# Use of simulators for the development and assessment of the soft skills of cadets

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**Abstract**. The main function of universities is to provide academic and vocational education to students for the business and industrial world, to conduct scientific research, and to provide benefits for the development of society. Today, business and industries need manpower donated with not only hard skills for the execution of the profession but also manpower with soft skills that will provide added value to them. When we say soft skills, it is meant to have the ability to communicate, work in a team, use numerical skills in an eventful manner, and have research skills. Simulators are used as a more realistic and efficient delivery method to prepare students for duties in business life and their use is constantly evolving. The use of simulators, which imitate and introduce the real conditions of life, is considered a suitable tool for developing and evaluating students' soft skills. In this context, EU Strategic Partner Project MARS-NET has provided a very good opportunity to test the soft skills of cadets as well as hard skills during the project learning and teaching activities that were carried out with the participation of a diverse student body from participant institutions.

The aim of this research is to investigate the use of simulators for developing and assessment of the soft skills of cadets at maritime schools.

Key Words: EU MARS-NET Project, Simulators for Education, Development of Soft Skills, Assessment of Soft Skills. Common Skills, …

## 1. Introduction

Employers are not looking only for vocational skills but also soft (common) skills when they select, retain, and promotion of their employees. Soft skills are highly important for management-level employees for better management and business development of the organization in a challenging environment.

Vocational and academic education and training in schools may be sufficient for the start of a profession. However, in order to develop both in the profession in the later years of the profession, people need to have skills beyond this. These skills are defined as soft or common skills today. These skills are essential, especially for those who will work at the management levels of the profession. These soft skills cover the main features of management, such as organizing their own tasks, communicating, working as a team, using numeric skills, personal development, and creativity.

Nowadays two types of skills are expected from all professionals. These are Professional Skills that are necessary for the achievement of the vocational responsibilities and tasks related to the profession, and the Soft (Common) Skills that enable the person to use his/her capacity more effectively. Today, Soft Skills are as important as professional skills in being recruited and promoted, and the importance of that skills is increasing gradually The College of Central London [1] defines soft skills as advised by BTEC (Business and Technician Education Council) [2] standards, as follows:

- Managing and developing self
- Working with and relating to others
- Communicating
- Managing tasks and solving problems
- Applying numeracy (Using math abilities)
- Applying technology (Using technological devices and systems)
- Applying creativity and design

As far as concerning the Seafaring officer profession, the professional skills and competencies are clearly defined in the STCW (Standards for Training, Certification, and Watchkeeping) Code [3] of IMO (International Maritime Organization) and deeply described in the various IMO Model Courses which define fundamental requirements of seafarer's education standards.

As a result of some investigation and lessons learned at the practices, it has been evaluated that a certain part of the pieces of training conducted in line with STCW can be used for the development of soft skills as well as professional skills. Especially the simulator pieces of training in the form of teamwork constitute the best example of that. Many MET institutes also use these pieces of training to develop and evaluate students' soft skills.

Bridge Resource Management (BRM) and Engine Resource Management (ERM) pieces of training have been added to STCW as part of operations and management-level officer training. The expected purpose of this training is to increase the task efficiency of the officers working on the bridge and in machine control as a team. While evaluating this training, the effectiveness of relations between officers is emphasized. Developed maritime companies send the officers working on the bridge and machinery control to the training institutions to ensure that they receive this training, and at the end of the training, they request that an evaluation be made and sent to them. In these pieces of training, soft skills are expected to be evaluated besides professional skills. For this reason, scenarios suitable for measuring soft skills are selected in BRM and ERM pieces of training.

In this research, the selection of suitable scenarios for the development of soft skills in BRM training is investigated.

## 2. Methodology

The aim of this research is to investigate the use of simulators for developing and assessment of the soft skills of cadets. in particular for seafaring officers' programs and making proposals to define the best applications.

The study is based on a field study for soft skills and simulator activities in the Maritime Education and Training (MET) institutes which are considered a significant tool for soft skills development and assessment. The results of this field study are discussed by an expert group to produce proposals to establish a soft skill development system based on simulator training. As a result of an expert group study, the findings will be carefully investigated and then tested to make reliable- applicable-acceptable proposals for the MET system.

The expert group will be established by maritime lecturers holding master's or chief engineer certificates and experience on MET issues and mostly holding Ph.D. degrees.

It is strongly believed that the outcomes of this research will trigger the MET community to start further studies aiming to get a promising solution to use simulators in support of the development of soft skills in support of students' future career planning.

## 3. Research

### 3.1. Definition of Soft Skills and their Outcomes

Soft skills are incredibly valuable in all industries, workplaces, and roles. These skills and qualities enable you to be a productive and communicative team member, which is why employers often seek these skills just as often as hard or technical skills. Understanding what soft skills can help you identify and improve upon your own, helping you become a more well-rounded candidate and employee. In this article, we explore 10 important soft skills you can include in a CV and ways to showcase them in the recruiting process [4].

Development and assessment of soft skills are important for all levels of education in particular for tertiary education. Cashian [5] examined the BTEC (Business and Technician Education Council) skills and core themes approach to common skills in the context of higher education. He concluded that the assessment of such skills could take various Doctorate in Education forms and identifies two particular methods that may be deemed suitable. He states: "The assessment could be merely formative, the Performance Criteria used as a guide to the student as to the behavioural characteristics that are desirable, and for feedback on performance, but with no formal grading of skills as a separate entity from the subject content."

The BTEC definition of soft skills and their outcomes are introduced in Figure 1.

| Common Skills | Outcome |
|---|---|
| **Managing and Developing Self** | 1. manage own roles and responsibilities |
| | 2. manage own time in achieving objectives |
| | 3. undertake personal and career development |
| | 4. transfer skills gained to new and changing situations and contexts |
| **Working with and Relating to others** | 5. treat other's values, beliefs and opinions with respect |
| | 6. relate to and interact effectively with individuals and groups |
| | 7. work effectively as a team member |
| **Communicating** | 8. receive and respond to a variety of İnformation |
| | 9. present information in a variety of visiual forms |
| | 10. communicate in writing |
| | 11. participate in oral and non − verbal communication |
| **Managing Tasks and Solving Problems** | 12. use information sources |
| | 13. deal with a combination of routine and non − routine problems |
| routine | 14. identify and solve routine and non-<br><br>Problems |
| **Applying Numeracy** techniques | 15. apply numerical and skillsand |
| **Applying Technology** | 16. use a range of technological equipment and systems |
| **Applying Design and Creativity** | 17. apply range of skills and tecniques to develop a variety of ideas in the creation |

Figure 1: The soft skills and their outcomes

*3.2. The Importance of Soft Skills for Operational and Management Seafaring Officers*

The expert group consists of maritime lecturers holding ship master or chief engineer certificates and experienced in MET issues and mostly holding Ph.D. degrees have discussed the importance of soft skills for the operational and management level of seafaring officers. The group reached a decision on the importance of soft skills for the operational level (Officer of the Watch) and Managerial level (1st Officer and Master) are discussed by the expert group and their considerations are introduced in Table 1.

Table 1: The Importance of Soft Skills for Operational and Management Seafaring Officers

| Soft Skill | Operational Level | Managerial Level |
|---|---|---|
| Managing and developing self | Required | Important |
| Working with and relating to others | Required | Important |
| Communicating | Required | Important |
| Applying numeracy (Using math abilities) | Required | Required |
| Managing tasks and solving problems | Required | Important |
| Applying creativity and design | Required | Required |
| Applying technology (Using technological devices and systems) | Required | Required |

As it is shown in Table 1, all soft skills are required for operational-level officers who will be team leaders or a part of a team. The management level requires more skills and qualifications to assume management functions and roles. Managing and developing self, Working with and relating to others, Communicating and Managing tasks, and solving problems is highly important to achieve managerial tasks.

*3.3. The Importance of Soft Skills for Career Planning for Seafaring Officers*

The European Union SAIL AHEAD [6] project provides an online guidance tool for a second career for seafaring officers. It covers a report with transferable skills and competencies.

The outcomes of this project are a mapping of competencies and profiles required for at least 10 alternative career paths ashore and an online tool to be used by students or captains that will help them assess the possibilities to work on shore. Proposed job profiles suitable for deck officers at the shore are as follows:

Coast Guard Officer, Chief Executive Officer (CEO), Operations Manager, Designated Person Ashore (DPA), Quality Manager, Occupational Health and Safety Manager, Maritime Lecturer, Maritime Auditor, Maritime Surveyor (Inspector – Auditor), Marine Advisor/Consultant, Port Authority officer, Pilot, Arbitrators. Stevedore Manager, Lashing Manager, Cargo Handling Manager, and Port Facility Security Officer (PFSO).

Many shipping companies also started to operate as logistics companies and/or have a logistics component. So, lo logistics jobs became a significant occupation for seafaring officers [7].

The above-mentioned posts are managerial positions that require advanced level soft skills to communicate with diverse groups with a high-level rhetoric capability and work as a leader or a part of a team to demonstrate creative capability using numerical skills for sounding solutions. It is clear that shore-based duties require having advanced levels of soft skills.

*3.4. A survey to define the best BRM (Bridge Resources Management) Scenarios for Soft Skill Development and Assessment.*

The aim of the BRM is "the use and coordination of all the skills, knowledge, experience and resources available to the team to achieve the established goals of safety and efficiency of a voyage or any other safety-critical task

GlobalMET [8] Crew [Bridge] Resource Management training is essential for any team wishing to function at its optimum. Designed to improve team performance, human factors training sets out to change individual and team behaviours by enhancing individual leadership, management, communication, and team skills. It examines people's crucial role in high-stress, high-risk environments and encompasses team training, simulation, and interactive group discussions. It educates teams about the limitations of human performance and develops an understanding of cognitive errors, and how stressors such as fatigue, emergencies, and work overload, contribute to the occurrence of errors. Compulsory for all aviators since 1989 and used in medicine and the nuclear industry, the course requires participants to assess self and peer behavior through case studies and experiential learning. Emphasis is placed on integrating the concepts into daily work routines to minimize the influences of human factors in causing accidents.

The expert group has discussed the best method for developing and assessment of soft skills. BRM (Bridge Resource Management) (training is accepted as the most effective way of delivering non-technical skills and how to use and build on these essential skills to achieve real, lasting, and cost-effective employee engagement. The group has also discussed suitable scenarios to be used in the BRM application. A survey has been prepared and distributed to Maritime lecturers. The aim was to define more suitable scenarios for each common skill. The survey is conducted for 20 maritime lecturers who are experienced in simulator applications in MET. Every participant was requested to mark suitable scenarios for each soft skill. Each mark is counted and the totals for each scenario are introduced in Table 2 and Figure 2.

Table 2: Simulator Scenarios Suitable for Developing and Assessment for Soft Skill

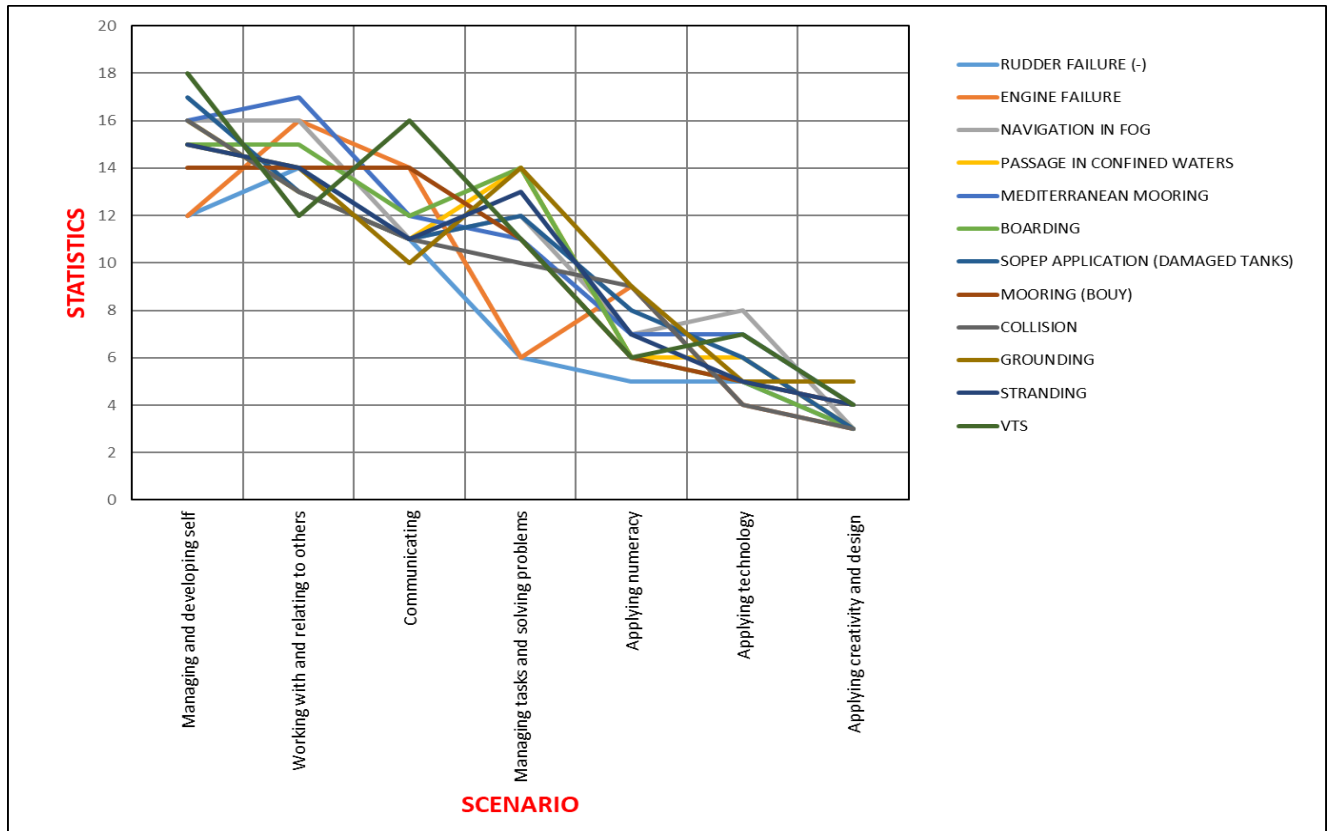| NO | EVENTS | SCENARIO | | | | | | |
|----|--------|----------|---|---|---|---|---|---|
| | | Managing and developing self | Working with and relating to others | Communicating | Managing tasks and solving problems | Applying numeracy | Applying technology | Applying creativity and design |
| 1 | RUDDER FAILURE () | 12 | 14 | 11 | 6 | 5 | 5 | 3 |
| 2 | ENGINE FAILURE | 12 | 16 | 14 | 6 | 9 | 4 | 3 |
| 3 | NAVIGATION IN FOG | 16 | 16 | 11 | 12 | 7 | 8 | 3 |
| 4 | PASSAGE IN CONFINED WATERS | 16 | 13 | 11 | 14 | 6 | 6 | 3 |
| 5 | MEDITERRANEAN MOORING | 16 | 17 | 12 | 11 | 7 | 7 | 4 |
| 6 | BOARDING | 15 | 15 | 12 | 14 | 6 | 5 | 3 |
| 7 | SOPEP APPLICATION (DAMAGED TANKS) | 17 | 13 | 11 | 12 | 8 | 6 | 3 |
| 8 | MOORING (BOUY) | 14 | 14 | 14 | 11 | 6 | 5 | 4 |
| 9 | COLLISION | 16 | 13 | 11 | 10 | 9 | 4 | 3 |
| 10 | GROUNDING | 15 | 14 | 10 | 14 | 9 | 5 | 5 |
| 11 | STRANDING | 15 | 14 | 11 | 13 | 7 | 5 | 4 |
| 12 | VTS | 18 | 12 | 16 | 11 | 6 | 7 | 4 |

Figure 2: Evaluation of Suitable Scenarios

## 4. Discussions

### 4.1. Soft Skill and their Outcomes

The mission of MET institutes is not to prepare their cadets for their existing but also for future roles in their profession. Our graduates will assume managerial roles after 4 years and command positions on board huge, highly expensive, and state of arts vessels in the following 4 years. MET institutes should also develop their soft skills, particularly for Managing and developing self, Working with and relating to others, Communicating, Applying numeracy (Using math abilities), Managing tasks, and solving problems. These skills are also important for operational-level duties. The seafaring officers will also assume shore-based duties at ports, shipyards, classification societies, maritime administrations, VTS (Vehicle Traffic Services), etc. They will also have to have "Applying creativity and design", and "Applying technology" skills.

Schools cannot be expected to provide students with all abilities. However, the foundations of some skills need to be gained during the student years. It has an intensive program for Seafaring Officers that includes both academic and vocational courses. In this respect, it is not possible to create separate lessons to gain soft skills. For this reason, instead of creating separate courses, it would be appropriate to gain these skills in existing courses.

Simulator training is a type of training in which the student himself is a direct participant. During this training, the student has to reveal his/her personal abilities. In this respect, it is obvious that it would be appropriate to use simulator training in soft skill development and evaluation. The important thing here is to determine which simulator training can be used for soft skill development. To achieve this, appropriate scenarios should be developed without changing the basic outcomes of the training. It is evaluated that the

simulator trainers who have become proficient in soft skills can achieve this by making some additions and editions to the existing scenarios.

STCW (2010) has already added BRM courses in both operational and management-level seafaring officer programs. This training, which is mainly carried out in the simulator, is considered to be the most appropriate tool for soft skill development and assessment.

Resource Management, Leadership & Teamwork is a specific training issues – sometimes referred to as human factors training, "soft skills" training, or non-technical training (Swedish Club Academy) [9]   For nearly 20 [30] years, this training has been carried out on a voluntary basis with great success by a large number of maritime schools and shipping companies around the world.

In the context of medical care [10] soft skills are defined as skills without knowledge and technical procedures, but instead include cognitive skills (such as decision-making, situational awareness, and prioritization judgment). These are called command skills. Another one is interpersonal skills, which can be separated into two aspects: exchanging information (communication) and interaction in the team (team). Soft skills assessments were developed and introduced initially in the aviation industry [11] and then adopted by other safety fields, such as healthcare, nuclear, and rail industries [12]. Finally, the classification methods of soft skills are almost similar, so there are three levels of soft skills in the BRM soft skills assessment.

BTEC/EDEXCEL have been great advocates of curricula that mix and integrate product and process objectives and since the autumn of 1986, courses have evolved where the assessment of 'process' and the development of 'common skills' has become a major part of the overall assessment strategy [13].

*4.2. The Importance of Soft Skills for Career Planning*

Due to the hard working conditions of the seafaring professions, they prefer working at the shore facilities. The maritime-related shore jobs mentioned in paragraph 3.2 are generally managerial positions that require the use of advanced-level soft skills.  These posts require communicating with diverse groups with a high-level rhetoric capability and working as a leader or a part of a team. It also needs to demonstrate creative capability using numerical skills for sounding solutions. The seafaring officers should try to gain soft skills for increasing their chances to find shore-based jobs. Having these skills should be the main issue in their career planning.

Today's business world is much more selective to find the perfect employee. Human Resources departments evaluate not only vocational skills but also soft skills in job interviews. For this reason, candidates should be prepared to prove their soft skills in job applications.

Individuals can develop their professional skills during their duties and support these skills with short courses and certificate programs. They can also develop Managing and developing self, Working with and relating to others, Communicating, Applying numeracy (Using math abilities), Managing tasks, and solving problems soft skills during their professional applications. But it will be the best way to have post-graduate education to improve their Applying creativity and design and Applying technology skills. Today, many organizations prefer people who have received post-graduate training in both managerial posts and positions in the project development and research departments.

*4.3. BRM (Bridge Resources Management) Scenarios for Soft Skill Development and Assessment.*

Based on the training scenarios, each training centre should form unified assessment criteria for BRM simulator-based training. The hard skills assessment form was adapted to the maritime field and combined with the soft skills assessment [14].

The scenarios are suitable for the development of Soft skills obtained as a result of the survey (Figure 2) were evaluated as follows.

- All scenarios are suitable for the development and assessment of "Managing and developing self, Working with and relating to others, Communicating, Applying numeracy (Using math abilities), Managing tasks, and solving problems" skills.
- In all scenarios, the level of meeting the "Applying creativity and design", and "Applying technology" criteria is relatively low. It is conceivable to develop scenarios that can support these two skills, but it will be very difficult to develop these scenarios within the scope of BRM.
- It seems appropriate to use Graduation Dissertations to improve these two skills (Applying creativity and design and Applying technology). In order to achieve this, in the selection of dissertation topics, the most suitable topics for these two skills should be selected.

**5. Conclusion**

Today, soft skills have gained importance at least as much as vocational skills. The business world prefers people with advanced soft skills for managerial positions. It is important for people to find suitable resources and ways to develop their soft skills, especially when career planning is done. Some soft skills may be developed during the professional application and short courses but it is necessary to have additional academic education to develop "Applying creativity and design and Applying technology" skills within postgraduate education.

Seafaring officers rise to managerial duties in a short time like 4 years, and in order to be successful in their duties, they need to develop their soft skills during the school period. MET institutes need to revise their program to provide soft skill development for cadets.

The most appropriate tool for the development of soft skills in MET institutions is simulator training, where the student also demonstrates his/her own abilities. Among the simulator training, the most suitable training for soft skill development and evaluation are BRM and ERM. This training will greatly contribute to the development of soft skills related to Managing and developing self, Working with and relating to others, Communicating, Applying numeracy (Using math abilities), Managing tasks, and solving problems.

Development of Applying creativity and design and Applying technology skills is relatively low in BRM/ERM applications. The creation of new scenarios for these skills is unlikely possible within the scope of BRM/ERM. It seems appropriate to use Graduation Dissertations to improve these two skills In order to achieve this, in the selection of dissertation topics, the most suitable topics for these two skills should be selected.

**Acknowledgment:**

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