Maritime Innovation Management – A concept of an innovative course for young maritime professionals

Bolmsten Johan [d*], Kasepold Kadi [c], Kaizer Adam[a], Ziemska Monika[a], Heering Dan [c], Alop Anatoli [c], Chesnokova Marina [b], Olena Sienko [b], Sköld Daniel

[a] Gdynia Maritime University, Gdynia, 81-225, Poland
[b] National University "Odessa Maritime Academy", Odessa, 65029, Ukraine
[c] Estonian Maritime Academy, Tallinn, 11712, Estonia
[d] World Maritime University, Malmo, 211 18, Sweden
[*]Corresponding author. E-mail: jb@wmu.se
Keywords: Maritime innovation management, social learning, e-learning

ABSTRACT
Rapid developments in the maritime sector state the need for MET institutions to provide future young maritime professionals with a new set of competencies to enable their participation in innovation processes in the maritime cluster. Four MET institutions took part in a one-year project to tackle this issue and to get an insight into the current situation regarding maritime innovation management and accompanying needs for the future. The results details the educational needs and an educational approach covering a subject and delivery plan, the input from local and global academic and industry experts, and cross-border and cross-sectorial cooperation. The approach incorporates the competencies of students, academia and the maritime sector in a course combining the aspects of e-learning and classroom activities in an international platform.

1. INTRODUCTION
Young maritime professionals entering the labor market in the upcoming years will be part of the rapidly developing maritime industry and will be working with novel solutions throughout their careers. Autonomous ships, "smart" port operations and new environmental and safety considerations are just a few examples that will impact both the individual maritime professional and other maritime industry actors, as well as how they relate.

In response to the growing interest in innovative management and lifelong learning, the idea was born to develop a new blended-learning concept to empower young maritime professionals to be active change agents throughout their careers.

In the light of current developments, it is recognized that the established standards for Maritime Education and Training (MET)[8] do not focus on equipping young maritime professionals with the competencies to be active agents in a context of rapid change where different types of problem-solving strategies and innovation processes are needed.

This manuscript reports on the first results of a project with the objective to develop a university level course in Innovation Management in the maritime sector for young maritime professionals. The course will be based on the assumption that innovation is increasingly driven in open and dynamic networks of people with complementary competencies, where professionals from industry, academics, and civil servants need to find spaces and approaches

to come together - in what can be referred to as a triple helix approach as described in the following section 2. The project explores two questions: what educational topics and what educational approach can build young maritime professionals capacity to participate in maritime innovation?

Section 3 describes the empirical research approach. Section 4 reports on the result of our findings. Section 5 summarizes and describes future directions of the project.

2. RELATED WORK
2.1. A TRIPLE HELIX APPROACH TO INNOVATION

A Triple Helix approach denotes how the interaction among universities, industry, and the government is key to innovation and growth in a knowledge based-economy [1]. Traditionally, industry is a key actor as the locus of production, government provides a base for contractual relations that guarantee stable interactions and exchange, whereas universities are focused on teaching and generation of new knowledge through research. The Triple Helix approach recognizes how these traditional spheres are in flux with e.g. elimination of clear dividing lines between science and business. In this new landscape, the universities play a central role in innovation through an extension of the traditional teaching and research mission in academia into a new focus on economic and social development to identify new spaces for science-based innovation and growth. This includes top-down policy and program development and bottom-up community development, where people find new ways of interacting in their work- and daily life [1] [2]. In this project, students at MET institutes as young maritime professionals are in focus in the triple helix relation and how they can be equipped with competences for maritime innovation management.

2.2. BLOOM'S TAXONOMY

To guide the inquiry of how to develop a university course to address maritime innovation management, the seminal work of Bloom's taxonomy [3] has been referred to. Bloom's taxonomy describes the development of intellectual skills ranging from recalling and understanding basic facts and concepts, to applying and analyzing concepts and information, and finally evaluating and creating new or original work [3]. In guiding the objective of designing a course on innovation management, it was relevant to inquire how the students could acquire a basic understanding of topics such as entrepreneurial skills to participate in open and dynamic innovation networks (e.g. the Industry 4.0 impacts to the maritime industry). Furthermore, it was relevant to inquire about how the students could be empowered to become active agents in applying those concepts and creating new solutions.

2.3. SOCIAL LEARNING AND E-LEARNING

This project, in particular, investigates how different educational approaches of social learning can be used in a course about maritime innovation management. E-Learning is at the top of UNESCO's agenda of re-thinking education for the twenty-first century empowering people to participate in societal, economical, and environmental change [4][1]. "Online collaborative

---

[1] Of relevance to this stud a connection can be made between triple helix approach to innovation and sustainable development [5]

learning" [7] as one of the established and documented social-learning theories, emphasizes three key aspects related to social learning: Idea generating to collect divergent thinking within a group; Idea organizing where learners compare, analyze and categorize their ideas through discussion and argument; Intellectual convergence with the aim of intellectual synthesis and developing a common understanding.

Social learning, understood in this way, highlights several considerations for a successful outcome, including the need for appropriate technology; clear goals; choice of appropriate topics; defining learners roles and expectations; monitoring participation; regular ongoing instructor presence. These dimensions and others need to be understood in the educational and technical design of, for example, a course or a program.

3. RESEARCH APPROACH

This manuscript reports on the results of a one year project funded by the Swedish Institute with the aim of exploring maritime innovation and growth processes, starting with competence development and life-learning processes from students and young maritime professionals point of view. The project focuses on the capabilities of MET institutes to serve as a central actor in the maritime cluster to support these processes. Four partners have been part of the project: World Maritime University in Sweden, Gdynia Maritime University in Poland, National University "Odessa Maritime Academy" in Ukraine, and Estonian Maritime Academy in Estonia. The project relates the European Union ERASMUS program framework of Strategic Partnerships in the field of Education, Training, and Youth. The analysis of three project activities constitute the empirical results that are reported in the following section:

- **An industry and student surveys** were carried out in the early stage of the project to understand the issues and the potential of maritime innovation from the perspective of the maritime cluster surrounding the partner universities and students. The results of the survey were used as an input to the partner workshops and the design of the student participatory workshop.
- **Partner workshops** were organized at each of the partner universities to localize the understanding of issues and potential solutions. As a result, potential educational topics and approaches from both the individual universities perspective as well as ideas of joint collaboration were established;
- **A student participatory workshop** with representatives from participating institutions aimed to gain students perspective on maritime innovation management. The students were asked to analyze the Strengths, Weaknesses, Opportunities, and Threats (SWOT) of Maritime Innovation Management from the perspective of their competence development, as well as come up with possible solutions.

4. RESULTS

This section reports the results of the main project activities about the educational needs and how to design a university course to build young maritime professionals' capacity in maritime innovation management.

4.1. EDUCATIONAL NEEDS

The initial survey results indicated that a course on maritime innovation management is found relevant. It is taken as a high-level indication on current issues and needs the maritime industry and students are facing with respect to maritime innovation management. The results from the student participatory workshop provided a ground perspective about what educational topics are needed and how they should be taught. Figure 1 shows the outcome of the SWOT analysis and rich mapping that the students used to present their results.
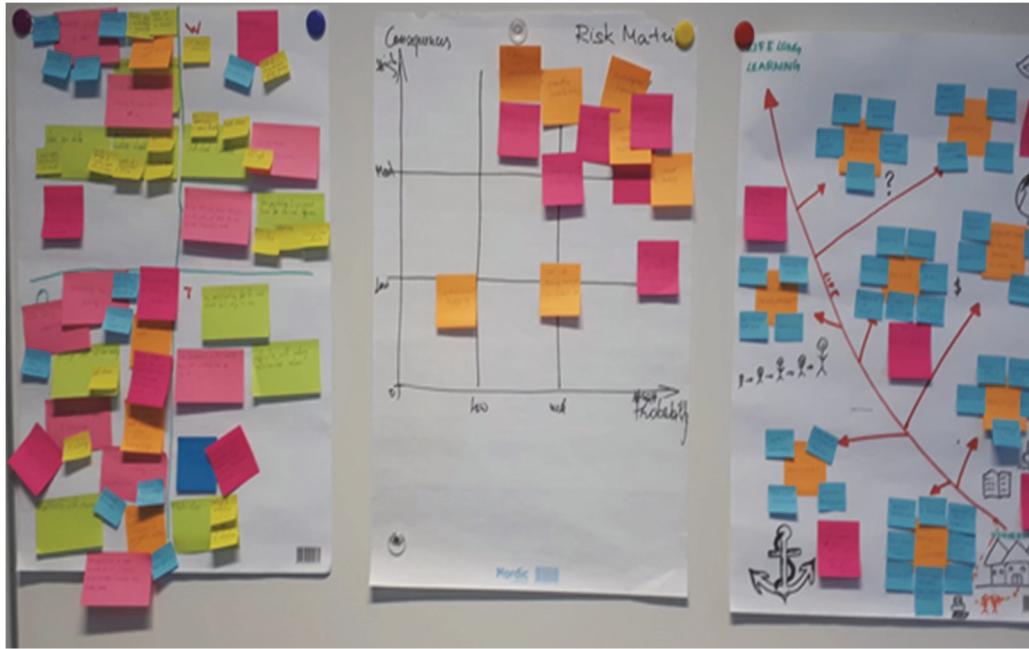

Figure 1. Results from the students' workshop. SWOT Analysis, Risk Matrix and Lifelong

learning perspectives in MET.

The key findings can be understood in three parts: In the first part, the students were asked to critically explore how they as young maritime professionals were equipped with competences to participate in the rapid development of the maritime industry that they will face throughout their careers. The students sensed opportunities with the development of the maritime industry, but perceived that it was a threat that they were not equipped with the competencies to participate in that development, ranging from the lack of topics to outdated teaching approaches and platforms (where for example e-learning was still a novel occurrence). In the second part, the students were asked to prioritize the outcome of the SWOT analysis in regard to consequences and probability. The result furthermore detailed how the students at the end of their studies lacked competencies for professional skills like teamwork, self-presentation, problem-solving, especially given the international nature of the maritime industry. They also lacked a systematic understanding of e.g. new trends in the maritime industry and the impacts of new technologies. In the third part, the students were asked to create a rich-picture exploring an educational solution to the prioritized issues. Combined with the outcome of the partner workshops, the result gives evidence to how the MET institutes, generally, are well positioned to provide competence development relevant for maritime innovation management, e.g. through having good contact with shipping companies and with graduates. Potentially this

could enable the students to learn from each other via experience-sharing and real-life examples, beyond textbook examples and hypothetical cases. However, it was perceived that the MET universities were not taking advantage of this possibility very often.

In summary, the MET institutes could do more to equip their students with the necessary competencies to participate in the rapid development of the maritime industry, and seize the opportunities available to them. At the same time, it is important to note the necessity to be sensitive to the differences between the MET institutions and the room for improvements.

4.2. EDUCATIONAL APPROACH

The design of an educational approach is the outcome of the partner workshops and is based on the outcomes of section 4.1. This section describes the current educational approaches, the potential of new collaborative educational approaches between the MET institutions and the provisions of new educational techniques. Figure 2 summarizes the results, combining the educational approach, subject and delivery plan.

Module 3 – Blended-learning (Evaluate, Create)
Students evaluate their local cases together with students and professionals from other universities and organizations. Creation of new solutions and insights

Students upload their local cases in the distance-learning platform for joint reflection and feedback thorough forums and webinars

Module 2 – Classroom learning (Apply, Analyze)
Apply conceptual knowledge in relation to local cases and students own challenges and opportunities

Students work with local instructors

Module 1 – Distance-Learning (Remember, Understand)
Conceptual understanding of Maritime Innovation Management, theories, frameworks, and cases

Distance-learning: recorded lectures and e-lessons with Global and local industry and academic experts

Figure 2. Blended-learning delivery approach

4.2.1. SUBJECT AND DELIVERY PLAN

A subject and delivery plan was designed to combine the educational needs highlighted in the previous section with the educational approach. The partner workshops indicated how a course structure in three sections may be foreseen. First, a fully distance-learning part where students collaborate in transnational teams around basic concepts and theories as well as practical aspects of Maritime Innovation Management using an e-learning platform. This is followed by students working in local innovation teams in collaboration with a local maritime company. Finally, the course will once again move into the e-learning platform and a blended-learning format where the student teams present the results of the innovation processes online and evaluate each other's outcomes. This subject and delivery plan concept is innovative in the sense that no similar syllabus or course concept for Maritime Innovation Management exist already.

4.2.2. LOCAL AND GLOBAL ACADEMIC AND INDUSTRY EXPERTS INPUT

Although the results from the project indicated the existence of capable instructors in MET institutions, it was also highlighted how their capacity needs to be developed to cater to a new innovative subject as Maritime Innovation. The innovative design of the proposed course develops the teaching capacity of local instructors with global academic and industry experts.

The core part of the digital section of the course will be the e-lessons presented by global and local academic, as well as industry experts. A platform containing materials like video lectures, reading materials, etc. enable students from different geographical locations to take part of the same lectures on their own time and they may also return to any lectures as they need during the course.

4.2.3. CROSS-BORDER AND CROSS-SECTORIAL COOPERATION

Taking into account the international nature of the maritime sector (as also stated in 4.1) it is important to provide the students with opportunities for cross-border, as well as cross-sectoral collaboration experience already during the studies. To enhance the quality of offered courses the cooperation between different MET institutions is considered the key aspect in the stage of development and delivery of the innovation management course. Engaging students, academia, the maritime industry, and the private sector in the real-life innovation processes at an international level could be an effective solution to stimulate sectoral development. Incorporating different relevant stakeholders in the educational process and innovation management increases the competitiveness of young maritime professionals in the labor market.

5. CONCLUSION AND FUTURE DIRECTIONS

The results of the project show the educational needs and an educational approach for a joint transnational course on Maritime Innovation Management. The outcome shows that students see potential with the developments of the maritime industry, but at the same are concerned that they lack the competences to participate in this development. The outcome of the surveys and student participatory workshops show that the students would like better education in current trends and the impact of e.g. the rapid technology development facing the maritime industry. They furthermore called for better possibilities to develop their problem-solving skills, team-working, and self-presentation in an international context, given the inherently international nature of the maritime industry. The results showed how there was a call for developing these competencies through collaboration: collaboration between students at different maritime universities, and collaboration with the maritime industry. The partner workshops gave an understanding of how a blended-learning educational approach could be developed to meet these educational needs. The educational approach is based on social learning and an online collaborative learning approach where the students both get to improve their understanding of concurrent topics through e-lesson by academic and industry experts, but apply their knowledge on local cases relevant to them and work together to analyze the results and create new solutions. This constructionist approach is innovative in MET as well the transnational and digital dimensions of the course.

REFERENCES

[1] Etzkowitz, H., The Triple Helix: University-Industry-Government Innovation in Action, Taylor & Francis, 2008.

[2] Hayes, K. J., Triple Helix Organisations, Communities of Practice and Time, In Handbook of Research on Communities of Practice for Organizational Management and Networking, 2018, pp. 245–264.

[3] Krathwohl, D.R. & Anderson, L.W., A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives, Longman, 2009.

[4] UNESCO, Rethinking education, UNESCO Publishing, 2015, pp. 1–84)..

[5] Meléndez-Ortiz, R., Auken, I., & Bacchus, J., A Multi-stakeholder Message: Key principles in the formulation of Sustainable Development Goals, 2014.

[6] Bates, A.W., Teaching in a digital age, 2015.

[7] Harasim, L., Learning Theory and Online Technologies, New York/London: Routledge, 2012

[8]http://www.imo.org/en/About/conventions/listofconventions/pages/international-convention-on-standards-of-training,-certification-and-watchkeeping-for-seafarers-(stcw).aspx