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# Enhancing self-regulated learning skills through the implementation of an e-portfolio tool

Aikaterini Alexiou<sup>a</sup>, Fotini Paraskeva<sup>a</sup> \*

<sup>a</sup>*Department of Digital Systems, University of Piraeus, Greece*

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## Abstract

This paper outlines the process of integrating an e-portfolio tool in tertiary education for students' personal and professional development. During 2009 spring semester, we implemented an e-portfolio tool for students of a computer science university department. We explored the potential of e-portfolio to support self-regulated learning. The evaluation of the research is based on quantitative and qualitative statistical analysis. The paper brings out new ideas and possibilities: the implementation of an e-portfolio so as to promote student self-regulation and as a consequence to enhance academic and professional skills.

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*Keywords:* Tertiary education; Web 2.0; e-portfolio; self-regulated learning.

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## 1. Introduction

An ideal vehicle for academic and professional development are Web 2.0 technologies which refer to the range of digital applications that enable interaction, collaboration and sharing thus providing users with unprecedented learning experience. It is believed that the e-portfolio tool - an emerging Web 2.0 technology - is uniquely suited to this digital age as a locus of learning and a viable way to frame and leverage this open revolution in education (Batson & Chen, 2008). Therefore, it has been suggested the e-portfolio as a tool for constructing and managing students' own knowledge.

Technology is not by itself the only factor of pedagogical change, but we should embed pedagogical frameworks which can promote learner-centered principles (Batson & Chen, 2008). In our current research we want to highlight the dynamic of the e-portfolio tool so as to support skills, to reflect one's academic and learning career and to support continuing professional development. Attwell (2007) acknowledges that 'there is not one generic approach but multiple approaches that are based on different pedagogic understandings of the purposes and processes of using e-portfolios for teaching and learning'. From this point of view, we based on the scientific area of self-regulated learning as the basic idea revolves around individuals' beliefs that they are able to perform a task and that they are responsible for their own performance.

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\* Fotini Paraskeva. Tel.: +30-210-4142755

E-mail address: [fparaske@unipi.gr](mailto:fparaske@unipi.gr)

The goal of this paper is the implementation of an e-portfolio tool by facilitating self-regulated learning skills on the educational environment, empowering students as active learners in order to enhance their knowledge and academic skills. We will outline the process of integrating an e-portfolio tool for students' personal and professional development. We will explore the potential of e-portfolios to support learning and we will consider major aspects of e-portfolios such as definitions, purposes, processes, pedagogies and implementation issues. Finally, we will report on the implementation of an e-portfolio within an undergraduate computer science course and how this implementation addresses self-regulated learning as the underpinning educational framework chosen for this application.

## 2. E-portfolios

### 2.1. E-portfolios: Definitions

E-portfolio is a term that is becoming frequently used, with many meanings. The National Learning Infrastructure Initiative defined *electronic portfolio as a collection of authentic and diverse evidence, drawn from a larger archive representing what a person or organization has learned over time, on which the person or organization has reflected, and designed for presentation to one or more audiences for a particular rhetorical purpose* (Barrett & Carney, 2005).

Challis (2005) provides a more in depth definition, *'an e-portfolio is described as a selective and structured collections of information, gathered for specific purposes, showing/evidencing one's accomplishments and growth which are stored digitally and managed by appropriate software, developed by using appropriate multimedia and customarily within a web environment and retrieved from a website, or delivered by CD-ROM or by DVD'*. In a generic level, electronic portfolios are part of a personal online space with a repository function and an organising function supporting collaboration and feedback (DfES, 2005).

As we identify e-portfolio as a tool for enhancing learning with many uses: for students while studying, for graduates while moving into or through the workforce, and for institutions for programme assessment or accreditation purposes (Butler, 2006) we based on the following definitions. An e-portfolio provides *a structured context for students and teachers so as to present text, audio, video in a fluid form which can be easily processed and it integrates synchronous and asynchronous communication functions* (Abrami & Barrett, 2005). Finally, a generic definition is that of an e-portfolio *'as a purposeful aggregation of digital items - ideas, evidence, reflections, feedback which 'presents' a selected audience with evidence of a person's learning and/or ability* (Sutherland & Powell, 2007).

### 2.2. E-portfolios: purposes and processes

E-portfolios arise a number of issues such as: ownership, multimedia components, reflection, evidence and multiple representations. It is also evident that there are different applications of e-portfolios: course portfolio, programme portfolio and institutional portfolio (Stefani, Mason & Pegler, 2007). This categorization depicts a great variety in the development of e-portfolios depending on its purpose and objectives (Barrett, 2005). E-portfolios are being used to meet different learning requirements such as: assessment, presentation, learning, personal development, multiple owner and working (Stefani, Mason & Pegler, 2007). Initiating an e-portfolio approach to support student learning, represents new challenges.

Stefani, Mason and Pegler (2007) suggest a purposeful plan for the implementation of e-portfolios which includes specific issues:

- Stating the Purpose: There should be a clarification of the purpose according to the learning context. The European Initiatives Co-ordination Committee distinguish 4 common types of conventional portfolio usage in different learning contexts:
  - *Assessment portfolio* represents an alternative way of evaluation where students are expected to provide evidence of their competence in particular subject areas.
  - *Showcase portfolio* depicts students' project work in different subject areas. It could be used for presenting oneself to potential employers.

- *Development portfolio* supports students' personal development planning (PDP) and provides a means of tracking and planning the development of the students over time.
- *Reflective portfolio* is the property of the student and specific to their needs. It shows students' accomplishments and how these relate to the learning goals.
  - Determining the scope: The issues that influence the scope of implementation are finances (investments, funding, costs and risks), human resources (technical staff and experts) and students.
  - Relating e-portfolio implementation to the curriculum: There are numerous issues to weigh up: the target group, the readiness for e-portfolio-based learning, the IT literacy skills, usage of the e-portfolio by students, a standardised format for the e-portfolio, a public or a private document, supporting students', reviewing and formative feedback. The overarching issue is the pedagogical principles underpinning the rationale for implementing e-portfolios into the curriculum.
  - Selecting content: The content of the e-portfolio consists of the types of information that may be stored. The type of e-portfolio content should be aligned with the agreed purpose.
  - Preparing the users: Implementing e-portfolio into a curriculum is dependent upon staff and students having the necessary technical skills, knowledge and appreciation of the purpose and the scope of the e-portfolio.

E-portfolios have been used as institutional devices to demonstrate student progress or to assess learning but there exists a need for students to feel that their e-portfolio belongs to them. So, the best way to develop an e-portfolio is to integrate it into a course (Stefani, Mason & Pegler, 2007). As the personalisation of learning is becoming an increasing trend, the ability for learners to customise and configure their e-portfolios is a key to creating a sense of ownership of the end product (JISC, 2008). Different JISC projects have shown that to support learning effectively e-portfolio systems should be able to accommodate the differing pedagogic models and curriculum approaches of each programme (JISC, 2008). We believe that the purpose of the e-portfolio will determine the pedagogies and processes of implementation. The underlying pedagogy of e-portfolio use draws on theories of constructivism (socio-cognitive dimensions), student-centered learning and authentic educational activities (Stefani, Mason & Pegler, 2007).

### 2.3. *E-portfolios and Web 2.0: Implementation issues*

Recent technological enhancements to e-portfolio software have broadened the available features: commercial VLEs, stand-alone commercial products, open source products and Web 2.0 tools. Many social networking sites and blogging tools are available on the internet and research shows that these can be incorporated into the learning environment and support active learning (JISC, 2008). It is agreed that software and standards play an important role on the success of building and maintaining an e-portfolio but we should emphasize on the fact that behind any e-portfolio lie rich and complex processes of reflecting, planning, synthesising, sharing, discussing, giving and receiving feedback. These activities are the focus of increasing attention since the process of learning can be as important as the end product (JISC, 2008). Current literature declares that e-portfolios can be used for different purposes (Barrett, 2000) such as reflection on learning, presentation of specific models or skills, and a space for introducing achievements. E-portfolios provide interface with flexibility (Barrett, 2000), facilitate authentic learning and learner's engagement (Wade, Abrami, & Sclater, 2005), strength the feeling of student's excellence, enhance motivation (Tosh, Light, Flemming, & Haywood, 2005) and share the workload. In tertiary education we need to provide students with the skills to manage the overload of information. E-portfolios offer a facility for doing this as they can be integrated into courses (Stefani, Mason & Pegler, 2007).

### 2.4. *E-portfolios and self-regulation*

Self-regulation is defined as self-generated thoughts, feelings, and behaviours that are planned and cyclically adapted based on performance feedback to attain self-set goals (Zimmerman, 1986). In essence, highly self-regulated learners approach learning tasks in a mindful, confident manner, proactively set goals, and develop a plan for attaining those goals. Self-regulated learners are active and efficiently manage their own learning in many different ways (Boekaerts, Pintrich, & Zeidner, 2000). Students are self-regulating to the degree that they are cognitively, motivationally and behaviourally active participants in their learning (Zimmerman, 1986). It seems that in computer mediated environments learners must have self-regulation skills to level the absence of motivating and

supporting factors such as group pressure, familiar learning situation, and social factors (Hodges, 2005). Zimmerman (2000) developed a cyclical model of self-regulation from social-cognitive theory and research. This model has been successfully applied to education (Zimmerman & Martinez-Pons, 1992). Zimmerman's (2000) cyclical model of self-regulation includes three phases:

1. 'Forethought' phase consists of processes that precede any effort; they involve the beliefs and attitudes of students. Important aspects are goal setting and strategic planning.
2. 'Performance Control' phase represents processes that occurring during learning efforts. Important aspects are self-control and self-observation.
3. 'Self-Reflection' phase processes occurring after learning or performance involves reflecting on the self-monitored information to evaluate one's performance and to make adjustments during future learning attempts. The two general processes in this phase include self-judgments and self-reactions (Clearly & Zimmerman, 2004).

E-portfolios are connected with student ability to self-regulate his own learning and to enhance skills and abilities (Wade, Abrami & Sclater, 2005). Educators believe that portfolios allow students to think critically, and become active, independent and self-regulated learners (Abrami et al., 2008). The aim of this paper is the implementation of an e-portfolio tool in order to enhance self-regulated skills and to empower students as active participants of their learning.

### 3. Method

The research was conducted within an undergraduate computer science programme in tertiary education, in a course titled "IT -centric Professional Development". We selected this course as the curriculum of the module corresponds and promotes the purpose of the e-portfolio. The application was designed in order to give emphasis to the e-portfolio tool as an emerging web 2.0 technology which encompasses the new technologies and services and enhances students' knowledge and academic skills (Figure I).

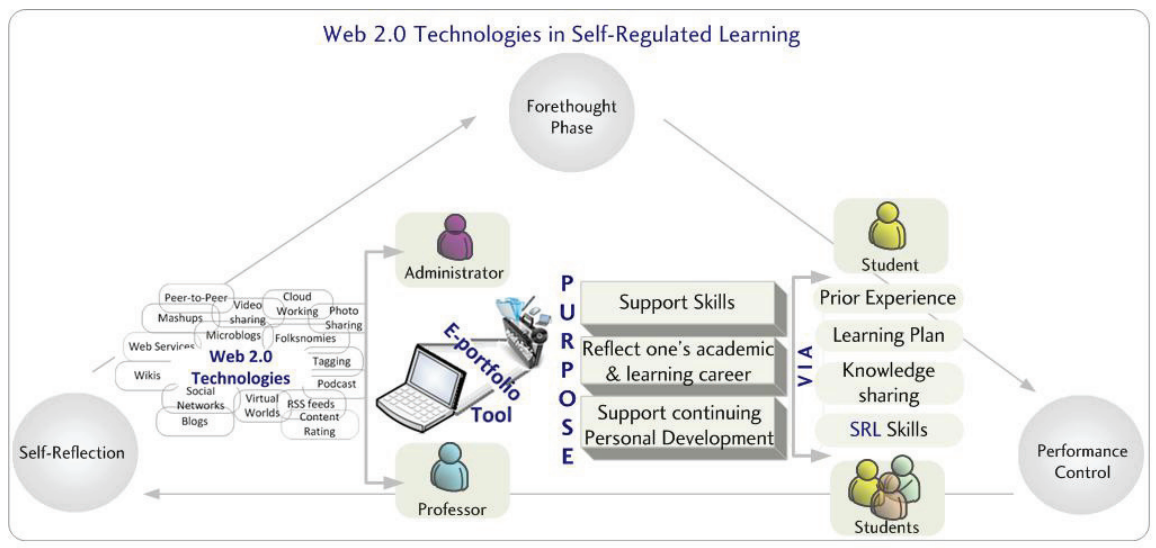


Figure 1: Schema of the e-portfolio implementation

#### 3.1. Participants

The sample of the study consisted of 41 undergraduate students and all were the experimental group. Participants assigned voluntarily to the e-portfolio tool with the view of acquiring new knowledge and enriched experiences.

### 3.2. Procedure

The implementation of the e-portfolio tool was conducted during spring semester in order to approach the objectives of the course. Before the project, participants had to complete a questionnaire on learning strategies, and their prior domain-specific knowledge about e-portfolios. The experimental procedure consists of three phases based on Zimmerman's (2000) cyclical model of self-regulation: forethought, performance control and self-reflection phase. Student had to enter the cycle of self-regulation from forethought phase then pass to performance control phase, which in turn influences self-reflection phase. Every student should register to e-portfolio tool which was named 'MySelf e-Portfolio', then he creates and configures his own profile and every week he must implement and submit the programmed activities. All activities were individually assigned except one cooperative activity, but all the participants could interact in an asynchronous mode with their peers, through message boards and personal messaging. During the experimental procedure the administrator of the system scaffolds participants with private and public messages. At the end of the experimental procedure and in the last phase of self-regulation cycle, students had to complete three rubrics of self-assessment.

### 3.3. Setting and learning environment

We emphasize on the conceptual framework of the e-portfolio activities so as to enhance self-regulated skills and to promote academic and professional progress. The purpose of the e-portfolio implementation was clear and explicit to the participants as they introduced in consulting procedures for their personal and professional development in an IT context. All activities included reflective questions at the end of the process, so individual could reflect on the process of learning. Firstly, student had to enter the cycle of self-regulation (Zimmerman, 2000) from forethought phase which included self presentation, goal setting and strategic planning. Secondly, student passes to performance control phase where he gathers information that will be used to evaluate the effectiveness of the strategic plan and to improve future learning attempts (Clearly & Zimmerman, 2004). The performance processes engage students in specific learning activities such as self-regulation assignment, writing a curriculum vitae and exercise on experiential scenarios in order to employ self-control and self-observation. Thirdly, student attains self-reflection phase where he should reflects on the self-monitored information to evaluate her performance (Clearly & Zimmerman, 2004). This phase includes self-judgements and self-reactions which performed with 3 self-monitoring rubrics.

### 3.4. E-portfolio tool

We suggest in our study the use of an open source Web 2.0 technology, Elgg ([www.elgg.org](http://www.elgg.org)) which is free and open source code and supports social networking systems. It is powered by Curverider Company. E-portfolio tool (<http://e-kpaideusi.gr/myself-ePortfolio>) has a simple interface with an horizontal menu with 5 sections profile, dashboard, tools, messages and settings. User can create, change, delete and update his profile and dashboard. The basic idea is to provide users simple tools in order to support their learning and to help them realize their metacognitive strengths.

### 3.5. Instruments

Before the initiation of the e-portfolio project participants (N=41) answered a questionnaire which was based on 'Student Learning Strategies Questionnaire' (SLSQ) of Abrami and Aslan (2007). This questionnaire contains 20 close-ended Likert scale questions; also they answered a 10 items questionnaire about their background on e-portfolios. At the end of e-portfolio tool students participated in the posttest activity (self-reflection phase) where they filled 3 rubrics. They answered a self-assessment rubric '*Self-assessment Myself e-portfolio rubric for Self-regulated learning*' which was based on a TACONET, TELEPEERS program as part of a European project "Self-regulated Learning in Technology Enhanced Learning Environments at University Level: a Peer Review". Participants had to answer to 40 items (Likert scale, from 1-disagree to 4-strongly agree) which were specifically connected to their project. We tried to evaluate self-regulated learning using criteria in the three cyclical phases. In every phase we defined 4 factors: cognitive, motivational, affective and social. The second rubric focused on

student's engagement. We used 'The student engagement index (Adapted from NSSE)' (Langley, 2006) with some modifications. Participants had to answer 35 items (Likert scale, from 1-disagree to 4-strongly agree). We specified three basic criteria: level of academic challenge, student interactions with faculty, active and collaborative learning environments in order to measure student's engagement. The third was a self-monitoring rubric based on e-portfolio evaluation criteria from Penn State University (2005).

#### 4. Results

The evaluation of the research is based on quantitative and qualitative statistical analysis. The log files of the e-portfolio tool show that from 41 participants of the project, 39 students successfully completed all activities; one participant completed 3 activities and one created only his profile. During project implementation, participants sent 900 messages, and they uploaded 691files. A significant point for the e-portfolio implementation is the positive feedback from the students as they succeed to become engaged and enthusiastic during e-portfolio process.

Data collection was via different questionnaires, which were analysed for their reliability. We estimated internal consistency with Cronbach's alpha coefficient as we want to examine how consistent or free from chance error are the measurements. Cronbach's Alpha coefficient for 'The Learning Strategies Questionnaire' is ( $\alpha=.683$ ), for the 'Self-assessment Myself e-portfolio rubric for Self-regulation learning' is ( $\alpha=.970$ ), for the 'Self-assessment rubric of student's engagement' ( $\alpha=.886$ ) and for the 'Self-monitoring Rubric of MySelf e-Portfolio' ( $\alpha=.754$ ).

In this paper we emphasize on the implementation of e-portfolio so as to promote student self-regulation and as a consequence to enhance academic and professional skills. So we examined 'Self-assessment Myself e-portfolio rubric for Self-regulation learning' with Pearson r correlations between the 4 factors: cognitive, motivational, affective and social. The data in Table I indicate that higher levels of cognitive factors are associated with higher levels of motivational and affective factors, across all phases of self-regulated learning and e-portfolio implementation.

Table 1. Pearson r correlations for 'Self-assessment Myself e-portfolio rubric for Self-regulation learning'

| 'Forethought Phase'  |                     | 'Performance Control' | 'Self-Reflection' |
|----------------------|---------------------|-----------------------|-------------------|
| Cognitive Factors    | Pearson Correlation | .461**(38)            | .543*(38)         |
|                      | Sig (2-tailed)      | .004                  | .000              |
| Motivational Factors | Pearson Correlation | .478**(38)            | .569**(38)        |
|                      | Sig (2-tailed)      | .002                  | .002              |
| Affective Factors    | Pearson Correlation | .514**(38)            | .620**(38)        |
|                      | Sig (2-tailed)      | .001                  | .000              |
| Social Factors       | Pearson Correlation | .468**(38)            | .370*(38)         |
|                      | Sig (2-tailed)      | .003                  | .022              |

Note: \* Correlation is significant 0.05 level (2-tailed).  
 \*\* Correlation is significant at the 0.01 level (2-tailed).  
 Numbers in parentheses are the sample size.

#### 5. Conclusion

This study examines the implementation of an e-portfolio in order to enhance self-regulated learning skills. From the quantitative and the qualitative data we suppose that this research has some positive effects. Taking into consideration participants' comments about the structure of the e-portfolio which supports students to use it as a tool in order to promote their learning and secondly it is viewed as a scaffolding approach of understanding and engagement. Lastly the process of structuring e-portfolio as a learning strategy can be used in order to enhance self-regulated learning skills.

A major limitation of this research is the small number of participants. From this point of view we think of this research as a pilot study in order to examine the process, the content and the tool. Another limitation is tool's functionalities, in other words this e-portfolio system could be embedded into a learning management system like 'Moodle' so as to manage participants. A future application of e-portfolio implementation it can be addressed for postgraduate participants so as to create a professional profile and enhance their academic and professional skills throughout their career development.

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