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VERSATILE TOOL FOR COMPETENCE MANAGEMENT

An e-Portfolio Management System for Higher Education in Applied Sciences

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Abstract: In the line of outcome based education and transferability of credits, we study a Higher Education case and propose an e-Portfolio solution as a versatile tool for assessment tasks. The solution tackles the problems firstly, of accreditation of prior achievements from both institutional and experiential learning. Secondly, the developed tool carries the process of learning outcome definitions management (derived from the real employment world), and the learner self-assessment and self-reflection as well as the guidance and support for these. The e-Portfolio management system, *ePofo*, supports the identification, assessment, recognition and accreditation of prior learning achievements and learning outcomes. Additionally, it is a tool to present the sectoral qualification requirements to the students, to derive learning needs and define the learning outcomes, thereby structuring the teaching. It also provides support for the learner's own management of achievements and competences, and finally for presenting the profile to potential employers.

1 INTRODUCTION

The change towards the European Union Bologna agreement requires attention not only on the philosophies but also on practices and tools to be used to enable the Higher Education Institutions (HEIs) to attain the centric Bologna goals. The competences acquired and striven for should be captured in such information systems that support the teachers in their task to appraise achievements attained in both the formal education setting and prior to enrolment to a HEI.

The importance of accrediting prior learning achievements is growing in higher education, following the strategies in the European Parliament and the Council of the European Union on the European Qualifications Framework (EQF). (European Commission 2005; 2006; European

Parliament Council, 2008), as well as the life-long learning principle.

This paper reports an effort to develop supporting system and electronic tool with the help of which students could self-assess their prior learning through reflecting their achievements required against the competences as described in curriculum. A solution, *ePofo*, an e-portfolio management system (ePMS, Ravet, 2007), is aimed for both teachers and learners. The system supports the student both in the studies and in the pursuit of employment career. S/he may have gained his/her competence either in formal education or in informal settings as work practice or on-the-job training. The developments of the ePofo described here is related to wider development of the recognition and accreditation of prior learning (APL) system for the higher education sector at JAMK University of Applied Sciences during the last decade (JAMK, 2011).

The paper is structured as follows: In the next section (Section 2), firstly (2.1) a brief account is given on the *competence based education* and its consequences at the HEIs Secondly (2.2 and 2.3), as further background, some discussion of the meaning of *assessment and judgment* in HEI, *Portfolio and e-portfolio* are defined. In Section 3, the study method is discussed, and Section 4 accounts the experiences with the tool this far. In Section 5, we discuss the implementation Section 6 concludes with remarks to further research opened by this initial work.

2 BACKGROUND

2.1 Competence driven education

The European Qualifications Framework (EQF, European Commission 2006) outlines the underlying principles and benchmarks the criteria for educational judgment. In EQF, educational achievements are described in terms of knowledge (factual and theoretical), skills (cognitive and practical deployment of knowledge) and competence (including responsibility and authority).

The achievement of these is valued with criteria for seven distinct achievement levels (European Commission, 2006). The concept of *competence*, translated in an institutional education context to '*learning outcome*' (European Parliament Council, 2008; Simon et al., 2011), is a point of focus and drives the planning and development of ICT based tools and systems to support educational activities. The learning outcome based education means a shift from teaching and curriculum centred paradigms to learner focus emphasizing achievement (Burke, 1995, p. vii). These targets are equally striven for in the European Commission guidelines.

Following the Bologna process outline, there are two-fold targets the HEIs aim at when developing the approaches towards *competence and learning outcome based education*. It is changing, firstly, the administrative attention to the educational offering. The definition and appraisal of the relevant knowledge, skills, and broader competence constitute the targeted and acknowledged achievements. Achievements accredited by HEIs in many fields mean official qualifications to professions (European Parliament Council, 2008). Thus, the governments delegate the judgment of a person's qualification for a profession to the HEIs as in the EQF definition of *qualification*: "*a competent body determines that an individual has achieved learning outcomes to given standards*".

Secondly, both structuring the teaching arrangements, e.g. to units (curricula, modules, courses), and the appraisal of the achievement of the learning outcomes are aligned along the competences targeted at. As stated in the EQF documentation, professional bodies in the respective fields shall provide this information. European Parliament Council (2008) EQF definition for "international sectoral organisation" is "association of national organisations, including, for example, employer and professional bodies".

2.2 Assessment of competences achieved

Concerning *recognition and accreditation of competence achieved* there are different concepts used that may take slightly different stand: *Learning, APL* (Burke 1995, p. 4), for assessing and validating result of learning prior to enrolment to an institutional program. To this, concept of APEL adds 'experiential' for learning in non-formal (e.g. work practice) context. Canadians use the concept *Prior Learning Assessment and Recognition*, PLAR, (Conrad, 2008) which combines learning results from both formal (education) and non-formal (practice) context for appraisal and validation process.

Prior learning achievements in the case of HE may come either through former institutional education, professional development (PD, e.g. courses by commercial education and training providers, staff training on-the-job), or through work practice. Appraising PD outcome as part of institutionally accredited qualification is in line with the lifelong learning idea.

Be it prior learning, or learning during education, assessment is the key to establishment of achieved learning outcomes and thus qualifications. Joughin (2009) derives from an extensive review of literature a definition of assessment that is well suited to both cases:

"To assess is to make judgments about students' work, inferring from this what they have the capacity to do in the assessed domain, and thus what they know, value, or are capable of doing."

European Commission (2005) defines validation as the process of assessing and recognising a wide range of knowledge, know-how, skills and competences, which people develop throughout their lives, for example through education, work and leisure activities. The learner gets assistance in developing their judgment (Joughin, 2009) of their own expertise, profile, and development needs. The profile of a student enrolling to a curriculum or

syllabus should be established for achievements required in the target profile that s/he might already have covered previously. The teacher has a tool for judging prior achievements with qualification profiles from authoritative professional bodies that help to sustain assessment criteria consistent in the appraisal of the achievements.

2.3 Assessment Tools & Case JAMK

As Joughin (2009) points out, assessment is a task for both teachers and students, and further, there are quite negative connotations with assessment in education. Assessment is, however, core of the HEI function: the responsibility of establishment of professional qualifications often lies with HEIs. Joughin's review of assessment studies shows that the student approach to learning can be influenced by the assessment towards a deeper (more reflective) learning. Through electronic tools, the assessment function can, also be enhanced to encompass self and peer assessment, motivation and professional profile building, to support the modes of assessment that pursue deeper learning goals.

HEI information systems retain information specific to each learner, so that his/her personal learning plans can be followed through over the study career. HEI learning management systems should therefore follow all legal requirements for the storage and processing of learner specific information. Using an electronic tool enables an assessment and APL process transparent to the student.

Portfolios have been in the focus of educational developments over the past decades (Kankaanranta et al., 2007; Barrett, 2001; Grant, 2008). A *portfolio* means a collection of pieces of work of an individual (professional), from which sets of samples can be presented as proof of the competence of the individual. With portfolios, diverse educational goals can be pursued: assessment in its various forms as the general summative, in some cases also formative, or peer assessment. Further, the portfolio augments the assessment processes with self-reflection and self-assessment and a learner profile construction for developing judgment (Joughin 2009, Barrett 2001) that is also according to the EQF a part of professional competence.

Learning judgment is a part of qualifications granted at HEIs, essential in expert or leadership roles. Cumulating work achievements, and the task to select and sample work achievements for establishment of qualifications, lead to reflection and insights into one's own capabilities. With a portfolio, the students can enquire their own strengths and weaknesses. An electronic portfolio enables with pre-established qualification profiles

from the labour market sector bodies a gap analysis process (comparison of target qualification to one's own profile) guiding to select the learning opportunities to cover the achievements still needed for the target.

At the JAMK University of Applied Sciences, the creation of the electronic portfolio solution started with developing APL procedures in HEI. The main objective of the first two projects coordinated by Teacher Education College in 2004-2007 called Taituri (Niskanen et al., 2006) and AAKE (Laitinen et al., 2007) was to develop theoretical background and pedagogical grounds for APL in universities of applied sciences. This development was followed in 2008-2010 with a line of three smaller projects called @mk-Tieturi, Anturi and Säihke (Niskanen and Virtanen, 2008) especially focusing on development of methods for identification, assessment, recognition, and accreditation of prior learning. These methods yet included development of theoretical principles and practical guidelines, but also ICT tools such as web-based e-Portfolio management system, self-evaluation questionnaires, and skill tests. The @mk-Tieturi project was a kind of a feasibility study phase. During that phase, existing e-Portfolio management systems were examined such as FSU Career Portfolio. (Lumsden, 2011). Promising open source tools or systems were found, such as Mahara (<http://mahara.org/>) and Elgg (<http://elgg.org/>), none of them, however, met all the requirements. The challenge is to choose from many alternatives the best combination and integrate them. Additionally, visualizing the connections between competencies and courses is important: it helps to understand the structure of the curriculum and helps to find potential omissions or inconsistencies. Later on, the development of e-Portfolio has been continued in the project called KORSI (Peltola, 2011).

3 METHOD (DSRM)

Design Science is recognized as the mainstream Information Systems research methodology for constructive efforts (March and Smith, 1995). A generic process model for DS type research endeavours has been defined (Peppers et al., 2008) as the Design Science Research Methodology DSRM (Figure 1). The process is iterative. The entry to this process is possible at any of the first five phases: a) Problem Definition, b) Definition of the objectives of a solution, c) Design and Development, d) Demonstration (of a functioning solution prototype) or e) Evaluation. A full research cycle includes all

these as well as the last phase, f) Communication in discipline specific ways and means to present the constructed solution to the scientific community.

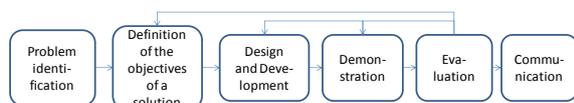


Figure 1 Iterative process of design science research (Peffers et al. 2008).

The construction of the solution presented in this study followed iteratively and incrementally in sequential projects, abided with the study of the topical literature. After the problem identification, five iterations (see Section 4), each resulting to an implemented system or an increment to the system are conducted. With each iteration, stakeholder input to the objectives, requirements, and constraints is taken in. The demonstration is undertaken in practical use. In this paper, one of the user domain experiences is reported. Evaluation follows through user feedback collection with surveys and interviews. A collaboration environment (wiki and ning) is used for management of the pre- and post-development user information.

4 E-PORTFOLIO MANAGEMENT SYSTEM - EPOFO

4.1 Definition of the objectives

One of the aims was to develop a web-based, theoretically and pedagogically well-founded e-Portfolio management system, which besides normal learning and assessment portfolio functionalities, supports also identification, assessment, recognition, and development of prior learning achievements. This is based on the idea that it is the responsibility of the individual student to invest in personal growth, development of professional judgment (Joughin 2009). The e-portfolio system facilitates this development.

One of the main requirements for the solution was to create a database structure and a competence matrix, which help in describing and visualising competences, both from the institute's and the student's view. The solution is based on generic and subject-specific competencies, as described in the EQF (The European Commission, 2005). The system should be modifiable so that any institute or organisation could define their competencies. Therefore, it is possible to add the key competencies (DeSeCo, 2005), project management competencies

based on the IPMA Competence Baseline (ICB) (Caupin et al., 2006), or any other list of competencies to the system.

One of the main requirements was the integration to the student register system. For example, the documents and other files that provide evidence about student's competences should be easily achieved. In addition, the courses, student groups etc. could be imported and/or linked to the system.

To develop a solution, the activities of the stakeholders and the requirements for a tool to support the stakeholders at a unit were analysed and listed. We present here the tasks for the learning facilitator (with sub-roles of teacher, tutor, content administrator), and the student, who are the main user groups of the solution.

For accounts of learner achievements, learning facilitators are involved in

1. Reviewing the items students are adding as their existing personal achievements (knowledge, skills, competencies);
2. Appraising and acknowledging learner prior achievements as learning outcomes e.g. to be part of required achievements for a certificate or diploma;
3. Providing tutoring to guide the student on their path through the program at their present learning institution (what is / should still be achieved, at what level and on what area to attain qualification);
4. Presenting the educational offering according to the outcome orientation principles to the students (i.e. how can the student cover missing learning achievements and qualifications through the courses given in the program of the institution); and
5. Managing the competence profile descriptions (e.g. qualification for a profession) coming from societal and professional bodies.

The student activities include:

1. Creating an account of their personal learning achievements, together with stored data and information on the achievement for valuation and proof (i.e. for judgment of their quality by institution staff), the students post documentation (certificates, job descriptions, letters of recommendation, produced files) into the portfolio tool;
2. Presenting their existing knowledge, skills and competences, i.e. prior achievements to the learning facilitators;
3. Comparing their achievements to the required qualification profiles of their desired learning targets that is provided in the system; and
4. Presenting their qualifications in the form of a sample portfolio to peers for peer support and review, and to other stakeholders, e.g. potential employers.

There are two approaches to competence evaluation, holistic and atomistic (i.e. the elements that together comprise the competence). The chosen approach is atomistic, i.e. the student has the opportunity to have small units or elements of prior achievements acknowledged as part of their personal achievements profile.

For the assessment, the aim was to offer a 360° perspective. The student gives his/her own evaluation, which is then commented and evaluated by the teachers or other experts from the institute. Finally, if the student has given permission, peers and external reviewers can give their evaluation and comments.

Further requirements for the tool were listed in our project environment called Nest (Rintamäki, 2008): it should allow 24/7 access, be based on open standards, support nationally agreed interoperability standards, and enable use over mobile and wireless technologies.

4.2 Design and Development

The e-Portfolio management system, ePofo, is developed by using incremental and iterative approach. Each year, one project group of four to five students took the responsibility of fulfilling the requirements given mainly by the experts of the Teacher Education College in JAMK. One of the students then took the results of the development to the group of the following year. The principal lecturer in software engineering was leading the development group making sure that the requirements were understood. One of the dissemination methods was using wiki and, during 2009, a Ning environment was established. Thus, the developers received immediate feedback and some requirements for the future versions.

The ePofo is based on free and open source software running in a Web site. The technical solution of the web server was built with the "LAMP" set of open source technologies, i.e. on Linux operating system, Apache HTTP server management software, the MySQL database management system, and the PHP programming language for developing the web interface to the database. The user interface was developed with XHTML with the help of CSS and JavaScript (AJAX).

The ePofo is technically a multimedia database, where the students can store their sample achievements (voice, video, image, text). This is an important feature for different skills and abilities as e.g. design, technical professions or music. Each user sets up the structure of the database for their personal portfolio. Following the reflective aspect, (Barrett, 2001), the user decides on the number and

names of the categories according to which they arrange their achievements.

An ePMS should enable the students to get familiar with the required competencies and then add proof of their individual skills and qualifications. ePofo combines characteristics of each of the typical portfolios: assessment, showcase, development, and reflective portfolio (Stefani et al., 2007).

The users store categorized descriptions of their achievements and add documents into the database as attachments to provide evidence of the achievement of the competencies or learning outcomes for the qualification (certificates, diplomas and the like). An example view is shown in Figure 2. In addition, sample files can be added to present performance in a competency area. The administrator decides the formats that are allowed, e.g. pdf, doc, jpg, mp3, avi etc.

To provide sample portfolio functionality, the solution allows the user to extract own data as a .zip file, containing an html page as a start page with the description of the user's portfolio and links to the attached files saved along to a portable .zip file to be used as a sample portfolio.

The ePofo consists of four user roles, each with their own views and user rights: Learner, Teacher, Content Admin (a role that provides the target achievement profiles) and Technical Admin (a role that provides technical support).

4.3 Demonstration

The ePofo was first introduced into use in 2007. Total number of pilot users in separate schools of JAMK has so far been 10 teachers and about 50 students during the three years of use. In each unit of the institution, one staff member has been trained to take the responsibility of a "content admin" (teacher's functionalities, point 5, see above). However, there has been hesitation to use the solution, which is usual with new e-Learning tools. The use has not been mandatory, and there has been no reward for use of the system.

For the development that started in 2007, there has been each year a student-learning project to develop the technical solution further. User requirements and user feedback has been collected in group interviews and survey forms. Because student project groups are changing and the target for them has been learning IT project work, the system cannot be compared with commercial solutions in e.g. usability. This is why the user base in this phase is teacher volunteers "early adopter". However, the tool has been in real use, and gained both positive feedback and many suggestions to improve it.

In the beginning, ePofO was mostly used in Teacher Education College of JAMK. However, ePofO has been further developed for the needs of young students in other schools of JAMK. Teacher Education College continues to develop further the development of APL and ePofO especially in adult learning. The results of these developments will be reported in a later point in time.

4.4 Evaluation

The development of e-Portfolio system in parallel with curriculum development has given a valuable learning experience for both the faculty members and the students. As an example, one of the teachers sent an email on May 2010 mentioning that (free translation) "Thank you, I have been really excited to (almost "drunk" about) this ePofO tool. It is a wonderful tool for a trainer to recognise students' skills!" The faculty members argue to understand both the basic concepts and the competencies required in the curriculum much better than before using the ePofO. A teacher (content admin) has to define the competencies, skills and knowledge, student groups, and courses, and link all of those in a way that a student understands their relationships. According to the feedback, this clarifies the competence-based curriculum for all stakeholders.

Competencies	Course	Degree	Other studies	Work experience	Experience
Project and product management in ICT	0	2	4	12	0
Learning competence	0	0	0	0	0
Ethical competence and social competence	0	0	3	16	0
Development competence	0	0	0	16	0
Internationalisation competence	0	0	0	19	0
Internationalisation competence	0	0	0	16	0

Figure 2. Skill matrix.

The development of ePofO has helped interacting in socially heterogeneous groups (one of the key competences in DeSeCo, 2005). During the development, teachers, students and administrators from different faculties learned to cooperate, understand each other's views, and manage and resolve conflicts. The decisions and ideas that emerged during the development were documented in wiki (<http://epofO.labranet.jamk.fi/wiki/>, in Finnish, see Figure 3). In addition, a separate ning environment (ahotat.ning.com) was created in order to help student groups sharing experiences and to answer questions.

The focus is on individual competencies. According to interviews, the ePofO helps a student

show his/her current knowledge. The different matrices in the system provide understanding about the competencies and how much evidence there already is. It also contains a dimension for different types of informal and non-formal learning categories, such as working experience, degrees, courses, and hobbies.



Figure 3. Wiki environment.

Students were an essential source of the development group. First, IT students have been developing the e-Portfolio system. Second, students' opinions were taken into account when defining new features. In addition, the competences required from a software engineer were recognised during the development process. Finally, students from three different subject areas formed the pilot user group and their comments were considered in improving the ePofO. During the project meetings, the experiences and comments from all three different user groups (administrators, teachers, and students) were collected and then parts of the documentation were shared by using the wiki.

According to discussions with students in the Master's Degree programme, enabling the use of an e-Portfolio can reduce dropouts. Some students, which work abroad and have the needed competencies, need a flexible way to proof their expertise. Feedback was that it is technically quite easy although time-consuming to add proof about their knowledge and skills once they learn the procedure. Students face the challenge how to express themselves clearly, so that teachers and other external reviewers can evaluate what the student's level of expertise is.

Variigated and voluntary student and teacher involvement during the development phase proved to be a good idea. We received valuable feedback for improving the e-Portfolio system. In addition, we were able to raise ICT skills and the level of understanding about recognising prior learning and validating competencies.

5 DISCUSSION

Introducing the competence-based approach induces several changes in both teaching and administrative

tasks at HEIs, conducted by the teacher and other staff. An important facet is that the learning needs should be derived from actual professional practice, which, among other things, turns into a motivational factor for students and a quality factor in teaching. In the presented solution, they are recorded into the portfolio management system, to be accessed by students and other stakeholders at the HEI. This alone is a factor that raises the quality and relevancy of teaching, which again reflects to student motivation.

A focal challenge in the e-Portfolio system constructed in this study is to enable the recognition of student non-formal and informal learning. From the administrative point of view, the e-Portfolio system supports recognition of prior learning besides providing the students a personal tool for documentation, assessment, and development of their learning achievements towards the targeted qualifications. Teachers can benefit from the e-Portfolio system in their curriculum work, releasing them from curriculum-bound thinking to learning objectives and learning outcomes driven thinking. Consequently, the portfolio tool supports the professional development and learning-on-the-job of a teacher.

An information privacy issue is how students can add confidential information to an ePMS. Some students in their current or previous work career worked in classified projects. Therefore, they cannot add detailed information on their work experience. In some cases, the teacher or supervisor has signed a non-disclosure agreement (NDA) with a company for confidentiality. The teacher might have a discussion with the company representatives to make sure that the student has the competencies that s/he claims to have. An evaluation report can then be added to the ePMS to be validated by the HEI authority.

There are many suggestions and ideas to be added to the next version of the ePMS. One idea is to integrate Mahara and competence descriptions e.g. by creating the necessary plug-ins. As an example, graduated students (alumni) can continue adding evidence to the ePMS and choose courses matching their professional development plan.

6 CONCLUSIONS

The ePofO solution development makes evident that the introduction of the outcome orientation in tertiary sector teaching and learning is means a thorough change in the educational institution practices. Consequently, it requires novel designs for the technological support for student, teacher, and

other stakeholder processes. The solution discussed here supports the students (learner) and the teaching staff (learning facilitator) (Simon, et al. 2011) and the assessment by a teacher and the institution. The teacher may assess the items in a student's portfolio at various points in the learning process: for diagnostic and formative assessment to be able to assist in planning the studies and guide the student underway; and for summative assessment to acknowledge competence and report to the institution that grants a degree. Last but by far not least, a personal portfolio developed during studies gives a head start to the professional career.

A portfolio tool appears to have the potential to be a bearing point for sharing information on competences at a HEI between students, teaching staff, and other stakeholder groups. It also supports the students in planning studies, and is a motivational factor. The collection of personal achievements "grow" concretely, reflected in own database. ePMS supports guidance by teachers: how to turn prior learning in diverse contexts into units of acknowledged competence. Sample portfolios can be presented to external stakeholders as potential employers. Further, the solution provides support for various activities as guidance in study plans, searching information on existing expertise e.g. in setting up project groups for learning projects. As teachers maintain their portfolios, with help of the ePMS the HEI can find among them those with required specific competences.

If an institute implements an ePMS, whether a commercial, proprietary, or open source, we strongly recommend simultaneous development of the curriculum, the competence based approach, and the ePMS. This ensures that all of them are consistent, e.g. there are no contradictions in use of concept and terms.

Further study is needed in several areas. To mention some: enabling the life-long use continuum e.g. from Bachelor to Master's level, and the support in career planning. Thus, an e-Portfolio is not only an instrument for individual development for professional specialisation studies; it may help finding skilful people and give valuable feedback to the institution about the specific competencies acquired.

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REFERENCES

- Barrett, H. C., 2001. *Electronic Portfolios - a chapter in Educational Technology*; An Encyclopaedia. ABC-CLIO, Online: <<http://electronicportfolios.com/portfolios/encyclopediaentry.htm>>.
- Burke, J. (ed.), 1995: *Outcomes, Learning and the Curriculum: Implications for NVQs and Other Qualifications*. London, GBR. Routledge.
- Conrad D., 2008. Situating Prior Learning Assessment and Recognition (PLAR) in an Online Learning Environment. A book chapter in: *Anderson, Terry (Ed.): The Theory and Practice of Online Learning*. 2nd Edition. AU Press, Athabasca University.
- DeSeCo, 2005. *The definition and selection of key competencies - executive summary*, Online: <www.oecd.org/dataoecd/47/61/35070367.pdf>.
- Duvekot, R.C., G. Scanlon, A. Charraud, K. Schuur, D. Coughlan, T. Nilsen-Mohn, J. Paulusse & R. Klarus (eds.), 2007. *Managing European diversity in lifelong learning*. The many perspectives of the Valuation of Prior Learning in the European workplace. Nijmegen/Vught/Amsterdam: HAN/EC-VPL& HvA.
- Duvekot, R., 2007. The glass is half-filled: valuing learning in the Netherlands. In *Laitinen, A., Nurminen, R. & Soininen, L. (eds.), Tunnistatko osaamisen? Näkökulmia ja välineitä osaamisen arviointiin ja kehittämiseen*. JAMK reports 80.
- Grant, S., 2009. *Electronic Portfolios: Personal information, personal development and personal values*. Woodhead Publishing.
- European Commission, 2005. *Towards a European Qualifications Framework for lifelong learning*. Brussels. Online: <http://ec.europa.eu/education/policies/2010/doc/consultation_eqf_en.pdf>.
- European Commission. 2006. *Recommendation of the European Parliament and of the Council on the establishment of the European Qualifications Framework for lifelong learning*. Online: <http://ec.europa.eu/education/policies/educ/eqf/com_2006_0479_en.pdf>.
- European Parliament Council. 2008: *Recommendation of the European Parliament And of the Council on the establishment of the European Qualifications Framework for lifelong learning*. Online: <<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2008:111:0001:0007:EN:PDF>>.
- IPMA, 2006. *ICB - IPMA Competence Baseline*, Version 3.0. Caupin, G., Knoepfel, H., Koch, G., Pannenbäcker, K., Pérez-Polo, F. & Seabury, C. (eds.). International Project Management Association.
- JAMK, 2011. Viewed 4 April, 2011, <<http://www.jamk.fi/vocationalteachereducation/research/priorlearning>>.
- Joughin, G. (ed.). 2009. *Assessment, Learning and Judgement in Higher Education*. Springer.
- Kankaanranta, M., Grant, A., Linnakylä, P. (eds.), 2007. *e-Portfolio: adding value to lifelong learning*. Institute for Educational Research. Agora Center.
- Laitinen, A., Nurminen, R. & Soininen L. (eds.), 2007. *Tunnistatko osaamisen? Näkökulmia ja välineitä osaamisen arviointiin ja kehittämiseen ammattikorkeakoulussa* [Do you recognize competences? Viewpoints and tools for assessment and development of competences in universities of applied sciences.] Reports of JAMK University of Applied Sciences 80.
- Lumsden, J., 2011. *Florida State University Online Career Portfolio*, viewed 4 April, 2011, <<http://www.career.fsu.edu/portfolio/publications/>>.
- March, S.T. and Smith, G.F., 1995. *Design and natural science research on information technology*. Decision Support Systems 15, pp. 251-266.
- Najjar, J., Grant, S., Simon, B., Klobucar, T. (eds.), 2011. ICOPER Deliverable D 2.3: ISURE: *Report on implementation and validation of a standardized model for learning needs analysis and the provision of learning opportunities*.
- Niskanen, A. & Virtanen, R. (eds.), 2008. *Taidatko tunnistamisen?* [Are you skilled in recognising competences?] Reports of JAMK University of Applied Sciences 92.
- Palola, T. & Pelkonen H., 2007. *Portfolio verkkosovelluksena Jyväskylän ammattikorkeakoulussa* [the Development of a Digital Portfolio for the Jyväskylä University of Applied Sciences].
- Peffers, K., Tuunanen, T., Rothenberger, M., and Chatterjee, S., 2008. *A Design Science Research Methodology for IS Research*. Journal of Management Information Systems, 2007-8. vol, 24, No.3, pp. 45-77.
- Peltola, H., 2011. *KORSI project*. Viewed 4 April, 2011, <<http://www.jamk.fi/english/research/projectreference/developmentofeducation/korsi/contact>>.
- Ravet, S. 2007. For an ePortfolio enabled architecture: ePortfolios, ePortfolio management systems and organisers. European Institute for E-Learning.
- Rintamäki, M., 2008. *NEST Net Working Platform Development from Aspect of Training Use (in Finnish)*. Jyväskylä University.
- Rojas Gutierrez, I., García, R., Leony, D. & Kloos, D. (eds), 2010. Deliverable D6.3 –ISURE *Best practice guidelines for assessment and evaluation specifications and standards*.
- Simon, B., Pulkkinen, M., Totschnig, M., Kozlov, D. (eds.), 2011. ICOPER Deliverable D7.3b: *ICOPER Reference Model Specification*. Viewed 4 April, 2011, <http://www.icoper.org/deliverables/ICOPER_D7.3b.pdf>.
- Stefani, L., Mason, R. & Pegler, C., 2007. *The educational potential of e-portfolios*. Routledge, London and New York.