Smart ePortfolio System
Experimental Prototype Testing in Living Lab and Further Artificial Intelligence Implementation Design within ePortfolio System

Aleksandrs Gorbunovs
Distance Education Study Centre, Riga Technical University, Azenes Street 12, Riga, Latvia

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Abstract: This paper's aim is to pay attention to actuality of new information system development in a form of engaging and reflective ePortfolios. Main accent in the system is put on an encouragement of learners' collaborative efforts in teams, activate their critical thinking and reflection, and as a result, achieve better learning outcomes and competencies. The author introduces experimental ePortfolio system prototype and its testing results in Living Lab environment in Riga Technical University. A notion of making ePortfolio system more reflective, interactive and intelligent brings further proposals of development additional artificial intelligence tools which might be embedded into the system.

1 INTRODUCTION

New technologies change our habits, work procedures, leisure hours, communication opportunities, and our life. These changes bring new breath also in educational environment; educational paradigms switch over from teacher-centric to student-centric, from mainly individual to mainly collaborative interaction; learners are oriented on development of their critical thinking skills, enhancement of creativity, wider use of technology in knowledge acquisition process (Churches, 2010). It allows students to be better prepared for nowadays challenges.

Educational sphere demands for effective managerial work, assessment and self-assessment processes to improve learning outcomes (Goldspink, 2007). Progressive educators try to find the most useful and suitable educational methods and tools to satisfy lifelong learning needs. They are seeking for new ways to make learning process more engaging, motivating, creative, and effective. Information technologies provide invaluable support in introducing of new teaching and learning methods. Occasionally scientists create new and modernize existing educational tools and systems; and this creativity process often is advanced by scholastic institutions requests.

ePortfolio systems might be considered as new effective competence enhancement instruments. They also have changed their own nature: from simple showcase forms (in the past) to motivating workspace environments (nowadays). These two different natures or faces of the ePortfolios indicate two different senses: ePortfolio as a product in the first case, and ePortfolio as a process in the second case (Barett, 2009). Showcase form of ePortfolios still has prevalence. Nevertheless, more and more educational institutions seek for more powerful end effective ePortfolio systems to improve learning outcomes.

Reflection, critical thinking, ability to work in collaborative and tied to time settings are considered as important factors to be able to enhance learners competencies. Excellent results might be achieved by „involving students in doing things and thinking about what they are doing" (Bonwell and Eisen, 1991). Stimulation of critical thinking and reflection could be considered as a fine solution to meet the competence enhancement demands.

This paper shows the latest ePortfolio developments realized by Distance Education Study Centre, Riga Technical University (DESC RTU), examines Living Lab testing and research results related to effectiveness of experimental ePortfolio system prototype, as well proposes a new generation ePortfolio system algorithmic model.

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2 DEVELOPMENT OF THE E-PORTFOLIO SYSTEM

2.1 Testing of ePortfolio System Prototype in Living Lab

Keeping in mind, that Living Labs are intended to involve users in the innovation process, knowledge sharing, exploration, experimentation, assessment, and co-creation (Pallot, 2009), created engaging scaffolding ePortfolio system was tested in RTU DESC Living Lab in study year of 2011/2012 (Gorbunovs, Kapenieks, A., and Kudina, 2012).

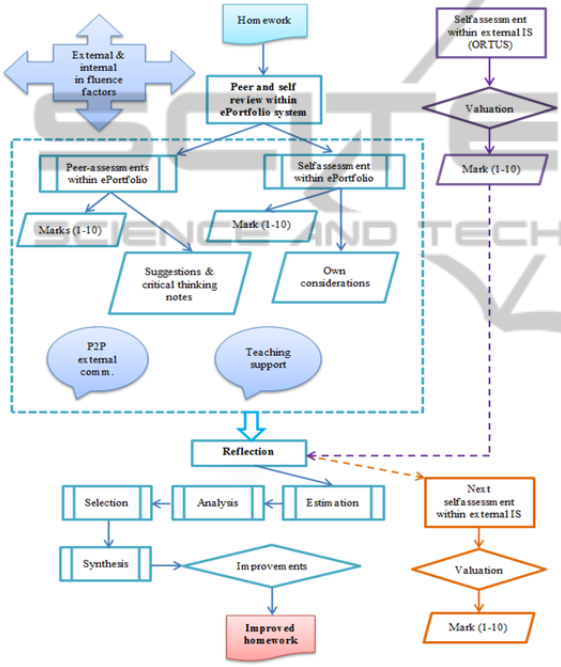

Figure 1. Simplified scheme of the ePortfolio system's algorithmic model (Gorbunovs, et al, 2012).

Experimental ePortfolio system (the left side of the Fig.1) embodies environment where students after submission of their accomplished homework (tasks) are divided in teams (groups) of four participants each and asked to acquaint themselves with other group members accomplished homework, reflect, assess them both in scores and in a form of critical thinking notes and suggestions, as well make self-assessments about own accomplishments and possible shortages. Students have a possibility to see group member names against their achieved assessment results: scores, critical thinking notes and constructive suggestions. To clarify details, students also can establish internal and external communication links. These processes are monitored by tutors who can give necessary advice and assistance. Students are also asked to reflect on own work and his/her group members feedback in a form of critical thinking notes and suggestions, take a note of tutors advice, estimate the data and put them against own calculations, analyse information, select appropriate conclusions, add something well-formed or synthesize creative ideas. All this might lead to increasing of the number of improved homework and growing better learning outcomes.

2.2 Results and Progress Report

From 203 joined the BPOM ("Business Planning for Open Markets") course students only 173 learners finished it. Drop out reasons vary but none of them are caused by BPOM course issues. 56 learners took part in all group-working activities (5 tasks) within ePortfolio system, 16 students also were very active – they participated in four group-working activities, 19 students were rather moderate – three group-working activities, 27 students were less active – two activities, 39 students were inactive – only one group-work was done, and 97 did not participated in any of ePortfolio group-working activities. As the participation in ePortfolio activities for students was not compulsory, shown numbers of participation activities is rather high.

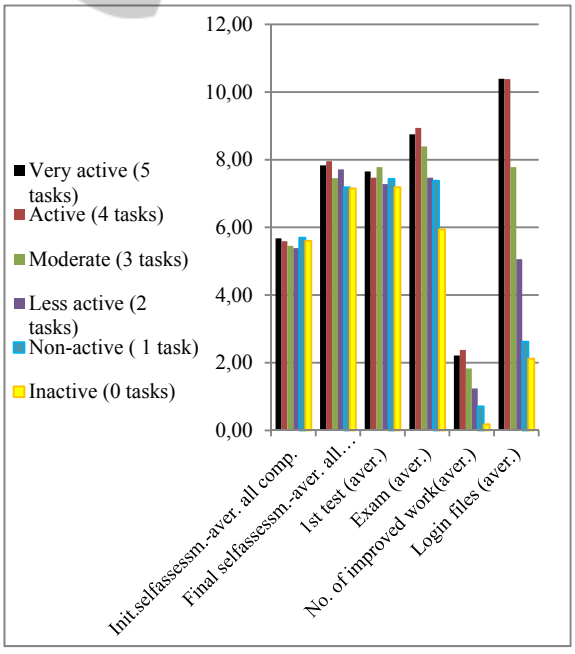

Figure 2: BPOM competence (on average of seven) development correlations with ePortfolio activities.

ePortfolio prototype testing results in Living Lab show (for example, Fig. 2) that activities within

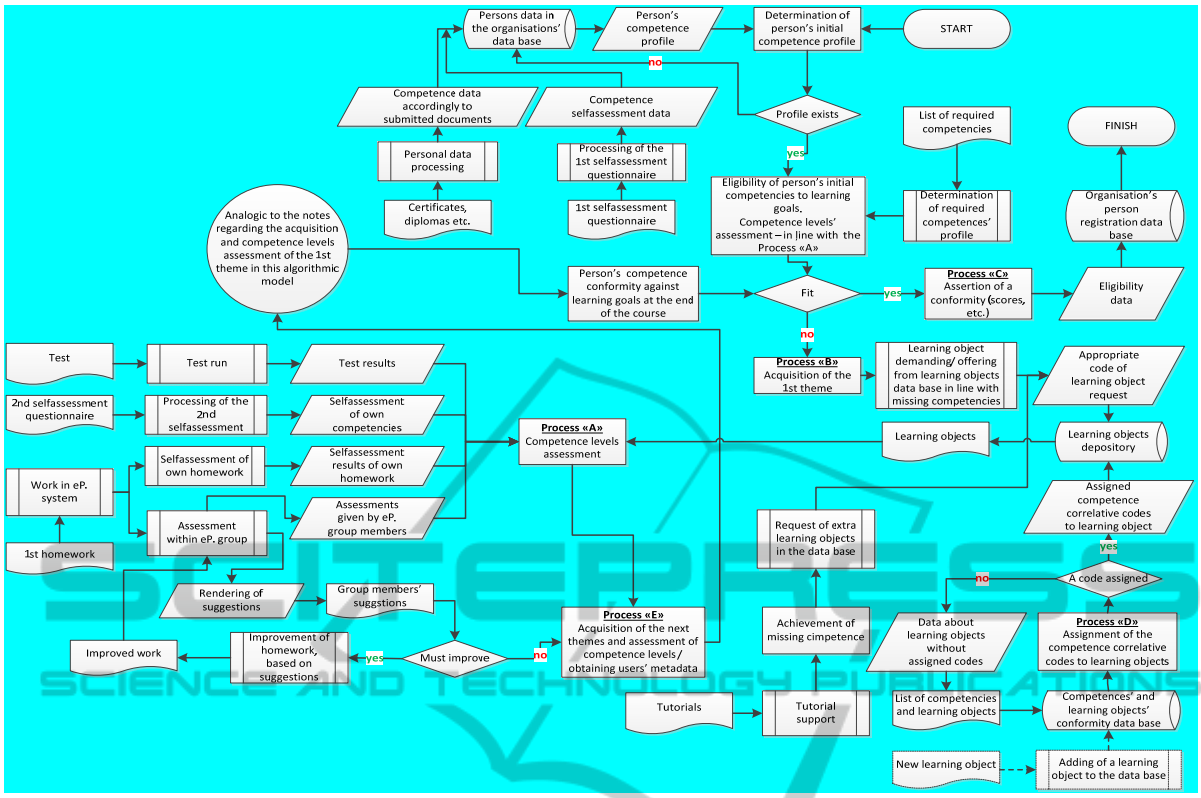

Figure 3: Proposed ePortfolio system's algorithmic model.

ePortfolio system have direct correlations with students' exam results and increased level of their competencies. Similarly, the number of improved homework also has direct correlation with activities within ePortfolio system, i.e. the number of ePortfolio login files. More active students much more take part in offered group work activities. It is clearly that learners' reflection on critical thinking notes and constructive suggestions leads to a creativity, synthesis and competence development. As a result, the number of corrected, slightly improved or crucially processed works depends on users' activity level within ePortfolio system. All in all there were received 312 improved works. From them the second homework was improved 78 times, the third homework was improved 66 times, the fourth homework was improved 65 times; and the fifth homework was improved 103 times.

In the current study year of 2012/2013 experimental ePortfolio system is improved by adding new features, such as automation of students' homework submission to the ePortfolio system and automatic ePortfolio group formation based on a sequence of submitted homework accomplishments. Nevertheless, the challenging issues regarding development of a new generation ePortfolio system, i.e. smart ePortfolios, still remain.

2.3 Initialization of Artificial Intelligence Methods

New smart ePortfolio system might be created by enrichment of existing system algorithmic model with artificial intelligence (AI) traits. The system will start by assembling person's achievements data (certificates, diplomas, self-assessments, exam results and so on) to form a person's competence profile (Fig. 3) and determination whether the person's competence profile exists or not. If the profile does not meet fixed requirements (there is no competence markers within a cell), the system will encore the procedure. If the profile exists, an eligibility of the person's initial competences against learning goals will be assessed. Further the system will analyse whether the person (i.e. person's competence profile) fits these requirements or not. In a positive acknowledgement an assertion of conformity will be issued. It means that the person does not need any learning for particular case.

Otherwise, the person will be asked to apply for the course. The system will issue corresponding

learning objects and/or links allowing acquisition of the course. The learner will accomplish the first home-work and test, make self-assessment and assess ePortfolio group members' homework which will include marking of required assessment criteria and formulating an opinion in a form of constructive recommendation. Based on these critical thinking notes the learner will reflect and decide whether peers' suggestions are useful or not. This decision may lead to further homework improvement and creativity actions. Improved work again will be input into the system and exposed for analysing and assessment by ePortfolio group participants once more. The student will be able also do not take any homework improvement actions if he/she concludes that ePortfolio system group members' remarks are not constructive and useful. In both cases after completion of the first theme the next course module will open.

Test results and competence assessments data further will be assembled and analysed in order to state the value of gained competences. Depending on achieved competence level appropriate learning object code will be generated; and the learner will receive necessary learning objects with assigned codes. Initial competence assessment is essential. Processes, such as an assignment of the competence correlative codes to the learning objects and the assignment of the learning objects' self-correction rates, play significant role in ePortfolio system's AI decision making process. They allow finding the most suitable learning path in specific case.

3 CONCLUSIONS

Created collaborative ePortfolio system prototype verified our expectations regarding system's positive impact on learning outcomes. Activities within ePortfolio system have direct correlations with students' exam results and increased level of their competencies. Students are encouraged reflect and think critically. Their creativeness grows by virtue of active participation in collaborative activities within ePortfolio system.

On the other hand, an analysis of students' self-assessments within university's study portal "ORTUS" displayed learners' inability to make self-assessments by objective considerations: many students had a lack of confidence, and, as a result, their initial self-assessment marks were far from real competence levels. It took time to get some confidence. Hardworking students enabled steady progress, which allowed them to acquire required competences and achieve remarkable final exam results. Other students overleapt themselves. Starting from the second course module they made corrections in self-assessment questionnaires. Activities within ePortfolio system influenced more precise adjustment of these changes.

Proposed artificial intelligence methods and tools to be embedded into ePortfolio system might look promising. Both students and teachers might gain by its use. There will be further considerations, developments and adjustments (creation of system modules, generating competence correlative codes to the learning objects, etc.) needed to build up the new generation ePortfolio system – smart ePortfolios.

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