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Case Studies on Transport Policy

journal homepage: www.elsevier.com/locate/cstp

Closing the gap between present and future through education: MINE-EMI project

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ARTICLE INFO

Keywords:

Maritime Education and Training (MET)
Emerging issues
Postgraduate programs
Maritime management
Innovation
Skills development

ABSTRACT

This study aims to discuss the need for a new postgraduate program intending to fill the gap between the curriculum of the current postgraduate programs and the contemporary requirements of the maritime sector regarding management, transport operations and logistics. It is the duty of the schools to train and educate the workforce of the future; therefore, the contents of the courses should constantly be reviewed and tackled with the new developments in science and society. New programs with new courses or contents to meet the educational demands of the sector and to develop skills and competencies to raise awareness on emerging maritime issues should be developed with the ultimate goal of promoting sustainable management of the maritime sector. To determine the courses of these programs and their contents, a survey that was prepared in the frame of the MINE-EMI Project* was used. The survey which was distributed to the stakeholders in 5 different countries was responded to by 224 stakeholders in the maritime sector. In addition, online and face-to-face interviews were made with them. The results showed that the contents of the present postgraduate programs should be modified to cover the newly emerging issues such as environment protection, technology-related issues, management of international waters, continuous professional development and inclusion of generation Z in the maritime industry. To make the maritime sector keep pace with the latest developments and to graduate students with up-to-date knowledge MET (Maritime Education and Training) institutions should be proactive and continuously adjust their programs to the needs of the sector in the future and prepare their students to meet the requirements of the future.

1. Introduction

The impacts of globalization and technological innovation have been increasingly affecting all people and institutions. Companies have to constantly renew themselves in order to fully meet the requirements of the new age and the expectations of the business world and gain a competitive advantage, since both the way work is done and the skills expected from employees have begun to change. Maritime-related industries, such as shipping, are complex socio-technical environments that function within highly variable operational, regulatory, economic, political, social, and international conditions. One of the most critical elements of safely operating today's modern and technologically sophisticated ships are the seafarers themselves (Mallam et al., 2019).

People must now work in an environment completely shaped by Industry 4.0 and acquire the skills required by this environment. They must be able to work in places where the pillars of the Fourth Industrial

Revolution—big data and analytics, robot-assisted production, self-driving logistics vehicles, augmented reality, and additive manufacturing, dominate (Nardo et al., 2020). Ellahi et al. (2019), who have identified composite variables of this revolution through content analysis, added the Internet of Things, cloud computing, and artificial intelligence to this list. They used these variables to propose that a curriculum matrix can be used as a roadmap for universities to incorporate and adapt to Industry 4.0 in their curricula.

The workforce has also changed in terms of skills, and there has been a transformation from employment in unskilled and large numbers into small numbers of skilled employees. Hard and specific operations skills have been replaced by the softer, more generic, and more transferable skills of the digital world (Gekara and Nguyen, 2018). Research shows that employers' five most preferred skills in new employees today are being a team player, having self-motivation, verbal communication skills, problem-solving skills, and being proactive (McGunagle and

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<https://doi.org/10.1016/j.cstp.2022.100936>

Received 28 May 2021; Received in revised form 9 November 2022; Accepted 2 December 2022

Available online 6 December 2022

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Zizka, 2020).

Employees' skills should be transferable. It is clear that technological changes will result in increased automation and a smaller workforce. According to the Future of Jobs Report prepared by the World Economic Forum (WEF) for 2020, 85 million jobs may be displaced by a shift in the division of labor between humans and machines, while 97 million new roles may emerge by 2025. This will require people to become more qualified to avoid unemployment. One way to prevent unemployment is to teach people transferable skills that can easily be applied to different job settings. Therefore, Higher Education Institutions (HEIs) should ensure that the workforce is educated in acquiring transferable skills so that the redistribution of the workforce across sectors will be possible (Gekara and Snell, 2018). In this context, industry-academia collaboration will be significantly important in reducing the skill gap between the present and future workforce and addressing the changing needs of the business world (Malik and Venkatraman, 2017).

Nowadays, knowledge and information may become outdated or irrelevant very quickly (Boulougouris et al., 2019). Professionals are expected to effectively respond to changing conditions; therefore, education with well-designed methods and contents is an effective and direct way to prepare students for the changing and increasing demands of the future. HEIs have been working hard to keep up with an ever-changing world and to equip students with up-to-date knowledge that will let them easily adapt to the demanding conditions of a work environment. While there is much to account for in terms of designing such a curriculum, it is most important that it addresses the realities of Industry 4.0. In terms of the maritime sector, the development of technology has had a great impact, similar to all other sectors (Tester, 2017). Maritime educational institutions around the world will need to be prepared to respond rapidly to this paradigm change and provide the skilled labor the industry will require to remain competitive (Simmons and McLean, 2020).

The way new technologies affect navigation and communication is very similar to the way they affect management. The main difference is that developments in the information systems that support navigation onboard a ship may lead to more decision-making processes onboard, while developments in the external information systems may lead to less individual decision-making in the same place, which increases the burden on managers ashore (Albayrak and Ziarati, 2010).

The advancement of information and communication technology has resulted in the physical distance between people becoming less of an obstacle, which has benefited the shipping industry among others. Today, it is easier to maintain communication between a ship and its owner, and this indirectly leads to more interference in terms of ship management. The master of the ship no longer seems to be in command of his ship, thus there is a misinterpretation that commercial requirements have superseded aspects of safety and security.

On the other hand, maritime transport and services, which account for more than 85 % of world trade (UNCTAD, 2020), have proven to be of crucial importance during the COVID-19 crisis. These services kept the world connected and contributed to ensuring that no territory is left behind, regardless of how peripheral it may be. Maritime industries have a central role to play in the impending economic recovery and industrial renewal. These sectors, which range from traditional activities such as port and shipping operations or shipbuilding to newer technologies such as marine energy, are key to sustainable development. While ship and port staff need to evolve to meet rapidly changing technological, environmental, and legal demands, there is also an increasing need for competent managers who can approach all maritime-related issues holistically to most efficiently utilize scarce resources without damaging the environment. International and regional cooperation, such as an established network and common operational concepts, is also critical in this field so that shipping tools, ships, and ports can be most effectively used in a limited sea space without interfering with each other.

Therefore, there is a need for a more coherent approach to maritime issues with increased coordination between different policy areas, in

order to benefit more from the sea basins and better respond to market needs through advanced education programs. These programs are expected to prepare experts and managers for the maritime business. In addition, maritime institutions should be capable of establishing and implementing maritime policies at the national and regional levels while fostering successful business projects.

2. Background information

Changes going in line with developments in all fields concerning maritime, such as technology, environmental policies, managerial concepts, and legislative regulations, have brought about the necessity of adapting the curriculum of the postgraduate programs in maritime universities, like all other universities, to the demands of the sector and meeting the expectations of all the stakeholders from these schools. Although there are a number of reasons that triggered these changes, the main motives can be grouped under the following headings:

2.1. Emerging issues

2.1.1. Rapid change in the relevant topics

The maritime industry is a striking example of how expectations of educational institutions are changing. The shipping sector is naturally ever-changing and is characterized by developments and growth (Phewa, 2020). The people in this sector should be qualified enough to serve in the sector because maritime is a dynamic market with high turnover, many technological evolutions, continuous policy amendments, and an enormous amount of information and knowledge (Boulougouris et al., 2018). Moreover, they should be willing to refresh their knowledge. Because of this, programs with up-to-date content, including emerging maritime topics, should be prepared in cooperation with the industry. It may be hard to keep this kind of program up-to-date because the newly emerging topics develop very rapidly. Studies made on the curriculum show that the MET sector must respond to change to remain relevant and viable (Smith-Johnson, 2020). Presently, there are efforts to adapt maritime training programs to these issues; this is mostly done by adding newly emerging topics to existing programs.

2.1.2. Demand by stakeholders in ashore units

Education programs in the field of maritime primarily emphasize the education of seafarers. However, due to the transformation of the maritime industry into a sector that requires large capital accumulation (World Finance, 2015), the education of professionals who will work in both public and private companies and organizations in not only afloat but also ashore units of the sector has gained importance. With an eye to meeting the envisaged needs of industry and a rapidly evolving educational and career context while catering for the professional development aspirations of individual seafarers, the Global Maritime Initiative was set forth, and the new concept of a Global Maritime Professional (GMP) has been described based on the information gained from a survey. Following an analysis of the knowledge, skills, and attitudes required by GMPs, their educational needs were determined (IAMU, 2019). The study found that the topics of importance within this concept include applications of new technologies impacting the maritime industry, soft-skill topics such as teamwork, leadership, project management, and cultural awareness, to cope with the international characteristics of the maritime industry, and specific topics like cultural awareness and leadership (Bolmsten et al., 2021).

2.1.3. Multidisciplinary approach

The increasing diversity in the sector underlines the necessity of knowledge and experience in other disciplines besides maritime. This issue reveals the need for a multidisciplinary structure in maritime education. Postgraduate students perceive the maritime programs they pursue as being too theoretical. To address this problem, tertiary institutions should put more effort into strengthening their networks with

the maritime industry. In return, the industry should offer more training opportunities, mentorship, and internship placements to allow students to establish or expand their industrial networks more effectively (Lau and Ng, 2015), since diverse disciplines and cultures provide multidisciplinary and multicultural knowledge transfer and sharing (Doukanari et al., 2020). A study conducted by Doukanari et al. (2020) proved that activities designed on a multicultural and multidisciplinary basis expose students not only to complex real-life cases and help them solve authentic problems but also equip them with the knowledge and skills necessary to succeed in today's competitive global marketplace. Another study made by Orozco-Messana et al. (2020) on a workshop that drew together students from a range of disciplines across engineering and science, law, and the social sciences and from a range of countries and backgrounds showed that cooperative project work develops transdisciplinary skills.

2.1.4. Internationalization of maritime activities

Maritime activities are mostly international activities. There are international organizations and regulations in this field, which is an international industry and can operate effectively if the regulations and standards are themselves agreed upon, adopted, and implemented on an international basis (IMO, 2021). Therefore, maritime professionals should be educated in accordance with international regulations. Maritime education cannot be supported only by national education methods, and all parties can improve their MET with mutual support from others. Parallel to that, maritime issues often have transboundary features. For this reason, measures and practices taken at the national level may not always give the desired result. This reveals the necessity of addressing maritime issues with both regional and global cooperation and standards.

2.1.5. Sustainability issues

Sustainability, especially environmental sustainability, has become one of the most important issues in terms of maritime transport. At a conference organized on this subject, Kitack Lim, IMO (International Maritime Organization) Secretary-General, said that the shipping sector is expected to adopt sustainable development targets starting in 2021. Thus, efficient plans can be made and implemented during the 20 s not only in the shipping sector but also all over the world (World Maritime News, 2019). He urged all the stakeholders in the maritime industry to work together for the realization of the common goal, which is progress on issues like climate change for the benefit of health and the environment. This crucial topic attracts researchers and projects like SHEBA (Sustainable Shipping and Environment of the Baltic Sea Region), which are implemented to provide sustainability in the seas (SHEBA Project, 2022). Experts from all fields in the maritime sector work together to provide a comprehensive and integrated analysis of the ecological, economic, and social impacts of shipping, emphasizing sustainability in this project and in all activities related to sustainability.

Many innate characteristics of shipping (including a broad range of stakeholders, multicultural and multinational aspects, ship-based and shore-based personnel, and the complexity of ship operations) cause additional challenges for the successful implementation of environmental policy instruments (Čulin et al., 2019). Therefore, innovative education programs must be designed to encourage and promote environmentally sound behavior adopted by all involved. The increasing importance of sustainability has been emphasized in the studies by Çelik et al. (2019) and Jeavan et al. (2022), who noted that it should be covered by the curricula.

2.2. Increase in need for distant learning

The limitation of time and access to information resources is one of the most important barriers to education. Creating networks based on developing information technologies and using distant learning methods through them can be a solution to this problem. Distant learning for

maritime education is of particular importance for different reasons: Students are often away from the educational institutions due to maritime duties, so it is necessary to coordinate the learning process with maritime institutions from different countries to ensure the mobility of students, lecturers, instructors, and others. The networks created for maritime educators from different regions can help them share their ideas and experiences in addition to combining different approaches, knowledge, teaching methods, and opinions, which will contribute to the development of maritime education (Makashina, 2016).

2.3. Demand for professionalism

The increasing use of information and communication technologies, the inevitable influence of globalization, and the continuously changing dynamics of interconnectedness among industries have made the business environment more volatile, uncertain, complex, and ambiguous, or VUCA (De Água et al., 2020; Bradley, 2018). In order to survive in this environment, companies try to increase diversity in their workforce and train and educate all stakeholders to make the best use of a broad variety of skills, experiences, and opinions, boosting creativity and innovativeness, which makes business management more difficult than ever. Another point that is crucial to having an efficient workforce is to recruit students who are aware of their future jobs and who choose to start maritime schools bearing the hardships of maritime jobs in mind. Thus, MET institutes should be aware of their students' intentions to enter the seafaring profession in order to manage their expectations effectively (Caesar and Cahoon, 2015).

Due to the rapidly increasing globalization and development of the industry, there is an increasing demand for professionalization in the maritime industry. Meeting this demand is the most important driving factor in increasing enrollment in postgraduate maritime education programs. These programs provide the most important support by adding value to students and by educating and refocusing them on customer-oriented service delivery (Adolf et al., 2009). The increasing number of institutions and postgraduate programs providing maritime education is one of the most important proofs of this. All these emphasize the necessity of curriculum modifications and adaptations in maritime courses.

Such a change will also help to improve the level of key competencies and skills of the maritime business managers, with regard to their relevance for the labor market and their contribution to the implementation of the integrated maritime policies. It will also improve the quality of the maritime business management programs, in particular through enhanced transnational cooperation between education and training providers and other stakeholders. As Muparadzi and Caesar (2021) point out, academia and practitioners should create opportunities to interact so that dialogue among themselves can be promoted, which may further contribute to knowledge sharing and the contribution of the industry partners to the design of the courses to address the skill-gap challenge. Another thing this change will help with is enhancing the international dimension of education and training, through cooperation between countries in the field of maritime transport, logistics, and management by increasing the attractiveness of the actions in this domain and supporting the promotion of cooperation among MET institutions, maritime businesses, and local administrations. It will also help in developing new tools that will cater to new phenomena such as the internationalization of education and support the creation of flexible learning pathways in line with learners' needs and objectives.

The need for programs to close the gap between demand and need regarding education and training given by HEIs has been the subject of several studies.

Tuljak-Suban and Suban (2013) emphasize the importance of human resources in maritime and say that an effective human resource depends on a well-organized work process and training, which requires it to be up-to-date and efficient. Costel et al. (2016), on the other hand, say that

Table 1
General results expected on the completion of the research studies.

1	More attractive education and training programs on management, transport, and logistics in the maritime domain
2	Greater effectiveness of activities for the benefit of the maritime business and local communities
3	Integration of good practices and new methods into daily activities
4	Support to economic stability and ecology
5	Blue growth, green and safe maritime transport operations, proper management of maritime areas in line with IMO (International Maritime Organization) and EU (European Union) Maritime Transport Policies and priorities.
6	Improved pedagogical competencies of the maritime trainers - benefit for the future trainees.
7	Integration of ICT (Information Communication Technology) in training
8	The use of maritime simulators, tools and software applications to improve the training process in the marine field
9	Promoting and supporting networks connecting education and training in the sea basins
10	Encouraging opportunities of cluster academia cooperation
11	Competency development and knowledge sharing through an assembly of the maritime skills
12	Meeting the demand of highly skilled maritime professionals and enhancing youth employment possibilities
13	Improving the attractiveness of the maritime profession and remedying the observed lack of articulated educational proposition.

the curriculum is global and changes are made in line with global demand in their study titled "Approaches regarding the harmonization of European Maritime Universities' curricula." [Smith-Johnson \(2020\)](#) said the MET sector must respond to change to remain relevant and viable. He said curricular restructuring in maritime education and training (MET) is a must from the perspective of the Fourth Industrial Revolution.

[Alop \(2021\)](#) is another researcher who stresses the need for a revision of the course contents. He says that in order to successfully meet the new challenges for shipping in the digital age, the focus of maritime education and training must shift from formalized and unified education to creative and "big picture" capturing solutions. Likewise, [Phewa \(2020\)](#) stressed the importance of curriculum development in line with the changes. He says that as the maritime sector transitions digitally, seafarers and other maritime personnel are left with no choice but to adapt, and this can be achieved through enhancing their knowledge and skills.

A report by the Nautical Institute says that the IMO explains that shipping requires a quality, motivated, and appropriately skilled labor force to thrive and, therefore, requires revision and alignment of the education and training of seafarers to meet the changing requirements. MET must provide appropriate knowledge and expertise to create a "future-ready" maritime workforce to meet the needs of diverse stakeholders ([Nautical Institute, 2022](#)).

The general results that are expected upon completion of the joint research studies conducted by maritime HEIs are given in [Table 1](#).

2.4. MINE-EMI project

To meet the above-mentioned demands and objectives, a new maritime business management master's degree program, MINE-EMI (Maritime Innovative Network of Education for Emerging Maritime Issues), was developed based on the pre-stakeholder need analysis in partner countries under the EU Project framework. The MINE-EMI Project aims to open three joint master programs (JMPs), which are integrated Maritime Policy (IMP), Port and Maritime Logistics (PML), and Port Management and Ship Operations (PSO). JMP aims to develop a strong set of academic and professional background and skills to support learning, practice, and research of emerging maritime topics; to enable students to acquire comprehensive, interdisciplinary knowledge; to understand and practice skills in these subjects; and to bridge the gap between post-graduate programs and industry needs. It also aims to

provide standardization of MET globally and regionally in existing training programs and to utilize a variety of learning, teaching, and assessment methods. Apart from these, JMP intends to facilitate the development of skills and competencies to raise awareness on emerging maritime issues and promote sustainable management of the maritime sector. The outcomes of this project will be shared with all interested parties, and programs developed within the frame of the project will be available for individuals from any country that would seek a carrier in the maritime domain—either public or private.

To realize the project, 7 partners involving universities and representatives from the business sector and local administrations from 5 different countries came together. Project partners are given in the following lines.

Piri Reis University, Turkey, is a private university founded by the Turkish Maritime Education Foundation in 2008 in Istanbul, Turkey. It has the support and sponsorship of the entire maritime sector (almost 9,000 stakeholders), namely the Turkish Chamber of Shipping through the Turkish Maritime Education Foundation, as a maritime university. There are undergraduate and postgraduate students in and out of the country at the university. Approximately 600 professionals attend professional development courses at the continuous professional development center of the university at various ranks and seniorities at different times of the year. The university educates competent and qualified engineers through student-centered and project-based education programs.

Constanta Maritime University, Romania, is a higher education and research institution. It bases its activities on the autonomy of the university and offers degrees at all levels, both for full time and part-time studies. It provides traditional marine education majors such as Marine Engineering, Electrical Engineering, and Navigation, as well as other degrees that allow for the integration of marine education and related activities in ports and inland waters. These new tracks are Environmental Engineering, Telecommunications Technologies and Systems, and Economic Engineering in Transports. 'Quality and Fair Competition' is the motto of the university; therefore, the curricula are structured in such a way as to ensure actual competencies for all students are realized.

Nikola Vaptsarov Naval Academy, Bulgaria, is the only higher education institution in Bulgaria for maritime officers and managers, both civilian and military. It delivers three-cycle study programs in the fields of maritime transportation, management, and security and defense. The Bulgarian Naval Academy has about 3,500 students overall and a professional teaching and research staff. Scientific research is focused on all areas of the maritime industry, thus including maritime and naval leadership topics. The Naval Academy holds the highest degree of quality in higher education in Bulgaria. Its international presence is also very visible, thanks to its English language study programs for foreign students and the various projects in bilateral or European projects.

The University of the Aegean (UAegean), Greece, was founded in 1984, aiming to introduce new approaches in higher education and promote regional development. In less than thirty years, the UAegean has evolved into an international research-oriented university offering 18 undergraduate and 40 postgraduate programs in modern interdisciplinary thematic areas such as environment, communication systems, cultural informatics, product design, food and nutritional sciences, education design, and Mediterranean studies. In addition, the UAegean has established joint international postgraduate programs (i.e., in biodiversity, environmental policy, and management, and European integration) as well as joint Ph. D. (Doctor of Philosophy) degree programs in a wide range of thematic areas. The UAegean has created a strong international academic and research profile.

Marine Cluster Bulgaria is a non-government organization consolidating the efforts of all sectors of the maritime economy in Bulgaria. The association acts towards the creation of favorable conditions for the development and enhancement of the competitiveness of

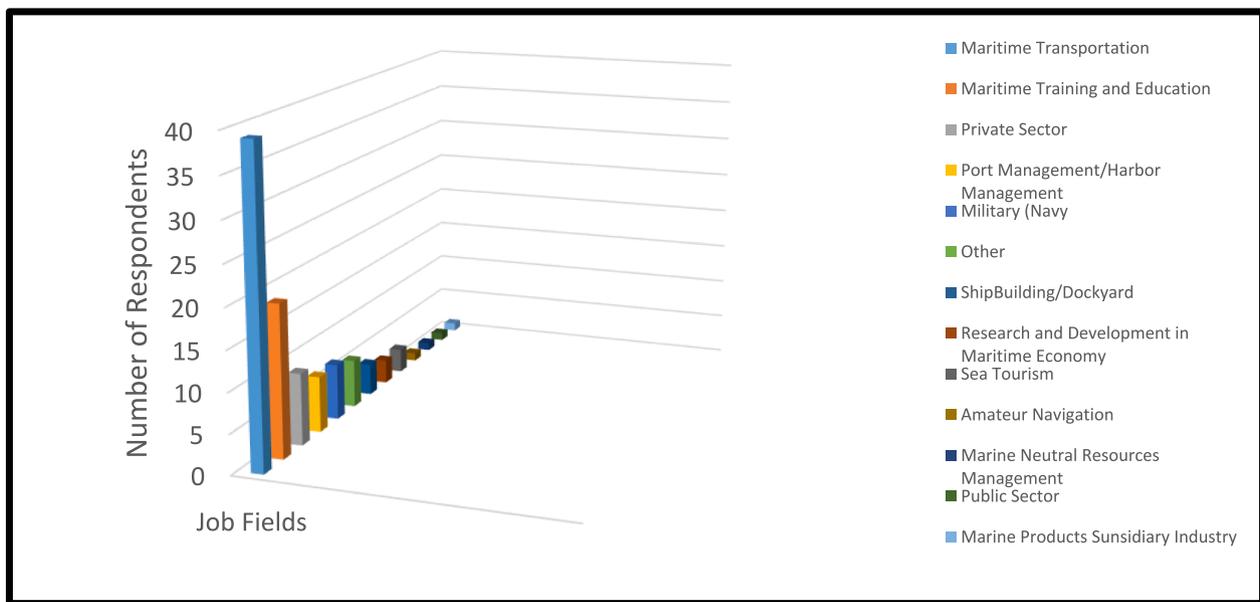


Fig. 1. Distribution of the respondents of the survey according to their job fields.

the blue economy by introducing new organizational, product, market, and technological solutions, training, and the implementation of best practices, as well as for its promotion at the national and international levels.

Piraeus Municipality, Greece, is situated in the Attica region of Greece and constitutes the third-largest municipality and settlement in the country. It is also a port city located within Athens' urban area. It is Greece's largest and most important port, as well as one of the largest on the eastern Mediterranean coast. It is an international commercial hub that provides services to ships of any type and size while offering unique advantages because of its strategic position and infrastructure. The City of Piraeus, following the quadruple helix principal, collaborated with local partners, including the University of Piraeus (UNIPI) and the School of Maritime and Industrial Studies, which have significant research in a number of areas, including the blue and green economies.

The Conference of Peripheral Maritime Regions, CPMR, France, which operates both as a think tank and as a lobby for regions, brings together some 160 regions from 24 states in the European Union and beyond. Representing about 200 million people, the CPMR campaigns in favor of a more balanced development of European territory. It focuses mainly on social, economic, and territorial cohesion, maritime policies and blue growth, and accessibility. It has a unique organizational structure that is subdivided into six geographical commissions that correspond to maritime basins: the Baltic Sea, North Sea, Atlantic Arc, Mediterranean, Balkan, and Black Sea Islands.

3. Methodology

The data in this study was obtained through a survey and some interviews in the frame of the MINE-EMI Project. The survey used in this study is given in the Appendix.

The survey questions were developed in four steps. In the first step, each partner university formed a committee of professors and associate professors who teach courses on current topics relevant to the programs and therefore follow the industry closely and are aware of developments, expectations, and possible changes. The committees prepared questions to get stakeholders' opinions on key points that should be covered by the JMPs. Interviews with some maritime stakeholders were also conducted to further develop the questions and make sure that emerging issues in the maritime field were included.

In the second step, these questions were sent to the leading partner,

Piri Reis University, where similar ones were removed and a question repository containing a lot more questions than were necessary to prepare the survey was created. In addition, survey specialists worked on the relevancy and consistency of the questions in the repository.

In the next step, this repository was sent back to the partner universities, where each committee made the final selection of the questions that should be included in the survey, in their opinion. Then they sent their own version of the survey to the lead partner, Piri Reis University.

In the last step, the committee at Piri Reis University reviewed the surveys sent by the partner universities and selected the questions that all or most partners agreed were important to create the final version. At the end, an online meeting was held to get the partners' opinions on the final version of the survey, and further adjustments were made in line with the decisions taken at the meeting.

A pilot test of the survey was carried out within the scope of reliability and validity tests. By determining the key components measured by the survey questions, factor loads were identified, and the internal consistency of the questions was checked. The final stage of the validity process was to review the survey based on the information gathered from the key component analysis. After that, the survey was activated online, and all the partners in the project requested that the maritime stakeholders in their country participate in the survey. Some brief information about the project was given at the beginning of the survey so that respondents would know what the aim of the survey was and how the data to be collected at the end would be used.

Among the maritime stakeholders to whom the partners sent the survey were those working at chambers of commerce, educational institutions, shipyards, tourism institutions, port companies, student organizations, etc., and 224 of them responded to the survey. Approximately 56 % of respondents were academicians and students in higher education institutes. The remaining 44 % were stakeholders from other areas of shipping (ship owners, seafarers, firm employees, etc.). In Fig. 1 below, the distribution of the respondents according to their job fields can be seen.

Besides demographic ones, there were 50 questions in the survey to be answered on a 5-point Likert scale. In addition to the survey, online and face-to-face interviews with some stakeholders regarding the issues covered by the survey were conducted, and details of their answers to the questions were recorded.

Extensive benchmarking was carried out as part of the project, not

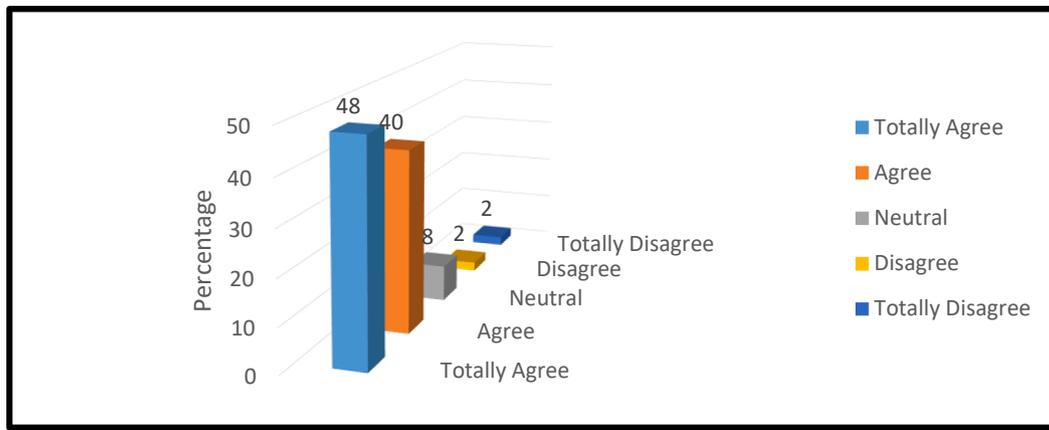


Fig. 2. Percentage of the respondents who defend that new master programs in maritime are necessary.

Table 2
Statements on the environmental issues.

		N	Mean	Std. Dev.*
1	Use of technology to address environmental and emission issues.	189	4,58	,668
2	Sustainable ship recycling	188	4,51	,763
3	Salvage: Dealing with crisis quickly and preventing container ship fires	189	4,49	,689
4	Port's social responsibility: Socially responsible behaviour and concerns for human safety, Environmentally safe operations etc.	189	4,44	,753
5	Decarbonisation of ships and ports operations	188	4,39	,816
6	Marine Eco-Environmental Protection; Ecosystem-based approaches into the planning of marine area management	188	4,37	,738
7	The Circular Economy: reducing waste by closing the loop in the supply chain, sustainable marine fuels from waste.	187	4,36	,794
8	The benefits of Marine Protected Areas	189	4,35	,822
9	Climate change; the effects on marine realm, development of new emission control areas.	188	4,33	,813
10	Bunkering: Operational feedback post implementation of the 2020 Sulphur Cap.	189	4,09	,832
	Pressure of population growth on management of marine areas	187	4,01	,922

Std.Dev.* Standard Deviation.

only in partner countries but also in major maritime institutions around the world. During this process, data was gathered from 242 master's programs at 134 universities in 42 countries. Then a comparison was made to determine the gap between existing courses and the future needs of the sector that were determined by the survey.

4. Results and discussion

The evaluation of the survey and face-to-face interviews, together with the discussions among partners, confirmed that there is a need for new master's degree programs to meet the requirements of all stakeholders in the maritime industry. Fig. 2 shows the percentage of the respondents who think that revising existing post-graduate programs or creating new ones to meet the demands of the sector is necessary..

Survey results showed that the new JMPs were expected to be designed with an emphasis on three issues: environmental concerns, the latest technological developments, and innovative changes. In the following part, statements related to these topics and the distribution of responses for some of them are given, along with the results that can be drawn from them. Although all of the statements in the survey are included in the Appendix with their means and standard deviations, some of them that are directly related to the issue at hand are also included in the findings section.

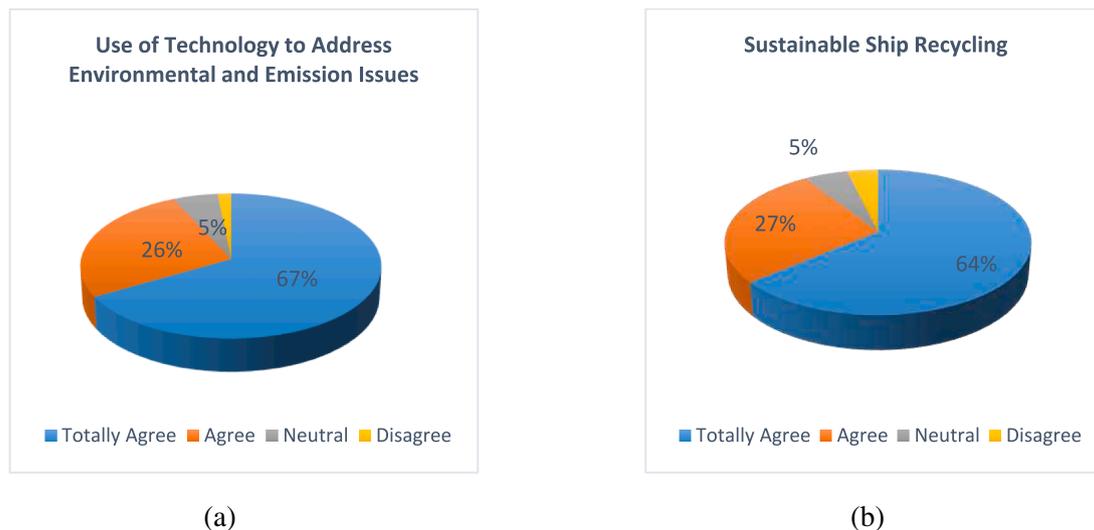


Fig. 3. Percentage of replies for questions 1(a) and 2 (b).

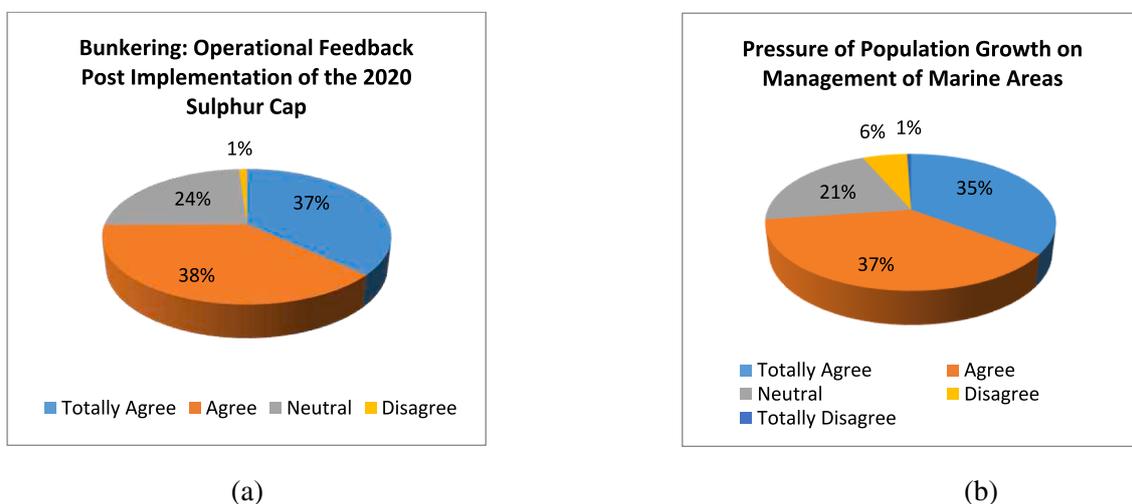


Fig. 4. Percentage of responses for statements 9 (a) and 10 (b).

Table 3
Statements on technological issues.

	N	Mean	Std. Dev.*
The techniques of electronic recording of information as a full alternative to paper version of documents required prepared by ships and maritime organizations.	189	4,39	,796
Maritime Traffic control system and technical (IT) supporting systems. Development of Maritime Single Window.	189	4,33	,735
Inclusion of advances in and expansion of satellite technology and related services in shipping operations.	193	4,32	,990
Smart operations and technologies such as big data, digitalization, artificial intelligence, block chain, robotics and internet of things.	186	4,26	,826
Critical services at sea in IT era.	187	4,26	,797
Development and widespread use of new technologies like 3D printing in manufacturing industry.	189	4,06	,935
Autonomous vessel operations; Regulations for autonomous vessel operations, Inshore requirements for autonomous vessel operations, training the operators; Unmanned aerial vehicles, unmanned surface vehicles, unmanned underwater vehicles, unmanned water surface vehicles. How they can be implemented in sustainable way?	187	3,74	1,196

Std.Dev.* Standard Deviation.

4.1. Environmental concerns

The survey had 10 statements about environmental issues. These statements, the number of participants who responded to these statements, and their mean and standard deviation values can be seen in Table 2.

Fig. 3 (a) and (b) show the percentage of the participants' responses for the first two statements in Table 2, which are among the statements with which the respondents agreed the most in the survey.

67 % of the participants stated that they totally agreed, and 26 % said they agreed with the statement, which said: "Technology should be used to address environmental and emission issues." That means 93 % of the respondents agree that this is an important issue and it should be included in the courses. The next statement on which the participants voted in favor of the most was the one related to sustainable ship recycling. The distribution of the choice preferences that can be seen in Fig. 3(b) means that a vast majority of the stakeholders in the sector pointed out the importance of environmentally sustainable ship

recycling. This shows their concerns for the environmental issues regarding ship recycling.

On the other hand, Fig. 4 shows the distribution of the responses that were graded the lowest by the participants in this group. Despite having the lowest acceptance rate, their percentage is still quite high when compared to other issues. They agreed that feedback should be given about the implementation of the global 2020 sulphur cap for bunker fuel, which represents a major challenge to the shipping industry. Most of the participants are in favor of getting such feedback, while some didn't want to express their opinion. The item that was voted the least favorably by the participants is about the "Pressure of Population Growth on the Management of Marine Areas." Although most participants agreed with these statements, the number of those who didn't agree was higher in comparison with the other statements. The percentage of the responses of the participants for statements 9 and 10 in the table can be seen in Fig. 4 (a) and (b).

As the mean value of the statements related to environmental issues in maritime shows, participants in the survey are quite concerned with environmental issues and they want them addressed in the postgraduate programs. Similarly, a significant number of interviewees expressed concern about the sector's environmental issues. They pointed out the importance of issues such as restrictions that could be brought to the use of the seas due to environmental degradation, the impact of climate change on the seas and maritime-related sectors, the development of integrated maritime strategies among the coastal countries, and technological developments that could halt and reverse the ecological deterioration.

4.2. Latest technological developments

Another result emerging from the survey is that there is a demand for the inclusion of technological developments in maritime-related fields that the new postgraduate programs will address. Survey results made it clear that efficiency, profitability, safety, and security, along with environmental awareness in the maritime field, depend on the successful adaptation of technological developments into the maritime field. This will lead to modifications in the courses to educate and train students in a way to make them capable of handling these developments as soon as possible. Statements related to technology in the survey can be analysed in two groups. The first group includes those directly related to the use of technology for up-to-date practices in the sector. These developments include the use of autonomous, unmanned vehicles, big data processing, artificial intelligence, off-shore technologies, fixed marine structures technologies, and autonomous cargo handling. Table 3 gives the list of statements in this group:

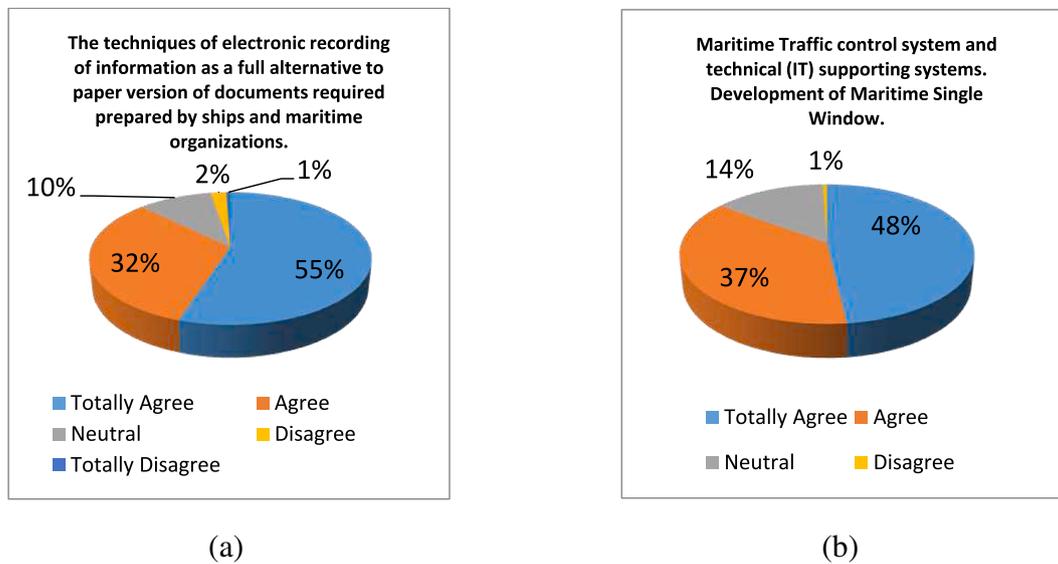


Fig. 5. The distribution of the responses for the first two statements with the highest mean.

Table 4
Statements on the managerial applications of technological issues.

	N	Mean	Std. Dev.*
Maritime critical infrastructure risk management; the relation between smart technologies, operations, performance and port safety management system. Smart technology in support of maritime risk management.	188	4,45	,689
Big Data is changing the shipping industry and will have great influence on smarter business decision making.	192	4,16	,743
Use of Digital marketing (Website marketing, Mobile marketing (i.e. Google Play, Apple Store), email marketing, online banner advertising, Video marketing, Social media marketing) as tool in the shipping and port industry.	189	4,12	,915
Understanding the innovation in the Fourth Industrial Revolution (4IR) to build the business context and the new business models	188	4,34	,747
Management of the multinational maritime enterprise	187	4,27	,812

Std.Dev.* Standard Deviation.

It is clear that the participants want technology to be used in a way to facilitate and secure life on board. 87 % of the respondents think “the techniques of electronic recording of information as a full alternative to the paper version of documents required to be prepared by ships and maritime organizations” is an issue that should be realized soon. Only

Table 5
Statements on the innovative ideas.

	N	Mean	Std. Dev.*
Understanding the innovation in the Fourth Industrial Revolution (4IR) to build the business context and the new business models.	188	4,34	,747
Bigger ports with more efficient and fast cargo handling systems will be needed to satisfy needs of Mega-Cities of future.	189	4,28	,868
Port management: Application of IT and EDI in operations.	188	4,27	,757
Maritime transportation liabilities of forwarders ship scheduling and automatic handling techniques.	189	4,21	,761

Std.Dev.* Standard Deviation.

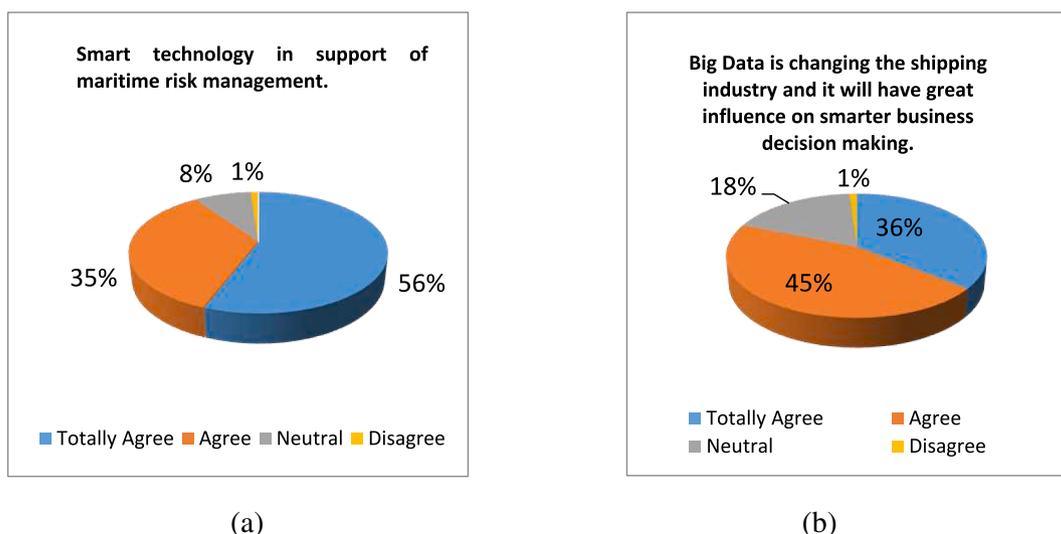


Fig. 6. The distribution of the responses for the first two statements with the highest mean.

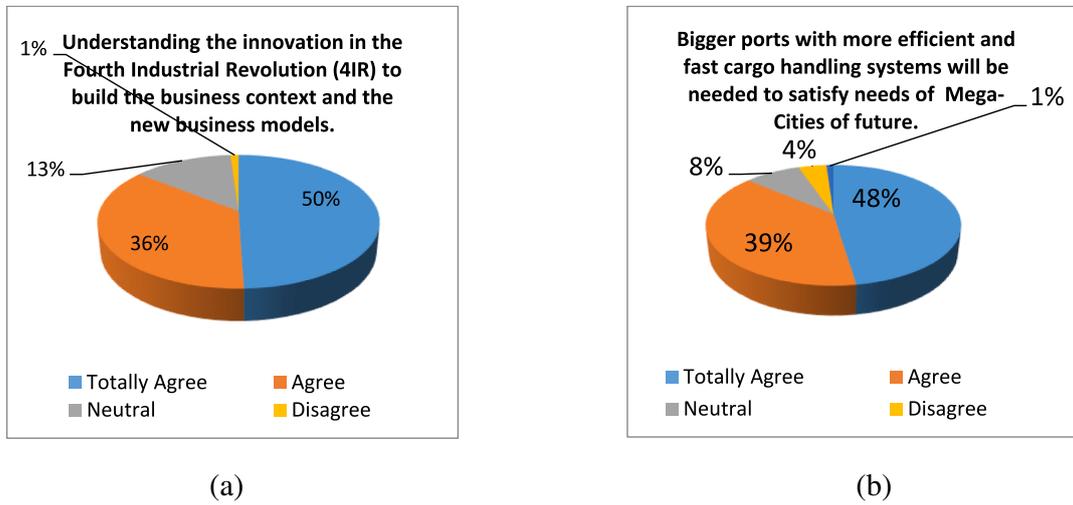


Fig. 7. Distribution of responses for the two most-positively voted innovation-related statements.

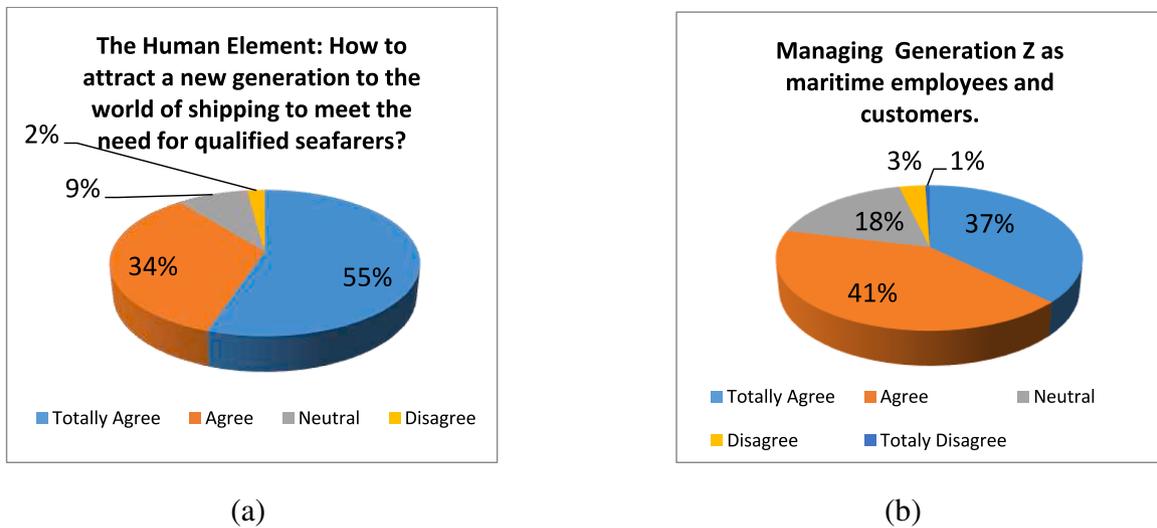


Fig. 8. Distribution of responses for the statements related to attracting young people into the sector.

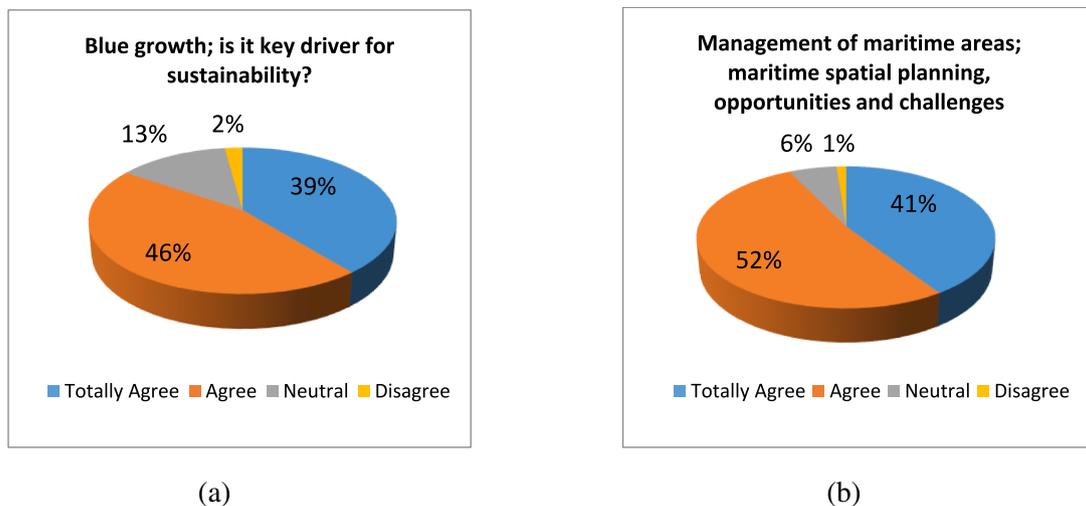


Fig. 9. Distribution of responses for general maritime management and policy.

Appendix

Statements in the survey with a descending order according to the mean values.

Descriptive Statistics	N	Mean	Std. Deviation
11-Use of technology to address environmental and emission issues	189	4,58	,668
8-Connectivity is key to many ship operations and the crew welfare of any vessel	189	4,52	,726
33-Sustainable ship recycling	188	4,51	,763
34-Salvage: Dealing with a crisis quickly and how to prevent container ship fires	189	4,49	,689
27-Maritime critical infrastructure risk management; the relation between smart technologies, operations, performance and port safety management system. Smart technology in support of maritime risk management	188	4,45	,696
17-Port's social responsibility: Socially responsible behavior and concerns for human safety, Environmentally safe operations etc.	189	4,44	,753
26-The techniques of electronic recording of information as a full alternative to paper version of documents required prepared by ships and maritime organizations	189	4,39	,796
13-Decarbonization of ships and ports operations	188	4,39	,816
31-The Human Element: How to attract a new generation to the world of shipping to meet the need for qualified seafarers?	187	4,39	,817
12-Cybersecurity in maritime industry and all aspects of maritime education and training at all levels	188	4,38	,885
44-Marine Eco-Environmental Protection; Ecosystem-based approaches into the planning of marine area management	188	4,37	,738
32-The Circular Economy: reducing waste by closing the loop in the supply chain, sustainable marine fuels from waste	187	4,36	,794
1-Master's degree programs on Maritime Business Management have to be revised to prepare graduates future business environment	193	4,36	,880
47-The benefits of Marine Protected Areas	189	4,35	,822
9-Understanding the innovation in the Fourth Industrial Revolution (4IR) to build the business context and the new business models	188	4,34	,747
46-Climate change; the effects on marine realm, development of new emission control areas	188	4,33	,813
28-Supply chain integration in the maritime logistics industry	188	4,33	,722
50-Maritime Traffic control system and technical (IT) supporting systems. Development of Maritime Single Window.	189	4,33	,735
4-Inclusion of advances in and expansion of satellite technology and related services in shipping operations	193	4,32	,990
7-Bigger ports with more efficient and fast cargo handling systems will be needed to satisfy needs of Mega-Cities of future	189	4,28	,868
15-Port management: Application of IT and EDI in operations	188	4,27	,757
24-Management of the multinational maritime enterprise	187	4,27	,812
38-Smart operations and technologies such as big data, digitalization, artificial intelligence, block chain, robotics and internet of things	186	4,26	,826
49-Critical services at sea in IT era	187	4,26	,797
18-Competitor analysis: Assessment of competing ports and evaluating their competitive advantage.	189	4,24	,808
45-Blue growth; is it key driver for sustainability?	187	4,21	,753
23-Maritime transportation liabilities of forwarders ship scheduling and automatic handling techniques	189	4,21	,761
2-Port facilities and equipment will be subject to profound technological changes that will require extensive revisions in the respective education programs	192	4,19	,856
41-Management of maritime areas; maritime spatial planning, opportunities and challenges	187	4,18	,733

Appendix (continued)

Descriptive Statistics	N	Mean	Std. Deviation
22-Multimodal transport regulations, Liability regulations for multimodal transport	188	4,18	,752
3-Big Data is changing the shipping industry and will have great influence on smarter business decision making	192	4,16	,743
14-Port users as an essential component of port authorities decision making process	186	4,16	,780
39-Vertical and horizontal market integration in port and shipping industry; alliances and joint ventures between terminal operators and liner companies	188	4,15	,783
10-Building maritime clusters	188	4,13	,784
40-Maritime Cooperation and Maritime Silk Road Construction	189	4,13	,828
42-Integrated Coastal Zone Management	188	4,12	,802
16-Port image/reputation: Port's reputation for reliability in the Market. Promotion strategies of ports (advertisements, public relations, sales promotions etc.)	188	4,12	,802
48-Managing Generation Z as maritime employees and customers	188	4,12	,845
21-Use of Digital marketing (Website marketing, Mobile marketing (i.e. Google Play, Apple Store), email marketing, online banner advertising, Video marketing, Social media marketing) as tool in the shipping and port industry.	189	4,12	,915
25-Bunkering: Operational feedback post implementation of the 2020 Sulphur Cap	188	4,09	,832
35-New corporate models in shipping (ownership): they will be the reality of vessel proprietary in the coming years and possible effects	187	4,09	,894
19-Market segmentation, targeting and positioning: Dividing the customer market into groups (segments), selecting the ones to be targeted and differentiating the port by positioning (perception management)	189	4,08	,781
20-Expansion of seaports hinterland	188	4,07	,884
6-Development and widespread use of new technologies like 3D printing in manufacturing industry	189	4,06	,935
37-Trade tariff's war and sanctions effect trade follows	188	4,05	,870
36-New tools of shipping finance (e.g. Green Finance); will they be the main determinant in the future of ship and port facilities finance?	188	4,04	,807
43-Pressure of population growth on management of marine areas	187	4,01	,922
5-Increasing demand for logistics after the shift of global economic power to Far East is expected to create a growing market for minor service providers	189	3,98	,902
30-Brown Water management	187	3,93	,916
29-Autonomous vessel operations; Regulations for autonomous vessel operations, Inshore requirements for autonomous vessel operations, training the operators; Unmanned aerial vehicles, unmanned surface vehicles, unmanned underwater vehicles	187	3,74	1,196

13 % of them think this doesn't have priority. The next issue the respondents consider more important than others is the "Development of Maritime Single Window, Maritime Traffic Control System, and Technical Supporting Systems." 85 % of the respondents have a positive view of the realization of this issue. The percentage of the responses of the participants for these statements are given in Fig. 5 (a) and (b).

The second group of technology-related questions includes those related to management in general. That means the research revealed that technology widely affects management in maritime since its importance in risk management, decision-making, or marketing processes has been underlined by the participants. Table 4 gives the statements in this group.

The distribution of the responses to the top two statements in this group can be seen in Fig. 6. They are “Smart technology in support of maritime risk management” (a) and “Big Data is changing the shipping industry and it will have a great influence on smarter business decision-making” (b).

Both statements were voted positively by the majority of the participants, which means they think the technology should be used in managerial issues. In this way, managerial processes will be more accurate, reliable, and fast. This will ease the work of people in managerial positions and give them time to deal with other issues for the development of what they do.

The next subject that the respondents think will gain importance soon is developing innovative ideas and putting them into practice. Table 5 gives innovation-related statements with their means from the survey.

Innovation is a keyword for success in all sectors. In today’s dynamic world, it is vital to respond to changes quickly. Therefore, realizing what is new and putting it into use will help enrich the sector with cutting-edge systems while also increasing the satisfaction of all stakeholders in the sector. Although innovation can be found in any field, the participants in the survey emphasized those in logistics and supply chain management along with those in managerial systems, which means the new programs should be designed keeping this tendency in mind. Fig. 7 (a) and (b) show the distribution of the participants’ responses regarding the top 2 innovation-related statements in the survey.

Participants indicated the importance of attracting Gen Z to the maritime sector. The gap between generations is getting bigger. The ways new generations are engaged and motivated are different from those of previous generations. Participants stressed the importance of handling Gen Z, which will be the next generation in the sector, in the right way. Knowing their preferences, needs, and goals will allow managers to make the best use of their knowledge and skills in the industry. The distribution of the participants’ responses regarding these issues can be seen in Fig. 8 (a) and (b).

Apart from the issues mentioned above, the participants rated some statements a bit higher than the others. They are related to general maritime management and policy, such as maritime cooperation and maritime Silk Road construction, integrated coastal zone management, and brown water management. That means, although the result proves that the stakeholders think the JMPs should give more emphasis to environmental and technological issues than those about general maritime management and policy, they also want these emerging issues to be included in the curriculum of the JMPs. Fig. 9 (a) and (b) give the degree to which they agree or disagree with two of the statements related to emerging issues.

As seen in Fig. 9 (a), 87 % of the respondents agreed that blue growth is a key driver of sustainability, while only 2 % thought just the opposite. Fig. 9(b) shows that 93 % of the respondents thought management of maritime areas would be a top priority in the future.

The second part of our research was the interview part. In this part, 21 stakeholders from the sector stated their ideas concerning the future of master’s education in the maritime industry. The information gained in the interviews shows that in addition to the topics that arose from the survey results, there are some more that should be tackled in the preparation of a new master’s program in social sciences in maritime. These interviews strengthened our belief that the demand for a new maritime master’s degree program has shifted to various areas of the maritime world, such as maritime business management, maritime administration, economics, marketing, planning, the environment, etc., as well as to the issues directly linked to maritime transportation, innovation, and the use of technology to address all these issues. A significant portion of the interviews stated that existing maritime higher education programs generally focus on maritime transportation or logistics, while they are lacking in other areas, particularly emerging ones. Some of the emerging issues mentioned by the interviewees are given below.

- Management of international waters
- The resilience of maritime and supply chain systems
- Maritime facility management
- Maritime law, insurance, and tax management
- Minimization of bureaucracy
- Maritime economics
- Continuous professional development
- Inclusion of Generation Z in the maritime industry

With the promotion and adjustment of new master’s degree programs focusing on the above-mentioned issues, it will be possible to concentrate on meeting the demands and needs of the industry and stakeholders and manage emerging problems, upgrade capabilities, and adapt to the requirements of the maritime industry. However, this is not the ultimate point. Everything is changing very fast, including the expectations and demands of the stakeholders and the needs of the sector. Therefore, studies to determine the present requirements of the sector should be made, and new courses, methods, or approaches should be adapted to the programs to meet these demands and make them up-to-date and effective.

5. Conclusion

According to the findings of this study, new maritime master’s degree programs that address emerging maritime issues are required. The result indicated that there was a significant gap between the existing maritime master’s degree programs and the ones that could meet the future needs of the sector. An innovative master’s degree program is needed to fill this gap. In addition to stating this need, the survey also reflects the opinions and proposals of the participants about what will be important in the maritime world in the future and, therefore, what should be covered in the new master’s education programs.

The data obtained from the survey and interviews made it clear that the issue on which the participants placed the greatest emphasis was the environment-related one. They are anxious about the pollution and point out that every effort should be made to minimize or abolish marine pollution and to observe environmental interests in activities such as port operations, ship recycling, salvage handling, and waste management. They also expressed their concerns about the growing population in marine areas and their probable contribution to the pollution, which gave way to the development of training programs to make people more conscious of the environment and to protect it. That means environmental protection is a priority for the stakeholders in the sector, and this should be reflected in the courses.

Another point that should be given great emphasis is implementing new technology as soon and precisely as possible in every field in the sector. That means not only using it in fields such as communication, automation and robotics, security, and managerial duties but also educating competent students who can make use of the advanced technology in their future jobs. That should be one of the primary policies of the MET.

Appreciating the importance of innovation and helping the managers of the future develop an innovative mind should be another goal of master’s programs. This can be accomplished by incorporating new topics into the curriculum in order to develop students’ innovative capacity, allowing them to be both innovators and consumers of innovation.

Innovation should be engraved into these programs, which means the programs themselves should be innovative in the methods they use. New master’s degree programs should be hybrid programs supported by online courses and digital course materials since these programs will certainly be gaining popularity, especially after the COVID-19 period. Therefore, it is important to prepare the training material to respond to both on-campus learning and distance learning enriched by online interaction and cooperation. Creative applications, gaming, and simulation applications should also be included in these programs, and the

theory should be supported by field trips and on-site experiences. The students in these programs will be members of Generation Z. Thus, the programs should be designed in a way to attract Generation Z students and address their way of learning. In this context, interactive and project-based learning methods focusing on active participation in the learning process should be given priority as learning methods.

Finally, it should always be kept in mind that although the sea, ships, and ports together with their respective human resources are still the main pillars of the maritime industry, emerging maritime issues take the maritime interest further beyond this trio. Business management, economy, finance, marketing, and planning, along with environmental, technical, and innovative issues, have started to gain importance in the maritime industry. For this reason, maritime master's degree programs should cover these issues from an interdisciplinary viewpoint. The goal of these programs should be to train and prepare managers and experts to find efficient, safe, secure, and environmentally friendly solutions to current and future maritime issues.

The composition of the partners is limited to a specific region and shares similar problems, which is the main limitation of this research. As a result, the survey results obtained from regional stakeholders may not be fully applicable in other maritime regions. However, due to the international nature of the maritime business and the diversity of maritime human resources, regional findings may easily be adopted in other regions and may provide a foundation for global standards. Another limitation may be considered to be the speed and scope of the changes in the maritime sector, which may easily make any educational program outdated within 2–3 years. Therefore, future research is suggested to monitor these changes, apply them to the existing programs, and disseminate the outcomes to other regions.

Funding

This work was supported by the Erasmus + program of the European Union within KA2 - Cooperation for innovation and the exchange of good practices, KA203 - Strategic Partnerships for higher education Agreement Number: **KA-203, 2019-1-TR01-KA203-077463**, of the project entitled: **MINE-EMI: Maritime Innovative Network of Education for Emerging Maritime Issues**.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

The realization of this article was possible with the support of the Erasmus + program of the European Union through financing within KA2 - Cooperation for innovation and the exchange of good practices, KA203-Strategic Partnerships for Higher Education, Agreement Number: KA-203, 2019-1-TR01-KA203-077463, of the project entitled: MINE-EMI: Maritime Innovative Network of Education for Emerging Maritime Issues. The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use that may be made of the information contained therein.

Appendix

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