

Proceedings
16th IAMU Annual General Assembly
Opatija, Croatia, 2015



Sveučilište u Rijeci
Pomorski fakultet Rijeka
University of Rijeka
Faculty of Maritime
Studies Rijeka



IAMU

International Association of Maritime Universities

DEVELOPMENT OF QUALIFICATIONS AND INNOVATIVE METHODS OF COMPETENCE ACQUISITION IN LOGISTICS AND MARITIME TRANSPORT – KIKLOP

Perić Hadžić, Ana*; Grubišić, Neven; Tijan, Edvard

University of Rijeka,
Faculty of Maritime Studies
Croatia

Abstract. Globalization and technological development are radically changing the higher education environment. In the future, an exponential increase in demand for higher education is expected globally. University of Rijeka, Faculty of Maritime Studies educates students for specific maritime related jobs, which for the most part belong to the Transport and Logistics sector (which employs 10 million people and accounts for about 5% of GDP in the EU), the Mechanical engineering/Metallurgy sector, and Electrical Engineering/Computer Science sector, all of which are marked as very dominant sectors. The demand for occupations in maritime transport and logistics is relatively increasing, and new skills and professions that are not systematized at Croatian national level are appearing in the maritime market in recent years. The competencies for those new qualifications are neither recognized nor included in the existing curricula. Furthermore, although the environment for e-learning in higher education exists, it is not sufficiently functional for all learning activities. For reasons of better time utilization and enhanced cooperation, it is necessary to develop the e-learning environment which will involve the use of browser-based mobile technologies, modeling and the development of specialized applications that will allow the retrieval, visualization and interaction with e-environment independent of location, time and space. The continuous improvement of competence of teachers is also of great importance. Since the education at the Faculty of Maritime Studies is not entirely adapted to the national and international market needs, teachers have to continuously monitor the development of modern technologies and technological achievements in order to ensure higher quality education. The purpose of this paper is to present a project aimed at development of qualifications and innovative methods of competence acquisition in Logistics and Maritime transport – KIKLOP, which was designed with the aim of researching and recognizing the real needs of the labor market in the field of maritime transport and logistics and the needs for new skills and professions, developing occupational standards and qualifications standards in accordance with the principles of Croatian Classification Framework (HKO), developing an environment for e-learning, improving teacher competences and adapting the curriculum of undergraduate university studies in accordance with market needs. The final aim of the project is to offer high-quality, efficient and innovative higher education based on the SMART learning outcomes, while retaining the flexibility to adapt to constant and rapid changes in the wider social context. Above mentioned goals will be met by Faculty of Maritime Studies (a leading higher education

***Corresponding author**

e-mail: ana@pfri.hr

institution in the Republic of Croatia in the field of education in maritime studies) in cooperation with the project partners; other educational institutions and prominent companies from the maritime industry.

Key words: KIKLOP project, Croatian Classification Framework, maritime education, innovative education

1 INTRODUCTION

The trends point to an exponential increase in demand for higher education in the next twenty years; from the existing 99 million students to 414 million by 2030 worldwide. Although the Republic of Croatia in 2005 adapted its higher education system according to the principles of the Bologna Declaration, a number of weaknesses have been noted. When introducing new study programs, some output parameters such as learning outcomes of students were not fully defined. With rare exceptions, the study programs were devised within the framework of higher education without specific consultation with other important stakeholders such as employers, relevant national authorities and others. The result is, as pointed out by the Ministry of Science, Education and Sports [1], a notable unevenness in the quality of various study programs, problems in their acceptance by the labor market as well as in their general contribution to society.

The Republic of Croatia established the legal framework of quality assurance in higher education by passing the Law of Croatian Qualification Framework [2], which defined the main tools for the equalization of study programs quality. According to that, a need to audit their structure and learning outcomes, as well as the means of carrying them out arose. Croatian Qualification Framework (HKO) has been established as a key reform instrument governing the qualification system, with the advancement of educational programs that comply with the standards of qualifications and their components – learning outcomes, with a goal of raising the quality of education and its alignment with the needs of the labor market and lifelong learning. Study programs must ensure the acquisition of learning outcomes, with an effective way of checking these outcomes. A part of higher education institutions has not yet shifted from classical "knowledge transfer" to the development of competencies, and only evaluates the contents which students memorized instead of evaluating the acquired knowledge and skills.

Maritime studies present a complex multi-disciplinary scientific field based on activities with various technological and economic and legal characteristics. Croatian higher education and research institutions in

the broad field of maritime affairs have to continually adjust their educational programs that are related to the needs of the domestic and international labor market, and at the same time be recognizable within the European Higher Education Area and comply with all the requirements of the Ministry of Science, Education and Sports, Ministry of Maritime Affairs, Transport and Infrastructure, the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, etc.

From the need for constant improvement of the teaching process, a project aimed at development of qualifications and innovative methods of competence acquisition in Logistics and Maritime transport – KIKLOP was devised [1]. University of Rijeka, Faculty of Maritime Studies, as the leading Croatian higher education institution in the field of maritime education, in cooperation with the project partners will research and identify the actual needs of the labor market in the field of maritime transport and logistics, identify new skills and professions, develop occupational standards and qualification standards in accordance with the principles of HKO, develop the environment for e-learning, improve teacher competencies and adapt the undergraduate university studies in accordance with market needs while offering high-quality, efficient and innovative higher education based on the SMART learning outcomes while retaining the flexibility to adapt to constant and rapid changes in the wider social context.

KIKLOP project partners are: University of Rijeka, Faculty of Maritime Studies, University of Split, Faculty of Maritime Studies, Croatian Association of Ship Agents, Jadrolinija (passenger shipping company), Autotrolej (municipal transport), Zorović Maritime (ship agent) and Panalpina Croatia (logistics operator). The project is financed by the European Social Fund [3]. The project began in June 2015, with set duration of 15 months.

In order to achieve the project objectives, will be necessary to carry out the following activities:

1. **Development of occupational standards and competencies**, based on the analysis of current and future labor market needs (cross-sector analytical background) and the development of **complete qualification standards** in logistics and maritime transport.

2. **Improvement of undergraduate university studies** (Seafaring and Transport Technology, Marine Engineering, Electronics and Communications in Shipping, Logistics and Management in Maritime Traffic, Transport Technology and Organization) that are structured in sets of appropriate level learning outcomes, stated in ECTS credits provided for the acquisition of these outcomes, and are consistent with the relevant qualification standards.

3. **Development of e-learning environment** that will enable advanced and adaptive learning and will support the planning of teaching processes in higher education and lifelong learning.

4. **Upgrading teacher competencies** through continuous implementation of professional development programs for teachers.

The project is in line with the strategic documents at the EU, national, regional and local levels regarding the maritime sector and transport sector in general, and in line with improving the quality of higher education. The European Commission identifies three priorities of smart, sustainable and inclusive growth in its **Europe 2020 Strategy** [4]. The project will increase the performance and international attractiveness of University of Rijeka, Faculty of Maritime Studies and will raise the overall quality of higher education and training in the field of maritime transport while promoting the principles of sustainable development. The project will also enable smart specialization and facilitate the entry of young people into the labor market. The **program framework Horizon 2020** [5] defines smart, green and integrated transport as one of the social challenges of Europe. The project is aligned with Croatian **Strategy for Education, Science and Technology** [6] in the part of improving academic programs with consistent implementation of the Bologna reform and redefinition of acquired competencies. The project is aligned with the other objectives of the said strategy: establishment of the quality binary system of higher education in line with national needs, ensuring adequate information and communication resources of higher education institutions, and integration into European and global higher education space. The project is also aligned with the **Strategy of maritime development and integrated maritime policy of the Republic of Croatia 2014-2020** [7] defining clear targets for development of maritime affairs as one of the most important industries in Croatia, where it stimulates development and promotion of Croatia as an international center of excellence for the training of seafarers with continuous improvement of the system of education and training of seafarers. The project contributes to the fulfillment of certain objectives of the **University of Rijeka, Faculty of Maritime Studies Development Strategy 2011-2016** [8], **University of Split, Faculty of Maritime Studies Development Strategy 2012-2017** [9], **University of Rijeka e-learning development strategy 2011-2015** [10], **University of Rijeka development strategy 2014-2020** [11]. Some of the goals from above mentioned strategies are: to increase the proportion of e-learning in study programs, capacity-building in teaching in higher education, development of study programs based on the development of qualifications, especially for interdisciplinary studies, etc.

2 PROJECT DEVELOPMENT AND IMPLEMENTATION METHODOLOGY

Methodology for the development and implementation of Work Packages includes specific and joint activities of the applicant and the project partners. In joint activity partners will mutually exchange knowledge and experience to contribute to the fulfillment of the project objectives.

The methodological approach to project design consists of three key actions, with the goal of increasing quality of maritime education. The first logical step is labor market analysis and identification of market requirements through occupation descriptions, job (task) description and activity description.

Competence development stems from the previous step, and includes the development of qualifications through measurable learning outcomes and assessment methods. Harmonization of education structure, through curriculum development for education in the maritime and logistics occupations, includes definition of courses, modules and complete curricula for undergraduate university studies. These three elements must be harmonized in order to ensure that education or training programs are in line with the requirements of the labor market.

Methodology for the development and implementation of Work Packages is shown in Figure 1.

Project implementation, other than the realization of individual methodological components, necessarily involves the development of multimedia laboratories, the development of e-learning modules and professional development of lecturers in order to improve the quality of maritime higher education as a multidisciplinary sector. The development of standards of complete qualifications, development of occupational standards with analytical background, adjustment of study programs, the development of e-learning environment and the improvement of lecturers' competence will be a continuous process, and set tasks and indicators will in fact be the performance indicators and benchmarks for project management.

3 WORK PACKAGES

In accordance with the proposed methodology developed within the specified project Work Packages that include activities within the Work Packages, methodology, roles of the applicant and all partners in Work Package implementation, measurable outputs and a time frame, the structure and links between Work Packages can be seen in Figure 2.

Work packages **Project management and administration** (WP – PM) and **Promotion and visibility**

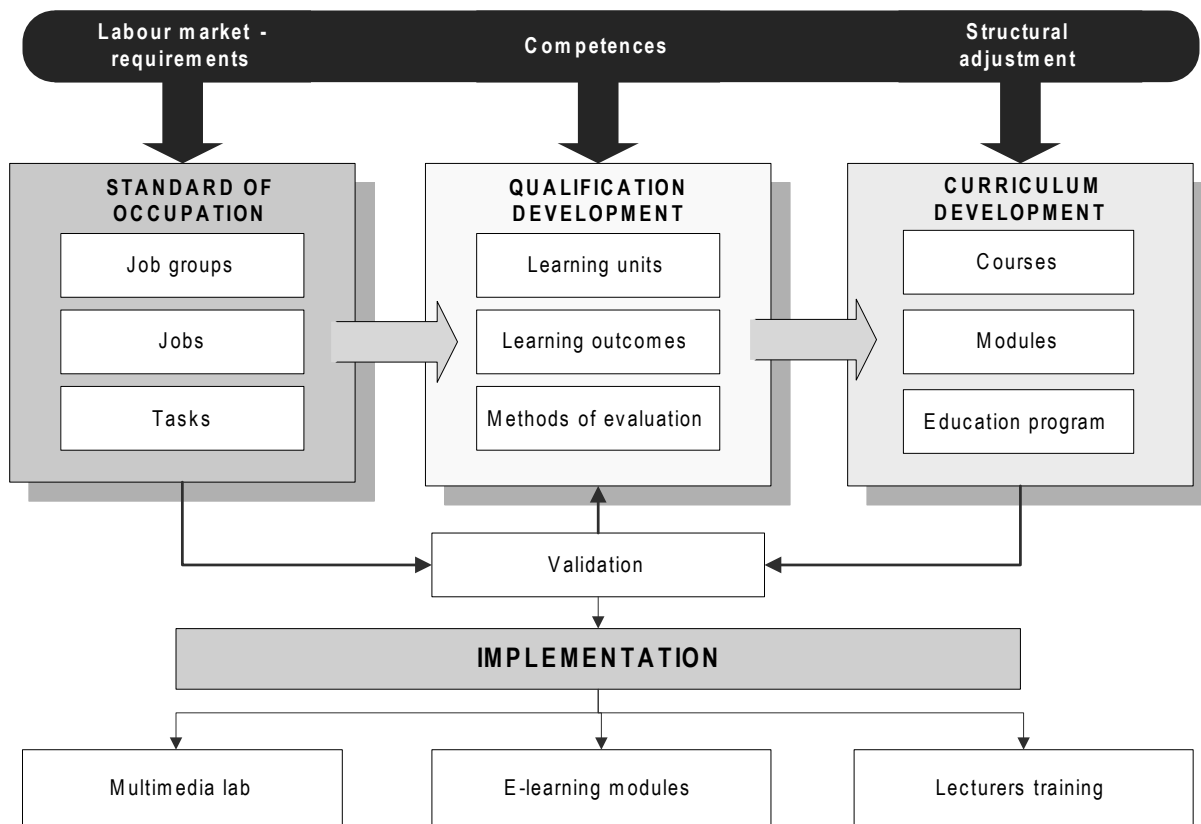


Figure 1 Methodology for the development and implementation of Work Packages

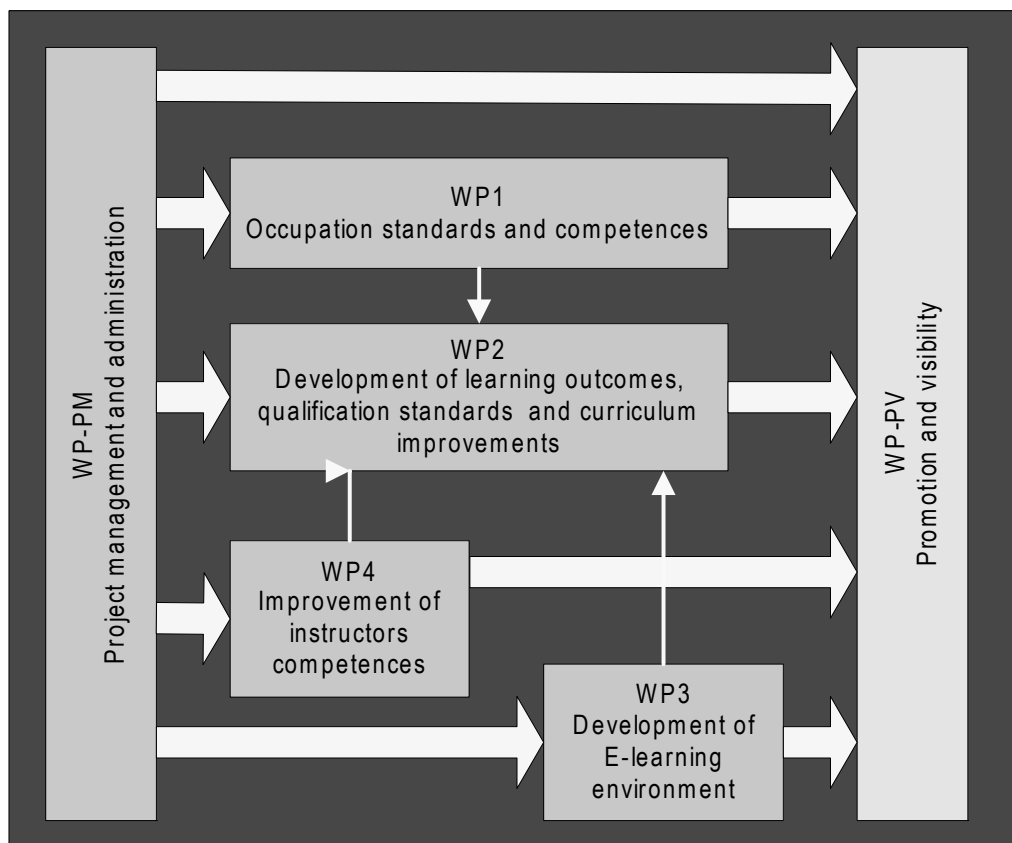


Figure 2 The structure and links between Work Packages

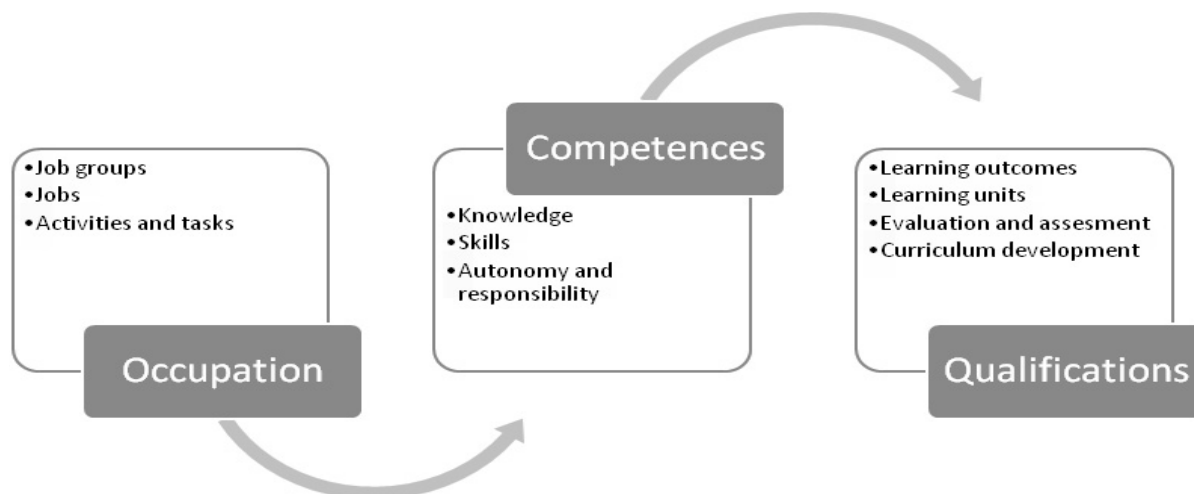


Figure 3 The structure and links between WP1 and WP2

(WP – PV) last for full 15 months, and are the main project support activities for implementation, feasibility and dissemination. Central Work Packages: **Development of occupation standards and competencies (WP1)**, **Development of learning outcomes, qualification standards and curriculum improvements (WP2)**, **Development of e-learning environment (WP3)** and **Improvement of lecturers competences (WP4)** are defined below.

3.1. Development of occupation standards and competencies (WP1)

Creating standards for specific occupations in maritime sector will be based on the **analysis of current and future labor market needs in the maritime economy and logistics – Cross-sector basis (background)**. In accordance with the relevant strategic documents, sector profile and analytical indicators the demand for occupations will be determined for a minimum period of 5 years. The planned methodology for the analysis of sector background includes trend analysis and assessment of the sector growth (in Republic of Croatia it includes the following sectors: Logistics and Transport sector, Mechanical Engineering, Shipbuilding and Metallurgy sector and Electrical Engineering and Computer Science sector). It also includes the trends analysis of key occupations within maritime activities (navigation, marine engineering, marine electronics, transport technology and organization, logistics in maritime transport), the analysis of knowledge and skills needed for a particular occupation and plan to adapt qualification standards and training programs. A special emphasis in the analysis of market needs will be the need for occupational standards that are projected to appear and exist in both immediate and lasting future. Furthermore, **competences for developed occupational standards will be defined** in accordance

with the HKO principles (which are displayed through achieved knowledge and the application of such knowledge). Research results will be obtained based on the expertise of applicants and partners, desktop analysis, online questionnaires circulated among stakeholders, employers, employer representatives, alumni, etc.

3.2. Development of learning outcomes, qualification standards and curriculum improvements (WP2)

Competence matrix for similar occupations will be defined based on the following: analysis of the complexity of individual competencies; factual and theoretical knowledge; cognitive, psychomotor and social skills; the associated autonomy and responsibility that a person must acquire through learning and prove in the process of learning. Based on that, measurable indicators of learning outcomes (or level of learning outcomes) will be defined. Learning outcomes will be structured according to the SMART principle: specific, measurable, agreed, purposeful and timely. The link between WP1 and WP2 is shown in the following figure.

In the second work package, a minimum of 5 complete qualification standards will be defined. Developed qualification standards for employment in the maritime sector mark the content and structure of a certain qualification, including all the information necessary to determine the qualification level, qualification volume and qualification profile, as well as the data required for quality assurance and improvement of qualification standards. With the aforementioned activities, as well as with the analysis of existing study programs, recommendations will be provided for improvement of 5 existing undergraduate university studies at University of Rijeka, Faculty of Maritime Studies:

- Navigation and Transport technology,
- Marine Engineering,
- Marine Electronics and ICT,
- Logistics and Management in Maritime Transport,
- Transport technology and Transport Organization

Above mentioned studies are structured in sets of learning outcomes of appropriate level, stated in ECTS points provided for the acquisition of these outcomes, and are consistent with the relevant qualification standards. Also, where applicable, it is necessary to ensure alignment with the STCW Convention in order to obtain the highest positions aboard vessels.

3.3. Development of e-learning environment (WP3)

Activities under Work Package 3 include planning, modeling, development, implementation and testing of the environment for e-learning that will enable advanced and adaptive learning and will support the planning of the teaching process in higher education and lifelong learning. All the specifics of maritime profession will be taken into account, including the possibility of e-learning implementation on board the ship/offshore platform with time-limited access to the Internet.

Due to the increased accessibility of mobile devices, time utilization and enhanced cooperation, the environment for e-learning will be developed, which includes, in addition to the use of browser-based mobile technologies, modeling and development of specialized applications that will allow the retrieval, visualization and interaction with the e-learning environment, regardless of location, time and space, which is extremely important given the specifics of maritime professions.

The e-learning environment will have the appropriate software to automate and administer educational events and to create, store, collect and execute the educational content. The elements of e-learning 3.0 based on linking technology and knowledge by means of social interaction among users will be included in the e-learning environment through learning templates with pre-defined rules, user interfaces and associated modules. E-learning environment will be implemented through the server system that requires a multi-user client/server software architecture where the application server supports mobile and stationary clients. In order to prepare the multimedia educational content of a better quality, which requires a multidisciplinary approach (graphic design, audio-visual applications, simulators...), an e-learning multimedia lab will be equipped with accompanying multimedia equipment (hardware and software). In order to optimize the user experience of e-learning environment (including students and teachers) 5 user tests for certain areas or courses at selected study programs will be conducted.

3.4. Improvement of lecturers' competences (WP4)

In order to train the teachers in higher education (professors, lecturers), which is one of the most important determinants of quality, recognized within the framework of the Standards and Guidelines for Quality Assurance in the European Higher Education Area [13] it is necessary to educate teachers through additional programs for training and upgrading. Accordingly, 15 faculty members from University of Rijeka, Faculty of Maritime Studies and University of Split, Faculty of Maritime Studies will participate in various programs for training and improvement during the duration of the project, namely in:

- **Training of lecturers in the learning and teaching program** in higher education and the planning and programming of the teaching process through a formal program of lifelong education with associated ECTS credits. 3 lecturers will be trained in order to be able to design and plan learning activities and develop a program course, while creating a stimulating environment for learning and supporting students.
- **Training of lecturers to work with specialized software platforms** used within the curriculum (such as CAD/CAE programs, modeling and optimization programs, simulation and/or optimization tools, GIS tools, design and modeling software, marine engineering and nautical simulators, radar plotting aids, electronic chart systems, etc.). 6 professors and assistants will be trained to work with the above mentioned platforms.
- **Training of lecturers in innovative teaching methods in e-learning field;** creating the educational content, managing the e-learning environment, the use of multimedia elements, etc. 6 professors and assistants will be trained to apply the above mentioned innovative teaching methods.

Activities within the Work Packages **Improvement of lecturers' competences** enrich the teaching process and accordingly improve its quality and contribute to the development and implementation of competence approach that puts students at the center.

4 CONCLUSION

University of Rijeka, Faculty of Maritime Studies, as the leading Croatian higher education institution in the field of maritime education, recognized the trends imposed by the market. The main trend is: constantly improving the educational process and the quality of education. Along with numerous continuing activities that the Faculty carries out in order to raise the quality

of education, the implementation of the KIKLOP project presents great challenges.

The collaborative KIKLOP project will explore and identify the actual needs of the labor market, develop occupational standards which are recognized in Croatian labor market, and also provide the new occupation proposals, define 5 qualification standards in accordance with the principles of HKO and adapt the undergraduate university studies at the Faculty of Maritime Studies in line with market needs.

The development of e-learning environment contributes to the development of innovative teaching methods, the development and improvement of existing teaching and didactic materials, audio-visual and interactive materials, e-learning tools and other content suited to on-line use. By improving competences in the field of teaching and learning, by working with specialized software platforms and by using innovative teaching methods in the field of e-learning, it is certain that high-quality, efficient and innovative higher education based on the SMART learning outcomes can be offered to students, while retaining the flexibility to adapt to constant and rapid changes in the wider social context.

REFERENCES

- [1] www.kiklop.eu
- [2] Ministarstvo znanosti, obrazovanja i sporta, *Poziv na dostavu projektnih prijedloga, Unapređivanje kvalitete u visokom obrazovanju uz primjenu Hrvatskog kvalifikacijskog okvira*, 2014., <http://www.strukturnifondovi.hr/natjecaji/46>
- [3] Zakon o Hrvatskom kvalifikacijskom okviru, *Narodne Novine Republike Hrvatske* br. 22, 2013.
- [4] European social Fund, <http://ec.europa.eu/esf/home.jsp?langId=en>
- [5] Europe2020, http://ec.europa.eu/europe2020/index_en.htm
- [6] HORIZON2020, <http://ec.europa.eu/programmes/horizon2020/>
- [7] Ministarstvo znanosti, obrazovanja i sporta, Strategija obrazovanja, znanosti i tehnologije, *Narodne novine Republike hrvatske*, br.124, 2014., http://narodne-novine.nn.hr/clanci/sluzbeni/2014_10_124_2364.html
- [8] Ministarstvo pomorstva, prometa i infrastrukture, *Strategija pomorskog razvoja i integralne pomorske politike Republike Hrvatske 2014-2020*, Zagreb, 2014. http://www.mppi.hr/UserDocsImages/Strategija_pom_razvitka%20_uz_odluku_289.pdf
- [9] Pomorski fakultet u Rijeci, Sveučilište u Rijeci, *Strategija razvoja Pomorskog fakulteta u Rijeci 2011-2016.*, Rijeka, 2011. http://www.uniri.hr/files/staticki_dio/propisi_i_dokumenti/Strategija%20Pomorskog%20f_%202011_-2016.pdf
- [10] Pomorski fakultet u Splitu, *Strategija razvoja Pomorskog fakulteta u Splitu 2012-2017*, Split, 2011., http://digured.srce.hr/arhiva/193/84699/www.pfst.hr/images/dokumenti/pfst_strategija_razvoja_fakulteta.pdf
- [11] *Sveučilište u Rijeci, Strategije razvoja e-učenja na Sveučilištu u Rijeci 2011 - 2015*, Rijeka, 2011, http://www.uniri.hr/files/staticki_dio/propisi_i_dokumenti/Strategija_e-ucenje_2011-2015.pdf
- [12] *Sveučilište u Rijeci, Strategija razvoja Sveučilišta u Rijeci 2014 - 2020*, Rijeka, 2014., http://www.uniri.hr/files/staticki_dio/strategija/Strategija_UNIRI_2014_2020_EN.pdf
- [13] European Association for Quality Assurance in Higher Education, Standards and Guidelines for Quality Assurance in the European Higher Education Area, 2009, Helsinki, 3rd edition, http://www.enqa.eu/wp-content/uploads/2013/06/ESG_3edition-2.pdf