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Description and concept of the specific dual models of HEIs Draft

Contacts: Špiro Ivošević, PhD, phone: +382 67 628 985
Milena Dževerdanović Pejović, PhD, phone: +382 69 381 530
Senka Šekularac Ivošević, PhD, phone: +382 67 816 841

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Abstract

This document describes the concepts of specific dual model developed at the Faculty of Maritime Studies Kotor, University of Montenegro. It represents a basis for presentation of specific dual models to companies and preparing documents necessary for piloting dual program at the Faculty of Maritime Studies Kotor.

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1. Motivation for the implementation of a specific model of dual education in the academic study program Marine engineering - module Inspection of marine engineering systems

Montenegro is the first country out of EU that adopted a Strategy of smart specialization in June 2019. The programme of access of Montenegro to the EU 2019-2020, in negotiating chapter 25: Science and research, in a part of strategic framework, anticipated adopting a Strategy on smart specialization 2019-2024, by means of which Montenegro adapted its strategic framework for research and innovations with the EU strategic framework.

By drafting of the Strategy of smart specialization, Montenegro joined the initiative of the European Union emphasizing a new model of economic development on national or regional level based on the aimed support of research, scientific and innovative activities. The Strategy of smart specialization (S3) has determined development priorities, aiming to build competitive advantage by connecting own resources in research and innovations with the needs of economy, thus responding in a coherent way to rising possibilities and development of the market.

The main goal of S3 are modernization and the rise of competitiveness of the Montenegrin economy, by concentrating available research, natural and economic resources on the limited number of priority fields. S3 has to ensure further accelerated development of subject priority fields and also the development of new subfields within them, as well as new industries with strategic potential based on synergetic interaction of the preferred fields. In the course of their defining, for the first time the consultations gathered all relevant actors in society: enterprises, academic community, state institutions, citizens. After detailed analyses, discussions, negotiations and compliances, narrow fields and technological domains to which our country should orient its resources were defined, and with the aim to create new values for our economy- new development projects, application of scientific research, innovations and focused investments from the economy. Priority fields defined by S3 specialization are: sustainable agriculture, green energy, sustainable green tourism and information technologies (ICT).

The mismatch between the education system and the labour market is a serious threat to economic growth and development of Montenegro. This disorder, which manifests itself as a mismatch between labour supply and demand for labour, ultimately leads to a decline in the usefulness of labour and inadequate use of the most important factor of production.

The research on this issue conducted in Montenegro in 2016 revealed that there are several aspects of mismatching between education systems and labour market needs.

Table 1: Forms of mismatch between supply and demand in the labour market

Vertical mismatch	The level of education or skills is lower or higher than the job requirements.
Horizontal mismatch	The level of education or skills is appropriate, but not the area of education.
Overqualification	The person has a higher level of qualifications than the job requires.
Underqualification	The person has a lower level of qualifications than the job requires.
Overskilling	A situation where a person is unable to make full use of their skills and abilities in the current workplace.
Underskilling	Situation in which a person lacks the necessary skills ability to perform current work according to applicable standards.
Credentialism	A situation in which the level of education required to get a job exceeds the level of education necessary to do the job adequately. This situation refers to the employer's belief that the certificate or diploma implies higher productivity

	of the individual.
Economic skills obsolescence	A situation in which previously used job skills are no longer necessary, outdated or lost in importance.

Source: MEA, 2016.

Table 1 points out that in Montenegro there is a recorded presence of various forms of mismatch between supply and demand in the labour market, which is predominantly a consequence of the mismatch between the education sector and the industry sector. Namely, the dominant type of non-compliance refers to the situation when a person has a lower/higher level of education than labour market requirements, as well as the case when there is a match in the level but not in the type of qualifications for a particular job. In addition to the above, mismatches in the labour market are manifested through the process of obsolescence of knowledge and skills of an individual necessary to maintain its competitiveness in the labour market during the time, which highlights the need to implement lifelong learning. Also, one of the problems pointed out by the mentioned research is that, viewed from the perspective of the employer, there is no adequate knowledge behind the diploma of the graduate student, which emphasizes the employer's assumption that a certificate of graduation should a priori guarantee higher productivity of graduated students.

Although significant efforts have been made in the past few years to harmonize the education system with the needs of the labour market, the situation has not reached satisfactory level yet. This is also confirmed by the report of the European Commission, which gave a recommendation related to development of the Economic Reform Program for 2021. The recommendation involved making additional efforts to improve the quality of higher education and developing skills that are aligned with labour market needs.

Better defined learning outcomes and their compliance with new challenges in the labour market, insufficiently developed concept of practical teaching and dual education and continuous monitoring and evaluation of achieved results are areas that need to be improved. The above especially emphasizes the role and importance of the DUALMON project, particularly if we keep in mind the fact that it targets all the mentioned disputed areas.

In order to fully understand the role and contribution of the DUALMON project, it is important to point out the challenges that are present in all phases of higher education: from education/career planning, enrolment to employment and meeting labour market expectations. Addressing these challenges involves the implementation of a series of activities aimed at making further progress in the three priority areas. The first area is to strengthen the links between education and the economy, with the aim of improving the quality of vocational education and the relevance of learning outcomes in vocational education. The second one refers to the process of lifelong learning and adult education, with the aim of creating flexible conditions and opportunities for retraining and additional training of young people and adults. Finally, the third area is related to the modernization of higher education, through improvement of the quality and relevance of practical education and training in higher education, in order to increase employability and reduce the gap between skills acquired during education and skills needed in the labour market (MEA, 2016).

Improving quality in the three mentioned areas has been recognized as one of the priority goals within the draft Strategy of higher education of Montenegro for the period 2021-2025. The mentioned document identified the biggest challenges and defines recommendations regarding the activities that need to be implemented in order to achieve future quality development in the field of higher education. In this sense, it is necessary to (Ministry of Education, Science, Culture and Sports, 2021)¹:

- Improve the model of practical teaching, in order to provide all students with adequate practical training

¹ Ministry of Education, Science, Culture and Sports. (2021). Draft strategy of higher education of Montenegro for the period 2021-2025. Available at: <https://www.gov.me/clanak/nacr-strategije-visokog-obrazovanja-crne-gore-za-period-2021-2025> (16.03.2022).

and preparation for the labour market.

- Conduct an analysis of learning outcomes and redefine them if justified, in order to best meet global labour market trends.
- Improve the quality of higher education in teaching, learning and professional development using European good practice and modern technologies.
- Align the quality assurance system of higher education with European standards and guidelines.
- Develop lifelong learning programs, while monitoring and controlling the quality of programs, including providing conditions for the recognition of non-formal and informal learning.
- Develop competitive educational staff, by investing in research and professional development.

The identified challenges are particularly visible in the field of Maritime Sciences having in mind the internalization of the programme and internationally approved standards. Namely, STCW convention prescribes minimal standards of competencies for obtaining maritime qualifications, making the maritime profession clearly profiled in terms of requirements for acquiring theoretical and practical knowledge. Motivated by this fact, Faculty of Maritime Studies Kotor implemented three technical study programmes Nautical Studies and Transportation, Marine Engineering, Marine Electrical Engineering and a humanities-oriented study programme - Maritime Management and Logistics.

Technical study programmes comply with international standards of the STCW convention allowing the possibility of employment on national and international companies. Besides, specific modules at the Faculty of Maritime Studies enable students to improve their knowledge in specific maritime fields, with application in maritime companies on shore, in marinas, shipyards, ports, harbour master's offices.

Maritime Studies, given that it includes a wide range of theoretical and practical knowledge in various fields, such as mechanics, engineering, safety and security, navigation, electrotechnics, management, accounting, marketing, logistics and etc. and whose adoption is to certain extent a prerequisite for acquiring practical knowledge by engagement in the company, i.e. work environment. Having in mind a large number of different disciplines in the field of maritime studies, a knowledge of which is important for understanding all segments of any sea and shore business entity, the integration of practical classes is crucial to enable students to successfully solve real problems and tasks. Hence, the implementation of the DUALMON project gives students of the Faculty of Maritime Studies the opportunity to gain knowledge and skills they need for successful integration within the company through work in the real sector, but also to better understand all work processes that take place within the company. In this way, a double effect is achieved - balancing theoretical and practical knowledge on the one hand, and strengthening the competitiveness of students in the labour market on the other hand. All previously stated is in line with Law on Higher Education, which stipulates that study programs should include at least 25% of practical classes conducted at a higher education institution or within a company, leaving room for educational institutions to define the manner of its implementation (Government of Montenegro, 2015)².

It is important to emphasize that the DUALMON project specified for Faculty of Maritime Studies is designed in a way to incorporate all activities previously suggested by draft Strategy of higher education of Montenegro. In that sense, this specific model is aligned with European standards and guidelines, and it is based on best teaching practices of other European countries, which have already implemented certain programmes of dual higher education. The dual model on Faculty of Maritime Studies will be organized in a way to improve practical teaching and to provide students with adequate practical training necessary for gaining and maintaining competitiveness on labour market. Besides, this specific model ensures achievement of outcomes that are commonly defined by all three main groups of stakeholders: students,

² Government of Montenegro. (2015). Law on Higher Education. Available at: <https://www.gov.me/dokumenta/9b4f57fd-9bae-465a-953a-0430da131af1> (16.03.2022).

higher education institutions (bearing in mind their possibilities and limitations) and companies and other entities from the market. In other words, the specific model of dual education at the Faculty of Maritime Studies enables the development of intersectional mobility, but also further strengthening of cooperation between this institution and the labour market, which is necessary in order to rationally connect the needs of students, education institution(s) and companies. Developed cooperation provides conditions for significant progress with numerous positive effects, both for the faculty and for the labour market, which is especially important for adequate and timely adaptation to dynamic changes in all areas of the labour market and contemporary requirements of Maritime industry.

2. Concept of specific model of dual education: Module – Inspection of Marine Engineering Systems

This section provides a detailed description of the specific model that will be implemented at the Faculty of Maritime Studies. Namely, the starting point for defining a specific model comes from the accreditation of study programs, and knowledge and skills that are the focus of individual modules. According to the last accreditation from 2017, basic studies at the Faculty of Maritime Studies are organized according to the 3 + 2 + 3 model, in order to harmonize studies with the way of studying at universities in the European Union, and to enable the implementation of the Bologna Declaration. In this way, compatibility with other universities in Europe has been achieved, and preconditions have been created for a better flow of students to European universities. At the same time, this contributed to leverage the international recognition of the Faculty of Maritime Studies, and the University of Montenegro at the same time.

Starting from the goals of the project and the way of organizing the studies, in cooperation with the partners, it is decided to implement dual education in the final year of basic academic studies in Marine Engineering. Specifically, the pilot project will be implemented in the module: Inspection of Marine Engineering System within the last (VI) semester of study. The reasons for making such a decision are multiple. First of all, the Inspection of Marine Engineering System Module is predominantly focused on the students who completed all theoretical and practical subjects necessary to embark on board a ship. In this way, the requirements of the STCW convention are fulfilled and in the 6th semester the students opt out a module that will provide them with additional knowledge concerning inspections and maintenance of technical systems. In other words, this model covers a wide range of areas in the field of Marine Engineering, which is in line with the needs of business partners at sea and on shore. In this way, students are directed to acquire specific knowledge and skills through dual education, which are especially valued by potential employers, and which are important for their competitiveness in the labour market. In addition, the Module Inspection of Marine Engineering System is represented in the last semester of basic academic studies, which ensures that the project includes those students who have already acquired theoretical knowledge, necessary to successfully adapt to the work environment within the company and solve real business problems and challenges. In this way, students can apply the acquired theoretical knowledge and upgrade it with practical skills gained through the process of dual education. Finally, this opens the possibility for companies, after completing the dual program (education) and academic studies, to offer employment to students, which enables to develop professional staff that is tailored to the specific needs of the company.

The project will be realized at the Faculty of Maritime Studies by applying the third sequential model defined by the generic model. According to the selected sequential model, the working hours of a dual student are scheduled after gaining the theoretical knowledge planned by all courses within study module Inspection of Marine Engineering System. More precisely, the first semester and a half of the second semester of the 3rd year is intended for learning at HEI, while the second part of the second semester is intended for at a company. This model also includes certain amount of time for individual learning of dual student, which is scheduled during the examination periods in January/February and June. The timetable of time intended for working, teaching and individual learning for this sequential model is as follows (Table 3):



- **Working time** – every day with 8h/day for 4 weeks during May in the second semester of the 3rd year of a study, and every day with 4h/day for 4 weeks in June.
- **Teaching time** – every day with 6h/day during the first semester and during the three months of the second semester of the 3rd year (i.e. in February, March and April)
- **Learning time** – during the teaching period (first semester and three months of the second semester) each day with 2h/day; also each day with 8h/day for 6 weeks during the examination period in January and first two weeks of February, as well as each day with 4h/day during the examination period in June.

The previous table shows that students will spend approximately 2/3 of their time at the faculty within the third year of study, VI semester, acquiring theoretical knowledge. The reason for this decision stems from the fact that by then (during the previous two years and the first semester of third year of study) students have already gained all necessary theoretical knowledge needed for their successful integration into working processes within a company. This is one of the most important prerequisites that must be met in order for students to properly understand business processes in the company

Practical work of students in the company will be evaluated as part of the final exam, or as the whole final exam, depending on the decisions of individual professor at the module Inspection of Marine Engineering System. This module involves five subjects and one elective, which are presented below in the Table 3.

Table 3: Subject included in the module Inspection of Marine engineering system

Subjects	Number of classes	ECTS
Safety and risk management in shipping	2+2+0	6
Organization of work and ship management	2+1+0	6
Technical survey and classification	2+2+0	6
Economics of ship’s exploitation	2+2+0	6
Elective subject	2+2+0	6

The selection of students who will be included in the dual education program will be conducted by selecting 5 students for each subject who stand out according to the achieved results, based on pre-defined criteria (which will be discussed in the next part of the document). This is important to point out, because the subjects covered by the Module Inspection of Marine Engineering System are organized so that each of them can be linked to a specific department in the company. Having in mind the specificities of different departments within the company, and the specificities of work tasks that employees solve in individual departments, it is important to emphasize that the expected learning outcomes of dual students will be defined depending on the company sector in which he/she will work. The choice of the sector in the company within which the student will be engaged, as well as the expected learning outcomes will depend on the content and goals of the subject to which the dual student was linked during the selection process. Hence, the expected knowledge that a dual student should acquire during his/her internship will depend predominantly on the subject to which he/she is related and the sector in the company in which he/she was deployed, so there will be certain differences in the expected outcomes between different dual students. A precise definition of learning outcomes will be the responsibility of the subject professors. In this regard,

depending on the sector in which dual students are involved, some general expected learning outcomes may be:

- Analyse the possible ways of risk reduction;
- Consider the existing safety systems at sea, and manage the risks in maritime operations;
- Understand the importance and role of standards in risk management;
- Identify specific dangerous situations as dangerous on board (eg, stress, alcohol, workload, distinct authority, etc.) and analyze the characteristics of seafarers (attitude, hard work, authoritativeness, positive initiative).
- Describe the basics of ship crew organization and planning activities and exercises on board.
- Analyze cultural differences of multinational crews, and with this in mind optimally organize the crew;
- analyse certain cases of failures in the engine room;
- adequately report to the Register on the conducted survey and average of the propulsion plant;
- manage, plan and prepare the ship for a survey by the Register and statutory institutions;
- describe the importance of certain ship's certificates and documents;
- Define the cost's division and structure of the different categories of costs in the shipping industry, with particular reference to the costs of exploitation marine engineering complex.
- Distinguish the concepts of efficient (commercial, technical and human resources) management of ships.

Monitoring the progress of dual students during their internship will be the responsibility of both the professor and the mentor in the company. In order to more accurately evaluate the achieved outcomes, special attention will be paid to monitoring the development of students' ability to solve real practical engineering and business tasks and challenges within a defined time frame, both individually and as a team member. In this way, after the students' internship is completed, it will be possible to more realistically assess the potential contribution of this project in the process of harmonizing curricula with existing requirements of employers and the labour market. Obtained results could serve as a starting point for further development of the legal framework of dual higher education.

3. Legal framework for the implementation of the dual education model at the Faculty of Maritime Studies Kotor

The Law on Higher Education does not recognize the possibility of Dual Higher Education in Montenegro. Hence, the aim of this project is to point out the needs and benefits of dual education in the higher education system, as well as to define the rights and obligations of all three parties involved in its implementation, to provide a basis for later specification of the legal framework of dual education. Hence, one of the goals of the project is to identify decision-making areas that will be used by policy makers in Montenegro to propose a law on higher education, which would provide a framework for the implementation of dual education in higher education institutions, and define mutual rights and obligations of students, higher education institutions and employers.

Piloting of a specific model of dual education at the Faculty of Maritime Studies Kotor, in academic studies within the module Inspection of Marine engineering system, will be performed taking into account the specifications given below.

3.1. Name of the higher education institution where the dual education project is implemented:

University of Montenegro, Faculty of Maritime Studies Kotor, Put I Bokeljske brigade 44, Kotor.

3.2. The process of selecting students to participate in a dual education pilot project

As previously mentioned, the pilot project will be implemented during the VI semester, in the academic studies of Marine engineering the module Inspection of Marine engineering system. Having in mind the larger number of students attending this module, but also the limited number of project partners, it is necessary to define the criteria according to which the selection of those students who will have the opportunity to participate in the pilot program of dual education will be made.

The selection will be done in such a way that up to 5 students will be selected for each subject in the module Inspection of Marine engineering system. Subject professors will be in charge of selecting students, who will rank them on the basis of certain objective criteria. Some of these criteria may be the results achieved by the student on the basis of colloquia, tests, or some other type of knowledge testing, and the method of testing students' knowledge will be determined by the decision of the subject professor. Accordingly, all students from the module will have the opportunity to participate in the dual program, but only five students per subject will be selected – those who have achieved the best results based on previously defined selection criteria.

Having in mind that this is a pilot project, adjustment of the work plan by subjects will be predominantly related to redefining the structure of student scoring, in a way that it includes work in the company. The number of points that a student can achieve on this basis will be an integral part of the final exam, and the maximum number of points that a student can achieve on this basis will be defined by the subject professors. In the part of theoretical classes, during the pilot project, there will be no significant changes, so dual students will follow the classes at the Faculty together with other students until May (i.e. until they are sent to work in the company).

3.3. Rights and obligations of participants (Faculty, companies and students) in the pilot project

It is important to point out that the number of students who can do an internship within one company is not predefined, but that number depends on the company's capacity, i.e. its ability to provide students with adequate integration into work processes and assign a mentor to each of them, who will oversee their work. Given that the areas of work covered by the module Inspection of Marine engineering system are presented in every company, the activity of the project partner is not particularly important.

During the pilot project, it is envisaged that dual students will have two mentors - an academic and a company mentor. Academic mentors will be subject professors who select students according to the previously explained process. The company with which the contract on the internship of the dual student is signed is also obliged to nominate mentors, who would monitor the student's progress during an internship. The academic mentor gives consent to the engagement of the mentor by the employer, after reviewing his/her CV and, if necessary, conducting an interview. The academic mentor and the mentor from the company are obliged to make a learning plan for each student according to the model of dual education, no later than one month from the beginning of classes in the sixth semester. In addition to information about the employer and the company mentor, the learning plan must contain the professional profile of the student, as well as learning outcomes that must be achieved through work within the employer.

In accordance with the defined model, the student is obliged to adhere to the schedule of internship. In other words, the student is required to work every day with 8h/day for 4 weeks during May in the second semester of the 3rd year of a study, and every day with 4h/day for 4 weeks in June.

The academic mentor and the mentor from the company are obliged to maintain continuous communication during the student's internship, in order to harmonize the student's learning and work and make it easier for him to write a report at the end of the internship. At the same time, it is important to emphasize that the mentor in a company must have a higher degree of education than the degree of

education of dual students, i.e. a minimum BsC in the field of maritime sciences (180 ECTS). The list of employers who meet the conditions for participation in the dual education program will be selected based on the attached documentation that will contain information regarding the following items defined by the HEI:

- List of activities of employers who can participate in the implementation of the working tasks covered by the selected study module.
- Specification of general obligations to be fulfilled by the employer in order to achieve learning through work on the study module (e.g. harmonization of work tasks within a specific employer with the program and subjects covered by HEI, occasional meetings of employer and academic mentor, HEI reporting on student work, way of presenting what has been learned, etc.).
- Competence of the mentor in terms of education (minimum 180 ECTS credits, etc.) and 2 years of work experience. The HEI should indicate how to check the competencies of the mentor with the employer (e.g. CV with professional achievements, interview with the teacher).
- A list of necessary equipment provided by the employer to the student.

The student is obliged to keep a diary of activities and to write a report at the end of the internship at the employer, in which he/she will point out what learning outcomes he/she has mastered and in what way. Upon completion of the internship, a survey of students, employers and academic mentors will be conducted, in order to obtain clear information on the quality of the dual model and its importance for all three parties, as well as information regarding eventual modification of dual education in the future.

3.4. Plan of the implementation of the curriculum by the employer

Specific obligations, as well as the plan of realization of learning through work will be defined by individual contracts that Faculty will sign with the employer and a student, no later than one month after the beginning of classes in the module Inspection of Marine engineering system, and in agreement with the academic mentor and the employer's mentor. The curriculum will contain the framework of dynamics of mastering the desired learning outcomes. Students will learn by working on projects that are implemented by employers, so this plan must define which projects can be applied by the employer and specify the stages in the implementation of the project in which the student must participate. It is planned that the student will study through work at the employer every day with 8 hours a day for 4 weeks in May, as well as 4 hours a day for 4 weeks in June. This means that the student will spend approximately 240 working hours with the employer.

3.5. Financial aspects of student admission by employers

During the piloting of the dual education program, the companies that sign the contract on participation in its realization and admission of students, are not obliged to pay compensation to students for the time spent in the company.

3.6. Verification of realized learning outcomes through internship

Employers will be required to issue a certificate to students upon completion of an internship program. The certificate will contain the time that student spent working, a description of the jobs in which the student was engaged and the competencies that he/she acquired.

3.7. Change of the employer

If it is determined that there are valid reasons for requesting a change of company within which the

internship is performed, the student will be allowed to do so. In that case, choosing a new company can be done in two ways. The first way is that the Faculty establishes cooperation with a new company, and the second is that the student proposes a potential company within which can complete the internship process. In both cases the final decision on the selection of a new company should be made by the Faculty, where the same (previously described) rules and conditions regarding the procedure of its selection should be applied.

3.8. Recommendation for future development of legal framework on dual higher education

The aim of this part of the document is to provide insight into the details of the implementation of the planned dual education program in the module Inspection of Marine engineering system and needed changes in legal framework. As already mentioned, this model will serve to acquaint employers interested in the participation in the future dual education programmes, so that they can express a desire to participate and define the number of students which they can receive and guide through the internship process.

Assuming the successful implementation of this pilot project, it will be necessary to regulate in the legal framework the key issues related to the further implementation of dual higher education. It is important to emphasize here that the dual education system is still not recognized in our market, and it should be previously accredited. One of the important results of the pilot project will certainly be the comments and recommendations of all three key groups of stakeholders (faculties, companies and students), which should serve as inputs for defining legislation in this area.

Therefore, the successful implementation of this project would require precisely defined rules regarding the further engagement of companies that would be partners in the implementation of dual education, as well as the method of selection and enrolment of students in the same.

In this regard, it is recommended that at least one month before enrolling students in the third year of academic studies in Marine Engineering, the process of selecting companies in which dual students will do internships. This is important because the number of interested companies depend on the total number of students who could be enrolled in a dual education program. Interested students would have the opportunity to apply for a dual education program when enrolling in modules. In case the number of interested students is higher than the one that the partner companies can accept, it would be necessary to carry out the selection process. In this part, it is recommended that the selection of students to be enrolled in the dual education program is based on the results achieved by students in previous years of study (average grade achieved during studies, awards, competitions, etc.). The process of pairing dual students and companies should be the responsibility of HEI in agreement with the subject professors from the module Inspection of Marine engineering system. The implementation of the above recommendations indicates the need to specify the key aspects of dual education programs in the legal framework, and in terms of the implementation of certain steps it is necessary to provide an appropriate dose of autonomy to University units.