Overview on Romanian Highschool Students' Attractiveness for Maritime Transport Studies

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Abstract

The paper is presenting a part of the results obtained between 2021-2022 within the Capacity building Project "Challenges of Maritime Digital Leaders in the Algorithmic Age (DIGITAL LEADER)", research grant by the International Association of Maritime Universities (IAMU) and the Nippon Foundation in Japan. Anticipating the structurally change of careers choice from sea to shore-based employment, in order to increase the attractiveness for studies, maritime educational institutions expand the focus of teaching technical core competences and knowledge necessary for on board jobs, to those competences needed for an array of on-shore jobs, complementary to seafaring. Some of the objectives of the study were to establish most in-demand skills for maritime digital leadership and to propose updated operational training methods for maritime training necessary to increase the students' attractiveness for maritime transport studies.

Key words: education, industry 4.0, digitalization, learning
J.E.L. classification: I21, J24, L91, R41

1. Introduction

While in the past, seafaring was considered to be a life-long occupation offering hierarchical advancement, job security and retirement certitudes, nowadays most seafarers individuals shift to finding on-shore employment opportunities at a moment of their professional path.

Although a conclusive statistical study was not yet published to analyze the percentage of seafarers' that structurally change careers from sea to shore-based employment, there is observed an increasing rate of such phenomenon in most maritime countries. In such context, maritime educational institutions need to find solutions to increase highschool/colleage students' attractiveness for maritime transport studies and to prepare students for both sea and on shore careers challenges.

2. Theoretical background

Romanian high school students' attractiveness for tertiary education in maritime studies raise certain concerns, in the context of constant decrease of new enrolments. "In contrast to early childhood and compulsory education, in upper secondary and tertiary education demographics have little influence in enrolments. At these levels, the number of students enrolled is influenced by other factors: education requirements, school drop-out rate, variety and popularity of existing post-secondary pathways and quality of higher education services in the country. The positive difference between the number of students enrolled at all levels in 2019 and 2009 is the highest" in well-developed European countries (France, Spain, Sweden) and the most negative in Poland, Romania and Portugal, revealing the evolution of needs for infrastructure investment in education in general. The difference between the number of students at all ISCED levels enrolled in 2019 and 2009 is negative for Romania: - 1 006 653 (European Commission, Directorate-General for Education,

Youth, Sport and Culture, 2022, p.31-32)

A European report focusing on the 2020-2021 school year during COVID-19 pandemic, part of a multi-country study coordinated by the Joint Research Centre of the European Commission shows that, in education, COVID pandemic made more visible some old and latent problems of the system and offered solutions for some others (…) New digital technology in education is a moving target (…) as digital education is not only about digital tools, but also about digital pedagogies" (Velicu, 2021, p.33)

In Romania, some efforts have been made to improve the quality of early childhood education and care and strengthen initial teacher education but there is still a need to increase the digital skills of teachers, trainers and students and better equip schools with digital equipment. A large percentage of young people have inadequate levels of basic skills. Ensuring quality and labour market-relevant education and training is still a key challenge. (Tamasan, 2020)

3. Research methodology

The paper presents an exploratory analysis between general and specific objectives of maritime studies programs of one maritime university from Romania, highlighting the need to update the classical educational curriculum with transversal skills relevant for the educational and business sector, as well as with specific competences required by the dynamism of the maritime industry.

Research data was collected within Capacity building Project "Challenges of Maritime Digital Leaders in the Algorithmic Age (DIGITAL LEADER)" research, grant by the International Association of Maritime Universities (IAMU) and the Nippon Foundation in Japan, between 2021-2022.

For identifying in-demand skills for maritime digital leadership, there was applied an online questionnaire to a target group of 25 international maritime companies to assess their in-demand skills further necessary for maritime digital leadership. After the questionnaire replies were received, data was processed and results were analyzed.

Further, for proposing operational training methods for maritime digital leadership training, necessary to increase high school students' attractiveness for maritime transport studies, a questionnaire tool was submitted online to maritime lecturers from one Romanian maritime university.

4. Findings

Maritime transport studies aim to expand the technical vocational training by conferring the managerial and technical-economic capability necessary to approach planning, organization, operation and evaluation of maritime transport systems in relation to the expectations of maritime companies.

In order to accomplish its mission, maritime educational institutions aim to provide the institutional framework and material means and infrastructure to enhance and develop the potential of skills, attract specialists in the field and establish an academic community to increase high school students attractiveness contribute to local, regional and international development through education, science and research.

Through the maritime transport studies, the subjects included in the curriculum ensure the multidisciplinarity and modularization of the study program which will allow the diversification of study options in the fields of transport engineering and management.

4.1. General objectives of maritime transport studies

The general objectives of the maritime transport studies are to ensure a complex, rigorous and interdisciplinary academic training, which combines theoretical and applied aspects, so that, through this training, professional, technical, scientific and managerial skills useful for graduates are formed.

Through the studies period, students develop and improve their professional skills and competencies related to the novelty elements of public management, the transfer of know-how from private agencies to public port services, implementation of the 3Es: Economics, Efficiency, Effectiveness in the organizations from the field of transport and will acquire skills necessary to be selected on the Romanian and international market and to have the opportunity to hold positions in the management of institutions and companies in the transport sector.

The maritime studies programs aim to continuously improve the educational process, promoting modern and solid forms of training, appropriate to the training requirements of transport engineers, being focused on student's ability to apply the assimilated knowledge. At the same time, the improvement of student evaluation methods was considered, emphasizing the role of individual study.

The development of study programs is an approach meant to ensure the completion of some general objectives envisioned at the faculty level:

Table no. 1 General objectives for MSc maritime program

No.	Strategic dimension	General objectives
1	Educational opportunities	Providing well-trained theoretically and practically specialists, at the level of current and future requirements for the transport market.
2	Academia- industry partnerships	Creating the necessary framework for the integration of education specific to the field of transport in the Romanian and international economic environment.
3	Academic partnerships	Continuation and extension of strategic partnerships with foreign faculties, as well as openness to joint study programs with other universities.
4	Scientific opportunities	Inclusion of the faculties among the best faculties in the country in terms of academic offer and scientific research.

Source: Maritime university educational plan for maritime MSc studies

4.2. Specific objectives of maritime transport studies

The specific objectives of maritime education programs are to achieve an optimal educational process, based on the complementarity of logical thinking with analytical and applied elements, the transfer of basic knowledge and specialized training to advanced, synthesis and advanced knowledge, respectively formation of technological and practical skills, using connections of technical-scientific, economic and managerial information specific to the field of engineering and management.

At the end of the study period, the graduates are expected to have much more educational, informational and formative experience, confidence in their own strengths and in the future. Through competencies, the acquired qualification gives them, immediately after graduation, special opportunities and professional satisfactions.

Specific objectives for maritime studies, professional skills and transversal skills expected by the maritime industry and their equivalent in maritime studies are enlisted in Tables 2-4 below.

Table no. 2 Specific objectives for maritime studies program

No.	Strategic dimension	Specific objectives
1	Educational opportunities	Acquiring advanced theoretical knowledge in the field of business administration in the field of transport
		Theoretical education of students at the level of current and future requirements for the international transport market
2	Academia- industry partnerships	Developing the managerial and professional skills necessary for the modern business environment
		Practical training of students for easy integration of graduates on the maritime transport labor market
		Acquiring the competencies of a specialist who can evolve in the field of maritime transport, in the field of both engineering and economic field.

	Studying the disciplines which provide the necessary information in the form of models or knowledge about the structure and operation of business processes in the field of transport in order to achieve the desired performance and adequate risk management within organizations.
	Training of specialists with superior technical training in economic profile, able to carry out their activity in the engineering field which is suitable for the use of digitization and business models, tools for measuring performance in transport, advanced techniques needed to solve complex challenges in the field of transport or specialized institutions in which the planning and management of infrastructure issues or the establishment of risk minimization strategies are essential etc.
	Acquiring advanced knowledge in areas such as the creation and development of entrepreneurial organizations, sustainable development, social responsibility, corporate governance and business ethics.

Source: data collected from maritime universities

Table no. 3 Professional skills included in maritime transport programs

No.	Type of skill	Professional skill
1	Theoretical based	C1. Creative application of knowledge and methods specific to the field of economic engineering
		C2. Operating with advanced concepts and techniques in computer science and information technology
2	Practical based	C3. Elaboration and interpretation of technical, economic and managerial documentation
		C4. Management of transport companies and supply chain subsystems
		C5. Financial and economic substantiation of transport supply development solutions (infrastructure, vehicles, technologies)
		C6. Ensuring the quality of transport services

Source: data collected from maritime universities

Table no. 4 Transversal skills expected by the maritime industry and their equivalent in maritime studies

No.	Transversal skill expected by industry	Transversal skill trained by the academia
1	Social soft skills: - Objective communication - active listening - teamwork - team management - writing skills	Efficient use of information sources and communication resources and continuous professional training for fulfilling the personal career development plan
2	Problem-solving skills: - team management - project management - resource management	Identification of requirements, resources, processes, deadlines and risks related to a complex professional task and elaboration of the execution plan
3	Emotional intelligence: - recognize, understand and positively use your emotions. - recognize emotional distress in others and help them overcome it	Distribution of roles and responsibilities in a team, ensuring coordination and control of team activity to achieve the intended objectives
4	Life-Long Learning Attitude: - learn new skills - gain new expertise to do your job well - learn constantly about new technologies, trends, and hard skills.	
5	Work ethics in shipping: - Integrity - Responsibility - Dependability	

Source: data collected from maritime universities; Sunarjo (2022)

5. Meeting Maritime Industry 4.0 expectations in the updated maritime studies educational plans

During COVID-19 crisis the Romanian educational system remote schooling prevailed, mostly as synchronous online classes, challenged by the inequal access to digital devices and internet connection, lack of educational digital pedagogical skills and lack of inclusiveness (Velicu, 2021).

The COVID-19 pandemic had substantial negative impacts and caused several disruptions to the global supply chain of the shipping industry. Key challenges identified during COVID-19 pandemic in terms of maritime manpower are the expiration issues for Certificates of Competency (CoC) or failure for revalidations due to pandemic constraints, which directly hinder employment retention and leads to lost opportunities at sea. Also, there is manifested the solid increasing need for distance learning capabilities and seafarers' digitalization essential for speeding up the online processes in shipping.

The fourth industrial revolution is expected to bring significant impact for the development of maritime transport, intermodal transport and supply chain.

Technology trends as Artificial Intelligence, Big Data Analytics, interconnectivity, smart port terminals and autonomous ships require the creation of new jobs in the maritime sector or a new approach for the existing jobs. Classic jobs need to adapt to the use of new technologies and in such context the maritime educational system already includes in the curriculum relevant content for the new expectations of the industry stakeholders.

Beside technical knowledge on classic seafaring topics (e.g. e-learning videos on Fire Prevention and Firefighting, Personal Survival Techniques, Elementary First Aid etc.) and particular knowledge relevant to the domain (e.g. Mental Health Training Curriculum; Maritime English Communication Package) a diversified content relevant for Industry 4.0 jobs in the maritime sector needs to be included in maritime studies educational plans.

The content of the courses should include relevant input regarding leadership and management skills necessary for the organizational functionality and professional development of the trainee.

Teaching content needed for Industry 4.0 jobs in the maritime sector should smoothly integrate technical skills with transversal skills and should include relevant input regarding leadership and management skills necessary for the trainees' organizational functionality and professional development, as enlisted in Table 5.

Table no. 5 Managerial and leadership skills needed for shifting between off-shore and on-shore jobs

No.	Managerial skills	Leadership skills
1	Technical-based skills and competencies to ensure the safety of personnel and cargo on board.	Comprehension of new cultures
2	precise judgment and decision making	human resources management
3	change management	active listening
4	operation and control	communication skills
5	operation monitoring	instructing and teaching
6	coordination	social perceptiveness
7	knowledge management	oral expression
8	owners' structure comprehension	oral comprehension
9	client management	far vision
10	critical thinking	problem sensitivity
11	maritime business development	depth perception
12	economic understanding	stress tolerance
13	project management	attention to detail
14	digital systems for administrative tasks	self-control and composure
15	quality assurance and supervision of machinery and maintenance systems	initiative
16	skills for maritime e-business development	independence
17	time management	persistence/ being adaptable

Source: data collected from maritime universities

Teaching content should develop critical thinking and problem-based learning and should provide educational resources for captain and high-ranked officers needed to optimize the fleet, decentralize decisions and reduce ship administration on-shore

Critical thinking determines seafarers ask questions, analyze, interpret, evaluate and judge what they perceive (see, hear, say, or write). Teaching content should include input related to sustainability and resilient, dynamic market challenges.

Maritime transport studies should contribute to raising sustainability awareness, innovation, operational efficiency, company resilience, stakeholders overview, risk management, establishing short, medium, and long-term goals, targets and key performance indicators, organizational culture in shipping, identification of clear roles for critical decisions, appropriate leadership and decision style.

Maritime officers need the knowledge and skills necessary for the operation and competent use of the computer systems with which modern ships are equipped, and of the various equipment and machinery that are controlled by computers.

Modern ships contain many different equipment and machines that operate non-stop. Systems such as the engine, fuel supply, electricity, climate control, among others, require constant monitoring. Changes in temperature, fuel and oil flows and other parameters must be observed, recorded and analyzed. By using computers, the task of keeping track and analysis is much easier, which in turn improves overall performance of the ship and voyage.

At the same time, the use of modern information technologies and their application on board ships make life on board easier to manage. Thus, ships and their crews depend on different types of supplies. These include food, water, fuel, oil, spare parts and more. By using computerized inventory management systems, records of supply use is analyzed and data can be used to make use and supply more efficient. Routine maintenance is facilitated by systems that monitor the daily use of the machines and record maintenance dates and times. Such systems help to remind the maintenance crew which systems need preventive maintenance and which ones need to be replaced.

Navigation systems for modern ships use GPS, radar, sonar and computer maps along with radio and satellite communications systems. These systems help navigation officers find their way and follow their routes even in the dark, bad weather or low visibility.

Cargo operations require the timely processing of cargo movements to and from ships. Systems that monitor the weight and balance of bulk and liquid cargo are vital not only for fast and efficient transfers, but also for the safety of transport and port crew.

Blockchain technology improves the transmission of cargo documents. A single container shipment can generate up to 200 communications, and the administrative cost of processing the accompanying documentation is estimated to be 15-20% of the overall cost of transporting the goods. (WCO, 2022, p.69) It is therefore essential to use easier, more efficient ways of transferring data and documents, verifying and archiving documentation. Allowing economic operators to submit scanned or computer-generated documents certainly makes the whole process easier and swifter, but it does not make it possible to determine ownership of a file where required. There is also no means of generating a reliable audit log, used to record a history of changes made to a document, or establishing a paper trail directly to the original source. One method of resolving these problems would be to establish a centralized authority responsible for processing these documents, determining ownership, compiling audit logs and facilitating the exchange of files. Blockchain technology helps digitize the shipping industry, where ownership, traceability and security are paramount.

ICT skills are increasingly important in port and related maritime industries, as technological advancements involve the digitization of information exchange and the automation of port activity (through connectivity to a local network and the Internet, radio and satellite communications systems), computerized inventory management systems, systems that monitor the daily use of equipment and record maintenance dates and times, automatic door opening systems, development of container terminals etc.

Information technology education and training for seafarers should be supported by the e-learning platform, built to enable participants to improve their knowledge and gradually assess their level of achievement. The main purpose of the training is to acquire skills for using the computer as an universal means of data processing, for the use of office programs dedicated for shipping activities, for word processing, spreadsheets, graphics processing, communications, the use of computer

networks and the Internet etc.

6. Conclusions

Anticipating the structurally change of careers from sea to shore-based employment, in order to increase the attractiveness for studies, maritime educational institutions expand the focus of teaching technical competences and knowledge necessary for on board jobs only, to those competences needed for multitasking and on-shore jobs. Inclusion of online teaching content needed for Industry 4.0 jobs in the maritime sector should focus on integrating technical skills smoothly with transversal skills. Maritime universities learning curriculums should be focused on developing practical competencies as critical thinking and problem-based learning. Teaching content should include input related to sustainability and resilient, dynamic market challenges.

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