



FIDIT

**Development of educational programs,
qualification standards and occupational
standards in the field of ICT in accordance with the
new needs of the market**

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Overview



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- Introduction
- Croatian Qualifications Framework - CROQF
- Project Dip2Future
 - What we did about Occupational Standards
 - What we did about Qualifications Standards
 - Revision of Study Programmes
- The following tasks

Introduction



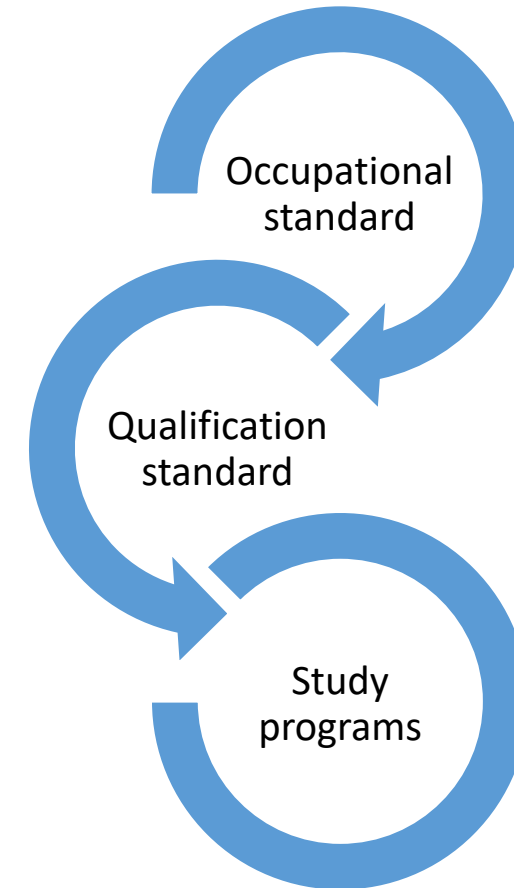
- FIDIT was partner at the project *„Development of educational programs, qualification standards and occupational standards in the field of ICT in accordance with the Croatian Qualifications Framework”* – **DIP2future**
- coordinator was Faculty of organization and informatics Varaždin, University of Zagreb
- project was co-financed by the European Union from the European Social Fund
- project duration was 36 months (march 2019 – march 2022)

Introduction – DIP2future



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- one of the goals was development of occupational standards, qualification standards and study programs in the field of distributed systems, digital transformation, information security and data technologies in accordance with CROQF guidelines



Introduction – DIP2future



- we (FOI & FIDIT) decided to develop 4 new study programs in following fields:
 1. Data technologies and artificial intelligence,
 2. Management of information security and privacy systems,
 3. Distributed and interactive systems and
 4. Management of transformation and innovation of business systems.

- the tasks of the project was not to implement study programs, but to define learning outcomes

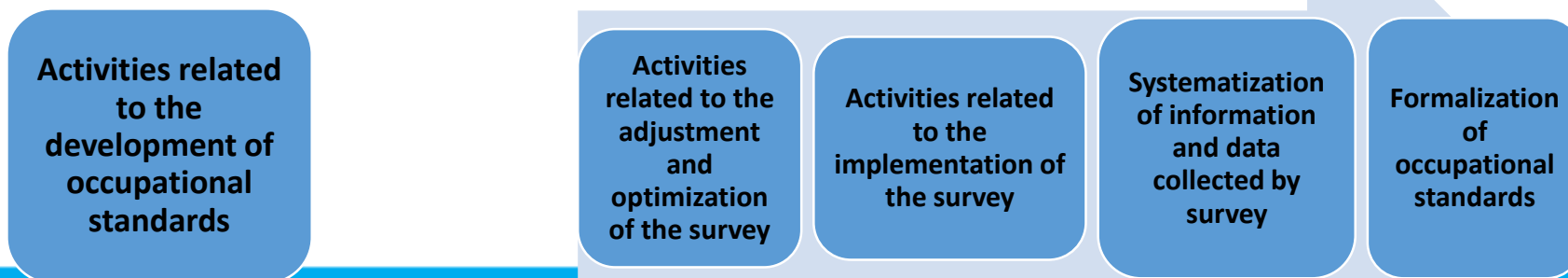
Croatian Qualifications Framework

- „The Croatian Qualifications Framework is a reform instrument for regulating the system of qualifications at all levels in the Republic of Croatia through qualifications standards based on learning outcomes and following the needs of the labour market, individuals and society”
- a framework which sets every qualification acquired in Croatia at its place
- the central elements of the CROQF are **learning outcomes**
- it introduces **qualifications standards** and **occupational standards** as well

Development of occupational standards



- the first step in the implementation of the project was the development of occupational standards
- there was a methodology for creating occupational standards that had to be adapted to our needs
- the methodology included:
 - guidelines for creating occupational standards
 - occupational standard survey



Development of occupational standards



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1. Activities related to the adjustment and optimization of the occupational standard survey
 - **Task:** to adapt the part of the survey that refers to the description of key jobs, knowledge, skills and competencies
2. Activities related to the implementation of the occupational standard survey
 - Selection of a sample of employers and employees
 - Principle:
 - Representativeness
 - Availability
 - Willingness to cooperate

Development of occupational standards



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- selection of the person who will fill out the survey on behalf of the employer
- total number of employers and employees
 - the number of interlocutors was moving from 8 to 20
- in the case that the occupational standard was being developed for completely new occupations, we took into account:
 - potential employers
 - employers from other sectors who employ complementary occupations
 - employers and employees from abroad

Development of occupational standards



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3. Systematization of information and data collected by survey on occupational standards
 - **Task:** to create lists of key jobs, knowledge and skills that will be included in the occupational standards proposal
4. Formalization of occupational standards
 - **Task:** to create a list of competencies, sets of competencies and key jobs with associated individual competencies for their performance

Development of occupational standards



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■ What we did?

- after we adjusted the surveys, we conducted an online survey with each selected employer and employee and based on their answers, we filled out the survey in excel format
- there were 8 to 20 surveys for each occupation
- for each occupational standard they provided a list of key tasks and associated competencies necessary to perform them
- we analyzed and synthesized the obtained results and at the end formed the list of competencies, sets of competencies and key jobs with associated individual competencies

Ustanova - Fakultet organizacije i informatike u Varaždinu, Sveučilište u Zagrebu

Mjesto Varaždin

Adresa Varaždin, Pavlinska 2

Web <http://www.foi.unizg.hr/>

E-mail ured-dekana@foi.hr

Vrsta ustanove Fakultet

Djelatnost Visoko obrazovanje

Standardi zanimanja (9)

- | | | |
|----|---|---|
| 1. | Arhitekt/ica informacijske sigurnosti i privatnosti
Sektor: Informacije i komunikacije
Predlagatelj: Fakultet organizacije i informatike u Varaždinu | Datum evidencije u Registar HKO: 21.3.2023
Datum do kada vrijedi: 1.5.2026 |
| 2. | Arhitekt/ica distribuiranih i/ili interaktivnih sustava
Sektor: Informacije i komunikacije
Predlagatelj: Fakultet organizacije i informatike u Varaždinu | Datum evidencije u Registar HKO: 21.3.2023
Datum do kada vrijedi: 1.5.2026 |
| 3. | Arhitekt/ica inteligentnih informacijskih sustava
Sektor: Informacije i komunikacije
Predlagatelj: Fakultet organizacije i informatike u Varaždinu | Datum evidencije u Registar HKO: 2.6.2023
Datum do kada vrijedi: 1.5.2026 |
| 4. | Arhitekt/ica transformacije poslovnih sustava
Sektor: Informacije i komunikacije
Predlagatelj: Fakultet organizacije i informatike u Varaždinu | Datum evidencije u Registar HKO: 21.3.2023
Datum do kada vrijedi: 1.5.2026 |

Development of qualification standards



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- the second step in the implementation of the project was the development of qualification standards
- four working groups for defining the qualification standards were formed
- based on sets of competencies from occupational standards we defined sets of learning outcomes
 - we tried to link competencies defined in the occupational standard with learning outcomes
- we agreed that each set of learning outcomes represents 2-4 ECTS generally and contains 4-6 individual learning outcomes

Development of qualification standards



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- for each learning outcome, as well as for the set of learning outcomes, it was necessary to specify the method of verification and the necessary material and human resources
- [example](#)

C. PRIJEDLOG SKUPA ISHODA UČENJA

The name of the proposed set of learning outcomes	Strategic planning and management in the field of digital transformations 7 - Razina 7
Prijedlog obujma skupa ishoda učenja	3 ECTS
List of learning outcomes	<ol style="list-style-type: none">1. Propose suitable criteria, methods and models for assessing the digital level capabilities and maturity of the given organization2. Evaluate the potential effects of changes in the business model in relation to strategy, mission, vision and organizational goals of the given organization3. Assess the resource gap in relation to transformation requirements.4. Propose a plan to improve the business model with technological innovations based on technological trends.5. Assess the elements of the organization's digital readiness in relation to transformation goals. <p>transformacijske ciljeve.</p>
Uvjeti za pristupanje stjecanju skupa ishoda učenja	Jednaki uvjetima za pristupanje stjecanju kvalifikacije.
Materijalni i kadrovski uvjeti potrebni za stjecanje/vrednovanje skupa ishoda učenja	<p>Opći materijalni i kadrovski uvjeti potrebni za stjecanje/vrednovanje skupa ishoda učenja sukladni su Zakonu o znanstvenoj djelatnosti i visokom obrazovanju, Zakonu o osiguravanju kvalitete u znanosti i visokom obrazovanju i Pravilniku o sadržaju dopusnice te uvjetima za izdavanje dopusnice za obavljanje djelatnosti visokog obrazovanja, izvođenje studijskog programa i reakreditaciju visokih učilišta.</p> <p>Specifični materijalni uvjeti potrebni za stjecanje/vrednovanje skupa ishoda učenja:</p> <ul style="list-style-type: none">• Prikladna učionica za održavanje predavanja, seminara i auditornih vježbi opremljena računalom s internetskom vezom, računalnim projektorom i pločom



<p>Procedure and example of evaluation of the set of learning outcomes</p>	<p>The predominant/dominant learning and teaching strategy is project-based learning and lecture classes, and the characteristic check is the result obtained according to specific methodology (steps over a certain period of time): making applications, design interface, the problem solution is evaluated according to predefined criteria (analytic rubric/achievement level and criteria), open and closed questions, multiple choice questions, solving tasks, a short essay review and there is a table with the correct answers.</p> <p>General example of checking:</p> <ul style="list-style-type: none"> • In a group of 2-3 students, it is necessary to create a proposal for a new information system and discuss and evaluate proposals with other teams. • Students should present a specific information system proposal.
<p>Naziv prijedloga skupa ishoda učenja</p>	<p>Razvoj strategije digitalne transformacije</p>
<p>Razina skupa ishoda učenja prema HKO-u</p>	<p>7 - Razina 7</p>
<p>Prijedlog obujma skupa ishoda učenja</p>	<p>2 ECTS</p>
<p>Popis ishoda učenja</p>	<p>1. Objasniti koncepte strategije digitalne transformacije.</p>

Prijedlozi standarda u postupku predlaganja i vrednovanja

Zahtjevi za upis standarda kvalifikacije

- | | | |
|------|---|--|
| 125. | Magistar informacijske sigurnosti i privatnosti
Razina HKO: 7.1.sv
EQF razina: 7
Znanstveno područje: Društvene znanosti
Predlagatelj: Fakultet organizacije i informatike u Varaždinu | Sektori: Informacije i komunikacije
Datum do: 1.3.2027
Klasa: cjelovita |
| 144. | Magistar/magistra distribuiranih i interaktivnih sustava
Razina HKO: 7.1.sv
EQF razina: 7
Znanstveno područje: Društvene znanosti
Predlagatelj: Fakultet organizacije i informatike u Varaždinu | Sektori: Informacije i komunikacije
Datum do: 1.3.2027
Klasa: cjelovita |
| 145. | Magistar/magistra podatkovnih tehnologija i umjetne inteligencije
Razina HKO: 7.1.sv
EQF razina: 7
Znanstveno područje: Društvene znanosti
Predlagatelj: Fakultet organizacije i informatike u Varaždinu | Sektori: Informacije i komunikacije
Datum do: 1.3.2027
Klasa: cjelovita |
| 146. | Magistar/magistra digitalne transformacije i inovacija
Razina HKO: 7.1.sv
EQF razina: 7
Znanstveno područje: Društvene znanosti
Predlagatelj: Fakultet organizacije i informatike u Varaždinu | Sektori: Informacije i komunikacije
Datum do: 1.3.2027
Klasa: cjelovita |

Development of educational programs (Study Programmes)



- the main goal of the project was to develop new study programs in the field of ICT that meet the needs for acquiring appropriate skills and competencies of ICT professionals in accordance with the requirements of the labor market and trends in technological progress
- the development of 4 new study programs was foreseen
- our Faculty decided to update and refresh its two modules of the graduate studies:
 - **Business Informatics (BI)**
 - Information Communication Systems → **Intelligent and interactive systems (IIS)**

LIST OF MODULES/COURSES

Semester: I.

MODULE	COURSE	COURSE INSTRUCTOR	L	E	S	ECTS	STATUS
IIS	Applied Multivariate Data Analysis for Computer Scientists	Prof. Maja Matetić, PhD	30	30	0	6	C
IIS	Data Mining	Prof. M. Matetić, PhD / Assoc. prof. M. Brkić Bakarić, PhD	30	30	0	6	C
IIS	Big Data Infrastructure	Assist. Prof. Vedran Miletić, PhD	30	30	0	6	C
IIS	Programming for Artificial Intelligence	Prof. Ana Meštrović, PhD	30	30	0	6	C
IIS	Elective course (from the BI module /common electives/common electives at UNIRI/programme-related micro-qualifications)					6	E
BI	Electronic Commerce and Digital Innovations	Assist. Prof. Danijela Jakšić, PhD	30	30	0	6	C
BI	Non-relational and Distributed Databases	Full Prof. Patrizia Pošćić, PhD	30	30	0	6	C
BI	Information Security and Blockchain Technologies	Assoc. Prof. Božidar Kovačić, PhD	30	30	0	6	C
BI	Quantitative Methods for Business Decision Making	Assist. Prof. Martina Holenko Dlab, PhD	30	30	0	6	C
BI	Elective course (from the IIS module /common electives/common electives at UNIRI/programme-related micro-qualifications)					6	E
Common elective courses:							
IIS/BI	Complex Networks Analysis	Prof. Ana Meštrović, PhD	30	30	0	6	E
IIS/BI	E-learning for Education and Business	Prof. N. Hoić-Božić, PhD	30	30	0	6	E
IIS/BI	Distributed Processing in Heterogeneous Systems	Assoc. Prof. Božidar Kovačić, PhD	30	30	0	6	E



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Semester: II							
IIS	Machine and Deep Learning	Assoc. Prof. Marina Ivašić-Kos, PhD	30	30	0	6	C
IIS	Big Data Analytics	Prof. Sanda Martinčić-Ipšić, PhD	30	30	0	6	C
IIS	Knowledge Representation and Reasoning	Prof. Ana Meštrović, PhD	30	30	0	6	C
IIS	Elective course (from the BI module or common electives)		2	2	0	6	E
IIS	Elective course (from the BI module /common electives/common electives at UNIRI/programme-related micro-qualifications)					6	E
BI	Software Engineering	Assoc. Prof. Sanja Čandrić, PhD	30	30	0	6	C
BI	Digital Marketing	Assist. Prof. Danijela Jakšić, PhD	30	30	0	6	C
BI	Managing Digital Transformation	Full Prof. Patrizia Pošćić, PhD	30	30	0	6	C
BI	Elective course (from the IIS module or common electives)		2	2	0	6	E
BI	Elective course (from the IIS module /common electives/common electives at UNIRI/programme-related micro-qualifications)					6	E
Common elective courses:							
IIS/BI	3D Computer Modelling	Assist. Prof. Martina Holenko Dlab, PhD	30	30	0	6	E
IIS/BI	Development of 3D games	Assist. Prof. M. Pobar, PhD	30	30	0	6	E
IIS/BI	Interaction Design	Assoc. Prof. Sanja Čandrić, PhD	30	30	0	6	E
IIS/BI	Computer Forensics	Assist. Prof. Vanja Slavuj, PhD	30	30	0	6	E
IIS/BI	Analysis of Sensor Data	Prof. Maja Matetić, PhD	30	30	0	6	E



Semester: III							
IIS	Intelligent Information Systems	Prof. Sanda Martinčić-Ipšić, PhD/Assist. Prof. M. Pobar, PhD	30	30	0	6	C
IIS	Soft Computing	Assoc. Prof. Marina Ivašić-Kos, PhD	30	30	0	6	C
IIS	Elective course (from the BI module or common electives)					18	E
BI	Business Communication and Communication Technologies	Full Prof. Patrizia Pošćić, PhD	30	30	0	6	C
BI	Information Systems Strategic Planning	Assoc. Prof. Sanja Čandrić, PhD	30	30	0	6	C
BI	Predictive Analytics	Prof. Sanda Martinčić-Ipšić, PhD	30	30	0	6	C
BI	Elective course (from the IIS module or common)					12	E

Common elective courses:

IIS/BI	Virtual and Augmented Reality	Prof. N. Hoić-Božić, PhD	30	30	0	6	E
IIS/BI	Interactive Web Technologies	Assist. Prof. Lucia Načinović Prskalo, PhD	30	30	0	6	E
IIS/BI	Applied Learning Analytics	Assoc. Prof. Božidar Kovačić, PhD / Assist. Prof. Vanja Slavuj, PhD	30	30	0	6	E
IIS/BI	Business Simulation	Assoc. prof. M. Brkić Bakarić, PhD	30	30	0	6	E
IIS/BI	Computer Vision	Assoc. Prof. Marina Ivašić-Kos, PhD	30	30	0	6	E
IIS/BI	Natural Language Processing Methods	Prof. Sanda Martinčić-Ipšić, PhD	30	30	0	6	E
IIS/BI	Man Machine Communication	Prof. Ivo Ipšić, PhD	30	30	0	6	E

Semester: IV

IIS/BI	Internship	Prof. N. Hoić-Božić, PhD				6	C
IIS/BI	Graduation Thesis					24	C



Instead of a conclusion - the next steps



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- this type of project has proven to be very useful
- this was the second project we have been doing in partnership with Faculty of Organization and Informatics
- new programs are implemented in 2022/2023
 - we held only the first year (first two semesters)
- student feedback is positive so far
- a survey will be conducted when the first generation of students completes their graduate studies (in the academic year 2023/2024)



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Thank you for your attention!

