could make the addressee more easily know the meaning what you want to express. For example, though the sentence of “We send you 5 NTM today according to your requirement on your letter on May 10 by air” could express the meaning, but it is confused and hard to understood, and if we written as “As your message dated May 10, we express 5 NTM to you today”, and obviously, the latter sentence is more clear. When need expressing relatively complex meaning, the simple sentence should be used as more as possibly.

Third, unnecessary repetitions should be avoided. Necessary repetition can be used to emphasize certain opinion or important fact. But unnecessary repetition without any reason will make the addressee bored, so the unnecessary repetition in the correspondence shall be avoided as more as possibly. For example, in the sentence “Export shipping order soon be ready”, “export” is repetitive. And the sentence of “We wish to acknowledge safe received your Email” could be replaced by “We
appreciate your Email” completely, and the sentence “Attached herewith please find two copies of” could be completely replaced by “Attached two copies of”.

**Concreteness**

Concreteness means that the content in the correspondence including time, place, price, and cargo number should be concrete and definite, and especially for the proceedings which need the addressee's reply or relate to both parties' rights and obligations should be specified to avoid any potential disputes in the future.

**Correctness**

Maritime English correspondence is the main approach and communication measure to setup business relationship, exchange information, and replay consultation, and it represents both parties' benefits, and the content of the correspondence can be legal certificate and proof to solve the disputes. Sometimes, one small written mistake can bring unnecessary trouble in the future, so the content shall be correct. The correctness concludes not only the expression, halting, and transliterating, but also standard language, proper depiction, exact numbers, and correct understandings about shipping phrases. Good habit is that the correspondence should be double checked from A to Z before it is sent, and once the correspondence with mistake is found, you need send the correctness correspondence as soon as possible or before the addressee’s reply at least to avoid troubles for both sides.

**The format requirements of the maritime English correspondence**

In the maritime English correspondence, the format of correspondence will always present to the addressee first, so the format should be correct first, normally below part is needed.

1. **TO (Addressee)**

“TO (Addressee)” means the name of the recipient which needs to be responsible for the mail or assumes the reply responsibility, and when one correspondence is sent to one known department (company), this item must be filled in. Normally the department (company) may has its public mailbox, and each employee have his own private mailbox, be borne in mind that all working correspondence shall send to the public mailbox, not the employees' private mailboxes.

2. **Attention**

“Attention” means the name of the staff that will in charges of this business in the addressee. When one mail send to more one addressees, above two items shall be repeated.

3. **Care OF/CC**

“Care of/CC” means the disputing party who needs to know the content of the mail only, but needs not assume the responsibility of reply, and especially. Should the addressee and the care of/cc are filled
wrongly, thus would cause a misunderstood to the addressee, and hence influence the business communication.

4. MSG Number
“MSG Number” equal to message number, it means the number for each correspondence. In daily shipping business, the employees need reading a lot of correspondence every day, the captain (or employees) need send tens or more correspondences to concern parties (including the ship-owner, the ship management company, the crew manning company, the local agent, the charterer, and the supplier etc.), and for reference and future inquiries purpose, the addresser are suggested to number all his mails which he sends in one day, and MSG number usually contain the data of the correspondence and the code name of the addresser and the serial number (because the captain is the only person who has right to send business correspondence, so the data and serial number is enough), and the correspondence number can help the addressee/addresser to check or cite the correspondence which has been sent in the past. For example, if we see the message “Regarding your requisition, my MSGNo051505 can give you some guidance”, the addressee can easily find relative answers in the fifth correspondence sent at May 15.

5. Date
“Date” means the data when the correspondence is sent out.

6. Object
“Object” is the topic of the correspondence which should not only be concise but also show the emphases of the correspondence, people shall know the main content from the object. As the shipping department always receive large amount of correspondences every day, many of them are garbage mails, employees usually have a glance at the object then judge whether they should open the mail and peruse it, and any correspondence being foreign to the shipping business will usually be deleted as the garbage, so the object should be filled carefully and exactly.

7. Salutation
“Salutation” means the form of address to the addressee, and when you don’t know the addressee’s name and sex, you can use “Dear Sirs” or “Dear Sirs and Madams”. And when writing the correspondence to the addressee you known well, you should write the addressee’s name, otherwise it is not polite. The shipping industry is of international nature, so the maritime correspondence has obviously international character, and because of the time difference, in most cases the local time for the addresser and the local time of addressee are not consistent, so in the maritime correspondence, the usual salutation is Good Day to you “(short as GDTU)”.

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8. **The body of correspondence**

The body of the correspondence includes three parts, i.e. the front, the demonstration, and the end. The front generally concisely tell the addressee why the addressee writes this letter or necessary self-introduction, and the demonstration should recite the fact or list the reasons to support his opinion of the first part, and the last part is to propose requirements or attention based on above expatiation, and the body of the correspondence is the core of the English correspondence, and the concrete written requirements are same with the above written requirements of the English correspondence.

9. **Complimentary close**

“Complimentary close” means the kind of holiday words to end the correspondence, and it shall accord with the former salutation, such as “With best regards”, “Best Regards” or “Mtks/ Brgds”.

10. **Attachment**

If one attachment is included in the correspondence, Encl. or Attached should be noted at the left bottom to highlight the attached file, and remind addressee not forget to read the attached file. And the addressee, the date, the salutation, the body, and the complimentary close are necessary parts, and the shortage of other items may not influence the integrity of the correspondence, but one standard maritime English correspondence should include above items as more as possibly.

**Conclusions**

With the development of the shipping industry in China, the maritime English correspondence has been the important tool for the shipping enterprises to contact with foreign shipping parties and develop the shipping business and other business activities, and relative employees shall familiar with the written characters of the maritime English correspondence, and exactly grasp several basic principles in the written process, and write polite, implicit, euphemistic, and decent correspondences, to construct China as the big shipping country.

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PREPARING STUDENTS FOR A DIVERSE WORKING ENVIRONMENT

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Abstract
Working environments whether at sea or ashore are characterised by diversity. Human resources originate from different social, cultural, education levels and linguistic backgrounds and converge at a common work environment.

Maritime Education and Training (MET) institutions face the ever-growing challenge of managing various human related factors including culture, language and competency of seafarers among others, emanating from the evolving, globalized and multicultural shipping industry. Nevertheless, these issues are of particular importance as most accidents have been reported to involve some aspect of human error. Additionally, increasing presence of multilingual and multinational crews on board ships necessitate clear and accurate on-board communication for vessel safety, environmental protection and smooth social interaction among the crew.

Cultural and linguistic issues are complex and varied and require critical consideration as they impact on maritime safety and protection of the marine environment. It is against this background the International Maritime Organization (IMO) has endorsed the importance of non-technical skills like leadership and teamwork for managers and crew. MET institutions should endear training that nurtures open-minded individuals ready for the diverse working environment. This paper attempts to discuss the elements of the diverse working environment on-board ship including language, culture, religion, education background among others. The discussion suggests how MET institutions can prepare students for a diverse work environment.

Key words: diversity, multi-national, communication, cross-culture, teamwork

Introduction
MET institutions play a very important role in the achievement of the IMO objectives of “safe, secure and efficient shipping on clean oceans”. Maritime professionals trained in MET institutions are the implementers of IMO strategy hence the need to empower, foster professionalism, tap talents and mold the trainees with the right attitude of working together cooperatively and creating flexible teams to achieve desired objectives. Maritime education and training ought to be geared towards developing
leadership skills and innovations in tandem with international business trends to ensure that the maritime sector grows hand in hand with global business.

The nature of maritime environment is diverse and deals with varied stakeholders’ expectations including, safety of the ship and its crew, protection of marine environment, energy efficiency, reduced cost of doing business, compliance with national and international regulations among other expectations. To this end, MET institutions should cultivate safety and pollution prevention culture, continuously improve standards of navigation through the use of technology, conduct risk assessment and positively engage the industry to understand industry needs.

From the foregoing, it is imperative that MET institutions take a proactive role and prepare inclusive programs which prepare trainees for a diverse working environment. Furthermore, MET institutions need to look beyond the technical aspects of training which count for competency and widen the training focus to encompass: culture, communication, language, teamwork and leadership, some of the aspects that may enhance safety and security and increase productivity in a diverse working environment.

### Preparing students for a diverse working environment

#### Cross-Cultural Training

Cross-cultural training refers to the analysis or study of more than one culture (Ptak et al, 1995, p.425-453). Since human resource is diverse and emanate from different cultures and backgrounds, management of cultural diversity needs to be inculcated in maritime trainees both seagoing and shore based to enhance efficiency and productivity in the maritime sector.

According to Horck (2006) MET institutions have not prioritized communication and cultural management skills in the training programs. This view is supported by Theotokas and Progoulaki (2007) who highlighted the absence of cross-cultural training in the Greek MET studies. In addition, Progoulaki, (2008) indicates that only a small part of the Greek-owned shipping companies (19%) offer some kind of cross cultural training and when it occurs, it is focused on the officers.

Cross-cultural training on-board ship cannot be just a simple ‘add on’ to the regular maritime curriculum. There is need to pay attention to the entire learning environment and include other dimensions of educational processes, such as academic life and decision making, teacher education and training, curricula, languages of instruction, teaching methods, student interactions and learning materials (UNESCO, 2003).
Teachers, should be master communicators who can influence young minds in positive ways. Learning how to instruct students in the art of cross-cultural communication is a necessary goal of effective educators. More importantly, teachers must take the lead and develop strategies that ensure their students will learn not only navigation and maritime technology, but also cross-cultural communication skills (Ungureanu & Rosenhave, 2012).

In terms of intercultural sensitivity, students must learn to respect and tolerate cultural differences of their peers. Being able to walk in another person’s shoes is an acquired ability that takes training and practice. Methods of instruction that enhance intercultural sensitivity include role-playing, group discussions and paired exercises (Littrell et al., 2005).

2 Language
Hofstede (2001) delineates language as the most recognizable part of culture and proceeds to define language as a learned characteristic which can be acquired. He further explains that once the first foreign language is learnt, people find it easier to absorb additional languages. Besides, language and culture are considered to exert significant influence on communication, this view is supported by studies undertaken by Whorf (1956), Fishman (1974, p.65), Knudsen & Froholdt (2009, p. 114 - 115).

Use of a common language for example, maritime English is observed to encourage the multicultural and multi-ethnic crew to integrate with the culture on-board and develop a homogeneous environment or “hyperspace.” Ships are described as ‘hyperspace’ as “they share common features regardless of their ownership, management, trading region or crew complement”. Therefore, when on board and separated from land, there is a tendency of the crew to detach from regional ties and embrace the ship’s culture (Sampson, 2003, p. 256).

3 Cultural issues on board ships
Currently, two thirds of cargo vessels worldwide employ multinational crews as seafaring continues to be one of the most globalized professions (Lane et al, 2002). In this regard, management of cultural diversity and cross cultural communication are key issues for MET institutions.

In addition, just as language is crucial for communication, culture plays an important role in achieving effective communication. Theotokas and Progoulaki (2007, p. 384 – 395) advance the view that problems in cross cultural crews “can be identified with cultural incompatibility, language differences and lack of adequate and appropriate training”. However, various studies show that cultural issues are complex and crew from the same nationality may have different cultures. For example, it is widely believed that Filipino seafarers are subservient, pliable and hardworking in addition to their ability to
speak the English language. However, Bankoff and Weekly (2002), contest this argument by suggesting that “Filipinos are very culturally heterogeneous…”

It is equally important to note that seafarers work and live within a social circle. It is therefore, not only important to be able to work together safely but also to live together harmoniously, as social tensions caused by various factors including language and culture can be magnified in the ship’s restricted environment. Consequently, most shipping companies are keen on cultural factors when choosing the “right crew” and most have no more than three nationalities on-board (MARCOM 1999).

4 Maritime English for safety and communication in diverse working environment

As stipulated under Regulation V/14.4 of the SOLAS Convention as amendedxiv, a standard language is essential for communication on the bridge and most importantly communication with Vessel Traffic Services (VTS) and at traffic separation schemes for safety of ships. Communication related problems cause more accidents than reported in investigation reports. At times when communication is the root cause of an accident, it is often overshadowed by more “visible follow up events in the chain of causation” (Trenkner, 2010).

Moreover, various casualty investigation reports point at poor communication as a possible cause of accidents. Two cases in point are the “Scandinavian Star”xiv wherein 158 lives were lost and the grounding of the “MV Sea Empress” single hull oil tanker whose spill resulted to substantial damage on the marine and coastal environment around Milford Haven. In both cases, lack of adequate command of Maritime English was observed to play a significant role in the development of events that led to the tragic casualties and damage to the ecosystem. As a consequence, the “Scandinavian Star” accident is often referred to as the origin of the Standard Marine Communication Phrases (SMCP)xiv (MSC/Circ. 673; MSC/Circ. 794).

Conversely, SOLAS Convention allows the “Company or the Master to determine the appropriate working language which each seafarer shall be required to understand and give orders and instructions…” It also provides for translation into the working language if the language used is not the official language of the flag state (SOLAS V. Reg.14 part 3). Nevertheless, a common language is essential both in normal and emergency situations as crew must interact to maintain social harmony on and off duty to strengthen teamwork, cohesiveness and ensure effective day to day operation (Pyne and Koester, 2005).

While maritime English enhances communication onboard ships, communication challenges experienced within multi-cultural, multi-lingual and multi-ethnic crews are not only due to linguistic differentials. There are other contributing factors, including varying standards of training, technical factors, cultural incompatibility and language differences. As a consequence, MET Institutions should
develop the seafarers’ maritime English competency as well as skills on multiculturalism for both safety and communication onboard ships (Knudsen & Froholdt, 2009, p. 111).

5 Legal Discussion

According to IMO Resolution A.947 (23), human element is expressed as a complex issue which involves a broad spectrum of human activities including crew, shore staff, regulatory bodies and classification societies who are in contact with the ship during its ship operations.

Nations ratifying International Maritime Conventions are responsible for domestication and implementation of such conventions in their national laws. For instance, if a member state ratifies the STCW 78 Convention as amended, it is the State’s obligation to comply fully with the Convention, for example STCW Reg. I/14 part 6 and 7xv.

The ISM Code, STCW, 1978 as amended and MLC, 2006 point towards the standardization of seafarers’ training, certification, qualifications and competencies. The STCW 1978 Part A and Part B places emphasis upon the demonstration of competence, as well as actual performance of the seafarer on board ship (Holder, 1997, p. 1). The ISM Code (Reg. 6.2, p. 17) requires “… each ship to be manned by qualified, certified and medically fit seafarers in accordance to national and international requirements”. ISM Code (Reg. 6.5 p. 17) further requires “the company to establish and maintain procedures for identifying any training required to support the Safety Management System (SMS) and ensure that such training is provided for all personnel.

Introduction of soft skills like communication, teamwork and leadership has been underlined by STCW, 78 as amended, MLC, 2006 and the ISM Code. MLC 2006 (Reg. 1.3) on training and qualifications of seafarers states that “seafarers shall not work on board a ship unless they are trained or certified and completed training for personal safety on board…” ISM Code (Reg. 6.7, p. 17) stresses the ability of seafarers to communicate effectively in the execution of their duties. It is therefore important that MET institutions closely follow the requirements of the various maritime Conventions that guide MET to comply with the national and international regulations.

6 Simulator training

Simulator training has gained increased recognition in raising safety standards and the incorporation of this technology in the STCW 1978, as amended attests to this claim STCW A-I/12xiv (2010,p. 93). In this regard, teaching facilities including equipment used in practical training and simulation programs should be monitored, evaluated and continuous quality assurance undertaken to ensure required performance is attained.
The objective of simulator training is to provide a link between what the student is experiencing while undergoing training and assessment and on-board ship experience. This includes notions of environmental realism, physical fidelity, psychological fidelity and functional fidelity (Barnet, 1997). Simulators are therefore a very useful tool in preparing students for the diverse working environment in addition to on-board ship experience.

**Conclusion and Suggestions**

From the foregoing, there is substantial evidence of the close relationship between language and cultural issues and their effect on effective communication. Yet, they are both instrumental in the reduction of human element related accidents as reported from maritime accidents that happened in the past including, the Scandinavian Star, Exxon Valdez and Costa Concordia among others.

In events leading, up to and during emergencies, the ability of the crew to communicate among themselves and with passengers has proven to be a crucial factor in the outcome of many shipping incidents. Effective communication should be maintained at all times for the enhancement of safety and pollution prevention.

Moreover, “twinning” of operational and communication aspects of training in MET institutions is an effective way to ensure that linguistic realization of maritime English is achieved to promote competence and credibility (Cole et al, 2006). In addition, networking with MET teachers from leading maritime institutions and practicing maritime professionals will enable upcoming MET institutions to provide quality training and competency for seafarers.

Indeed, MET institutions have a crucial role to develop social-cultural competence of seafarers as part of their professional training to enable them gain a better comprehension and appropriate response to different cultural and professional situations within the multicultural compositions of the ship workforce.

Since culture and language issues are closely related, standardization of the English curriculum may enrich this training, enable seafarers to overcome social cultural contrasts and promote intercultural relationships hence effective communication and maritime safety in general. Furthermore, competency and experience of the maritime teachers plays a great role in enhancing teaching methodology, delivery and hence learning.

As ships continue to evolve in technology and size, use of simulators during training cannot be over emphasized. Nonetheless, simulator training should provide as much realism as possible to the various
environments in the diverse working situations. In addition, sea borne experience is equally valuable to provide the trainees with training in the real working situations.

Finally, these efforts geared towards preparing students for the diverse working environment will largely be enhanced through industry stakeholder involvement in education and training for seafarers. Cooperation between training institutions and the industry will provide the multi-disciplinary and globally oriented qualifications for the potential seafarers.

References


PREPARING STUDENTS FOR A DIVERSE WORKING ENVIRONMENT

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Abstract

Maritime is the movement of goods by sea and all other supporting activities at sea. In its nature, it is an international trade. The paper will look at the variety of jobs in the industry and the diversity of the workforce (Age, Race, Gender, Culture, Language).

The industry itself is vested with a variety of different careers and lines of business. The maritime and integrated transportation allows different modes of transportation to complement each other in the international supply chain. Having a holistic understanding of the industry permits students to have security knowing that they can work in which ever sector in the industry.

This paper will also look at the diversity of the human capital in the international supply chain. The core element of the shipping, operates worldwide in a multinational, multicultural and multifunctional environment (DEMiREL & MEHTA, 2009). It is in the interest of the team to learn how to work efficiently in such diverse environment. Hence it should be included in the curriculum, worldwide.

This paper seeks to highlight importance of training students on interpersonal relationships to prepare them for when working within a diverse workforce. A diverse work force presents a number of challenges related to changes in the social, legal and economic landscape, individual expectations and values as well as the inevitable change in organizational culture.

Shipowners are aware that a multicultural crew compliment can have a costly ending. Port and terminal operators find the ship interface communication cumbersome because of reciprocal mediocre English and lack of cultural awareness.

Challenges do exist, but it is better to teach the students in a manner that includes interpersonal and communication workshops. This allows a situation whereby most challenges are prevented, minor incidences will lead to on the job solutions.

Key words: Diversity, Gender, Culture, Workforce, Maritime Education and Training

The transportation of goods by sea is part of a global supply chain. Where cargo is transported from one country vested with: mineral resource, food or general cargo to another country, the purchasing
country. This process involves a number of different parties all from different countries, at least 2 or more countries. Normally they do business communication via emails, fax, telephonically, and even video conferencing nowadays days.

At sea, Kelly (2010) states that “65% of the world merchant fleet use multi-national crews, and over 10% of fleet staffed with crews composed of 5+ nationalities”

The diversity that exists on board the vessel is also further explored when the ship enters a port in a different country, different language, with English being the common language, different culture, age gaps and so forth. John Horck (2008) argues that in the ship port interface (SPI) there are several opportunities for lack of communication and misunderstanding. Over and above that, Olawepo (2013) argues that while original definitions (Carter et al. 1982) refer to the dimensions of gender, ethnicity, nationality, age and religion, additional dimensions have been included throughout the years to the definition of diversity: sexual orientation, socioeconomic class, education level, physical (dis)ability, and moral values.

With regards to the issue of gender, some female marine pilots shared that some captains don’t have much trust in their ability to navigate the vessel in the port just because they are females. Some get so alarmed and even take videos because it is a taboo to them seeing a female marine pilot. For purposes of this paper, the focus on diversity will zoom into language, gender and culture.

According to Baylon, A, Santos, V (2011) On October 15, 2011, during the General Assembly of the International Association of Maritime Universities (IAMU), the International Maritime Organization (IMO) Secretary General Ethimios E Mitropoulos, in his keynote address said: “As human element at sea is critical in ensuring safe, secure, clean and efficient operations, it is only feasible to secure, and to preserve, properly qualified human resources for the maritime industries through effective education and training – based on scientific and academic rigor; the development of a clear linkage between practical skills and management techniques; and an unerring focus on quality.”

Language
The Maritime industry as indicated, is an international industry in nature. The one common and unifying language in the World is said to be the English Language. It is thus important for shipping companies’ staff to articulate in English when communicating with a client abroad. At sea, on board a vessel, the crew compliment is likely to be diverse in terms of ethnicity, culture and language, just to name a few. It thus becomes imperative that the crew can understand each other when communicating. The English language, as mentioned above is therefore a need for a crew member on board the vessel. One of the International Convention on Standard of Training, Certification and Watchkeeping (STCW)
resolutions adopted in 1978 conference is with regards to 'Human Relations, and it emphasizes the importance of good human relationships between seafarers on board' (IMO).

For this resolution to be achieved, a number of contributing factors come to play, for instance, without proper communication and understanding of the language used, meaning is bound to be lost in translation, as a result there wouldn’t be any meeting of the minds. It is for that reason, and more, that the STCW set English requirements for seafarers on board the vessel. It is thus included on Maritime education and training to educate Maritime English especially to non-English countries. For example, at the World Maritime University, students without an internationally recognised English proficiency certification or in their academic record are required to join the English & Study Skills Programme (ESSP) from June to September. This sets a foundation for them since all modules are lectured in English.

John Horck (2010) states that The seafarers’, and port workers’, spoken English has been found to be substandard. Therefore, in the MET curricula the English language has to be strengthened. The importance of English cannot be over emphasised, the communication breakdown that is caused by lack of English proficiency can lead to serious loss, insurance claims and even need salvage. John Horck (2008) after the ship Bright Field crashed into the river walk Marketplace at the port in New Orleans the National Transport Safety Board cited maintenance and Communication errors as contributory to the accident (Malone 2000).

The Ship Port Interface (SPI) is also one of the noticeably affected component of the international supply chain. Not only language is an issue at this juncture, culture and gender play a significant role in potentially causing problems in the SPI. John Horck (2008) argues that “an additional problematic to differences in culture is operational managers and stevedores possible weak English. Therefore the lack of communication leads to lack of understanding, thus accidents are bound to happen especially at the SPI or on board the vessel.

It is for that reason and more, that Maritime English training is needed for individuals pursuing careers in the Maritime industry.

**Culture**

Culture has to be one of the most complex concepts to define, One of the definitions that stands out is ‘Culture ... is that complex whole which includes knowledge, belief, art, morals, law, custom, and any other capabilities and habits acquired by man as a member of society.’ Tyler (British anthropologist) 1870: 1; cited by Avruch 1998: 6. Equally it is said to be ‘... the set of attitudes, values,
beliefs, and behaviours shared by a group of people, but different for each individual, communicated from one generation to the next.’ Matsumoto 1996: 16.

People identify more with those of the same culture, this eliminates the element of unpredictability of other people. One is more comfortable in a predictable environment, it assures them of an element of belonging. Culture and Language go hand in hand, the ease of communication eliminates the element of being isolated due to inadequate English. Thus people end up grouping themselves according to their culture and language. Tyler’s definition also speaks to customs, one may also add religion that is most of the time inclined with culture. Certain religions pray at a particular time customarily and some in a particular fashion different from others. That can cause division in groups but can also work well when everyone respects each one’s culture, language, religion.

South Africa is indicative of the diversity that exists in the Maritime industry, at a smaller scale though. With 11 official languages, comes a number of different cultures, some complimenting each other and some significantly different. Furthermore we have a vast set of religious groups that are all recognised by the state. And we pride ourselves of being a rainbow nation that is united in diversity.

Institutions of higher learning have a responsibility to sensitize students about the multicultural nature of the industry. For instance, making mention and examples of how different cultures view certain things.

Matsumoto’s definition suggests that culture is not stagnant, it evolves with time. There is a culture also on board a vessel, the maritime industry as a whole has its specific culture, one that is driven by “our word is our bond” motto. Steve Dougal argues that ‘our word is our bond’ is an ethic from the last century. I also remember Mr Langa Dlamini from UKZN Maritime studies emphasizing this as a cornerstone in the maritime culture. With that said, over and above the different cultural backgrounds, we are united by the Maritime culture that we grow to learn and adapt to.

Gender

“IMO produced its strategy for the integration of women into the maritime sector in 1988 and began implementation of the IMO Women In Development Programme (WED) in 1989, concentrating on equal access to maritime training through both mainstream programmes and gender specific projects (Popescu, C. & Varsami, A)” One would argue that this WED set a good foundation for Women in the Maritime industry. This is evident in how women’s participation is gradually increasing.

This change is not much of a shock for the generation Y as opposed to the Baby Boomers. When one had a conversation with one of the Transnet Female Marine Pilots, they mentioned that some old male
captains have a hard time giving them control of the vessel because they feel they might not navigate it properly. For instance, this would be an issue if they didn’t allow them to do their jobs just because they are females.

Some issues that female seafarers face is the discrimination and sexual (direct and indirect) harassment on board a vessel. Some men even make comments that seek to suggest that “a man, who’s a breadwinner, is not working because of her”. Such mentality needs to be eradicated during education and training phase. Other cultures strongly believe that a woman is not permitted to be working with men, but as mentioned above, the Maritime culture should come before an individual’s culture, thus allowing social cohesion in the workplace.

When students from different backgrounds work together, each student comes with a unique element to the group. These elements can complement each other. If not, more diversity management techniques need to be explored. Relaxed social gathering allow people to know more about each other and thus understanding each other’s cultural backgrounds. Even students themselves, would have more respect, tolerance and understanding of each other’s uniqueness.

**Diversity training can even take place in a lecture room and translated in the workplace.** The diversity that exists in Maritime is not only limited to social demographics. It can be argued that the diversity of the careers is also prevalent. There is a variety of Careers in the shipping industry. More often than not, these careers complement each other; it is thus great to have a syllabus or curriculum that explores the complementary nature of these careers. This eliminates the fear of being stagnant in the work environment, it allows flexibility. For instance, for the purposes of this paper, if we briefly look at the new Shipping and logistics diploma from Durban University of Technology, the course equips students with enough knowledge to be marketable in a number of different shore based jobs. Few are mentioned below.

**Ship Management**

When a ship is purchased for importing and exporting goods, a ship management team is required to operate and maintain the vessel. Most management companies provide the owner or the operator with crew onboard. When the ship comes of the shipyard the management company takes it over providing technical support to the owner. Maritime students in SA should also be fully exposed to studies involving the roles played prior to ship building activity i.e ship inspection prior to purchase, supervision during the building of the ship, lay up plan and ship supply solutions.
Classification Societies

These organisations or groups operate by having employees that are fully trained and educated enough to know exactly what is expected of them when a ship owner has decided or chosen to class the ship under that particular society. As explained in the ship management, classification societies are expected to monitor the ship’s entire construction, ensures that the ship is seaworthy as always expected, they also responsible for approving the ship’s design plan. Therefore for all of these duties or expectations to be performed, there needs to be personnel which shouldn’t only available from other countries or nations, but should also be coming from our country, and are ought to be properly skilled, trained and educated for such duties readily available within the maritime industry.

When we visited Germany as part of the Shipping Management and Logistics specialization at WMU, we went to DNV*GL and they also gave us insight on their ship classification services. Such is very beneficial for students to have that an opportunity to link their academic knowledge and the real world experience. In SA we do have DNV*GL offices in Cape Town. A visit can be arranged for students.

Ship Brokerage

Sales and purchase brokers for instance are merely responsible buying and selling of existing vessels in the second-hand market or contract new ships in the industry from ship builders. S and P brokers discuss opportunities and market trends with ship-owners, charterers, investors, and bankers, report on market sales, vessel values, market trend and activity. Companies therefore when looking to hire personnel do assess them to establish the level of training and or skills people acquire to perform duties such as those mentioned above. As much as a person may be a qualified logician, or may have a degree or diploma in a maritime related aspect, it is with no doubt that such companies weigh options by comparing the amount of knowledge our local applicants have compared to foreign applicants. Therefore a lot of attention need to be given to ensuring the intensity of knowledge is instilled to these learners so to fully prepared them for the wide world of work ahead of them. Perhaps even if there are modules specifically prescribed for such topics maybe that could enlighten students a bit more when it comes to things such as brokerage etc.

One of the reasons Why I am saying this is that there are many types of brokers also, namely:

• Chartering broker
• Loading broker
• Ship owner’s broker
• Insurance broker
• Cargo broker
Forwarding agent
Forwarding agent is employed by the shipper to find a ship, usually on a liner trade, to carry his cargo. It is the forwarding agent’s normal duty to ascertain the date and place of the vessel’s sailing, the forwarding agent is also responsible for allocating the space on board the ship for a seller’s container(s) and also preparing the bills of lading on behalf of the seller or the buyer. The forwarding agent are expected to know all the formalities and the procedures that he or she must follow e.g. understanding customs regulations and laws, understanding the bills of ladings, port procedures, documentations involved in the process of arranging for goods to be transported to the harbour and vice versa.

Marine Insurance
Marine insurance is also one of the very important aspect of shipping. For shipping industry it is the marine insurance which is available for the benefits of a client’s business in case of any unforeseen events which may possibly take over. Shipping involves a lot of highly valued items which could really be a huge risk to anyone involved in this industry with the intention of making successful business without ensuring whichever property that concerns you within the industry. There are different insurances involved within the industry, and one should make note of the fact these insurance companies are big and are doing enormous and is a very important job by making it possible to become “underwriters”i.e insurance providers to a lot of people involved i.e

- Ship-owners
- Cargo owners
- Port facilities
- Crew members etc

For instance there is cargo insurance which caters specifically to the cargo of the ship and also pertains to the belonging of a ship’s voyagers.

A lot of these insurance companies are in need of personnel to work for these companies and should have been given proper information or knowledge in colleges or universities to prepare them for workplace within the maritime insurance companies.

There is also Protection and Indemnity insurance which has been developed over the last 150 years in response to the need by ship-owners for insurance cover for third party liabilities that were not recoverable under the standard hull and machinery policies. The original purpose of P and I insurance was to protect ship-owners against liability in respect of personal injury and death, one quarter collision liability, that is, the liability in excess of the sum insured in the hull policy. However, the standard, modern and P and I policy includes coverage for a very wide range of liabilities and the losses that a ship-owner may incur including the following, liabilities arising from the carriage of cargo, marine
pollution liability, loss of life and injury to crew members, passengers, and others, such as stevedores, liabilities for damage to fixed or floating objects, and liability arising out of a collision with another ship.

**Shipbuilding**

Shipbuilding is an important and strategic industry in a number of EU Member States. Shipyards often play a significant role for the regional industrial infrastructure and, with regard to military shipbuilding, for national security interests. The European shipbuilding industry is the global leader in the construction of complex vessels such as cruise ships, ferries, mega-yachts and dredgers. It also has a strong position in the building of submarines and other naval vessels. Equally, the European marine equipment industry is world leader for a wide range of products from propulsion systems, large diesel engines, environmental and safety systems to cargo handling and electronics (Kotler, 2010:234). There are around 150 large shipyards in Europe, with around 40 of them active in the global market for large sea-going commercial vessels. Around 120,000 people are directly employed by shipyards (civil and naval, new building and repair) in the European Union. With a market share of around 15% in volume terms, Europe is still vying (with South Korea) for global leadership in terms of the value of civilian ships produced (15 billion Euros in 2007).

This is a clear indicator of how vast and important the shipbuilding is the other continents, therefore also locally there is a lot that still should be out in place to ensure that the European countries are challenged when it comes to such. Again going back to the issue hammering a lot of time, knowledge and skills as early as university level so that personnel with such potentials could be available amongst us. Wilson D.J(1997).

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LET NUMBERS SPEAK: CULTURAL AWARENESS, JOB OPPORTUNITY AND THE INTERNATIONAL STUDENT EXCHANGE PROGRAM BETWEEN MARITIME UNIVERSITIES

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Abstract:
For six years, Massachusetts Maritime Academy (MMA) of the USA has been facilitating a student exchange program with Shanghai Maritime University (SMU) of China. The program, conducted in two countries that differ massively in culture, history, social values, economic systems and governmental structures, imposes huge challenges on the participants.

The exchange students need to survive cultural shocks, overcome language barriers and adapt successfully to the new environment. Presently the exchange program has become increasingly popular at MMA; the number of participating cadets has risen from 11 in the year of 2010 to 27 in 2013. The participating students, who have been “gold gilded” in China, tend to stand out in the job market upon graduation, especially in comparison to their peers who have not participated in the international program.

The paper presents an empirical analysis of how the international student exchange program affects future job opportunities and enhances outstanding qualities of participating cadets. Applying a case study methodology, drawing on school-wide surveys, analyzing questionnaires, and applying data collected over the course of six years, the paper examines the relationships between the international experiences and job market success for participating students upon graduation and their subsequent career development after graduation.

The findings indicate that MMA cadets who went to China obtain more lucrative job offers than those who did not. Maritime companies hiring cadets who traveled to China tend to be larger in terms of their asset values or multinational corporations with branches in many parts of the world. The results also show that the exemplary qualities needed of exchange students, such as language proficiency, cultural adaptability, flexibility, initiative, world vision, genuine curiosity, and perseverance, are displayed and encouraged, allowing the participating students to reach their full potential. Furthermore, it is clearly demonstrated that the program-participating students are more successful in their career development after graduating from the institution.
Keywords: international exchange program, labor market competitiveness, entry level salary, cultural adaptability, international experiences and job offers.

Introduction
As the world has become increasingly interdependent, especially in the maritime industry, more and more maritime institutes are engaged in various exchange programs in the hope to broaden their cadets’ international views, enhance their capabilities of conducting cross-cultural business and their abilities to get along with the more diversified workforce of the maritime industry. For 6 years, Massachusetts Maritime Academy (MMA) of the USA has been conducting a student exchange program with Shanghai Maritime University (SMU) of China. Every spring term, about twenty cadets are selected from each institution and sent to the other campus to study for one semester. Strictly speaking, it is an exchange of Maritime Training and Education (MET) between two maritime institutions, since the participating students pay tuition, room and board to their home school while studying at the host university. The program, conducted in two countries that differ massively in culture, history, social values, economic systems and governmental structures, imposes huge challenges on the participants. The exchange students need to survive cultural shocks, overcome language barriers and adapt successfully to the new environment. Presently the exchange program has become increasingly popular at MMA; the number of participating cadets has risen from 11 in the year of 2010 to 27 in 2013 and 23 in 2014. The participating students, who have been “gold gilded” in China, tend to stand out in the job market upon graduation, especially in comparison to their peers who have not participated in the international program.

The paper presents an empirical analysis of how the international student exchange program affects future job opportunities and enhances outstanding qualities of participating cadets. Applying a case study methodology, drawing on school-wide surveys and applying data collected over the course of six years, the paper examines the relationships between the international experiences and job market success for participating students upon graduation and their subsequent career development after graduation.

The paper is structured as follows: Section II describes the fast growth of the MMA-SMU exchange program. Section III presents the changes brought about to the MMA campus due to the international program and the underlying reasons that account for the success of cadets participating in the program. Section IV looks into the fact that the fast growth in both the shipping industry and Chinese economy creates great opportunities for American maritime students. Section IV offers a conclusion.
Cultural Awareness and the International Exchange Program

The MMA-SMU student exchange program started with 11 cadets of two majors, Marine Transportation and Marine Business in 2010. Now it has expanded to well over 20 cadets from 5 majors, adding Marine Engineering, Marine Protection and Facility Engineering to the list. Table 1 shows how quickly the number of MMA cadets participating in the exchange program has grown over the course of 5 years. We will then present some explanations which account for the popularity and success of the exchange program.

Table 1. Participation number of MMA cadets in the MMA-SMU/DMU exchange program 2010-2014

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</table>

1 The basic facts about MMA

Massachusetts Maritime Academy is a principal maritime educational institute in the US with a focus on excellent ocean centric majors like Marine Engineering and Marine Transportation. However, as a state college, the great majority of cadets enrolled are from Massachusetts and other local areas in New England, a region in the northeastern corner of the United States. The academy has shown, more or less, the features of homogeneity and conservativeness. Thanks to the vision and courage of President Gurnon, MMA has stepped out of its comfort zone in response to the proposal of SMU in China and set up the MMA-SMU exchange program in 2008. The exchange program was the first international exchange program at MMA and is still the only successful international exchange program with Chinese maritime universities among all American maritime institutes. The following school-wide survey of 109 cadets in 2011 how prepared they were in regards to international travel.

Table 2. The world travelling by MMA cadets

<table>
<thead>
<tr>
<th>Destination of travel</th>
<th>Percentage of survey participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>3%</td>
</tr>
<tr>
<td>Asian Countries (except China)</td>
<td>7%</td>
</tr>
<tr>
<td>European Countries</td>
<td>31%</td>
</tr>
<tr>
<td>Caribbean, South &amp; Latin American Countries</td>
<td>97%</td>
</tr>
<tr>
<td>Canada</td>
<td>78%</td>
</tr>
</tbody>
</table>

Table 2 indicates how extensively (or not quite) American students travelled outside US and places they felt comfortable going to. Only a few American students had gone to Asian countries (except China), such as Israel, Jordan, India, Japan, etc. and three had visited China, including one American-
born Vietnamese. Around three-fourths of responding cadets made trips to Canada; a country that holds similar political, economic, social and cultural systems to the USA. And yet out of the eighty five students who had visited Canada, all of them went to English speaking areas like Toronto, Vancouver and Ottawa, and only one third had gone to French speaking areas like Montreal and Quebec City. About 31% of the respondents toured European countries, and the highly frequented destinations were Italy, Ireland, Portugal and England. To a great extent, this is due to the fact that many of the respondents are descendant of the British, Italian, Portuguese and Irish, can still speak the language, or have family members living in Europe. One cadet explained that his grandfather lived in a village outside of Rome and has more than 20 Italian cousins.

The statistics in Table 1 also shows that nearly all of the MMA cadets paid visits to Caribbean, South and Latin American countries, such as Mexico, Barbados, Puerto Rica, Evader, Panama, Costa Rica and Tortola. That is mainly because cadets at MMA are required to take sea destination when the cadets take voyages with the school training ship.

2 Cultural Awareness and the Exchange Program

With the on-going exchange program, 2 surveys were conducted at MMA in 2011 and 2013 respectively to see how MMA cadets perceive the exchange program.

<table>
<thead>
<tr>
<th>Survey Questions/ Answers</th>
<th>Positive</th>
<th>Negative</th>
<th>Neutral</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>The impact the China program would impose on MMA?</td>
<td>81.9%</td>
<td>0.9%</td>
<td>17.4%</td>
<td>2011</td>
</tr>
<tr>
<td></td>
<td>84.5%</td>
<td>0%</td>
<td>15.5%</td>
<td>2013</td>
</tr>
<tr>
<td>How will the China program influence you?</td>
<td>33%</td>
<td>2.8%</td>
<td>64.2%</td>
<td>2011</td>
</tr>
<tr>
<td></td>
<td>39%</td>
<td>1.5%</td>
<td>59.5%</td>
<td>2013</td>
</tr>
<tr>
<td>Do you want to go abroad for jobs or studies?</td>
<td>56%</td>
<td>22.9%</td>
<td>21.1%</td>
<td>2011</td>
</tr>
<tr>
<td></td>
<td>63%</td>
<td>15.1%</td>
<td>21.9%</td>
<td>2013</td>
</tr>
<tr>
<td>What do you think of the Chinese students?</td>
<td>75.2%</td>
<td>0%</td>
<td>24.8%</td>
<td>2011</td>
</tr>
<tr>
<td></td>
<td>78.1%</td>
<td>0%</td>
<td>21.9%</td>
<td>2013</td>
</tr>
<tr>
<td>Do you want to be the roommate of a Chinese cadet?</td>
<td>19.3%</td>
<td>71.5%</td>
<td>9.2%</td>
<td>2011</td>
</tr>
<tr>
<td></td>
<td>21.2%</td>
<td>69.4%</td>
<td>9.4%</td>
<td>2013</td>
</tr>
</tbody>
</table>

Table 3 presents the 5 principal questions raised in the survey and the answers the participating cadets selected. For each of the 5 above-listed questions, the cadets have 3 choices, “positive”, “negative” or “not much either way”, and they can only pick one choice to each question. For the second question “how would the China program influence you?”, one third of the respondents selected “positively”, about two thirds (64.2%) picked “not much either way” and only 3 students chose “negatively”.
The MMA cadets expressing positive opinion about the program focused mainly on the three points: developing good relations between countries and people, allowing MMA students to gain experiences of different cultures and a great opportunity to meet the cadets of the same major from other countries.

We can see that, though 81.7% of the MMA cadets believe that the China program would bring positive effects on MMA, and none have negative opinions about Chinese students (see the answers to the 4th question), most MMA cadets would prefer not to have too much involvement with China program/students at the personal level, such as becoming a roommate of a Chinese visiting student. When being asked the reason, several MMA students said that they would like to have a roommate who could be quite similar to themselves, same personalities, same background, and same hobbies, as one student put it, “I want to room with one of my friends.” Some others were worried that rooming with a Chinese exchange student would be a big, time consuming responsibility, since they would be expected to introduce SMU students to American culture and show them around.

Both Table 2 and Table 3 clearly state that many MMA cadets did not go too far away from their comfortable zones, and they were still looking for, as much as possible, similarities rather than differences. The exchange program prepares MMA students to meet the challenges of the increasingly cross-cultural maritime industry, and encourage them to take that extra step to embrace the different. It is also worth mentioning that over the course of four years, each group of Chinese students has brought the fine qualifications of diligence, strong work ethic, and determination to succeed; many MMA cadets and faculty members have been greatly impressed. Though Chinese exchange students would experience cultural shocks and language barriers, they have made impressive efforts to blend in and excel in the classrooms. One MMA professor of Internal Combustion Engine said: “It is a pleasure to have the Chinese students in my class. They work so hard and get the best grades.”

On the first day of the Spring term of 2014, one questionnaire was conducted in the Chinese Economy class. The following two tables sum up the answers from 20 participating cadets registered for the class, which shows how much MMA cadets, mostly seniors and a few juniors, knew about China when they sign up for the class, and how eagerly they would like to learn about the country.

Table 4. Answers to the question: list five things you know about China (March 2014)

<table>
<thead>
<tr>
<th>Categories of answers</th>
<th>Answers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Politics</td>
<td>communist government, internet control</td>
</tr>
<tr>
<td>Economy</td>
<td>fast economic growth, high ranking in merchant fleet, big trading</td>
</tr>
<tr>
<td></td>
<td>partner of US, big shipping industry</td>
</tr>
<tr>
<td>Society</td>
<td>long history, rich culture, lots of ethnic minorities, good food,</td>
</tr>
<tr>
<td></td>
<td>most populated country, 2008 Olympics, small families</td>
</tr>
<tr>
<td>Geography</td>
<td>capital is Beijing, the Great Wall,</td>
</tr>
<tr>
<td>People</td>
<td>Confucius, Mao Ze Dong</td>
</tr>
</tbody>
</table>
The answers to the question “Please list five things you know about China” can be put into five categories, politics, economy, society, geography and people. Table 4 tells that MMA cadets knew some general information about China, such as political structure, rapid economic growth, maritime industry in China, culturally rich society and good food. However, they only have some general ideas about the country, not much in the way of details.

Table 5. Answers to the questionnaires (March 2014)

<table>
<thead>
<tr>
<th>Answers to the question: Why would you take the Chinese Economy Class?</th>
<th>Percentage of cadets surveyed</th>
</tr>
</thead>
<tbody>
<tr>
<td>To know more about the country and its economic growth</td>
<td>30%</td>
</tr>
<tr>
<td>To fulfill the requirement of an elective course</td>
<td>20%</td>
</tr>
<tr>
<td>Both of the above</td>
<td>45%</td>
</tr>
<tr>
<td>Other reasons, such as to know more about Asian culture, seems to be an interesting class, etc.</td>
<td>5%</td>
</tr>
</tbody>
</table>

Table 5 shows that 75% of the registered cadets for the Chinese Economy class intended to know more about the country and its rapid economic growth. One student wrote that the reason he signed up for the course was “to learn more about one of the most growing countries in the world”. Another one wanted to know more about “US and Chinese trade regulations and differences in culture that may affect economy”. One cadet would like to find a job in China after graduating from MMA, as he loved the country after spending one semester as an exchange student at DMU. One cadet even wanted to “discover whether it is good to invest in China”.

Job Market Success for MMA Cadets Participating in the Exchange Program

Most of MMA exchange students are juniors, only a few would go as sophomores. Usually they will graduate the following year after spending one spring term in China. At this point we only have four groups of MMA cadets graduating from the academy since the exchange program started in 2010 and most received good job offers upon graduation. In this section, we will look at the companies who offered the exchange cadets jobs during their senior year and how much their experiences in China contributed to their current jobs and later promotions. We see three trends clearly from the available data collected by the Office of Career and Professional Services of the academy: companies that employed the cadets tended to be large with many international elements, cadets received decent salary offers, and they are on steady rising track of career development.

The first group of 11 MMA exchange students went to SMU in the spring term of 2010, nine of them graduated in June 2011 and two in June of 2012. Five cadets responded to the school survey with jobs, and they happened to be all maritime business majors.

Myra, the first female who went to China in 2010, received a job with SpecTec upon her graduation as a regional sales manager. SpecTec is a premier provider of asset management solutions for the
marine, offshore & energy, defense and yachting industries all over the world. Her responsibility is to identify and evaluate sales opportunities in the United States, Canada, and Latin America. After working at SpecTec for two and half years, Myra switched to DNV GL Group, the world’s largest ship and offshore classification society of the maritime industry, a leading technical advisor to the oil & gas industry, and a leading expert in the energy value chain including renewables. The company has 16,000 employees across 300 sites in more than 100 countries and gains revenue of EUR 2,500 million per year. Myra works as Sales Support Manager and she loves her challenging and rewarding job.

Johnathan was offered a job as a technical coordinator by Canada Steamship Lines (CSL). CSL is a Montreal based company which brings highly-efficient, gravity-fed, self-unloading capability to bulk shipping and transhipment markets throughout the world. Only two years out of college, White has completed project work in China for CSL International and is now based in England, working for CSL Europe and their Technical Operations Director conducting analysis and development of fleet wide operational, financial and energy efficiency improvements. The young graduate also assists in development of a monitoring system to improve the CSL Europe safety program. As the front page article of MMA website put, “this young grad hopped on CSL’s sturdy corporate ladder and started climbing!”

Two cadets received jobs at Back Office Associates (non-maritime ashore), which is a Massachusetts based software and services company focused on data migration, information governance, master data management (MDM) and data quality for enterprise systems. The two cadets work as Data Migration Analyst and Consultant with salary range of $50,000-$75,000 and $75,000-$100,000 respectively.

Two cadets worked for maritime related on-shore jobs upon graduation. One works as a Freight Trader at Heidmar with entry level salary in the $50,000-$75,000 range. Heidmar is one of the world’s leading commercial tanker operators with a fleet of approximately 100 vessels. From offices in the U.S., U.K., and Singapore, our staff provides around-the-clock service to major oil companies and oil traders on a world-wide basis. Another was hired as assistant to marine operations at APM Terminals upon graduation with salary range of $50,000-$75,000. APM Terminals is is an international container terminal operating company headquarte red in Hague, Netherlands. Starting from January 2014, the graduate works as Sr. Outbound Analyst at Johnson & Johnson. Johnson & Johnson is an American multinational medical devices, pharmaceutical and consumer packaged goods manufacturer founded in 1886. Its common stock is a component of the Dow Jones Industrial Average and the company is listed among the Fortune 500.

The salary range of the 5 responding cadets from the first group has the following distribution, one in the range of $35,000-$50,000, three in the $50,000-$75,000 and one in the $75,000-$100,000. And
these 5 cadets happened to be Marine Business Majors and customarily, non-sea-going majors receive 15%-20% less than sea-going majors at MMA. When we compare the whole academy’s salary range reported for the year of 2011, which includes the seagoing and nonseagoing graduating cadets, it is obvious that the 5 cadets stand out for not only the prestigious companies they work for, but also the salaries they received upon graduation. The following graph shows the salary range from 81 MMA seniors graduating in the year of 2011.

Graph 1: Salary ranges of MMA seniors in 2011

The second group of MMA cadets that went to China graduated in June of 2012 with two majoring in Marine Transportation (MT) and eight majoring in Marine Business. For the two MT cadets, one was hired by Military Sealift Command as 3rd Mate and the other at Hanjin Shipping Company as 3rd Mate and both received the entry level salary in the $50,000-$75,000 range. Military Sealift Command, part of US Navy forces, is the leading provider of ocean transportation for the Navy and the rest of the Department of Defense – operating approximately 110 ships daily around the globe. Hanjin Shipping is a South Korea based global shipping and logistic company and one of the top ten container carriers in the world. The eight Marine Business (MB) graduates got jobs as either maritime ashore or non-maritime ashore. Two female cadets work for Canada Steamship Lines (CSL), and the others work for respectable companies. Five MB cadets reported their salaries; two receive the range of $35,000-$50,000 and three at the $50,000-$75,000. In comparison to the salary range at MMA, as reported in the following graph, the exchange students certainly had an edge over the peers who did not participate in the program.
There are 6 MMA exchange cadets who responded fully to the survey conducted by the Career & Placement Office in June of 2013. The six cadets were hired as good entry level positions, and by the huge multinational companies. Four MB cadets worked for BP, GE, General Dynamics, and McLaughlin, One MT cadets at Military Sealift Command as the third mate and one MSEP at Able Services as regional Safety manager. The salaries were reported as the following: one falling in the range of $35,000 - $50,000, four in the ranges of $50,000-$75,000 and one in the range of $75,000-$99,000. In comparison to the seniors of the whole cohort at MMA, the cadets participating in the MMA-SMU exchange program were obviously in advantageous positions.

Since the year of 2013, the MMA Career and Placement Office added one more category in data collection to put the salaries seniors receive into different ranges according to their majors. Graph 4 shows in details the salary ranges for six majors at MMA. Two seagoing majors like Marine Transportation and Marine Engineering get higher entry level salaries than non-sea going majors like MB, Emergency Management (EM), MSEP and Facility Engineering (FE).
The MMA cadets going to China certainly gain an edge in the job market upon graduation and their later career paths. MMA President Gurnon made the comments: “The unique international experience adds an extra level of value to the job applicants. Big companies would be greatly impressed when they see our qualified cadets have the courage to travel to another country and be successful in a different environment.” The director of Career and Placement Office has the similar observation, “in job market, the cadets make themselves stand out among many applicants when they add the China experiences to their resumes. Big companies love the students who have overseas experiences.”

Positive Experiences and Great Opportunities in China

1 Positive experience of American students gain in China

Each year the participating cadets from the academy gained very positive experiences during their stay in China. They believed the program helped them in the following three areas: developing good relations with Chinese people by experiencing the country first hand, putting them in more advantageous positions in different cultures and among different people, and meeting cadets of the same major from other countries. One student wrote in his report of the exchange program: “It is a great opportunity to meet people from other countries in similar fields of study.” Another cadet said that “It allows exchange of cultures and offers a new unique experience. It also helps educate everyone in the school about the Chinese culture, not just those who get to go.”

Many participating cadets from the first groups became strong advocates of the exchange program and promote the program in every possible way. The cadets present papers about the program and their own personal experiences at international and domestic maritime conferences, hold positions in the student council, serve as cadet officers of foreign exchange program, give talks to cadets’ parents, and encourage other MMA students to join the program.
To participate the MMA-SMU student exchange program, the cadets not only show their fine academic qualities by expressing language proficiency, intuitive vision, and genuine curiosity and perseverance, but also their spirit and personality through determination, cultural adaptability, flexibility, and the capability to overcome all difficulty which goes above and beyond the expectations the Chinese would have for the first overseas students. Here is a good example: Myra was the only female cadet going to China in the first year. On top of being the best student in the class, averaging 85.2, while the class mean was an 82, Myra joined the soccer team as the eleventh member representing MMA to play against SMU and other university teams in Shanghai. It turns out that she scored the most in the games, and although she was once injured badly on the field and rushed to the hospital in an ambulance, her optimism and determination made a deep impression on her teammates, the Chinese cadets, and the doctors who treated her in the hospital. One Chinese faculty at SMU exclaimed, “Wow, fragility, your name is not American women.”

The cadets from all these years have been trying to maximize their time in China. They travelled extensively to gain first-hand experience of Chinese tradition, history, culture, and society. They sampled various types of Chinese foods, learned unique customs, met people from other parts of the world, and built life-long friendships.

2 Fast Growth in China and Opportunities for Maritime Cadets

For three decades, China has developed tremendously and despite the Asian financial economic crisis in the late 1990s, the Chinese economy continued to grow at rapid pace, with an average annual growth rate of almost 10% between 1991 and 2010. China’s total international trade of goods in 2013 reached $3,982 billion, surpassed USA’s $3,848 billion, and made China the largest trading country in the world. In 2012, China’s GDP, valued at $8.358 trillion, surpassed Japan’s $5.96 trillion dollars and became the second largest economy in the world, just next to USA ($16.245 trillion).

During the same period of time, there has been a dramatic development in the Chinese shipping industry. In 2013, eight Chinese ports were on the top ten of the global cargo throughput rankings.
China’s shipping industry and container transportation has reached international standards both in handling efficiency and building networks. In 2009, China reached 26.1 million TEUS in containerized cargo shipping, surpassing the USA, and has been ranked the largest exporter of containerized cargo shipping country ever since. The Chinese government has not only set up massive shipping companies like China Ocean Shipping Company (COSCO), but has also invested heavily in the water transport infrastructure, constructing new ports and rebuilding and enlarging older facilities. Shanghai is the largest city in China and has become the center of international finance and global shipping. Many international corporates set up branches in Shanghai and intend to hire personnel with training in their own field and with a world vision. The MMA cadets with China experiences would be considered as highly valued candidates to work for the international companies. For instance, a couple of years ago, an American waste management company (Wheelabrator Technologies) announced plans to construct five waste-to-energy facilities in the suburbs of Shanghai and intended to hire MMA cadets with China experience and with training in marine engineering and environment protection to work in Shanghai, and would offer internships to MMA cadets even before graduation.

In late May of 2014, the Deputy Chairman of Foremost Group visited MMA and intended to hire graduates who were familiar with China. Foremost Group is a New York-based shipping, trading, and finance enterprise that have recently expanded their business to Asian countries, including Hong Kong and Shanghai. All potential job opportunities greatly encourage the MMA cadets to participate in the international exchange program and gain foreign experiences.

**Conclusion**
Looking at the available data, it is clear that the exchange students are given an edge over their peers. In regards to international experience that can easily be applied to future jobs, cadets who choose to take this opportunity find themselves much better candidates within a rapidly expanding market. When
combined with qualities of leadership, risk-taking, language proficiency and cultural adaptability, it becomes an invaluable tool to help exchange cadets stand out in the increasingly competitive job market.

The international corporation between two maritime institutes, such as the MMA-SMU student Exchange program, would be very effective to help the participating cadets enhance their self-confidence, broaden global vision, and adapt to a new environment with ease and grace. The successful experiences of the MMA-SMU program are applicable not only to the maritime universities of USA and China, but also to the institutions located in two other culturally diverse countries, like the UK and Vietnam. When the participating cadets prove that they can survive and perform well in two completely different cultures, they demonstrate that they have all the necessary and sufficient skills to be successful within any type of job they are offered. And this is exactly what the potential employers are seeking of all graduating maritime cadets nowadays.

With the on-going development of the exchange program and availability of additional data of the female cadets at MMA, more rigorous statistical analysis could be applied to the research, generating more significant conclusions. To do so will unquestionably help us to see how the exchange program enhances cultural awareness, educates maritime cadets to embrace the differences, and fosters leadership qualification of cadets of maritime institutions.

References:
TRACER STUDY ON THE EMPLOYMENT OUTCOMES OF PORT & SHIPPING ADMINISTRATION GRADUATES OF THE REGIONAL MARITIME UNIVERSITY

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Abstract
Over the last two decades many traditional maritime institutions have incorporated courses and programmes related to the management and administration of shipping into the vocational maritime training courses or have developed new programmes in maritime management altogether. The Regional Maritime University is one typical institution that has gone through this evolution. The Bachelor of Science and Master of Art in Ports and Shipping Administration and their forerunners the Diploma and Postgraduate programmes was introduced in 2003 to educate and train shore-based personnel from the sub-region for engagement in the maritime and allied industries. The purpose of this paper is to track down Ports & Shipping Administration graduates of the Regional Maritime University and ascertain the employment opportunities available to them (in the maritime or other sector), their employability and ascertain whether the training obtained meets the needs of the industry.

This would require careful methodologies not only to ensure the correct data collection, and analysis, but also that valuable lessons are fed back into the school to enable adaptation and innovation. The methodologies should also ensure that valuable information is sought to establish the effectiveness and relevance of course and training. In this tracer study, snowballing will be used in tracing the graduates. We will utilise the Google docs online survey system to serve questionnaires and analyse and present the feedback.

This paper is part of a larger project, findings of which will inform planning and quality assurance efforts of the RMU.

Keywords- Employment, Graduates, Maritime Management, Maritime Institutions

Introduction
The Regional Maritime University (RMU) has evolved from the erstwhile Ghana Nautical College which trained seagoing personnel for the national carrier. It metamorphosized into the Regional Maritime Academy and now it has become a full-fledged university with a presidential charter to issue academic degrees. Many maritime universities around the world have adopted the combination of vocational/academic approach in order to give the seafarers the opportunity to pursue 'life long learning' and to take advantage of jobs ashore when they decide to retire from active seafaring. The
issue of combining vocational seagoing courses and the academic ones has been debated severally in various fora.

The Regional Maritime University did not only upgrade the diploma awarding Nautical Science, Marine Engineering and Electrical/Electronic Engineering courses to degree programmes but introduced a new course in Ports and Shipping Administration. The Ports and Shipping Administration programme of the Regional Maritime University was introduced in 2003 to train shore-based personnel from the sub-region for engagement in the maritime and allied industries. This will enable graduates to take charge of maritime transport services and fishing industries and ensure continuous supply of qualified personnel for the sub-region’s shore-based maritime industries. Additionally it seeks to provide a high level training that will promote and enhance efficiency in the administrative, managerial and operational skills of shore-based maritime personnel. (Regional Maritime University Students Handbook, August 2012, pg.105)

The idea of introducing shore based courses sounded great against the popular background that many of the National Shipping Lines of West African States are thought to have collapsed because of poor management and staff who had little knowledge about shipping business. This comes second to Government interference amongst others in the league table of reasons why the national carriers collapsed.

It has been eleven (11) years since the BSc Ports & Shipping programme was introduced with the pioneers graduating in 2007. However, there has not been any study to see if the intended impact of the programme on industry was being realized and to see whether the graduates are employable with the skills and knowledge they gain through the programme. This write up is based on findings from the pilot project that heralds a larger study.

**Objective and Scope**

The objective of the study is to assess the employability of BSc Ports and Shipping Administration graduates in terms of availability of opportunities and the ability of the graduates to compete for those opportunities and the value that the course offer in relation to seeking employment. Specifically the study seeks to

- Determine the level of employer satisfaction with regard to course graduate employee’s skills and performance levels.
- Determine the overall Course graduate employment rate both in the maritime related and non-maritime related fields.
- Ascertain the peculiar difficulties encountered by the graduates in finding relevant employment.
- Ascertain the relevance and effectiveness of the course in relation to employability.
Determine the average waiting times for first employment and reasons for this.

The study is limited to the employment outcome of Ports and Shipping Administration graduates of the Regional Maritime University between the years 2007 and 2012 irrespective of their various nationalities. It identifies the relationship between the skill and knowledge acquired from the programme and the industry as well as the general employability of the Ports and Shipping Administration graduates, RMU.

The study covers graduate batches from 2007 to 2012 due to the following:
The 2014 batch of graduates was not included in the study because they just commenced their mandatory national service.
The 2013 batch of graduates was not included in the study because they just completed their national service seeking to enter the job market.
The Programme started in 2003 and thus the first batch of graduates was in 2007.

**Approach**

This study is part of a larger study that will access the employment outcomes of graduates of the Regional Maritime University. In order to achieve this, a survey of graduates had to be conducted and their employers also interviewed.

The University has graduates who come from different countries in Africa namely, Ghana, Nigeria, Cameroun, Liberia, The Gambia, Sierra Leone, Ethiopia, Congo and Ivory Coast. This makes it difficult to get in touch with them. One easy way to get in touch with them was via email. However the problem is that many of them do not use the email addresses they used when they were students as recorded by the school. The snowball method was utilised in getting access to the respondent of this study. A couple of the graduates for each year group were identified and then they in turn supplied the valid email addresses and/or telephone numbers of their colleagues. Another innovative way used in getting in touch was through facebook where some year groups had created pages where they communicate. Here, the questionnaire which was created via Google docs was made available to those willing to complete. So far 61 people have responded which we are working with for now. The number continues to increase gradually as more people get to know about the survey.

**Employer Satisfaction**

Some prospective employers of the Ports and Shipping graduates were contacted and a face-to-face interview was conducted to know their opinions about the graduate employees in terms of Productivity, Pro-activity, Professionalism, Industry Knowledge as well as what they (the employers) look out for in these graduates.
Literature

Graduate tracer studies are generally defined as surveys of graduates from institutions of higher education and are often seen as an important tool of institutional development especially when the world of work is changing rapidly. From information provided by tracer studies, the higher education institutions can get a systematic feedback from their former students. The institutions can know the whereabouts of their graduates; their working conditions and their retrospective assessment of their course of study might stimulate the curricular debate and could be also very interesting for the current or later students (Schomburg, 2003 as mentioned by BOTA, 2010). Tracer Studies provide quantitative-structural data on employment and career, the character of work and related competencies and information on the professional orientation and experiences of their graduates (Millington, 2008). Guzman et al (2008) advocated for the use of a graduate tracer study as an appropriate tool in determining institutional capability in preparing graduates to meet the demands of the work place. The graduate tracer studies involves the determination of graduates in the job search mode, lead time and employment condition, where the knowledge acquired in schools are used to work, in promotions, and job satisfaction (Guzman et al, 2008).

FINDINGS

Initially 100 graduates were targeted. However, due to the challenges as already stated, 61 graduates responded to the questionnaire. This represented a response rate of 61% which we believe is quite encouraging for analysis to be made upon. The shortfall in the response rate could be attributed to; obsolete e-mail addresses, probable lack of interest from some graduates and time factor.

As mentioned in BOTA (2010), “Other studies have recorded even a lower response rate for tracer studies that were repetitive. The Joint Japan/World Bank (2007) study reported a 42.9% and 11.9% response rates for the first cohort and repeat respectively. Debono et al. (2004) conducted a study on career outcomes of University of Malta graduates and reported a response rate of 55.65%, 49% and 45% for the studies conducted in 2000, 2002 and 2004 respectively”. BOTA (2010) in pursuit of its study also recorded a response rate of 53%.

Response Rate by Gender And Age

Gender and age were not considered key variables in sampling of graduates in this study. However, information on respondents by gender and age is presented here to give insightful understanding of respondents to the study by these variables.

Apart from depicting a possible fair distribution of sampling by age and gender, this information could highlight the attractiveness of the Ports and Shipping programme by age and gender. Figure 1 shows the distribution of respondents by age.
The majority of respondents (64%) were between the ages of 25 and 29 followed by 18% of respondents who were aged between 30 and 34, 15% of respondents who were aged between 20 and 24. A small proportion of the respondents (2%) were aged between 35 and 39. We however recorded 0% for respondents aged over 40.

This shows that the Ports and Shipping Administration programme interests direct school leavers either who have attained either high school certificate of education or O-level certificate. Figure 2 shows the distribution of respondents by gender. The majority of the respondents (56%) were male while 44% were female.

### Age

![Age Distribution](image)

**Figure 1: Response rate by Age**

### Response rate by gender

![Gender Distribution](image)

**Figure 2: Response rate by gender**

#### 1 Response rate by level of qualification

The majority of respondents (89%) graduated from RMU with a Bachelor of Science Certificate and 11% who graduated with a Diploma Certificate. However, none of the respondents fell within the ranges of Post Graduate Diploma and Master of Art in Ports and Shipping Administration.

#### 2 Employment and Unemployment status

The graduates were asked to indicate whether they were currently employed fulltime, employed part-time, employed temporarily, self-employed and unemployed and looking for employment. 8% of respondents were unemployed and looking for a job, 69% were employed fulltime, 20% were employed temporarily, 3% were self-employed and none was employed on a part-time basis.

The results show that unemployment is generally low Ports and Shipping graduates. These findings indicates that majority (92%) of the respondents are employed.

#### 3 Employment Status By Area Of Specialization

Figure 1 shows that of a total 52 graduates who indicated their employment status by area of specialization, 26% specialized in the Transport and Logistics field, 20% in Shipping and Customs
Brokerage, 10% in Maritime Administration, 5% in Oil and Gas, 3% in Maritime Security, 3% in Insurance, none in ICT and the remaining 16% specialized in Other fields. However, the other graduate respondents (15%) out of the overall 61 did not indicate their area of specialization.

Figure 3 Areas of Specialisation

4 Time lag between graduation and securing employment

The lag time between graduation and employment, can also be informative with regard to the easiness and/or difficulties by graduates in finding employment after graduation. Graduates were asked to state the length of time they have been looking for jobs after graduation. The results are summarized in Figure 2. It shows that it took 51% of the graduates less than 6 months to get their first employment, 21% took between 6-12 months, 11% took between 13-24 months, 5% took between 25-36 months while it took 5% over 3 years to secure their first employment. However, 4 graduate respondents representing 7% did not indicate the time lag.

Overall, 72% of graduates got their first job within 12 months after graduation. This further supported by that only 21% of graduates respondents had a difficulty in securing job within a year after graduation when job hunting. This could indicate that where jobs are available, the lag time between graduation and employment could be at most a year.

Figure 4 Time lag between graduation and first employment

5 Methods used and easiness of securing employment

The methods one uses for recruiting and looking for work could be critical in linking Professional Training Institution to available jobs. Some of the ways that graduates used in securing employment were through Friends, Family, responding to Media Advertisements, moving Door to Door (Job Hunting), via National Service, via internship and Other means. Figure 5 shows that predominant methods used to securing a job were via National Service (21%), contacts through friends (16%), Media
Advertisement (16%), Door to Door (job hunting) (11%), assistance from Family (10%), via Internship (5%) and by Other means (8%).

Figure 5 Methods used in securing jobs

6 Adequacy of training & Graduates Employability

This study also sought to inquire from the graduate respondents whether or not and/or how the training they attained from the Ports and Shipping program adequately prepared them for the demands of the industry. This was intended to give the department an insight of how their own products rate the training given them.

Figure 6 gives an account of the graduate respondents’ opinion about how their training adequately prepared them for employment. 54% of the graduate respondents agree that the training obtained adequately prepared them for employment and 15% also strongly agreed to the same point. However, 10% said it was not applicable, 7% disagree and 2% strongly disagree that the training acquired had adequately prepared them for employment.

Figure 6 The training adequately prepared the graduates for employment

7 Employer Satisfaction

Again graduate respondents were asked to confirm whether or not their current or former employers were satisfied with the level of skills and knowledge they possessed and the findings are as in figure 7. The chart reveals that 56% of the graduate respondents agree that their employers were satisfied with their level of skills and knowledge, 23% also strongly agreed to the same point and 7% said it was not applicable. However none of the graduate respondents disagreed or strongly disagreed that their employers were satisfied with the level of skills and knowledge they possessed.
Furthermore an enquiry was made from the graduate respondents’ point of view on how easy it is for them to be trained to improve their levels of skill and knowledge. Figure 8 shows their response. 59% strongly agree that they could easily be trained to improve upon their level of skill and knowledge, 30% also agree to the same view, while none disagreed or strongly disagreed to the fact that they can be easily trained to improve upon their level of skill and knowledge. 11% of the graduates respondents however did not respond to this question under review.

In addition graduate respondents were given the opportunity to upraise their effectiveness in their current and previous jobs. Figure 9 gives an account of the findings about this assertion. A relatively large percentage of the graduate respondents (44%) agrees that they are very effective in their jobs and 39% strongly agree. However 2% disagree, none strongly disagree and 2% said it was not applicable.
8 SKILLS ACQUISITION, QUALITY OF TRAINING AND EMPLOYER SATISFACTION

The quality of an educational programme and the value of skills acquired from such a programme could be assessed by its graduates rating it highly to an extent that they would recommend it to a friend or family member.

1 Skills acquisition

The graduate respondents were asked to compare the skills they acquired from the training and their ability to perform on their current or previous jobs. The graduate respondents were tasked to indicate how relevant or otherwise they would say the training was. From figure 10, a relatively large percentage (44%) of the graduate respondents indicated that the training they acquired was relevant, 34% said it was adequate, 7% said it was irrelevant and 11% indicated that the skills they acquired was inadequate.

![Figure 10: Relevance of training](image)

2 Quality Of Training

Respondents were asked to appraise the programme they went through in terms of content, instructional quality, duration and resources. Suggestions for improvement were evenly distributed across programme content, practical component, theory component, resources (books etc.), instruction quality and programme duration. However, a significant majority of the graduate respondents proposed that there should be a massive improvement in all aspects of the training even though they were generally satisfied with the programme as a whole.

About the duration of the programme, an enquiry was made from the graduate respondents to know if it will be necessary to increase the duration or not, 89% of the graduate respondents indicated that the duration of the programme should not be increased but 8% had a different view, indicating that the duration of the programme should be increased.

![Figure 11: The need or otherwise to increase duration of programme](image)
From figure 11, 75% of the graduate respondents indicated that they did not have to take an additional course(s) to get a job. On the other hand 18% said they had to take an additional course in order to get jobs.

**Figure 12: Whether or not graduate took additional course(s) to get a job**

When graduates were asked if they would recommend the programme they went through to a friend or family member, an overwhelming majority (82%) said they would (see Figure 10). Even those who were not employed would strongly recommend the programme they went through to their contemporaries, with 80% of them indicating that they will recommend the programme they went through to others. This further show the high premium graduates placed on the programme they went through.

**Employer Satisfaction**

Some prospective employers of the Ports and Shipping graduates were contacted and a face-to-face interview was conducted to know their opinions about the graduate employees in terms of Productivity, Proactivity, Professionalism and Industry Knowledge as well as what they (the employers) look out for, in employing these graduates. The results are as elaborated below. Their suggestions on improving the quality and performance of graduate in order to help build the industry was also taken.

The employers contacted were:
- Ghana Ports and Harbours Authority, Tema
- Oil and Marine Agencies (OMA) Ghana, Tema
- Bollore Africa Logistics Ghana, Tema
- PIL Ghana, Tema
- Intermodal Shipping Agency Ghana (ISAG), Tema
- Meridian Port Services (MPS), Tema
- Trans Global Logistics, Tema
The industry operators acknowledged that RMU graduates are very distinct from graduates of other universities when it comes to knowledge of the industry due to the maritime background of Ports and Shipping graduates. This is a factor that leads to the retention of most graduates who come from RMU to have their national service with OMA Ghana for instance. Most were of the view that when graduates are placed in the area of specialization as related to their fields of study, they tend to be very proactive. However, when they are placed in an area not really related to their programme of study at the RMU, for example Sales, the graduate employees tend not to be very proactive.

The general consensus was that the Ports and Shipping graduate from the RMU exhibited a high sense of professionalism on the job in terms of skill, good judgment, behavior, dressing and general attitude. In terms of Productivity, they acknowledged the fact that indeed the Ports and Shipping graduates of the RMU are very productive because they make minimum errors in the discharge of their duties attributing this success to their training background.

As a result of the above, the Ports and Shipping graduate employees have paved the way for students and other graduates with the same background to secure internship, national service and employment opportunities from their company.

Unlike in OMA Ghana, Bollore Africa Logistics have employees who had undergone some training from the Ports and Shipping programme. These were already on the job before they undertook the programme and as such they were already knowledgeable about the industry due to their high levels of experience already obtained with the company making them highly Productive, Proactive and Professionals in the industry. However, Bollore admitted to the fact that the additional training obtained from the Ports and Shipping programme by those employees of theirs have helped improved on their activities as individuals and the company as a whole.

A key suggestion given was that the students should take it upon themselves to build themselves in other aspects other than the training they went through at the Regional Maritime University in order to help them broaden their opportunities in the industry.

Some advocate for control of entry into the shipping industry just as it is in some fields such as the medical, legal and other fields. This they believe will help apply more sense of professionalism to the industry and make the profession a better one than it currently is. They proposed a collaboration between the RMU and other stakeholders of the industry to ensure this works.

Meridian Port Services, the only dedicated container terminal operator in Ghana indicated that their firm has a training process that is given to all employees irrespective of your background since they utilise a lot of technology. This they related to the fact that all systems, software and procedures their firm deals with is totally different and as such every employee would need to be trained again to suit
their working environment. They however, admitted that the Ports and Shipping graduate employees of the RMU were better because they easily adapt.

**Conclusion**

There are varied implications of the research at this point. Chief amongst them is the fact that there is positive impact of the course in industry as RMU graduates take up responsible positions. Apart from the positive fit in industry, there also seem to be a feeling that many graduates are being produced for a small industry hence the call for regulation and collaboration. Last but not least, the course must emphasis other aspects of management such as marketing/sales, apart from the detailed maritime knowledge it offers.
THE DEVELOPMENT OF SPECIALIZED TRAINING PROGRAMME FOR SEAFARERS IN CHINA

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Abstract:
In the last decade, China has invested significantly in maritime education and training infrastructure. As a result, there are thousands of graduates from the Maritime Academies to look for job opportunities onboard ship every year. However, it is still a big challenge for the shipping companies to not only recruit the suitable seafarers but also to retain them to operate their vessels. Considering the rapidly expanding Gas Tanker (LNG and LPG) fleet as well as Mobile Offshore Units (MOUs), more dedicated seafarers with adequate task-specific training and experiences are needed urgently for the industry. In this article, the author will give a brief introduction about the development of LNG transportation involving fleets and terminals and the status quo of the specialized training program. China’s condition will be also mentioned accordingly. The state quo of specialized training for LNG carrier will be described concerning STCW regulations, industry competency standard and China’s situation. How we prepare the future crewing needs as well as improve the training programme for seafarers will be suggested accordingly.

Key words: specialized training programme, LNG transportation, LNG fleets, LNG terminals, industry competency standard,

Introduction
In the last decade, China has invested significantly in maritime education and training infrastructure. As a result, there are thousands of graduates from the Maritime Academies to look for job opportunities onboard ship every year. However, nowadays the bigger challenge for the shipping company is to recruit the suitable seafarers to operate those ships for the special purpose. Considering the rapidly expanding Gas Tanker (LNG and LPG) fleet as well as Mobile Offshore Units (MOUs), more dedicated seafarers with adequate task-specific training and experiences are needed urgently for the industry.

In this article, the development of LNG transportation both at home and abroad will be introduced considering the number of fleet and terminals. Secondly, the status quo of specialized training will be discussed involving STCW 2010 amendment, industry competency standard, etc. Thirdly, how to develop the specialized training program in China will be discussed with those requirements from the industry as well as the experiences from the Maritime institutes.
Development of LNG transportation

Currently, LNG has been widely seen as a future “seed corn” trade for maritime business. Geographically, most of the nature gas located far away from the world’s major consumer zones and the sea transportation is the only way to bring it to market. Moreover, it is a clean fuel, which is becoming increasingly preoccupied with reducing emission of carbon and other pollutants into the atmosphere.

I LNG trade

Nowadays, energy is the biggest shipping’s single market that accounts for 43% of the cargo moved in 2013. The gas trade reached 307 million tonnes in 2013, of which about 244 million tonnes was LNG and estimated 63 tonnes was LPG. Furthermore, LNG has become one of the options that available for ship owner to comply with the increasingly strict requirement for ship’s emission control. More and more gas-fuelled vessels that are not LNG carriers are ordered by ship owners. Considering the demand in an energy hungry worldwide for the cleaner fuel (see Figure 1), the global LNG trade is expected to reach one billion tonnes in 2030s.

As a new game player, China started to import large amount of LNG in 2006 and now has become the third largest importer in 2013. Referring to the energy intensity target of 12th Five Year Plan set by State Council in China, it mandated that the non-fossil energy sources should be increased to 11.4 percent of total energy use. According to the China Energy Statistical Yearbook 2013, the total nature gas consumption as percentage of total energy production increased from 2.7 % in the year of 2000 to 4.3% in the year of 2012 and the average daily energy consumption increased from 0.7% to 3.6%. It is estimated that China’s total LNG imports will reach 60 million tonnes by 2020. Therefore, more and more long-term and strategic energy relationship has been built between China and major LNG exporting countries so as to meet this increasing domestic demand.
2 LNG fleet and terminals

The increasing demand in LNG transportation worldwide led to a rapid growth of LNG fleet and receiving terminals. There are now almost 400 LNG carriers on the high seas and another around 120 vessels on order. More than 100 LNG vessels on order are due for delivery between 2014 and 2016. Regarding the LNG receiving terminals, the total number of regasification terminals in the world has reached 94 with a total receiving capacity up to 690 MTPA by the end of 2013 according to the IGC World LNG report.

In China, LNG receiving capacity has been increasing rapidly in the past few years. There are now 7 LNG receiving terminals with a total capacity of 21.9 MTPA in operation and another 7 terminals with a total capacity of 21.2 MTPA under construction. However, there are only five LNG vessels in operation by the end of 2014 and the fleet has been used to its maximum. There are 15 new LNG carriers on order or under construction nowadays so as to meet the rising demands for the bigger LNG fleet in China. It is estimated that China will need another 60 to 65 LNG carriers to fulfill the gap.

Status quo of specialized training for LNG carriers

Concerning the rapid growth of LNG trade worldwide as well as the increasing number of LNG fleets and terminals mentioned above, the LNG shipping industry is now under great manning pressure. LNG shipping has established an excellent safety record and one of the reasons for its performance is the training regime now in place. For these new delivery LNG vessels, there will a big challenge for the operator to manning the vessel with suitable officers with appropriate training.

1 STCW regulations and model courses

The International Maritime Organization (IMO) sets minimum standards for seafarer training and specific additional training is mandated to ensure the safe and proper handling of cryogenic LNG cargoes. Seagoing experience (at least three month) and classroom training are essential elements of this basic training. Considering the advanced training, a supernumerary capacity including at least three loading and three unloading operations is added to approved onboard training according to Regulation V/1-2 of STCW 1978, as amended.

According to the minimum requirement in STCW convention, IMO also provides several model courses relating to LNG operation for the specialized training. All model courses are developed with relevant Competence, Knowledge, Understanding and Proficiency (KUPs) as well as the methods for demonstrate competence and criteria for evaluation competence. In 2013, the revised model training courses for basic training and advanced training separately were validated so as to reflect closely the requirement of the 2010 Manila Amendments.
Although STCW regulations as well as IMO model courses only set the mandatory minimum standard for seafarers, it has still laid a solid ground for those training institutes to build up their own curriculum and teaching materials for specialized training programme. Moreover, the authorities that issue the relevant certificates are provided with appropriate evaluation methods and criteria.

2 Industry competency standard
The LNG shipping industry also sets voluntary standards in excess of IMO requirements. The Society of Gas Tanker and Terminal Operators (SIGTTO) has developed LNG Shipping Suggested Competency Standards for various senior officer ranks on LNG carriers and has published minimum accepted experience levels for such ranks. The standards are produced after consultation within the industry and are intended to represent the default best practice operational training standard for officers serving onboard LNG vessels. The main section of the standards contains the functions from all eight ranks address including ELECTRICIAN, 3rd /4th ENG, CHIEF ENG, CARGO ENG, 2nd/3rd OFFICERS, 2nd ENG, CHIEF OFFICER, and MASTER. These functions outline what tasks and knowledge are suggested to be necessary to satisfactorily perform in a particular rank.

What's more, other organizations like DNV also set up its own Standards for the Shipboard LNG Cargo Operators. The standard is meant to specify competence requirement over and above those covered by the STCW convention and any requirement imposed by national legislation. Besides the written test with multiple choices, there is also testing of shipboard LNG Cargo Operators Utilising Practical Assignment that should be carried out by appropriate cargo handling simulator.

Considering the overall regime for LNG carriers including all standards, regulations, experiences for LNG carriers mentioned above, it means it takes almost ten years to train a deck cadet to become a master and an engineering cadet to become a chief engineer. Therefore, it is a big challenge for the industry to recruit more as well as retain those qualified crews so as to meet with next expansion phase for LNG transportation.

3 Specialized training for LNG in China
As a latecomer to this industry, China started to train its own crews for LNG carrier several years ago. Until now, those senior officers such as captain and chief engineer for LNG carriers owned by Chinese shipping companies are almost recruited through brokers from European countries. Recently, some of the Chinese maritime training institutes have offered basic training courses for specific LNG carrier. Those seafarers shall spend essential classroom hours to obtain all relevant topics according to STCW regulations under assistance of simulator and computer and then spend another three months onboard LNG carrier to go through all practical training with appropriate guidance and recording. However, the scale of training is still restricted because of the limited training instructors and facilities. China now is still seeking for better ways to train its own crews adapting to future rising demand.
Suggestions on the development of specialized training programme in China

As Chinese shipyard now is building LNG carriers for Chinese shipping companies, it is quite obvious that those LNG carriers also need qualified Chinese seafarers including captains and chief engineers in near future. Therefore, maritime training institutes shall make great efforts to improve the specialized training programme.

Firstly, maritime institutes shall improve their training strategies for students in the school. Considering the increasing demand from industry, more courses relating to gas tanker shall be offered to the students. Moreover, the university could train students that have signed a contract with shipping company for future recruitment. The special training plan and objectives will be established for those students and be adjusted according to the company’s requirement. The on-board training for students could also be arranged by their contracted company with competent tutors and appropriate recordings. Therefore, those students could work on gas tanker directly after graduation and fully meet with the companies’ requirements.

Secondly, in order to provide qualified training courses, the maritime institutes shall continuously upgrade their training facilities such as simulators and virtual operating system. In 2014, Shanghai Maritime University launched the big project for “Combined – type tanker for Training” (see Image1) . This full-size training ship located in campus can be used for specialized training courses such as gas tanker, oil tanker and chemical tanker.

Last but not least, there is another urgent need for the improvement of training instructors for LNG training programme. The maritime institutes shall fully cooperate with shipping companies to build up an excellent teaching group to train the students. More “Train the Trainer” courses shall be delivered for those new instructors so as to improve their knowledge as well as teaching skills. The company could provide more opportunity for trainers to refresh their knowledge and practical skills onboard ship.

Image 1: Combined – type tanker for Training in SMU campus
Conclusions and future works

The global shipping industry is emerging from a five-year downturn, the worst in 30 years, however, the rapid development of LNG transportation has opened another window for the shipping industry. China, as the largest shipbuilding nation, is seeking opportunity in developing its skill and technology to build up its own LNG fleet. The expansion of LNG fleet and the receiving terminals together will push the industry to a bright new era. However, it poses challenges for the adequate Manning and appropriate training programmes for seafarers. Maritime education and training institutes in China still shall work harder to develop their training program and valuable experiences from other organizations such as SIGTTO and DNV shall be analyzed carefully. Moreover, training facility shall be updated as soon as possible according to the industry requirements as well as STCW regulations. Furthermore, there will always be need for qualified instructors. The good cooperation between shipping companies and training institutes and the adjustment of training plan for recruited students is an option for METs in China to catch up with the rapid growth industry.

Furthermore, the increasing number of ships powered by LNG led to another urgent need of specialized personnel operating the system with and more receiving terminals in operation will result in the sever shortage of competent onshore workers and managers. The METs in China shall also pay attention to these future needs and carry out necessary research concerning these hot topics in the shipping industry.

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MET EXPERIENCES IN THE EAST AFRICAN REGION

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Abstract
Maritime education and training in East African region has undergone various stages of development since its inception in the 1960s when the three East African States Kenya, Uganda and Tanzania operated as a common East African Community. MET was established to provide manpower to provide human resource for the East African Shipping Line, until its collapse in 1977. This training for deck officers and Engineers was carried out in the United Kingdom but the program stopped with the collapse of the East African Community.

This paper aims to explore the background of MET, progression through the IMO process of qualification entry to the IMO “whitelist”, current situation and experiences in the East African region. The paper also aims to discuss the MET programs on offer, the challenges the East African region is facing in the implementation of MET and the initiatives being explored to mitigate the challenges in the MET situation. This is more so, with the radical changes in MET towards compliance with the Standards of Training Certification and Watch keeping (STCW) Convention 1978, as amended.

Suggestions are proposed which include collaboration with the shipping industrial players, MET institutions, IMO in various aspects including technology, equipment, human resources and sea board training.

Key words: Education, National standard, Collaboration, Human resources

Introduction
Maritime education and training in East African region has undergone various stages of development since its inception in the 1960s when the three East African States Kenya, Uganda and Tanzania operated as a common East African Community. MET in East Africa was established to provide manpower to provide human resource for the East African Shipping Line, until its collapse in 1977. This training for deck officers and Engineers was carried out in the United Kingdom but the program stopped with the collapse of the East African Community.

The current scenario is that each country is undertaking the training individually and at various level. With the revival of the East Africa Community block discussions are underway on the implementation
of join training of the seafarers in the region. The economic activities at the port of Mombasa, Dar es Salam and the proposed new port of Lamu under construction are bound to increase and this will imply there will be need for more trained personnel to carry out the various maritime related tasks. This indeed poses a great need for more MET institutions in the region.

According to Josephine Kenyan institutions commenced MET programmes from 2011 while in Tanzania, Dar es Salam Maritime Institute (DMI) is noted to have started 10 years ago. In comparison with other MET institutions in Africa, the author indicated that Regional Maritime University (RMU) in Ghana has been offering MET for about 55 years and AAST in Egypt 41 years. Institutions in Europe and China have shown a long experience in MET except LNAC in France which was established 16 years ago. From her finding it is worth noting that MET institutions in East Africa are still in their formative stage with a minimum experience in years of operation as MET institutions.

The implementation MET process in Kenya has been made possible through the legal framework established through KMA and enactment of the merchant shipping act 2010 and through the legal framework that established Kenya Maritime Authority and the enactment of the Merchant Shipping act of 2010. Kenya as a nation entered the IMO white list in 2006 (KMA, 2006).

MET institutions in East African region are now working day and night to ensure that they are also in the IMO white list. This will take a lot of effort of the different institutions.

**Status of Maritime Education and Training in East Africa**

Though maritime trade in Eastern Africa started several centuries ago, yet formal training of seafarers in Kenya started only a few years ago. For example Bandari College was set up in 1980 to offer foundation certificates courses and to train KPA staff in port operations, administration and management as well as marine while at the same time offering training for seafarers to obtain STCW certification by IMO. Despite having been white listed by IMO and therefore having an opportunity to compete for the international maritime operations, Kenya is yet to develop adequate maritime training facilities to offer the much required training. Table 1 shows the institutions in Kenya currently involved in maritime education and training.
Table 1: Institutions offering Maritime Education and Training

<table>
<thead>
<tr>
<th>S/No.</th>
<th>Institution</th>
<th>Courses offered</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>STCW mandatory courses, STCW advanced courses, Training for both Ratings for Deck and Engine.</td>
</tr>
<tr>
<td>2.</td>
<td>Mombasa Technical Training Institute</td>
<td>Craft and artisan certificates in Marine Engineering and Nautical studies.</td>
</tr>
<tr>
<td>3.</td>
<td>Marine Training School (Kisumu)</td>
<td>Professional mandatory courses (yet to be launched).</td>
</tr>
<tr>
<td>4.</td>
<td>Technical University of Mombasa (TUM)</td>
<td>Diploma in Marine Engineering and Nautical Studies.</td>
</tr>
<tr>
<td>5.</td>
<td>Jomo Kenyatta University of Agriculture and Technology (JKUAT)</td>
<td>BSc. Marine Engineering.</td>
</tr>
</tbody>
</table>

It can be seen that the number of institutions offering maritime training is very low. In addition, the number of trainees in the Universities and tertiary institutions annually are very low. There is not a single University in Kenya and the East Africa region dedicated to maritime education and training.

The position of Africa when compared to other countries with maritime education and training can be clearly understood if we consider, for instance, Philippines. Phillipines alone has over 37 maritime academies, about 20 maritime training centres and 17 crew manning agencies and supplies over 20% of the world seafarers. In fact, the share of Africa in supply of seafarers is almost negligible as can be seen in Fig. 1, where the entire continent, combined with the Latin America contribute only 8% of the global seafarers. Thus, East Africa and indeed the whole of Africa have to invest a lot in order to be at par and compete favourably with such countries.

This has given rise to a growing demand for highly qualified professionals to handle such vessels. Surveys conducted by various maritime institutes and organizations show that there are not enough such highly trained personnel and even then they come at a great premium. This global and unyielding demand for qualified and well trained seafarers has continued unabated and so, to compete effectively and fairly with their counterparts from other parts of the world, young person from East Africa...
continue seeking the related training in foreign countries with some neighbouring countries offering some of the courses which are nowhere available in the region. The gap between the demand for and availability of seafarers has continued to grow and has culminated in the present state, where the shortage of qualified seafarers to serve both local and international enterprises is still pervasive.

**Challenges in implementing MET programmes in East Africa**

It is worth noting that the first challenge is the lack of qualified trained staff in the field of marine and maritime related courses. As the literature review depicts, the shortage of instructors in Kenya can partly be attributed to a knowledge gap in the seafaring profession in Kenya since 1977 when the programme of training Kenyan seafarers in Britain ceased. Secondly fully equipped workshops and laboratories with the requisite pieces of equipment is still a major hindrance. This is basically due to the high cost of these pieces of equipment and funds outside the MET institution should be sought. Thirdly it is also noted that for students to be able to work on board the sea going vessel they need to be trained a board training or chartered ship for at least twelve months which is lacking as required by the IMO regulations. Kenya for instant does not have national flights of commercial ships.

Measures to mitigate the challenges of implementation the maritime education and training programmes due to the enormous capital required for acquiring the requisite pieces of equipment, human resources and vessels for sea time, which most MET institutions still lack them the following measures are proposed. The following are the proposed measures to cap these problems in the MET institution. Among this is the need to encourage the national government to secure training ship for the country has done by other countries in the Western and in Asia. In the recent concluded first maritime conference in Kenya bringing together stakeholders from across the world it was proposed that for us to tap this great market there was need to have a national training ship.

Secondly the MET institution should be encouraged to invest in the human resource development. This could include hiring of qualified personnel from the renowned MET institutions world-wide as adjunct professors. They could be able to visit the MET institution on short term and mentor the individual staff within the institutions. The other point could be to recruit and send for training the staff in specified qualification areas that may be needed.

Thirdly, the governments of the East Africa community should be encouraged to purchase and maintain fully equipped central national training centre for all the seafarers. The Netherlands have had a central national simulation centre catering for the citizen of the nation for a long time and we could learn from them. Individual institution should also seek funding for the acquisition of these pieces of equipment to be stationed in the institutions.
Fourthly, in case of the sea time for the cadets it is worth noting that there is need to seek collaboration with the established shipping lines and MET institutions world-wide with the training ship. A few MET institutions in the East African region have embarked on this seriously and it is bearing fruits. In general for the East African community to achieve the objective of proper training of the seafarers in the region there is need for cooperation at both the national and international level of MET institutions, ship owners and other international organizations.

Conclusion
MET institutions in the East African region is still in the formative stage and a lot of issues have to be resolved in order for the region to be established in the maritime training sector. Institutions engaged in maritime education and training should have a working plan on the training of the teaching staff and engaging experts from other countries to aid in the building of capacity. It remains the mandate of the institution to invest in the human resource training. Further, institutions offering maritime education should embrace research and postgraduate training in order to develop and maintain global standards.

In conclusion the following are proposal that could aid in resolving these challenges noted in the implementation of the MET in the region.

1. It is important that the MET institutions have a structured way of acquiring the experienced instructors and investing in the training of staff in the specialized areas
2. There is need for the governments within the region to invest in training ships which could serve individual countries.
3. Collaboration with the ship owners to acquire slots for the cadet to practical attachment in order to meet the required sea time as stipulation in the IMO regulations.
4. Collaboration with renowned MET institution of learning across the world should be sought. This will aid in the building of the capacity and making use of their facilities for the training of the cadet from the East African region
HUMAN RESOURCE DEVELOPMENT IN THE MARITIME SECTOR IN ASIA PACIFIC

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Background

In response to major concerns about maritime education and training (MET), including inability to cope with the accelerating impact of technology on ship operations, GlobalMET was established in 1996 by the Australian Maritime College with support from the Australian Federal Government, in its initial form as the Association of Maritime Education and Training Institutions in Asia Pacific (AMETIAP). The coverage was extended from regional to global in 2003 and the name changed to the Global Maritime Education and Training Association. The name GlobalMET Limited was registered in February 2007.

The Fisher Report

In 2012, at the behest of GlobalMET Limited, the Asian Development Bank agreed to a consultancy project. The project SC 100966 “Human Resource Development in the Maritime Sector in Asia and the Pacific” was funded. Fisher Associates of Lymington, United Kingdom, was commissioned and delivered the Consultancy Report in June 2013.

The Fisher Report is a high level strategic review of seagoing human resource needs. It informs the adoption and implementation of a human resource strategy by stakeholders. Under Outputs and Activities, the Report provides sieved and prioritised activities which address Maritime Safety Agency administration and Maritime Education and Training.

The Report reaches out to four key constituencies:
Maritime safety agencies, responsible for accreditation of colleges and certification of seafarers in accordance with international convention and their own standards;
Employers of seafarers – primarily shipping companies or manning agencies;
Seafarers themselves – primarily through collective organisation (unions);
Maritime education and training colleges – where the seafarers are trained.
It also reaches out to a large geographical region, covering many countries, large and small, in Asia and the Pacific.
Discussion

The Vision is that the Asia Pacific will sustain and enhance its position as the leading source of seafarers.

The Mission is to positively influence recruitment, training, certification and retention of seafarers from Asia Pacific countries, and encourage a cascade of seafarer supply from one country to another as countries develop socio-economically over time.

The Objectives are to:
Enhance the overall capability of MSAs in Asia Pacific, and specifically their implementation of regulations related to seafarers (by improving the policy and regulatory environment);
Improve the overall level of competence of professional seafarers newly trained in Asia Pacific (by strengthening knowledge sharing and improving the quality of maritime education and training);
Better match the resources required to train seafarers, with the resources available to train them (by strengthening partnerships in maritime human resource development between employers, seafarers, maritime education and training colleges and MSAs).

For countries that wish to participate, the Report recommends the provision of technical assistance to individual MSAs to:

- Consider their structure and identify resources required to improve overall capability;
- Raise standards of implementation of regulation in Asia Pacific for:
  - Accreditation of colleges and examiners,
  - Assessment/examination/certification of seafarers to international best practice standards;
- Develop quality management system guidelines to support accreditation and assessment/examination processes.
- The key steps would be to agree on terms of reference for the review, undertake a baseline review, prepare an action plan and implement the plan.
- Homogeneity is not the aim. Country-by-country solutions are sought, using this framework to identify bespoke actions to improve standards that suit the location.

For all countries, the framework is:

- Forward thinking policy makers and MSAs from current leading supply nations will have opportunity to receive support to sustain their positions;
- Secondary supply nations, or new entrants that wish to grow as supply nations, will have the opportunity to set up well-structured supply capabilities with reference to best practice.

It is proposed that assistance is available to support one-off implementation costs, to assist MSAs to set fair on a new course if they wish to do so.
In addition, the Fisher Report’s recommendations give priority to the following activities:

**Improved partnership working:**
- Increase direct participation of employees in colleges;
- Asia Pacific recruitment and retention initiative;
- Asia Pacific regional quality mark for colleges;
- Support training of trainers;
- Course structure and curricula;
- Centre of excellence for knowledge sharing;

and it gives second order priority to:
- Development of model competency management system;
- Gap funding for equipment and classroom improvements;
- Improved use of distance learning techniques;
- English language instruction.

A diagram summarising these outputs and actions is attached.

**Action**

While the Fisher Report opens a door to the possibility of a project funded by the Asian Development Bank and/or IMO’s International Technical Cooperation Programme, it is necessary to first get the support of the MSAs in Asia Pacific.

As a result, Rod Short, Executive Secretary of GlobalMET Limited, is to attend the 16th annual meeting of Asia Pacific Head of Maritime Safety Agencies (APHoMSA) in Shenzhen, China on 21-23 April to present a paper soliciting support. An update will be provided.
I. Technical Assistance to Individual MSAs

II. Partnerships strengthened

II.1) Improved Partnership Working

II.2) Increase Direct Participation of Employers in Colleges

II.3) AP Recruitment and Retention Initiative

II.4) Development of Model Competency Management System

III. Quality of MET improved

III.1) AP Regional Quality Mark for Colleges

III.2) Support Training of Trainers

III.3) Course Structures and Curricula

III.4) Gap Funding for Equipment and Classroom Improvements

III.5) Improved Use of Distance Learning Techniques

III.6) English Language Instruction

IV. Knowledge sharing strengthened

IV.1) Centre of Excellence for Knowledge Sharing

Extract from the Fisher Report June 2013
Research on the application of ship handling simulators in Chinese MET

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Abstract
The International Maritime Organization (IMO) is encouraging the application of ship handling simulator in the maritime education and training (MET). There are also detailed provisions in the Manila Amendments to the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers,1978 (STCW 1978) on its application in MET. Taking the advantage of computer graphics techniques, internet technology and advanced interactive simulation technology, the modern ship handling simulator can simulate the bridge environment to the life. The trainees are personally on the scene and their actual operational capacity on bridge can be enhanced in a short time, saving lots of time and money.

However, there are some deficiencies and problems in the simulators and also their application in MET, such as distortion of projection, ship handling mathematical model and so on. The paper first introduces the current situation of ship handling simulator in China, and then explains the functions and composition of ship handling simulators. The deficiencies and problems of the application of simulators in MET are analyzed in detail. Finally, suggestions on the improvement of the application of simulators in MET are proposed.