

THE EVALUATION OF PROFESSIONAL PRACTICE IN MARITIME EDUCATION: A CASE STUDY AT FACULTY OF MARITIME STUDIES IN THE REPUBLIC OF CROATIA

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Abstract: Professional practice in higher education has a threefold function: it enables students to gain practical knowledge and skills needed to enter the job market, it provides employers with access to human resources, and universities offer better study programs. Professional practice at the Faculty of Maritime Studies in Rijeka (Croatia) is conducted as part of five undergraduate and five graduate study programs and is organized through activities that enable the acquisition of practical knowledge, such as laboratory exercises, simulators, polygons, practicums, practice grounds, study visits, training ship and in maritime shipping companies. The paper presents the results of research conducted within the Pandora project, funded by the European Social Fund, Operational Programme Efficient Human Resources 2014-2020. The Pandora project aimed to explore existing forms of professional practice at the Faculty of Maritime Studies Rijeka-Croatia, evaluate and make recommendations for improving existing forms of professional practice. Interview and survey methods were used for data collection. The research was conducted on 100 respondents, of which 50 respondents were students, 17 respondents were professors, and 33 respondents were maritime companies. Constructive recommendations are provided to contribute to the higher quality of different forms of professional practice. The results show that the organization of professional practice has no logistical-administrative support and is often individualized, mechanisms for the evaluation of professional practice are not established, an insufficient connection of the tripartite student-teacher-employer relationship leads to an underdeveloped mentoring system, and there is a lack of bachelor's and master's theses written in collaboration with the maritime shipping industry.

Keywords: higher education, professional practice, maritime education, experiential learning

1. INTRODUCTION

The promotion, development and continuous improvement of professional practice and practical teaching as an integral part of study programs, i.e. the acquisition of knowledge and skills through work-based learning, is an ongoing process by which the Faculty of Maritime Studies in Rijeka (FMSRI) seeks to expand the students' knowledge acquired in classical forms of teaching and at the same time to test the acquired knowledge in the work environment. Professional practice (PP) at the Faculty of Maritime Studies in Rijeka is carried out in 5 undergraduate (UG) and 5 graduate (GR) study programs within the courses and independently as stand-alone courses.

Forms of professional practice carried out at the FMSRI include both technical skills like laboratory exercises, work on various simulators, work on various computer programs but also more general educational activities such as field trips and guest lectures. Of the above forms of teaching at the FMSRI, special emphasis is placed on work on various simulators aimed at acquiring knowledge and skills about business processes on board and in port.

First and foremost, the focus of PP must be on the acquisition of practical knowledge, typically defined as a repertoire of examples, metaphors, images, practical principles, situations, and rules of thumb used in PP [1]. The aim of professional practice is to gain extensive experience working on real problems in a professional environment to improve various skills, knowledge and abilities of students [2].

The importance and role of simulators in maritime education has been proven by numerous scientific studies. The University of Minuto de Dios, Bogotá, the Technical Faculty of Munich and the University of Southeast Norway concluded that the use of simulators in maritime education and training is an essential component for the development of seafarers' competencies, noting that simulators and virtual reality facilitate the acquisition of practical skills [3]–[6]. From the Department of Science Education at the University of Genoa concluded that the practicum gradually influences students' reflective practice, which promotes the acquisition of new knowledge [4]. Findings from Edith Cowan University and the American University for International Service show that appropriately informed, qualified, interesting and engaging guest lecturers play an important role in active learning through practical examples to enhance students' competencies [7], [8]. At Bryansk State Technical Faculty and University of the Aegean it is claimed that the constant improvement of the quality of professional practice and study programs has a positive impact on the professional development of students [9], [10]. The University of Plymouth at United Kingdom is one of several educational institutions that train maritime professionals. Students on the courses use ship simulators and sail on training vessels [11]. For practical training, London John Moores University offers unique laboratories, training equipment, various simulators and a comprehensive ship simulation model that emphasizes the importance of professional practice [12].

To conclude, various forms of professional practice are carried out not only at FMSRI, but also at numerous other universities. Which forms of professional practice are carried out at a particular faculty is determined by the faculty itself, depending on the competencies they want their students to have upon graduation. For example, a student of FMSRI will find professional practice on a navigation simulator useful, while a medical student will find it completely useless for their future field of work. Due to the dynamic nature of the maritime industry, the developments achieved through problem-based learning practices in maritime

education will not only help to improve the outcomes of the industry's education systems, but will also make a significant contribution to professional practice in general [13].

Forms of PP conducted outside the Faculty include training grounds, navigation on a school ship, visits to maritime companies, ports and terminals, and professional practice in maritime companies. All these forms of PP enable students to acquire and develop practical knowledge and skills. Professional practice at the FMSRI is an important part of the curriculum which, according to previous research, encourages students' creativity and facilitates the acquisition of theoretical and practical knowledge [14]–[16]. The knowledge and skills acquired in the course of study should be acceptably and effectively integrated into the business environment and ensure that future graduates are integrated into the business and work processes as painlessly and quickly as possible when they are employed [17], [18]. Such a system should allow the acquisition of new and practical knowledge specific to the work process itself, but also the acquisition of some general skills and social competences such as: adaptability, communication, teamwork, decision making, etc.

2. METHODOLOGY

Due to the awareness of the importance of the implementation of the PP in maritime education, the FMSRI, within the Pandora project, conducted an extensive research on the representation and implementation of the PP, the main results of which are presented in this paper. The paper presents a detailed analysis of the representation of professional practice in FMSRI study programs. Current study programs, previously reaccredited and accredited by the University of Rijeka, were used to prepare an analysis of the representation of PP. Data on study programs were obtained from Students' Record Office and on their basis a statistical analysis of the representation of professional practice at the FMSRI was carried out. Statistical processing of data regarding the presence of PP was performed for 5 bachelor's and 5 master's degree programs.

In addition, the results obtained based on workshops with students and teachers are presented. A total of three workshops were conducted with a total of 50 students and 17 teachers. Focus group interviews - teachers and students - were conducted at the workshops. The aim of the interviews was to gather opinions and attitudes towards satisfaction with the implementation of PP. The forms of PP that the students evaluated were navigation practice, work on a simulator, work on a training ground/ practicum, field trips, professional practice in maritime companies and guest lectures. The survey took an average of 10 minutes per participant. The answers were recorded in writing.

A survey method was used to collect the opinions of maritime companies on ways to improve professional practice. The questionnaire contained 27 questions, 11 of which required a short answer from the respondents, 12 multiple choice questions and 4 questions rated on a scale of 1 to 5. The questionnaire was

completed by 33 companies. Based on the processed data from the questionnaire, a SWOT analysis was developed that identifies strengths and opportunities for improvement PP as well as weaknesses and threats that make it difficult for the FMSRI to achieve the desired goals.

The detailed abbreviations and definitions used in the paper are listed in Table 1.

Table 1 List of abbreviation and acronyms used in the paper

ABBREVIATION	DEFINITION
FMSRI	Faculty of Maritime Studies in Rijeka
PP	professional practice
UG	undergraduate
GR	graduate
NSMT	Nautical Studies and Marine Transport Technology
MEMT	Marine Engineering and Maritime Transport Technology
MEIT	Marine Electronic Engineering and Information Technology
STCW 1978	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers
TOT	Technology and Organization of Transport
LMIT	Logistics and Management in Maritime Industry and Transport
ECTS	European Credit Transfer and Accumulation System

3. REPRESENTATION OF PROFESSIONAL PRACTICE BY STUDY PROGRAMS AND LEVELS OF STUDIES

Professional practice in the FMSRI is part of 5 undergraduate and 5 graduate level of study. The degree programs Nautical Studies and Marine Transport Technology (NSMT), Marine Engineering and Maritime Transport Technology (MEMT), and Marine Electronic Engineering and Information Technology (MEIT) train students to work aboard ships as deck officers, engine officers, and electrical engineering officers. These fields of study are harmonized and compatible with the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW 1978). The FMSRI also includes fields of study that educate students for land-based professions through the programs Technology and Organization of Transport (TOT) and Logistics and Management in Maritime Industry and Transport (LMIT). A detailed analysis of the representation of professional practice in the study programs of FMSRI is presented below.

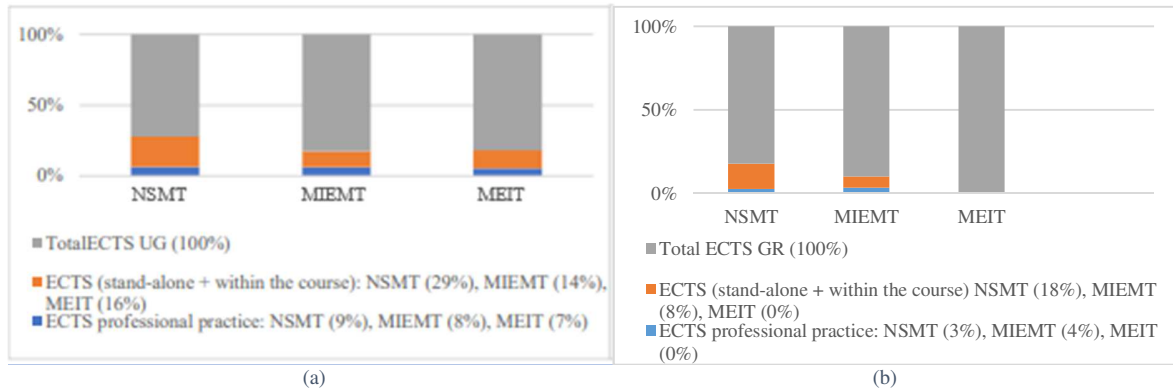


Chart 1 Representation of PP within NSMT, MEMT, and MEIT programs at (a) undergraduate level; (b) graduate level.

Chart 1a shows that the percentage of European Credit Transfer and Accumulation System (ECTS) of all courses that conduct PP (stand-alone and within courses) at the undergraduate level of study, by study program, is as follows: NSMT (29%), MEMT (14%), and MEIT (15%). Looking at the proportion of ECTS related solely to PP in relation to the total number of ECTS at undergraduate level, the proportion of PP is as follows: NSMT (9%), MEMT (8%) and MEIT (7%). From the presented chart 1b, the percentage of ECTS of all programs that carry out PP (stand-alone and within courses) is for: NSMT (18%), MEMT (8%) and MEIT (0%). Looking at the percentage of ECTS related solely to PP relative to the total number of ECTS at the graduate level of study, the percentage of PP by program of study is: NSMT (3%), MEMT (4%), and MEIT (0%).

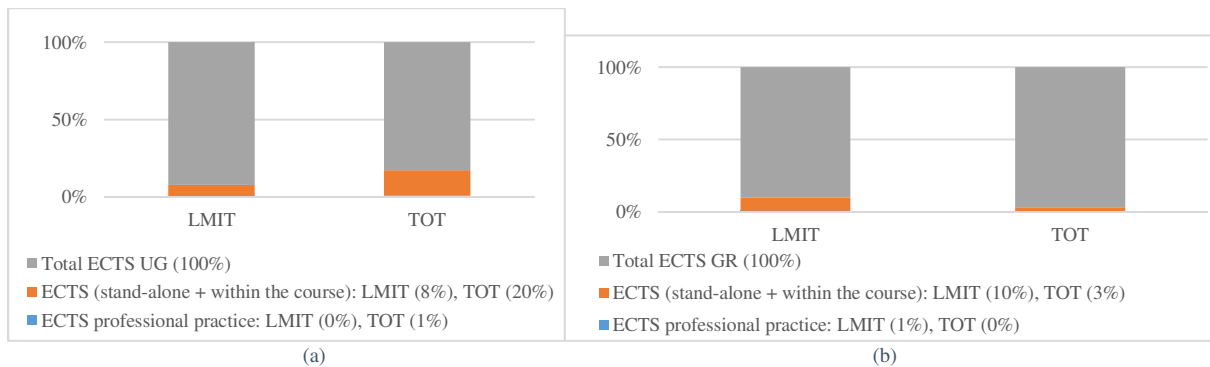


Chart 2 Representation of PP within the LMIT and TOT programs at (a) undergraduate level; (b) graduate level

Chart 2a shows that the percentage of ECTS of all programs that conduct PP (stand-alone and within the course) is for undergraduate programs: LMIT (8%) and TOT (20%). On the other hand, if we consider the proportion of ECTS related solely to PP in relation to the total number of ECTS at undergraduate level of the program, the proportion of PP is: LMIT (0%) and TOT (1%). Chart 2b shows that the percentage of ECTS of all courses that include PP (stand-alone and within course) at the graduate level of study program is: LMIT (10%) and TOT (3%). Looking at the percentage of ECTS related solely to PP relative to the total number of ECTS at the graduate level of the program, the percentage of PP is: LMIT (1%) and TOT (0%).

The results of the detailed analysis indicate the following: insufficient representation of professional practice at the FMSRI, especially in the areas that educate students for land-based professions, and insufficient evaluation of professional practice carried out within the courses.

4. GUIDELINES FOR IMPROVING PROFESSIONAL PRACTICE

The aim of the interviews at the workshop with students and the questionnaire sent to maritime companies was to conduct a detailed analysis of all forms of PP in different study programs at the FMSRI and later to develop guidelines for their improvement at the workshop with professors. The questionnaire sent was used to gather employers' opinion about the current way of conducting the professional practice, possible ways of improvement and their opinion about the students coming to their company to complete the professional practice and the competencies required for the PP. The main research findings are presented below.

4.1. GUIDELINES OBTAINED BY THE METHOD OF INTERVIEW IN WORKSHOPS WITH STUDENTS AND TEACHERS

The students' opinions are summarized below and presented in Table 2.

Table 2 Summarized students' opinions after the workshop.

TYPE OF PP/ STUDY PROGRAM	Navigation practice	Work on the simulator	Work on the training ground / practicum	Field trips	Professional practice in maritime companies	Guest lectures
LMIT, TOT	POSITIVE: x	POSITIVE: x	POSITIVE: x	POSITIVE: - visits to various ports and terminals - useful and interesting - increased student-professor communication	POSITIVE: x	POSITIVE: -new and useful information -easier acquisition of practical knowledge -interesting lectures and examples of
	NEGATIVE: - missing	NEGATIVE: - only in the 2nd year of graduate study	NEGATIVE: - missing	NEGATIVE: - insufficient frequency - unprofessional guidance	NEGATIVE: - missing - insufficient readiness for the job market.	NEGATIVE: x
NSMT, MEMT, MEIT	POSITIVE: -acquired practical knowledge - teamwork -insight into ship systems	POSITIVE: - increased skills - facilitated acquisition of theoretical material - availability	POSITIVE: - useful - instructive and interesting - new knowledge and skills gained	POSITIVE: - interesting, useful and instructive - facilitates the acquisition of practical knowledge - well organized	POSITIVE: x	POSITIVE: - facilitates the acquisition of new knowledge - received numerous tips - interesting and instructive
	NEGATIVE: - short duration - insufficient preparation in class	NEGATIVE: -short duration -insufficient number of simulators	NEGATIVE: - short duration	NEGATIVE: - short duration - only theoretical part -lack of practical part	NEGATIVE: - lack of competences which would be remedied with PP	NEGATIVE: - short duration - only theoretical part

							- lack of practical part
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Guidelines for improving certain modalities of professional practice were obtained based on students' opinions and then analyzed and synthesized in the workshop with professors according to the form of professional practice.

Guidelines for improving Navigation practice:

- it is necessary to increase the duration, i.e., the days of stay on the school ship
- it is necessary to improve the laboratory exercises at the faculty to better prepare the students for navigation practice
- it is necessary to offer more practical work at Faculty
- in study programs that do not go on a navigation practice it is necessary to organize field trips to the shipyard and / or to the ship

Guidelines for improving the work of the simulator:

- it is necessary to increase the duration
- it is necessary to increase the number of courses with simulator work
- it is necessary to provide more different simulators
- it is necessary to reduce the number of students per group to increase the quality of teaching.

Guidelines for improving work on the training ground/practicum:

- it is necessary to increase the duration, i.e., the days of the students' stay
- there is a need to include this form of PP in the LIMT and TOT study programmes

Guidelines for improving field trips:

- it is necessary to organize more frequent field trips
- it is necessary to organize the field trips better and to include more practical work
- they should be led in the future by port or terminal staff and not by professors

Guidelines for improving professional practice in maritime companies:

- it is necessary to organize PP to increase students' skills and readiness to enter the labor market and perform work tasks

Guidelines for improving guest lectures:

- it is necessary to organize a larger number of guest lectures
- it is necessary to organize guest lectures based on practical knowledge

4.2. GUIDELINES OBTAINED ON THE BASIS OF A SURVEY QUESTIONNAIRE SENT TO MARITIME COMPANIES

The Faculty of FMSRI conducted a survey as part of the project PANDORA. Based on the completed questionnaires, the opinions of the employers who participated in the survey were presented and then analyzed. The most interesting results are presented below.

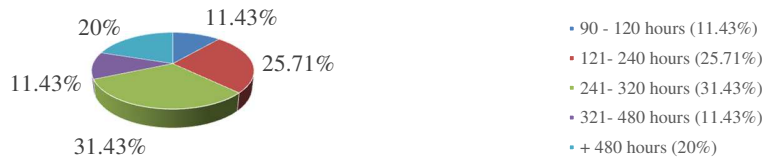


Chart 3 Optimal duration of professional practice

Chart 3 shows the opinions of the surveyed companies regarding the optimal duration of PP to familiarize students with the company's business processes. For 11.43% of the respondents, the optimal time is between 90 and 120 hours. The percentage of companies who think it is sufficient between 121-240 hours is 25.71%. 241-320 hours is the choice of the largest number of companies, 31.43%. The percentage of companies that think it takes between 321-480 hours of practice is 11.43%, and 20% think it takes more than 480 hours to familiarize a student with the company's business processes. Moreover, 97.14% of employers think that the course of PP should be compulsory during the study, while 2.86% disagree.

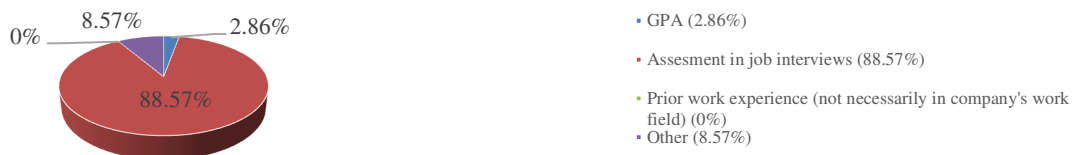


Chart 4 Criteria for selecting students for professional practice

Chart 4 shows the opinion of the companies surveyed on the criteria for selecting students who would undertake a PP in their company. Firstly, 88.57% are of the opinion that the selection of students should be based on the assessment of the students in the interviews. The average grade as a criterion is mentioned by 2.86% of the companies and 8.57% are of the opinion that selection should be done based on certain other criteria which are not known. None of the respondent companies mentioned work experience as a criterion. Considering that even 88.57% of employers think that assessment in interviews is the most important criterion for selecting students, it is not surprising that 85.71% of them want to be involved in selecting students for internships.

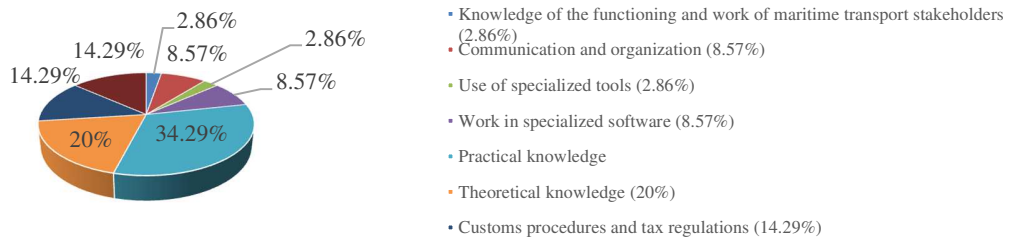


Chart 5 Knowledge that needs to be supplemented within study programs

It is evident from Chart 5 that the largest percentage, 34.29% of the respondents are of the opinion that practical knowledge should be supplemented. This is followed by theoretical knowledge which 20% of the companies feel needs to be supplemented. Knowledge of customs procedures and tax regulations should also be supplemented according to 14.29% of the respondents. The same percentage of companies did not respond or could not determine a specific area of knowledge that should be supplemented. Furthermore, 8.57% of the companies consider that it is the knowledge area of communication and organization, and the same percentage of the companies consider that working with specialized software is a knowledge area that should be supplemented. The use of special tools is a knowledge area that 2.86% of the companies consider to be complemented and the remaining 2.86% believe that it is knowledge about the functioning and work of maritime transport stakeholders.

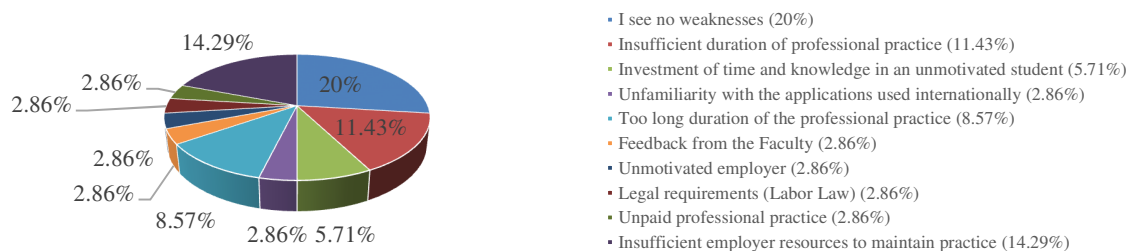


Chart 6 Disadvantages of conducting professional practice

Chart 6 expresses the opinion of employers on the main shortcomings in the implementation of the SP. The largest number of respondents, 20%, see no weaknesses in the implementation of PP. The main drawback for 14.29% of employers is the lack of resources to maintain the professional practice. Insufficient duration of the PP is the main disadvantage for 11.43% of the companies and 8.57% of the companies consider the duration of the PP to be too long. For 5.71% of the companies, the main disadvantage is the investment of time and knowledge in unmotivated students. Unfamiliarity with internationally used applications is a disadvantage for 2.86% of companies, while 2.86% of companies believe it is faculty feedback, i.e., lack of it. Unmotivated employers are the main drawback for 2.86% of the companies, legal requirements for 2.86% of the companies as same as unpaid professional practice.

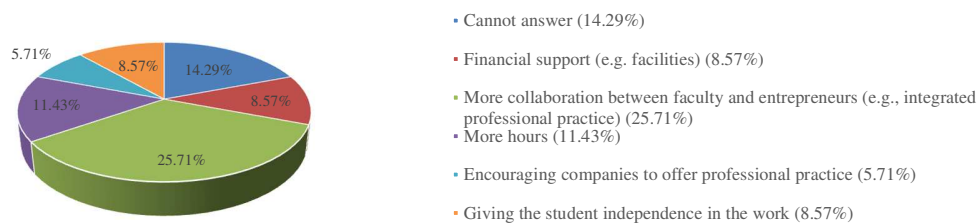


Chart 7 Ways to improve professional practice according to the opinions of employers

Chart 7 shows the opinions of employers about ways to improve PP. 25.71% of them believe that one of the possible ways to improve PP is greater collaboration between faculties and entrepreneurs. A larger fund of hours of PP is the opinion of 11.43% of the companies. Giving students independence in work is a way to improve it according to 8.57% of companies. Encouraging companies to provide internships for students is the opinion of 5.71% of the companies, while 14.29% of the companies could not give an answer to this question.

5. SWOT ANALYSIS

Based on the obtained data, the FMSRI can use the SWOT analysis as a starting point within their own strategic thinking on improving professional practice. The analysis of the obtained research results as the main strengths and weaknesses (internal factors) and opportunities and threats (external factors) are presented in Table 3.

Table 3 SWOT analysis of professional practice at the Faculty of Maritime Studies in Rijeka

STRENGTHS	WEAKNESSES
<ul style="list-style-type: none"> - Diversity of forms of professional practice undertaken within study programs - Recognizability and uniqueness of most study programs - Qualified teaching staff - Many experts from industry are involved in teaching - International mobility of staff and students - Many different simulators for acquiring practical skills in the study programs: NSMT, MEMT, MEIT - Use of e-learning systems - Continuous investment in equipment - Close cooperation with the business community - Continuous training of professors for the use of special tools - Sources of funding from EU funds - Continuous investment in equipment - Training grounds outside the faculty - Use of the ship "Kraljica mora" for professional practice 	<ul style="list-style-type: none"> - The organization of PP has no logistical and administrative support - Inadequately developed models of student practice in all study programs - Mechanisms for evaluating PP are not established - Insufficient interest of employers in the implementation of PP - Underdeveloped mentoring system - Lack of master's and bachelor's theses prepared in collaboration with companies - Financial constraints in obtaining equivalent complementary systems to acquire practical knowledge and skills - Lack of systematic linkage in the employer-teacher-student triangle - Inadequate number of teachers involved in the implementation of PP - Inadequate attendance and activity of students in class
OPPORTUNITIES	THREATS
<ul style="list-style-type: none"> - Willingness of employers to collaborate with the Faculty of Maritime Studies in implementing professional practice - Willingness of employers to cooperate in establishing criteria for selection of candidates - Availability of EU funding - Development of modern technology to support the teaching process - Demand of the labor market for employees with specific professional skills 	<ul style="list-style-type: none"> - Shortage of employees on the labor market - Unstable epidemiological situation - Growth and intensification of competition in the field of higher education - Rapid obsolescence of technology - Dominant share of micro and small entrepreneurship, because of international segmentation of the maritime market

<ul style="list-style-type: none"> - Cooperation with alumni of the Faculty - The desire of employers to hire the best students - The possibility of increasing the number of hours of the PP - Most employers do not have students at the PP 	<ul style="list-style-type: none"> - Limitation of space for mass placement of students into professional practice in maritime companies - Lack of time for employers to devote to students
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6. CONCLUSION AND DISCUSSION

Based on the research and analysis carried out in the project PANDORA, the existing forms of implementation of professional practice at the Faculty of Maritime Studies were identified, the representation of professional practice in the curricula by all study programs and study levels carried out at the Faculty of Maritime Studies was analyzed, the students' satisfaction with the current forms of PP according to the currently available data, the documentation of PP was analyzed and the shortcomings and limitations in the implementation of professional practice were identified. During the workshop with the students, the students' opinions were collected and then analyzed in a workshop with the professors. After the workshops, the guidelines for improving PP were developed, which will serve as steps to improve professional practice. Based on the opinions of employers collected through the questionnaire, it was found that most companies do not have students in professional practice. Those who have internships say that they want to give students the opportunity to gain professional experience, while most companies that do not have interns agree that they cannot involve students in their daily work.

Most of the companies surveyed believe that internships should be mandatory for students during their studies. Various criteria related to professional practice were also mentioned by employers. In addition, employers have emphasized that they would prioritize interview skills over grades when hiring applicants. Study programs should hold more frequent workshops, such as "How to shine in a job interview?" or "Psychological factors in job interviews" to improve the interview skills of students entering the job market. Also, respondents expressed their opinion on the necessary knowledge and skills that they consider important for the quality of PP and the knowledge and skills that the faculty should complement. They expressed their opinions on the shortcomings in the implementation of professional practice, which provided direct insight into the areas of knowledge and skills that should be part of new programs and/or the improvement of existing programs. In addition, the companies expressed interest in possibly collaborating with FMSRI on specific activities and expressed personal opinions about what professional practice should look like.

The results show that the organization of professional practice lacks logistical-administrative support and is often individualized, that mechanisms for evaluating PP are not established, making it difficult to implement PP, that the inadequate linkage of the tripartite student-teacher-employer relationship leads to an underdeveloped mentoring system, and thus a lack of bachelor's and master's theses written in collaboration with the maritime industry.

Based on the data obtained directly from companies that carry out and / or would carry out professional practice and those obtained during the workshops, a starting point for further training and design of professional practice at the FMSRI was obtained, which can greatly influence the quality of professional practice, but also the satisfaction of all participants in the process of carrying out professional practice.

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