Competence Model for the First Cycle (Bachelor's) Degree in Information Technologies at Vilnius University

Introduction & Theoretical Competence Model

Erasmus+
vetmeduni vienna
CARL VON OSSIETZKY universität OLDENBURG
University of Ljubljana
1869 USAMV
VILNIAUS UNIVERSITETAS 1579
universität wien
WU Wirtschaftsuniversität Wien Vienna University of Economics and Business
ENQA European Association for Quality Assurance in Higher Education
EAEVE
AQ Agentur für Qualitätssicherung und Akkreditierung Austria

Background

In this document, you will find an example of good practice for a competence model for a bachelor's degree in Information Technologies developed at the Vilnius University Faculty of Mathematics and Informatics. In contrast to the other examples of good practice, this model was initially developed as part of the national project "European Credit Transfer and Accumulation System (ECTS): Credits and learning outcomes"(VP1-2.2-SMM-08-V-01-001) from 2010-2012. This national project provided a training course on designing programmes and learning outcomes. The goal of the training course was to empower representatives of different stakeholder groups within the degree programmes in Information Technologies to contribute to identifying learning outcomes. Students, faculty members, administrative staff, and decision makers all took part in the training course. Together, they developed the competence model presented here during the course of the project.

After this national project, Vilnius University was invited to participate in the international project 'Internal Quality Management: Evaluating and Improving Competence Based Higher Education'. Even though the Erasmus Partnership project further updated the theoretical framework for developing a competence model, Vilnius University decided to stick with the competence model developed during the national project. This decision was necessary for monitoring purposes. It is the intention of Vilnius University to monitor the implementation of learning outcomes in the curriculum by performing an annual screening. Maintaining the same competence model ensures the comparability of the screening results and hence allows students' competences to be tracked over the years.

Possible changes to the competence model will be discussed in 2020 after the curriculum has been fully implemented.

Below, we present the current version of the competence model.

Competence Model for the Programme Information Technologies Developed by Vilnius University

This competence model is based on the national assessment and accreditation of programmes in the field of information technologies as well as on the Vilnius University's education policy.

The competences were grouped into two competence areas, namely

- Generic competences (6 competences) and 6 extended learning outcomes
- Subject-specific competences (6 competences) and 6 extended learning outcomes

The competence levels were defined for students in their 5th and 7th semesters. 5th semester students are at the middle of their studies, are organized in groups and hence can easily take part in the competence screening. This group of students was chosen so that measures can be initiated to overcome possible shortcomings before the end of their studies. The 7th semester students are at the end of their studies and are conducting specialized work on a concrete project.

The formulation of competence levels follows the European Qualification Framework but was adapted for the project's needs. This formulation of competence levels works well for Vilnius University. However, we do not recommend using it in other contexts as the purpose of the European Qualification Framework is to be able to compare national education systems. The purpose of the competence screening is to find out the strengths and weaknesses of a single study programme. The competence levels we used are displayed at the end of this section.

Below, we present the theoretical competence model. The competence model was developed in English, as this language is used for the external assessment of the degree programme. At the end of this document, we provide guiding questions for revising the competence model.

Competence Model				
Competence Area	**Competence**	**Aspect**	**Competence Level**	
			5th semester	**7th semester**
Generic competences	**1.** Ability to use existing theoretical models, terminology, recommended programming, modelling and system administration principles and tools in applied sciences and everyday life	**Cognitive**	3	3
		Practical	3	3
	2. Ability to communicate one's own subject area and work specifics in Lithuanian and English to any professional or non-professional	**Cognitive**	3	3
		Practical	3	3
	3. Ability to sum up and systematize received/provided requirements or the process for solving the task/work	**Cognitive**	3	3
		Practical	4	4
	4. Ability to define a problem in an application area and apply the existing solution	**Cognitive**	3	4
		Practical	4	5
	5. Ability to identify pros and cons of software according to the properties of user's interface, support, installation, compatibility with other software; knowledge about the components of hardware (computer and network)	**Cognitive**	3	3
		Practical	4	4
	6. Ability to plan individual or group activities and ability to distribute tasks among group members based on task difficulty or according to expert recommendations or comments	**Cognitive**	3	4
		Practical	3	3

Competence Area	Competence	Aspect	Competence Level	
			5th semester	7th semester
Subject-specific (IT) competences	**1.** Ability to write programs in the application area using programming languages from various programming paradigms (imperative, object-oriented, functional)	**Cognitive**	4	3
		Practical	4	4
	2. Ability to generalize the software interface, dependency on other software or hardware and provide specifics on integration	**Cognitive**	4	3
		Practical	4	4
	3. Ability to present the algorithm for a given task or program using various techniques (pseudo-code, schema, etc.); ability to implement others' algorithms; ability to formulate tasks at different levels of abstraction	**Cognitive**	3	3
		Practical	3	3
	4. Ability to write software (service) specifications and user manuals	**Cognitive**	4	4
		Practical	4	4
	5. Ability to define the testing environment and its requirements for projects in the application area, create testing scenarios and partially automate testing	**Cognitive**	4	3
		Practical	4	4
	6. Ability to apply project management standards to the project work	**Cognitive**	3	3
		Practical	3	3
	7. Ability to apply traditional data structures and modelling methods in the application area	**Cognitive**	3	4
		Practical	3	3

Competence levels	
Knowledge (Cognitive aspect)	**Level**
(Almost) no knowledge	0
Basic general knowledge	1
Basic factual knowledge in a field of study on a low level	2
Basic factual knowledge in a field of study on a high level	3
Detailed factual knowledge and knowledge of principles, methods and general terminology in a field of study on a low level	4
Detailed factual knowledge and knowledge of principles, methods and general terminology in a field of study on a high level	5
Skills (Practical aspect)	**Level**
No skills	0
Basic practical skills to carry out easy tasks	1
Basic practical skills to carry out more complex routine tasks and solve routine problems using simple rules and methods – on a low level	2
Basic practical skills to carry out more complex routine tasks and solve routine problems using simple rules and methods – on a high level	3
Advanced practical skills to carry out very complex routine tasks and solve problems more complex than routine problems using appropriate methods, material and information – on a low level	4
Advanced practical skills to carry out very complex routine tasks and solve problems more complex than routine problems using appropriate methods, material and information – on a high level	5

Guiding questions for revising the competence model

If the IQM Team at Vilnius University's IT programme decides to revise the competence model, the following questions can be discussed:

- Can the degree programme competences be grouped into sub-areas?
- Suggestion: Make sub-areas within each competence area and describe them in terms of learning outcomes that meet Vilnius University's educational policy. Each competence should be developed at the modular (or single-subject) level and described in the context of a particular module. Advantage of operationalization of competences into learning outcomes: They are easier to measure and you can create more specific quality measures. The disadvantage is that you need to have a very long competence screening questionnaire.
- Do we want to stick with the current formulation of competence levels?
    - If not: Check whether the levels provided in the CSQ-HE are appropriate for this study programme.
- Are the intended levels still appropriate or is adaptation needed?
- Do we want to stick with the two groups of 5th and 7th semester?
- Are the competences formulated in a domain-specific way?
  One example from the area of subject-specific (IT) competences:
    - 'Ability to apply project management standards to the project work' does not refer to the IT domain/context.
    - Suggestion: Do not include the domain/context in each competence but clarify the context in an introduction paragraph to the competence model. E.g.: 'The following competences are formulated for the context of information technologies'.
- Did we address the domain or context we really want to?
  One example from the area of generic competences:
    - 'Ability to communicate one's own subject area and work specifics in Lithuanian and English to any professional or non-professional'.

- Does every competence include both the cognitive AND the practical aspect?
  Two examples from the area of subject-specific (IT) competences:
  - 'Ability to generalize the software interface, dependency on other software or hardware' seems to address the cognitive aspect, not really the practical aspect.
  - 'Ability to provide specifics on integration' seems to address the practical aspect, not really the cognitive aspect.
- Do we want to stick with the wording 'cognitive aspect' and 'practical aspect' or do we want to use 'knowledge' and 'skills' instead?
- Check whether the formulation of competences is consistent.
  - We recommend describing the task/content and adding a verb, e.g.
    - Presenting the algorithm
    - Defining testing environment
    - Writing software (service) specifications.
  - Check whether the revised formulations still address both the cognitive and the practical aspects.

This competence model was developed during the course of the project

'Internal Quality Management: Evaluating and Improving Competence-Based Higher Education.'

The project was co-funded by the Erasmus+ Programme of the European Union.

Further information on the project is available on the Erasmus+ platform for project results:

- Go to http://ec.europa.eu/programmes/erasmus-plus/projects.
- Enter the project title 'Internal Quality Management: Evaluating and Improving Competence-Based Higher Education' in the search bar to get to the project homepage.