Integrated Information System for Higher Education Qualifications

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In the present article we aim to study thoroughly and detail aspects related to architectures specific for e-learning and management of human resources training interconnected to management of qualifications. In addition, we take into consideration combining e-learning architectures with software in an e-learning system interconnected with the National Registry of Qualifications of Higher Education, in view of developing and information system that correlates educational supply from higher education from Romania with labor market demands through qualifications. The scientific endeavor consists of original architectural solutions to integrate data, systems, processes, services from various sources and to use them in the proposed system. The practical result of the scientific endeavor is represented by design of architectures required for developing an e-learning system interconnected with the National Registry of Qualifications from Romania, which involve in first stage the qualifications provided by higher education. The proposed innovative solution consists in the fact that the proposed information system combines the advantages of content management system (CMS) with learning content management system (LCMS) and with reusable learning objects (RLO). Thus, the architecture proposed in the research ensures the integration of a content management system with a portal for information, guidance and support in making a professional project. The integration enables correlation of competences with content areas and specific items from various teaching subjects, thus evaluating the usefulness for this registry from learning/educational perspective. Using the proposed information system in enables correlation among qualifications, content of educational program and continuous self-evaluation opportunities, which facilitate monitoring of progress and adjustment of learning content.

Keywords: *Qualifications Integrated Information System, Learning Content Management System, Reusable Learning Objects*

1 Introduction

In the framework of information and knowledge society development, taking into account the significant differences between the population aged 24-64 years that takes part in education and training at european level and in Romania, we consider of great interest to study aspects related to lifelong learning, as it involves investment in people and knowledge, and among the abilities to be gained are also the digital ones, moreover, the learning processes can be undertaken by using innovative, more flexible forms of learning. The interest in lifelong learning is also justified by the labor market, given that training is one of the measures mostly used for reintegrating people on the labor market, both at European level and in Romania.

The strategy for human resource development can be divided into two dimensions: the European one and national one.

2 The information system

In 2000, in the European Union the Member States were launching the Lisbon strategy, with the explicit purpose to revive community policies. The main objective of

the Lisbon strategy, that to transform the European Union in the most competitive and dynamic economy of the world by 2010, was reformulated in 2005, after the medium-term evaluation of the strategy. The objective of the revised Lisbon strategy aims to transform the European Union in a more attractive space for investments and labor, to promote knowledge and innovation and to create higher number of jobs and better ones. For the financial programming duration of 2007 – 2013, Member States had to allocate specific amounts from structural funds due to be received for funding projects related to fulfilling the Lisbon Strategy objectives.

In order to implement the strategy objectives, Romania can count on financial resources of 3.47 billion euro from the European Social Fund, through the Sector Operational Program Human Resource Development 2007 – 2013.

Another important document at national level is „The integrated strategy for human resource development from the perspective of lifelong learning" 2009-2020 (SIDRU). With regard to education and training, the programmatic document mentions that „in the Romanian society there is large recognition of the fact that education represents the strategic factor in the future development of the country due to its essential contribution to multidimensional and predictive modeling of human capital".

Promoting the principle of continuous education through lifelong learning represents for Romania a priority direction for action, given that it lags behind in participation to various forms of qualification, requalification or continuous improvements of competences.

Monitoring the European process to reform the management of higher education institutions through initiatives and actions to comply with Bologna process emphasizes the fact that the issue of creating national frameworks of

qualifications in higher education can not be separated from increasing effectiveness in ensuring quality, measured among other things by the employability of graduates.

Focusing the quality in higher education on the results of learning, respectively on the employability ensured by higher education qualifications obtained on completion of a graduate program deepens the internal quality assurance process in European universities. In the new culture of quality, the effort to gather the input factors required to conduct a study program (accreditation stage) is completed with the concern for quantitative and qualitative results of teaching-learning and with the performance of qualifications awarded upon completion of a study program.

In the triennial report on progress achieved in ensuring quality in higher education, the European Commission highlights that in order to implement the Lisbon Strategy, universities were invited to modernize the curricula of study programs, to adjust them to labor market requirements, in the wider framework of a more dynamic university management.[2] In this document from September 2009, the European Commission claims that quality assurance standards should cover priorities of contemporary higher education, such as graduate employability, quality of services made available to students, in general, the quality of student and graduate advisors for career choice and / or jobs, in particular.[1]

The institutions involved in developing national frameworks in qualifications deal with two reference documents at European level – the European Qualifications Framework (EQF) and the European Qualifications Framework for Higher Education (EQFHE) – that, although have the same goal, they use different concepts

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[1]   Ibidem, p. 10. International student mobility, increasing institutional capacity in financial management and in implementing the European Charter of Scientific Research and the Code of Conduct for Researcher Recruitment are other priority objectives of European universities that should be properly expressed by reformulating / reviewing internal evaluation quality standards.

and own terminology. Morever, although they were developed in parallel, documents do not clearly relate, they do no set the way to integrate the European Qualifications Framework for Higher Education within the European Qualifications Framework from the perspective of lifelong learning.

This diversity approached at European level generated in most countries, legislative initiatives disjoint, often to two or more national authorities dealing in parallel with the issue of forming and managing transparent tools of the national qualifications system, yet without any effective dialogue to create a common language and a single methodological framework.

From an analytical perspective, the concerns from national level have several common elements from the perspective of compatibility / convergence of measures, despite several elements and practices that rather reflect diversity / divergence.

The compatibility / convergence can be observed by the following aspects from managing the requirements of the European Qualifications Framework at national level from the perspective of lifelong learning and the recommendations for implementing the European Qualifications Framework for Higher Education at national level:

- To strengthen social cohesion and social inclusion, by employability and active citizenship of people holding qualifications;
- To answer better to requests of knowledge society and the modern information framework, by promoting lifelong learning;
- To increase contacts and make more efficient the dialogue between supply and demand of qualifications at all levels and of all degrees.

Measures are necessary at European and national level, which should:

- Clarify the report between the two dialogue tools between trainers and employers, starting with the eight levels of qualifications accepted by consensus at European level;
- Unify the language to describe the results of learning (descriptors of qualifications) for all levels of qualification.

The analysis of the contents of lifelong learning needs brings out a tendency of increasing inequalities among graduates and post-graduates. Those holding a better position on the labor market have the tendency to further develop their knowledge, abilities and competences and to diversify the opportunities to affirm in society. This tendency exists both as intent and as behavior towards lifelong learning.

Employers have attitudes of encouragement towards lifelong learning activities. Most of them consider that graduates manifest predispositions to learning on the job. Companies are perceived by a quarter of the employers as holding a main role in training of graduates for on-the-job requirements; half of the employers organize different training forms for their employees. Yet, although there is a strong market for lifelong learning / training services universities are almost absent from this market as suppliers of lifelong learning.

The target for training offers for lifelong learning could be initially for small companies, employers from the public sector and private companies with Romanian capital, as for these categories of enterprises, own training services are weaker represented than in the consultancy.

The architecture needed to evaluate RNCIS proposed within this article consists in integrating RNCIS with a content management system and an information, orientation and support portal for undertaking a professional project. Integration enables correlation of competences with content areas and specific items for subjects, thus evaluating the

usefulness of the registry from learning   perspective.
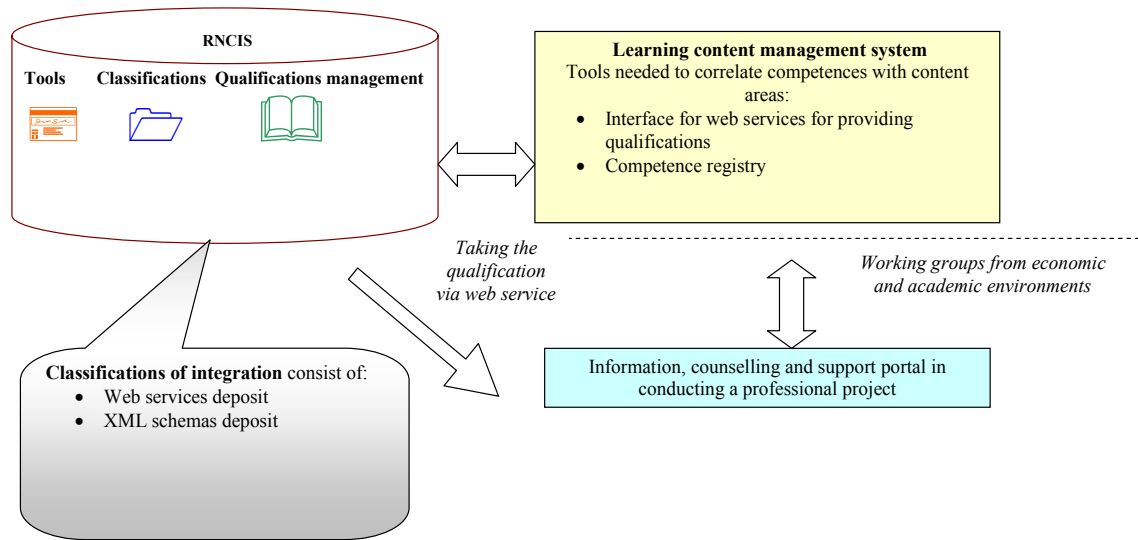
Figure 1. Proposed architecture

The proposed architecture, shown in figure 1, emphasizes the need for classifications for integration that consist of web services and XML schemas required to correlate competences with learning objects from within the learning content management system.

Each component of the learning content management system is considered as a relatively independent part that presents a strict definition of resources, results, relations and affiliations with main system modules. The system consists of several modules integrated at data and application levels. The principle of division of the system into modules comes from identifying basic activities of e-learning. This means especially creating content, allocating competences on content items, distributing them to students and course management, which include for example student, tutor, course management, testing, evaluating and other activities needed for undertaking e-learning courses. For these reasons, we consider that the following modules are absolutely necessary:

▪ Authors module − part of the system that provides tools for content preparations and storage in the system. Partial modules are: on-line editor, multimedia objects library and the submodule for defining relations among different fragments of courses.

▪ Distribution module − part of the system that distributes content of different courses tp authorized users with the assistance of different types of portals. The most important types of portal are the student portal and the tutor portal.

▪ Administration module − a collection of sub modules that ensure functions included usually in LMS. A very important module is that to manage users' rights, which enables management of system users' activities in an effective way. Many data included in this module are taken from the university management system and for this reason many usual management applications are not implemented.

▪ Communication and cooperation module − this group of applications create the virtual learning environment. This translates in asynchronous and synchronous communication tools, applications

for assignments and help tools (calendars or student notes).

▪Testing module − a set of sub modules for preparing test questions, tests, test statistics, test archives and other functions related to testing / evaluation.

The author module consists of the following:

o Guide to course preparations – basic segment of the author module meant for creating courses using sets of templates. The module outputs are course sections taking the form of XML fragments.

o Course management −

application to create relationships among course items and defining their dependencies and order.

o Importing courses and learning objects − importing courses or course fragments from other e-learning systems and tools for authors.

o Export of courses − application for exporting courses in several output options (XHTML, PDF, RTF etc.) by using XSLT/FO styles.

o Creating styles of results − defining styles of course results. The application should be accessible also to students.
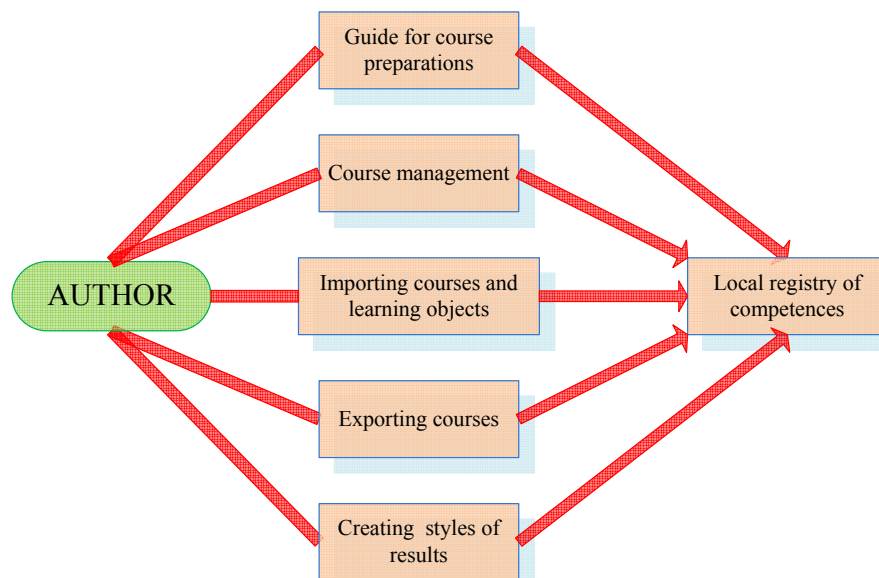
Figure 2. Author module

In figure 2, one may observe the way in which XML fragments of courses will be added from the local registry associated with content items in the form of specific XML files.

The distribution module contains the following:

o Generating courses − performed from the XML source, through sequences of learning objects and through checking roles and requirements for working

with each individual course section.

o Going through the course − supervising student activities during courses and their evaluation.

o Course map − creating a map of lessons and other course components. This implies developing a hierarchical tree of course components.

o Course statistics − statistical reports on the way the course is

used, the time spent for study, tool usage rate etc.

The communication and cooperation module contains:

- o Assignments and tasks − managing tasks during courses.
- o Student teams − creating student teams for solving tasks in teams.
- o FAQ –frequently asked questions.
- o Information sources − external sources of information needed to better understand the issues raised into discussion.
- o Glossary, examples, notes, calendar, news − applications for supporting course study.
- o E-mail, chat, group discussions, electronic blackboard − synchronous and asynchronous tools for communicating and exchanging information among students and tutors.

The module for testing and evaluation contains:

- o Examination − preparations and management of self-testing and testing in view of course completion, with printing option.
- o Managing test questions − preparing databases with test questions and their import into other systems.
- o Random generation of tests − the tests and correction grids are generated automatically.

- o Test archiving − libraries with test conducted and management of student access to various tests.
- o Test analysis − tools for statistical evaluation of test results, measuring credibility of tests, correlating results, graphical presentation of the analysis.

During the research conducted, we considered necessary to develop this module to correlate competences with content areas. In this sense, one may observe in the architecture proposed and developed, that there is link between the local registry of competences and the process for preparing and conducting the evaluation process.

Management module focuses on:

- o Managing user roles − granting rights, granting the users with the possibility to manage activities.
- o Library styles − archive of styles for determining the visual aspect of courses.
- o Course evaluation − evaluation of course quality. The results are important for comparing and controlling teaching aspects of the course.

The system needs to be integrated at presentation level with the university information system already used by all the people from the university. Users are used to this and their use should not be problematic. Access to applications is done on the principle of sets of portals. All logical modules of the system contain a portal of their own, with links to inferior sides and create a hierarchical structure. (figure 3).
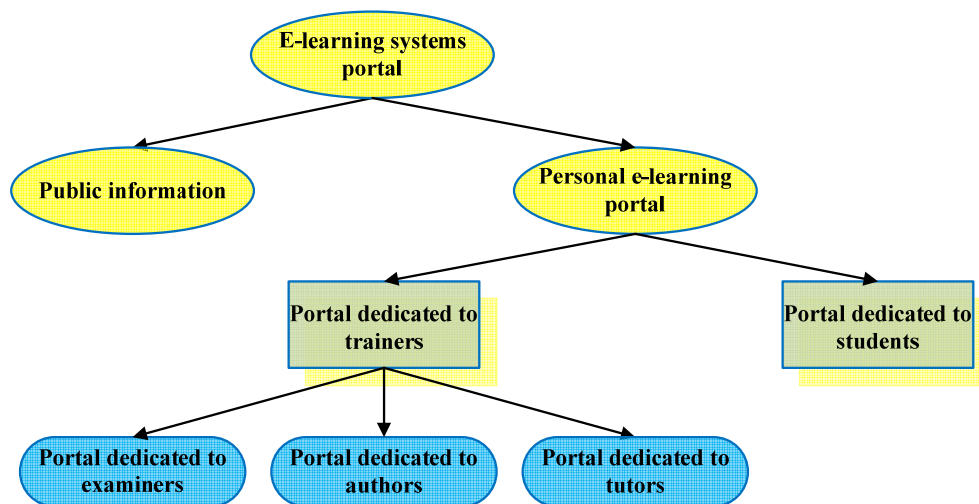
Figure 3. Systems interface

The module represents an interface to describe competences in the learning content management system and evaluation of student activities in relationship with associated competences. This module enables the following operations within the learning content management system:

- Data import in RNCIS,
- Declaring activities related to developing competences,
- Proposing activities associated to competence evaluation.

The content management service issues a request for providing specific content from the deposit. The content sequentialisation service makes a selection based on competences desired to be acquired. The selection is based on the list of correlation among content items and competences provided by the specific services. The content management service issues a request to launch the provision service, which makes available the specific content of the system to the navigator.

The student progress tracking service is provided with data from the navigator, the list of competences, the minimal standards and the level of achievements. The information gathered are made available to the service for providing student profile in order to provide a better

image both to the student and to the one wishing to develop the student's necessary competences. In addition, this service provides information needed with regard to the way of choosing the testing of competences with taking into account the minimal standards that need to be met.

Based on the service for providing the student profile, the individual receives access to different areas of content that define the qualification which are made available through the course management service.

From the figure, one may notice that the service for providing competences and correlating content items play an essential role in the proposed solution. The competences, the list of correlations and the minimal standards represent the essential elements required for testing, choosing content and tracking progress achieved.

Attention is focused on maintaining the modularity of the system. With this requirement fulfilled, the processes of innovation and further development of the system are much easier. All the modules are implemented in basic version with basic functionalities and are developed in time, based on user suggestions. This approach to problem-solving is rather difficult, given the need for flexible reactions from the development team, based on user suggestions and requests, yet caution is also

necessary, in the framework of dynamic expansion of the entire system. The main features of development are as follows:

- Increasing expansion of system;
- Repeated improvements in the functional versions of the application;
- brainstorming analysis;
- continuous communication among developers and users;
- small development team;
- joint use of program coding;
- the re-use;
- taking information while running the program.

The learning content management system makes a request to RNCIS through a web service, receiving as reply an XML file that contains the description of the qualification. The need for two modules to be integrated in the learning content management system comes out – one for interface of web services and one for making a local registry of competences correlated with learning content items on the basis of the XML file provided by RNCIS and of internal correlations of the proposed module.

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