The Sixth International Conference on e-Learning (eLearning-2015), 24-25 September 2015, Belgrade, Serbia

IMPLEMENTING E-PORTFOLIOS WITHIN AN ACADEMIC ENVIRONMENT

MARIJA RADOJIČIĆ
University of Belgrade, Faculty of Mining and Geology, marija.radojicic@rgf.bg.ac.rs

IVAN OBRADOVIĆ
University of Belgrade, Faculty of Mining and Geology, ivan.obradovic@rgf.bg.ac.rs

DALIBOR VORKAPIĆ
University of Belgrade, Faculty of Mining and Geology, dalibor.vorkapic@rgf.bg.ac.rs

ROBERTO LINZALONE
Università degli Studi della Basilicata, roberto.linzalone@unibas.it

Abstract: *In this paper we outline an approach to implementing the possibilities offered by e-portfolios for improving the educational process within an academic environment. These dynamically maintained electronic collections include texts, files, images, multimedia, blog entries, hyperlinks and the like, managed by users and demonstrating their special interests and skills. A review of relevant research and the results already obtained by using e-portfolios in education is given. Special attention is paid to the effect of e-portfolios on knowledge amassment and knowledge management performance. Various platforms for implementation of e-portfolios in university courses are analyzed followed by a presentation of some best practice examples. The paper also addresses some interesting open research questions on the topic of e-portfolios in education. Finally, details are given on an approach to the implementation of e-portfolios aimed at facilitating university students' knowledge management performance within the university course of Informatics at the University of Belgrade Faculty of Mining and Geology.*

Keywords: *e-portfolios, knowledge management, knowledge amassment*

1. INTRODUCTION

A wide range of possibilities offered by information technology (IT) has prompted universities around the world to deliberate the implementation of information technology in regular teaching activities [1], [2], [3]. From the pedagogical side, special attention is paid to setting up the student at the center of education, as well as to monitoring of the educational process of students. The main goal is to foster the autonomy of students within the learning process, as well as to enable them to use a range of strategies to improve their competencies. In this context, e-portfolios have been often applied as a convenient software solution in contemporary classroom activities. E-portfolio is an electronic tool used for systematic collection of students' work, achievements, objectives, also useful for students' self-regulation and learning management during learning. Finally, it represents a tool which monitors growth and progress during the learning process. An important goal is to make knowledge visible in any situation, by putting the products or objects of learning on the web, creating a portfolio that is more available and easier to access and view [4]. E-portfolio can be of great use for teachers, both for their own work and for monitoring the progress of students. The process of creating an e-portfolio involves acquisition, organization, storage, accumulation, inquiry, application, sharing, innovation, and management of knowledge. This has a positive effect on knowledge acquisition and improvement of educational attainment.

In the next section we give an overview of e-portfolio experiences and advantages they offer over paper portfolios. Different types of e-portfolios are outlined in Section 3 and some of the available software solutions for their implementation are reviewed in Section 4. An approach to implementing e-portfolios within an academic institution, namely University of Belgrade Faculty of Mining and Geology is given in Section 5, followed by some concluding remarks.

2. E-PORTFOLIO EXPERIENCES AND ADVANTAGES

When e-portfolios are discussed, effects on knowledge management (KM) are often analyzed. Thus, Chang et al. observe the implementation of e-portfolios with the aim of improving knowledge management among students [6]. According to them, knowledge management in higher education "can be regarded as an approach that enables students and teachers to collect information and share what they know, leading to action that improves services and outcomes." Thus, connection of KM with e-portfolio is not surprising. It is often noted that KM can be viewed through the following aspects: knowledge acquisition, application, storage, accumulation, transferring, sharing, and innovation [7], [8]. The aforementioned study involved experimental and control groups, within which the effects of e-portfolios on knowledge management was

observed, bearing in mind each of the five aforementioned aspects. The research results showed that when it comes to KM performance and its aspects, the experimental group using e-portfolios had significantly better results. Results of this study are an additional encouragement for application of e-portfolios in higher education.

It is undisputable that the e-portfolio compared to a conventional paper-based portfolio offers a wider range of options. However, the results of a very interesting study [9] showed that the media used to create a portfolio had no significant impact on students' perception and learning outcomes. Although responses of students show that they have a more positive attitude towards e-portfolio, the difference is not statistically significant. It is interesting that students who have worked with e-portfolios have used more time to create them in comparison to students who created paper-based portfolios. This result can be interpreted, on the one hand, as greater students' motivation to work with e-portfolios, or on the another hand, as insufficient knowledge regarding information technologies. This dilemma certainly represents an interesting research topic for further research.

The relation of knowledge amassment and e-portfolio is also very often discussed. For example, Chang et al. [10] analyze the application of e-portfolios for raising knowledge amassment among university students. Knowledge assessment can be described as the ability of students to preserve, store and integrate newly acquired knowledge with already existing, with the aim of creating firm and stable knowledge. The key research issues tackled in the aforementioned study pertain to the impact of e-portfolios on improvement of knowledge assessment and higher level knowledge acquisition among students who use e-portfolio (experimental group) compared to students who do not (control group). Results of the study show that the experimental group had a significant improvement in terms of knowledge acquisition after the application of e-portfolios. Also, by measuring knowledge amassment within the control and experimental groups after applying e-portfolios within the experimental group, the authors concluded that there is a statistically significant difference in favor of the experimental group. The authors note that this result is not conducive to generalization and suggest that further research is needed for comparison with the use of conventional portfolio, as well as the use of e-portfolios based on various web platforms.

When it comes to any innovation in the teaching process, perceptions, attitudes and behavior of students towards that innovation are of great importance. This issue has been tackled by Lopez-Fernandez et al. [11]. The results of their study show that students generally have a positive attitude towards the implementation of e-portfolio in the teaching process. It is also interesting that the attitude of students toward e-portfolio has been rising over the time. However, only half of the students believed that e-portfolios contribute to the process of learning. The students liked the idea of portfolio application and considered it to have positive effects, but they also cited two facts as impediments: the need to master new platforms and the time-consuming process of creating e-portfolios. When attitude towards e-portfolios is concerned, it would be interesting to conduct an empirical research on the attitude of both students and teachers on e-portfolios in higher education institutions, as well as their experiences in e-portfolio implementation.

E-portfolio aims to classify information related to students' achievements and thus make reviewing of educational and intellectual progress of students easier, namely it facilitates the sharing of students' achievements with teachers, colleagues, associates, consultants and researchers. Creating an e-portfolio can be significant for the promotion and interactive summarizing of students' achievements among potential employers, enabling them to get introduced with students' work and engagement. E-portfolio is also important for the process of self-reflection, which is crucial for wider learning, deeper understanding, and applying theory to practice.

Another advantage offered by e-portfolios is that it provides for presentation and exchange of experiences among colleagues at work [5]. The portfolio may serve to promote personal achievement, knowledge and success of both individuals and educational institutions. The essential advantage of e-portfolios, in comparison to conventional portfolios, is that it allows a systematic set-up and presentation of content in various media such as photos, videos, presentations and audio files. E-portfolio can also contribute to the process of creating a more appropriate image of students to their professors while allowing professors to explore the work of the students and the students' achievement [4], [13].

In addition to the benefits mentioned, some of the technical advantages of e-portfolios are: access from anywhere, by computers or mobile devices, the possibility of updating and adding information, the possibility of setting up links and customizing portfolio outline, the ability to easily print and publish its content, as well as to use e-mailing [12]. From the point of view of didactics, making e-portfolios has a beneficial effect on development of systematization skills and gradual learning. Moreover, it may have a positive impact on the development of computer skills to a certain level. Given the fact that e-portfolio platforms offer opportunities for peer review of e-portfolios, these types of platforms can foster the exchange of educational ideas and competition spirit. In addition to its beneficial effects on exchange of ideas and personal reflection, e-portfolio offers the possibility of feedback, which is also of great importance for students' progress. Results of scientific studies testify to the positive impact of e-portfolios on self-regulation in the learning process, as well as knowledge management.

3. TYPES AND STRUCTURES OF E-PORTFOLIOS

Given the already wide usage of e-portfolios in different educational and professional fields, it is not easy to offer an exact classification of the types of e-portfolios. Thus, for example, the authors Abramiand Barrett [16] offer the following classification: process portfolio, assessment portfolio and showcase portfolio. Process-portfolio aims to present the educational progress and development of students over time. It is based on works-in-progress and

includes both self-assessment and reflection, as well as feedback elements. Communication among university students is significant when this type of portfolio is concerned. On the other hand, the assessment portfolio is a presentation of the student's competence and skills, usually after the course and program realization. The objective of this portfolio is to emphasize student competence and its achievements. Finally, the showcase portfolio is designed to display students' exemplary work and skills. This type of portfolio is created to highlight the quality of students and display their greatest achievements and most important results. It is aimed at presenting the students to potential employers. A similar classification was given in [17], where the learning portfolio corresponds to the process portfolio, and the credential portfolio to the assessment portfolio and showcase portfolio. Some classifications introduce the "hybrids portfolio", as the combination of the three types of portfolios [18]. A totally simplified approach, where a career portfolio encompasses the functions that could be identified with other types of portfolios is presented in [19].

Since e-portfolio represents a systematic collection of various types of materials aimed at displaying a student's work, achievements and skills, the student can expect a number of different types of materials that should be adequately organized. The meaningfulness of e-portfolio largely depends on the organization and arrangement of the materials it contains. It is difficult to set a unique template for creating a portfolio, but a general structure of content can be identified. There are several studies which discuss tabulation of e-portfolios [20], [21]. Tabulation is a set of linked buttons that provide a clear navigation through the portfolio. The most important fact is to keep the portfolio structure clear, because it helps both its creator and the visitor who wants to see a particular portfolio. Tabulation may be different, depending on the purpose of the portfolio, focusing on content within a specific course, or shifting the focus on skills or self-reflection. The interface should offer easy navigation to users, so they know at each moment where they are in the portfolio, as well as a high degree of interactivity and easy review. There are various suggestions for interface, such as folder-style menus, double level style menus or guide map [22].

4. AVAILABLE SOFTWARE SOLUTIONS

Due to the growing importance of e-portfolios and their ever widening usage in recent years many various software solutions have appeared that enable creation of e-portfolios. E-portfolios can be created in different ways from simple applications blogs and modular platforms to specialized platforms for creating and publishing e-portfolios. There is a variety of both commercial and non-commercial platforms for creating e-portfolios**.** One of the most famous commercial platforms is Digication (https://www.digication.com), which offers detailed instructions and a large number of templates both for individuals and for educational institutions. Boston University [4], decided to implement this platform in teaching, and some other universities followed this pattern (Figure 1).

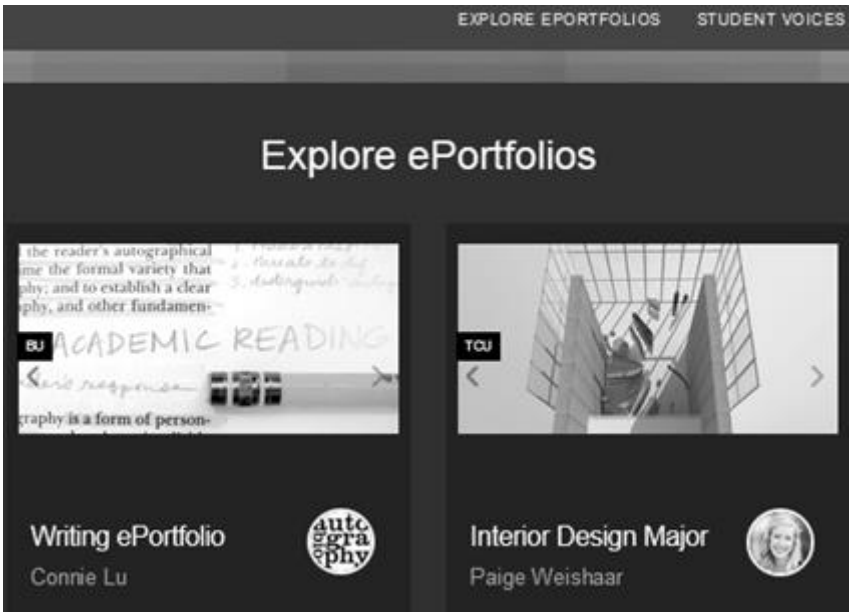

Figure 1: Examples of e-portfolios

There is a number of other mainly commercial e-portfolios such as PebblePad, Angle E-portfolio, Fronter, Webfolio and eXact Portfolio as well as those offered at "50 Fresh Portfolio Websites for Your Inspiration" [14] and "22 Beautiful Portfolio Websites to InspireYou" [15]. When it comes to non-commercial platforms, the most frequently mentioned and very often applied is the Mahara platform [12]. This platform was created in mid-2006 as an open source e-portfolio platform for Massey University, Auckland University of Technology, The Open Polytechnic, and Victoria University of Wellington (New Zealand). Mahara is a flexible platform offering a personal learning environment mixed with social networking, allowing the students to collect, reflect on and share their achievements and development on line, in a space they control. This open-source platform also

offers an interface to the modular learning management system Moodle. Generating an e-portfolio on this platform consist of creating pages that may contain different types of files, text video, audio and others. After the pages are created, they can be grouped into collections and thus structured within the content of e-portfolio (Figure 2). Finally, the platform offers a range of possibilities for portfolio sharing and allows forming of discussion groups, as well as their own accounts and profiles. The interface is largely applicable and is suitable for implementation for users with different levels of computer skills [12].

Figure 2: Lists of collections in Mahara

5. IMPLEMENTING E-PORTFOLIOS WITHIN AN ACADEMIC INSTITUTION

Given the advantages of e-portfolios, as well as the large number of platforms and policy directives that may provide significant support, we decided to implement e-portfolio as a tool to facilitate students' knowledge management and allow self-promotion to possible employers at the University of Belgrade Faculty of Mining and Geology. E-portfolios are introduced at the freshmen level within the Informatics 1 course with the aim of help students to get familiar with their use. The course lasts one semester and during the semester students will be trained to create and actively use e-portfolios. The aim is to provide an environment suitable and adaptable for acceptance, implementation and exploiting outcomes of e-portfolios.

5.1 Software solution

At the Faculty of Mining and Geology the learning management system Moodle (Modular Object Oriented Distance Learning Environment) has been used for several years, with the purpose of introducing e-learning within blended learning in the teaching process. Having in mind the advantages of Moodle, like good organization of content as well as resources, such as forums, wiki pages, chat rooms, assignments, files, links etc. it isn't surprising that Moodle is used on many higher education institutions and that it is widely accepted by students [23]. Based on our positive experience in using Moodle at the Faculty of Mining and Geology our approach was aimed at connecting an e-portfolio platform with Moodle platform. There are a few platforms which can be connected to Moodle. After a comprehensive analysis we decided to choose Mahara as the e-portfolio platform. As we have mentioned in the previous section, Mahara presents an open source platform which provides for creating and managing e-portfolios. Mahara was particularly suitable for our purpose as it contains the Single Sign On (SSO) mechanism, which allows user authentication and authorization with the same username and password used in Moodle, thus simplifying the interface within Moodle and Mahara (Figure 3). Thus the students can access both Moodle and Mahara with only one log on process, which is especially important for freshmen who are faced with a new learning environment. The interface between the two platforms enables easy transfer to e-portfolios in Mahara of students' work, such as seminars, videos, pictures, essays, practice reports, which are mostly stored at Moodle. At the first glance, it looks as if Mahara is embedded in Moodle, despite the fact that they are two different platforms.

In order to integrate Mahara with Moodle it is necessary to make certain preparations within both Mahara and Moodle. The networking service needs to be turned on servers, thus enabling the generation of public keys, which are important in order to actually establish mutual "trust" between the services. The institution needs to be created and registered within Mahara, where the way of reporting through authentication plugin XML-RPC - Authentication via SSO from an external application is defined. All users who sign in through Moodle will be placed in the defined institution within Mahara. Administrator authorities have to define the parameters of Moodle servers to able access to Mahara. Mahara is added in Moodle as a network service and it can be added to any course on Moodle, as well to the home page. The possibility of adding the network service Mahara is available to every user who has privileges to edit the course. In order for SSO to function the time on the two servers must be synchronized. Differences in time of a few minutes is treated as an unsafe connection and leads to disabling logging to Mahara through Moodle. Network Time Protocol (NTP) is proposed as a solution for time synchronization.

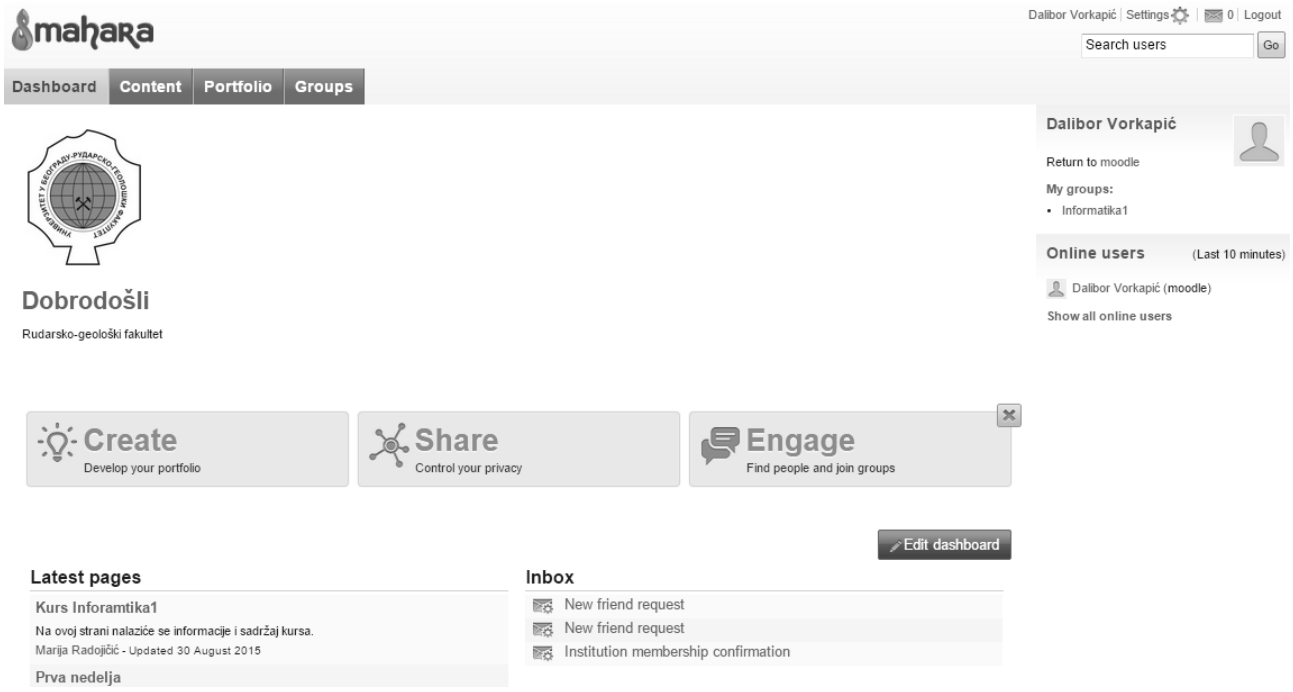

Figure 3: Mahara within Moodle at the Faculty of Mining and Geology

5.2. Advantages of Mahara in line with students needs

The wide range of activities of future engineers of mining and geology during their studies requires a comprehensive and flexible platform for creating their e-portfolios, which allows a high level of modularity, such as Mahara. Education of engineers of mining and geology is specific because it requires a lot of practical work at mines, pits, dams, landslides and the like, recorded in extensive documentation that includes images, videos, documents and other formats of recorded work.

There is a need for structured and systematic storage of these materials which is provided by Mahara. In addition to that, Mahara's options enable creating various types of e-portfolios such as process, assessment and showcase portfolio, but provides also for the hybrid approach, which is and additional advantage for students. The platform has a user friendly interface, allowing social networking, by enabling students to manage their own accounts through options for adding friends, creating groups and assigning different levels of permissions for published content.

5.3. Research issues

By introducing this new tool to freshmen of the Faculty of Mining and Geology we expect to improve their studies in the field of self-regulation and knowledge management. Namely, by the application of e-portfolio, we want to facilitate the process of learning, as well as to provide another option for their personal and professional presentation. The idea is to adapt the tool for creating e-portfolio to the specific needs of students of the Faculty of Mining and Geology. In addition to that, we also plan some research associated with introducing e-portfolios in order to assess the application of this tool and whether to make it an integral part of the teaching process in general. Also, the aim is to detect potential weaknesses of portfolio implementations, in order to overcome them in subsequent applications.

There are not many researches of the topic of e-portfolio involving students of engineering colleges. Thus we plan to assess the attitude of our students towards the e-portfolio during time, as well as their results in terms of knowledge management. Interviews with a number of students is planned, but also with teachers for assessing their perception of e-portfolios. We will analyze whether

there is a statistically significant connection between the attitude of students and their results in terms of knowledge management. We will also analyze whether there is a significant difference in the attitude of students and the results of knowledge management by gender.

6. CONCLUSION

In recent years different educational platforms have appeared and offering new opportunities in education that can contribute to more meaningful learning. One innovation of that kind is the e-portfolio. E-portfolio is broadly applied at different levels of education, in many countries around the world. Still, in Serbia the application is not so popularized. Having that as in mind, we want to promote with our work the positive effects and the importance of e-portfolio for education.

The aim of this paper is to incite and familiarize educators with the positive effects of e-portfolio in order to make the results of the education process applicable as much as possible. Given that the implementation of e-portfolio does not require excessive resources, we hope that it will soon be used in our country to a greater extent. Despite the fact that e-portfolio is accepted by the pedagogical public worldwide, and that there are lot of research results on this subject, there are still many open questions that await future research.

LITERATURE

[1] Cuthell, J. P. (2002). *Virtual learning: The impact of ICT on the way young people work and learn*. Aldershot, Ashgate.

[2] Kimball, M. A. (2003). *The web portfolio guide*. New York, Longman.

[3] Greene, M., &Ferrell, M. (2007). *Electronic portfolio: designing innovative artifacts that meet program standards*. In R. Carlsen, et al. (Eds.), Proceedings of society for information technology & teacher education international conference 2007, 3370–3375, Chesapeake, VA, AACE.

[4] *Why use e-portfolio, guideline.* https://bu.digication.com/portfolio_about_portfolios/Why_Use_e-portfolios). Boston University. Retrieved: August 2015.

[5] *7 Ways to Create E-Portfolios.* http://www.informationweek.com/software/7-ways-to-create-e-portfolios/d/d-id/1110673 Retrieved: August 2015.

[6] Chang, Chi-Cheng, et al. (2013). *Using e-portfolios to facilitate university students' knowledge management performance: E-portfolio vs. non-portfolio*. Computers & Education, 69, 216-224.

[7] Liebowitz, J. (2012). *Knowledge management handbook: Collaboration and social networking*. Boca Raton, FL, CRC Press.

[8] Lee, K. C., Lee, S., & Kang, I. W. (2005). *KMPI: measuring knowledge management performance.* Information & Management, 42(3), 469–482.

[9] van Wesel, M., & Prop, A. (2008). *The influence of portfolio media on student perceptions and learning outcomes*. Proceedings of Student Mobility and ICT: Can E-LEARNING overcome barriers of Life-Long learning? Maastricht University, 73.

[10] Chang, C. C., Liang, C., Tseng, K. H., & Tseng, J. S. (2014). *Using e-portfolios to elevate knowledge amassment among university students*. Computers & Education, 72, 187-195.

[11] Lopez-Fernandez, O., & Rodriguez-Illera, J. L. (2009). *Investigating university students' adaptation to a digital learner course-portfolio.* Computers & Education, 52(3), 608-616.

[12] Milošević, D., *ICT u nastavi - E-portfolio*. https://onlineobuka.wordpress.com/ict-u-nastavi/e-portfolio/. Retrieved: August 2015.

[13] Živić, M., *Elektronski portfolio.* https://informatikabelapalanka.wikispaces.com/file/detail/Elektronski%20portfolio.pptx. Retrieved: August 2015.

[14] *50 Fresh Portfolio Websites for Your Inspiration*. http://www.smashingmagazine.com/2009/07/50-fresh-portfolio-websites-for-your-inspiration/. Retrieved: August 2015.

[15] *22-beautiful-portfolio-websites-to-inspire-you.* https://webdesignledger.com/22-beautiful-portfolio-websites-to-inspire-you#sthash.l2CWgDUQ.dpbs. Retrieved: August 2015.

[16] Abrami, P. C., &Barrett, H. (2005). *Directions for research and development on electronic portfolios*. Canadian Journal of Learning and Technology, 31(3), 1–15.

[17] Zeichner, K., &Wray, S. (2001). *The teaching portfolio in US teacher education programs: What we know and what we need to know*. Teaching and Teacher Education, 17(5), 613-621.

[18] *e-Portfolio Basics: Types of e-portfolios*. http://academic.regis.edu/LAAP/e-portfolio/basics_types.htm. Retrieved: August 2015.

[19] *Guidelines for creating a career portfolio*. http://info.hartwick.edu/library/hewlett/Guidlns.htm. Retrieved: August 2015.

[20] Wang, S. (2009). *E-Portfolios for integrated reflection*. Issues in Informing Science and Information Technology, 6, 449–460.

[21] Kuo, S. Y. (2004). *Educational test and assessment*. Taipei, ChingHua.

[22] Chang, Chi-Chen, Tseng, Kuo-Hung, Yueh, Hsiu-Ping, Lin, Wei-Chien (2011). *Consideration factors and adoption of type tabulation and framework for creating e-portfolios*. Computer & Education, 56, 452–465.

[23] Milošević M., Zećirović E., Krneta R. (2014). *Technology acceptance models and learning management systems: case study*. Proceedings of the conference: eLearning 2014, 35-40.