LIFELONG LEARNING SUPPORTED BY EPORTFOLIO PROCESS

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Abstract

The concept of lifelong learning is based on the principle of the self-directed pursuit of knowledge or skills that occur throughout ones life. While the concept is not new, the importance of lifelong learning skills in addition to academic and subject knowledge has been increasingly emphasised in the workplace and public policy over the last decade. Higher education institutions, and universities in particular, recognise the importance of lifelong learning and define their own strategies to promote it such as including learning attributes in their graduate profiles. Yet, at this stage, lifelong learning support provided in universities is not strong enough to meet learners' needs.

This research project explores theoretical concepts, available technical solutions and lifelong learning support needs of universities. As it is shown in the literature review, theories in this area have already been developed followed by raising awareness and attempts at universities to support lifelong learning. Currently basic level technical solutions are available, such as ePortfolio systems or accommodation of Personal Learning Environments (PLE) into university settings, but their shortcomings are hindering full adoption.

This PhD research proposes a learner-centered e-learning environment which will provide comprehensive support for lifelong learning. This environment will be built on an institutionally focused Learning Management System (LMS) and a learner focused ePortfolio system. While these systems already have some low-level connections, extensions are required to adequately support lifelong learning: students need to be in charge of their own learning progress; they need to be able to choose the environment that serves their needs best and has a smart data workflow to easily connect to their institution's environment; the approach should be streamlined for both, teachers and students.

Acknowledgements

I would like to thank...

Publications and Presentations

Peer-reviewed international conferences

Bozhko, Y., and Heinrich, E. (2011). Concept Map-Based Framework for Learner-Centered Knowledge Management in ePortfolios. In Proceedings of The 11th IEEE International Conference on Advanced Learning Technologies 2011 (pp. 160-163). Athens, GA, USA.

Bozhko, Y., and Heinrich, E. (2011). Enhancing ePortfolio Systems to Better Support Lifelong Learning in Universities: Students' Perspective. In Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications 2011 (pp. 1912-1917). Chesapeake, VA: AACE.

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Book chapter

Heinrich, E., and **Bozhko, Y.** (2012). The Role of Institutions in Creating Student-Focused Virtual Learning Spaces with ePortfolio Systems. In Keppell, M., Souter,

K., and Riddle, M. (Eds.), Physical and Virtual Learning Spaces in Higher Education: Concepts for the Modern Learning Environment. (pp. 119-135). IGI Global. doi:10.4018/978-1-60960-114-0.ch008

Other publications

Bozhko, Y. (2011). Concept Maps for Learner-Centered Knowledge Management in ePortfolios. 9th New Zealand Computer Science Research Student Conference (NZCSRSC) 2011. Palmerston North, New Zealand.

Bozhko, Y. (2010). Towards an Institutional Lifelong Learning Environment. 8th New Zealand Computer Science Research Student Conference (NZCSRSC) 2010. Wellington, New Zealand.

List of Abbreviations

CLI – Composite Learning Index

DSR – Design Science Research

ELLI – European Lifelong Learning Indicators

LMS – Learning Management System

OECD – Organisation for Economic Co-operation and Development

PLE – Personal Learning Environment

UNESCO – United Nations Educational, Scientific, and Cultural Organization

VLE – Virtual Learning Environment

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Chapter 1

Introduction

> Learning is not a product of schooling, but
> the lifelong attempt to acquire it
>
> *Albert Einstein*

The concept of lifelong learning has become very popular over the last decade. The original idea has gone through a lot of changes, through the stages of continuing, recurrent, and adult education (Jarvis, 2004, pp. 46-55). On one hand, the lifelong learning concept has an entirely economic background, where the learners themselves are seen as tools for economic development and their needs are firmly tied to the needs of the industry (Carter, 2008, pp. 112-114). On the other hand, as stated by UNESCO, lifelong learning is a cultural policy which influences society and promotes changes (Boshier, 2000, pp. 12- 14). However, no matter which point of view is adopted, world economics, employment policy and society are changing. The importance of lifelong learning is increasing. For full participation in education, workplace, and society individuals today require well- developed lifelong learning skills, developed from the early stages of their lives (Otala, 1997).

In addition to being a subject for political and economical discussions (Bagnall, 2009), lifelong learning has been also established as a topic of interest in higher education, in particular universities (Knapper and Cropley, 2000). Universities provide the necessary organizational framework, theoretical principles and practical experience for lifelong learning (Knapper and Cropley, 2000). This can be seen in the role and influence of the universities in the educational systems of most countries as the keepers of the intellectual traditions of a nation (Longworth, 2003, p. 96). Based on this background of the importance of lifelong learning and the central role of universities, this PhD research is focused on and explores the need for lifelong learning support in universities. Chapter 2 is focused on discussing the background of lifelong learning. Its connection to

universities, the current situation in this area and the problems associated with lifelong learning in universities are shown in this chapter.

1.1 Reseach Goals

1.2 Research Design

1.3 Scope and Limitations

1.4 Thesis Structure and Outline

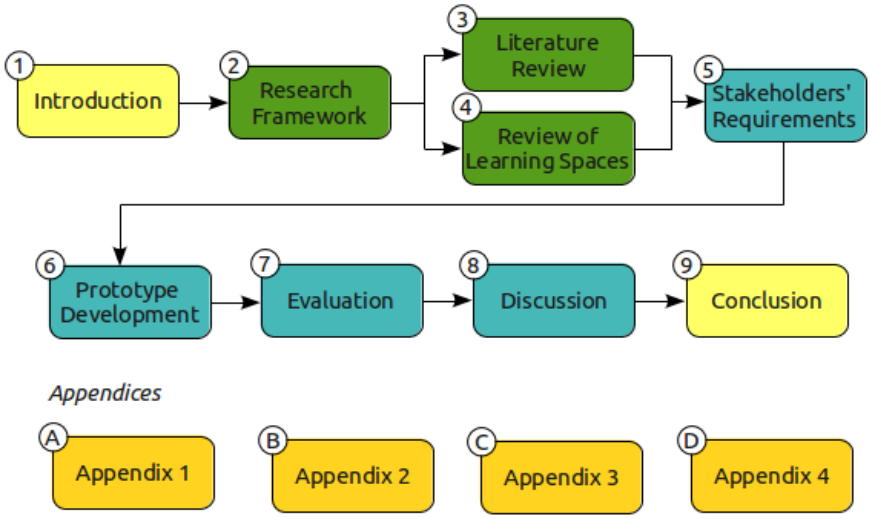

Figure 1.1: Thesis structure

Chapter 2

Research Framework

2.1 Objectives

To achieve the research aim a number of objectives are proposed:

- To determine student and institutional requirements for a lifelong learning environment within the university context;
- To map these requirements against the e-tools, and ePortfolio system in particular, already used in universities to support lifelong learning;
- To implement the features required in ePortfolio systems in conjunction with LMS to satisfy the defined requirements;
- To evaluate how these combined systems meet the needs of all stakeholders in supporting lifelong learning.

2.2 Research Questions

1. *What is the concept of lifelong learning and its connection to the universities?*
    - What is the role of lifelong learning in the university context?
    - What is the motivation of universities in supporting lifelong learning?
    - What are the existing university policies for supporting lifelong learning?
    - What are the components of lifelong learning environments in universities?
    - What are the requirements for successful lifelong learning support in universities?

2. *What e-tools are available to support lifelong learning within the university context?*

    - What e-tools are available to support lifelong learning:
        - in general?
        - in universities?
    - What are the conceptual strengths and weaknesses of these e-tools in university context?
    - What is the relationship between LMS and e-tools support for lifelong learning in university context?

3. *How can LMS and/or ePortfolio systems be extended to support students in a university context in lifelong learning?*

    - What features are available now in these systems?
    - What are the students and institutional requirements for LMS and ePortfolio to support lifelong learning?
    - How can these requirements be translated and implemented into new or improved features?

4. *Do this extended environment meet the needs of the stakeholders in university teaching and learning contexts?*

    - How can lecturers use new features to provide students with their guidance and help them to understand lifelong learning skills?
    - How can students address institutional graduate attributes and other skills using new features?
    - How can new features help students track their learning progress, manage ePortfolio knowledge and content, demonstrate and share their achievements with others?

2.3 Research Approach

2.3.1 Design Science Research Methodology

2.3.2 Design Science Research Applied to This Project

2.3.2.1 Stage 1. Problem identification and motivation

2.3.2.2 Stage 2. Objectives for a Solution

2.3.2.3 Stage 3. Design and Development

The prototype development in this project followed established software engineering practices that interleaved coding and revision, forming iterative development cycles, as it shown at 2.1.

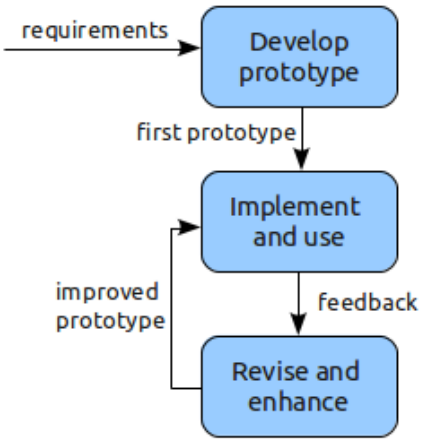

Figure 2.1: Prototyping (based on Sommerville (2007, p. 411))

2.3.2.4 Stage 4. Demonstration

2.3.2.5 Stage 5. Evaluation

2.3.2.6 Stage 6. Communication

2.4 Methodological Limitations

2.5 Related Work

As the field of lifelong learning became popular, there were a number of studies aimed to explore lifelong learning support in various contexts. To date research similar to this project has not been identified, although projects found were a valuable source of information and examples of previous research experience.

- Lifelong Learning in London for All[1] (L4All): This project is focused on developing of lifelong learning system to support independent learners (particularly those 16+ learners who traditionally have not participated in higher education) by recording their learning pathways. This project aimed to provide lifelong learners in the London region with access to information and resources that facilitates their progression from secondary education to further education or from secondary education directly to higher education (de Freitas et al., 2006);

- The Regional Interoperability Project on Progression for Lifelong Learning[2] (RIPPLL): This project was going to establish a model of cross-sector collaboration in personal development planning technology in the UK. The aim was to make interoperable all the major existing electronic systems for study- based progress files in use in further and higher education to provide an easier transition process from school to further education (Hartnell-Young et al., 2006);

- ELGG-Moodle: In autumn 2006 Klagenfurt University, Austria was piloting the project aimed to integrated Moodle LMS and ELGG platform. This integration was used for professional development for all academic staff. Project outcomes provided integration between systems such as single login and file transfer (Attwell, 2007).

[1] http://www.lkl.ac.uk/research/l4all.html
[2] http://www.jisc.ac.uk/whatwedo/programmes/edistributed/rippll.aspx

2.6 Summary

Chapter 3

Literature Review - Lifelong Learning

In order to answer the first research question, it is important to establish a basic understanding of the main concepts used in this work. Although, underlying concepts can be found primarily in the domain of education, they make a good starting point for a discussion.

This chapter introduces the key concept of lifelong learning that will be in focus throughout the thesis. First, the origins of the term of "lifelong learning" and related concepts are discussed in Section 3.2. The crucial differences between these concepts and how they transformed over time, driven by changing society and economics, are explored. Second, through the increasing focus on lifelong learning skills in the world of work and in higher education, Section 3.3 shows the need for lifelong learning support in universities. Universities are in center of this dicussion as they provide the necessary organizational framework, theoretical principles and practical experience for lifelong learning (Knapper and Cropley, 2000), which can be seen in the role and influence of the universities in the educational systems of most countries as the "keepers of the intellectual traditions of a nation" (Longworth, 2003, p. 96). Third, in Section 3.4 the general needs for successful lifelong learning are outlined. No explicit requirements have been found in the literature. However, commonly accepted recommendations and guidelines were discovered in various sources that will be used as a background for further exploration in Chapter 5.

3.1 Literature Review Process

The literature review on lifelong learning (Chapter 3) and a review of institutional and open learning spaces (Chapter 4) that provide and support background for this thesis were conducted by systematically reading and reviewing books, journals and conference proceedings in the area of research. The main methods to identify relevant literature were recommendations of domain experts and a library search. Relevant articles were identified by reading titles and abstracts of selected journal articles and papers in conference proceedings. Where possible the latest ten years of issues of the following journals were looked through: "British Journal of Educational Technology", "International Journal of Lifelong Education", "European Journal of Education", "Lifelong Learning in Europe", "International Journal of Emerging Technologies in Learning", "New Zealand Journal of Adult Learning", "Journal of Computer Assisted Learning", "European Journal of Engineering Education", and "International Journal of ePortfolio". In addition, a keyword search was carried out on the Internet and academic resources (such as Education Research Complete[1], Academic Search Premier[2], Directory of Open Access Journals[3], Google[4], Google Scholar[5]) to cover conference publications not available in the library. The following keywords and combinations of keywords were used in the search: "lifelong learning", "life-long learning", "e-learning", "ePortfolio", "e-portfolio", "electronic portfolio", "Web 2.0", "learning environment", and "learning technology".

This review helped to discover previous work in the area (described in Section 2.5), explore methods that could be applied to this research, increase the depth and breadth of knowledge of the field, and identify domain experts and other people working in the same field who could be valuable to contact. Besides finding relevant information in the literature, it was also notable to identify the gaps that currently exist (more detailed discussion can be found in Chapter 4). It will be shown further that these gaps are based on facts that although a lot of work has been done on developing lifelong learning theories as well as developing technologies for education and learning, there is little substantial work done on combining these two areas.

As a continuous process, the literature review for this research was updated by actively acquiring and reading the relevant articles emerging in the literature.

[1] http://www.ebscohost.com/academic/education-research-complete
[2] http://www.ebscohost.com/academic/academic-search-premier
[3] http://www.doaj.org
[4] http://google.com
[5] http://scholar.google.com

3.2 The General Concept of Lifelong Learning

3.2.1 Terms and Definitions

The European Commission (2000) defined lifelong learning as:

> *All learning activity undertaken throughout life, with the aim of improving knowledge, skills and competencies within a personal, civic, social and/or employment-related perspective.*

However, it is not as simple as it looks: the concept of lifelong learning consists of a variety of meanings, models and ideas. Such terms as 'lifelong learning', 'lifelong education', 'adult education', 'recurrent education', 'continuing education', and 'further education' create a set of to some extent related, yet different concepts (Hager, 2011).

'Continuing education' (also referred to as 'adult education') was introduced in the late 1970s and early 1980s. There was no common definition of this term, but in some sources (Jarvis, 2004) it was described as all learning activities which could be undertaken after compulsory schooling is finished. Figure 3.1 compares the main concepts in education according to the time spent by individuals learning/studying across their lifespan. As can be seen, continuing education was usually part-time and accured less frequesntly than other forms of education.

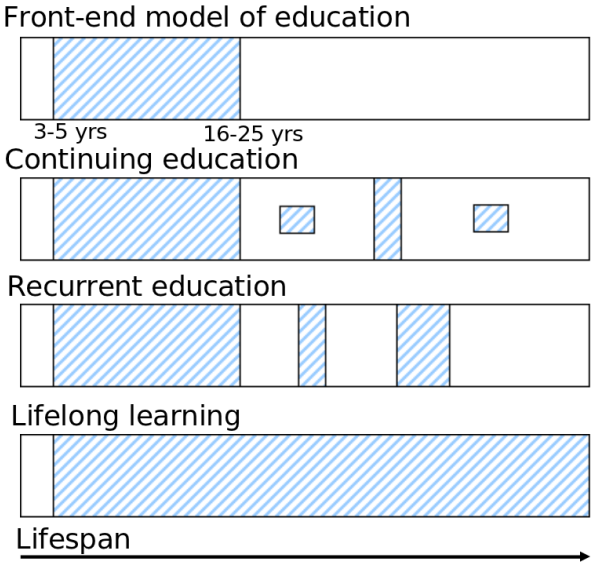

Figure 3.1: Changing concepts of learning (Jarvis, 2004)

The term 'recurrent education' was widely used by OECD until the 1980s (Jarvis, 2004). Unlike intermittent continuing education, its idea was in allowing adults to

spent full time studying in formal education sector doing on-the-job trainings or post-compulsory education of any kind. Arguably, this main feature of the right for full time study made the concept of recurrent education disappear from the governments' eduactional agendas: it was too expensive and difficult to support this policy.

Rejecting the concepts of recurrent and continuing education played an important role in development of the new educational models. While they had different undelying philisophy, they both recognized the fact that aquisition of knowledge should be a lifelong process, from "cradle to grave" (Hargreaves, 2004).

The origin of the term 'lifelong learning' goes back to the early 20th century and is contributed to by John Dewey (2004). From his perspective, lifelong learning had to be centered on the individual's ability to take an active role in democratic society. He saw education as a learning process which was influenced by the growth of the individual and society, both interlinked. Dewey's key to lifelong learning was in developing active learning, enabling the individual to reflect and change throughout life, emphasizing that non-formal education was as important as formal education.

The concept of 'lifelong education' was discovered in 1972 after Edgar Faure's Report "Learning to Be" for UNESCO. The concept described in the report was announced to be the leading one for the reform in education. Faure's Report used four principles for the lifelong education architecture (Faure et al., 1972): vertical integration (education should occur throughout one's life), horizontal integration (acceptance of non-formal and formal education), the democratization of education (more widespread involvement of learners) and learning society (restructuring of educational system). However, according to Hager's (2011) analysis, UNESCO's concept of 'lifelong education' put the emphasis on formal education as the only sufficient and relevant form of learning to provide actual 'education'.

3.2.2 Paradigm Shift and Lifelong Learning Today

Almost 40 years after the idea of this lifelong education was introduced, many governments rediscover not lifelong education, but lifelong learning (Boshier, 2000). This shift was not only semantic, but also substantive, which showed that lifelong learning and lifelong education are not the same: lifelong education aimed to develop more humane individuals and communities, while lifelong learning's goal was in retaining and gaining new skills that would help individuals adapt to rapid changes in their workplace (Medel-Añonuevo et al., 2001). Lifelong learning is based on the notion of the individual learner as a consumer. And as a result if consumers decide not to take advantage of all the opportunities they have – then it is their fault. Therefore, being constructed as

individual activity, learning depends entirely on personal motivation. Unlike learning, education is a provided service (Boshier, 2000) that requires someone to be responsible for providing resources, developing policies, etc. The emphasis on 'learning' rather than 'education' is significant (Tuijnman and Boström, 2002), as it moves focus from the institutions onto the individual. Although, it does not mean that institutions and govermnets play no role whatsoever. Their role is rather transformed into investment in individuals and creation conditions for them to take charge of their learning (Chen, 2009).

Over the last decade, lifelong learning support has become a part of official government policy in a number of countries around the world. As an example, European Commission has established a budget of nearly 7 billion Euro for the period of 2007-2013 for 'Lifelong learning programme' which aims to support education and training at school, college, university, in the workplace and in the community across Europe (EACEA, 2009). In New Zealand a number of governmental documents (New Zealand Ministry of Education, 2008) now mention the "success of all New Zealanders through lifelong learning". As a result, the national tertiary education system of the country has been transformed to support lifelong learning ideals (Benseman, 2006).

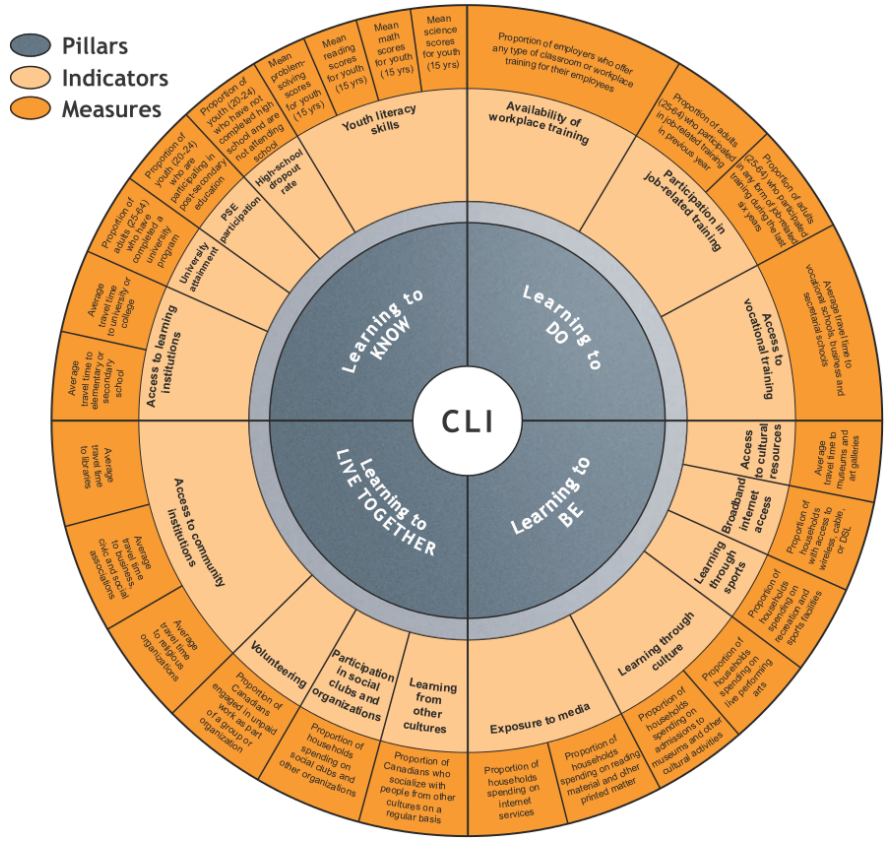

Figure 3.2: The 2010 Composite Learning Index of Canada

In 2006 Canadian Council on Learning developed the 17 indicators and 26 specific measures (Figure 3.2) called Composite Learning Index (CLI) that is used to calculate annual progress in lifelong learning in the country (Canadian Council on Learning, 2011). Using CLI, Canadian government expects to draw attention to the benefits of lifelong learning and demostrate learning opportunities that occur outside of classroom settings. In August 2010 European Union adopted this Index as European Lifelong Learning Indicators (ELLI). Similar to CLI, ELLI were using UNESCO approach of four pillars of learning: Learning to Know, Learning to Do, Learning to Be, and Learning to Live Together (ELLI Development Team, 2010).

3.2.3 Components and Attributes of Lifelong Learning

In terms of purposeful learning activities lifelong learning consists of the following components (Longworth, 2003; Tuijnman and Boström, 2002):

- Formal learning – institutionally graded, and hierarchically structured system, often leads to qualification;
- Non-formal learning – organized systematic educational activity external to formal education;
- Informal learning – planned or not planned, but conscious learning from the experience;
- Incidental learning – not intentional, an accompaniment to everyday life, learning during the action.

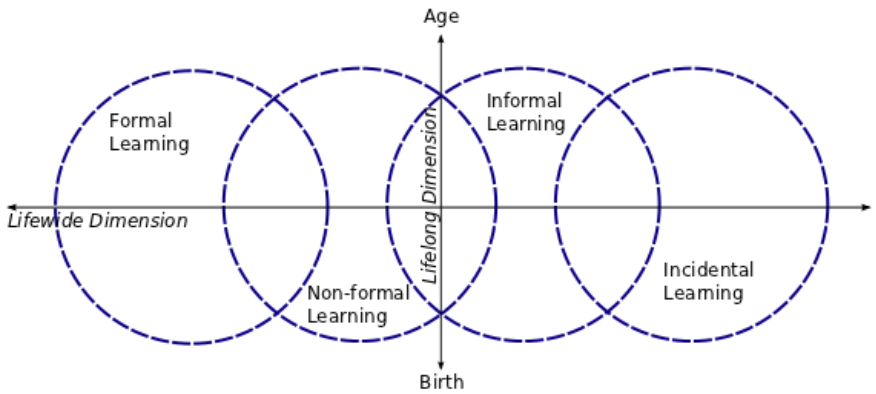

Figure 3.3: Framework for Lifelong Learning (based on Divjak et al. (2004, p. 11))

Some researchers (Longworth, 2003) recognize only two categories of lifelong learning, formal and non-formal, leaving informal and incidental parts of it as the elements

of non-formal learning. Boshier (2000) states that the current reality is such that the formal and non-formal categories of lifelong learning are like "two parallel railway lines. Both cross the landscape but never touch" (p. 11), explaining this way that formal setting have practically nothing to do with non-formal.

From another perspective, lifelong learning encompasses the elements of self-direction, long-term and life-wide learning (Schuetze and Casey, 2006). Rubenson (2002) called these 'three fundamental attributes of lifelong learning ':

- Lifelong – means everything from cradle to grave;
- Life-wide – takes place outside the formal education system;
- Self-directed – is guided by the learners themselves and does not limit itself to education.

Weert and Kendall (2004) gathered other essential characteristics of lifelong learning:

- Most of lifelong learning occurs outside of classroom as is not triggered by text-books;
- The driving force in lifelong learning is self-motivation and active participation of learners;
- Lifelong learning involves interactions, groups, community learning and other social activities;
- Solving atrificial tasks does not matter in lifelong learning. Achievements in real-life situations measured by common standards are important;
- Lifelong learning is learner centred and aims for personal achievements;
- Lifelong learners should maintain their achievements portfolio.

These characteristics describe lifelong learning as demand-driven, flexible, social and personal at the same time. Hereinafter, any further reference to lifelong learning will be made in terms of the concepts outlined in this section.

3.3 Lifelong Learning in Universities[6]

As lifelong learning consists of the concepts of 'life-long', 'life-wide' and 'self- directed' learning, it has following significant implications. As already mentioned above, 'life-long' means the full life span of an individual. From the institutional view it starts when students are enrolled in the university and finishes when they graduate. 'Life-wide' component of learning implies that learning can and should occur not only as formal university study, as personal and professional development takes place in many contexts. Attwell (2007) considers the fact that everyday non-formal types of learning are not connected to institutional formal education to be the major issue of modern learning, which can make students see their study at university as "something irrelevant to their identities" (p. 4). For successful lifelong learning , progress of the achievements should be recorded and maintained over a long period and across various sources, formal as well as non-formal (Kay, 2008). A lifelong learning environment needs to acknowledge this and allow learners to record and reflect on experiences from all these contexts.

Over recent years the skills that provide lifelong learning ability were identified, they include: solving problems, critical thinking, utilizing technology, and information literacy; working with others in teams, communication skills, leadership and social interaction skills; self-management; collecting, analyzing and organizing information; planning and organizing activities; cultural awareness and understanding (Brooks and Everett, 2008; Heinrich et al., 2007; Otala, 1997; Pitman and Broomhall, 2009). The importance of these skills in addition to academic and subject knowledge has been increasingly emphasized in the workplace and public policy (Morgan-Klein and Osborne, 2007; Sutherland and Crowther, 2006). Individuals today need to continue to update and upgrade their skills and knowledge even after completing formal education in order to survive in the changing world. Otala (1997) states that required flexibility and adaptability to these rapid changes are gained through "better developed learning skills and the right attitudes that help individuals quickly and easily learn new things" (p. 456). Therefore, current students need to "possess something more than skills which grow obsolete as technology advances" (Field and Leicester, 2003, p. 195).

Higher education institutions have responded to the need for lifelong learning skills by defining their own strategies to promote lifelong learning. Many institutions in Europe, the United States, Australia and New Zealand now explicitly express the lifelong learning characteristics they strive for in their graduates (Scanlon, 2006). Australian

[6]This section was adopted from the section originally published as part of Chapter 8 "The Role of Institutions in Creating Student-Focused Virtual Learning Spaces with ePortfolio Systems" of the book "Physical and Virtual Learning Spaces in Higher Education: Concepts for the Modern Learning Environment". Full reference can be found in Publications section.

universities, such as Curtin University, have made policy declarations committing to graduate attributes across their programmes (Curtin University, 2006). The College of Sciences of Massey University has formulated a draft lifelong learning policy (Massey University, 2008) that expresses values, support and expectations in regards to lifelong learning. Graduate profiles, naming lifelong learning skills such as critical thinking, effective communication, teamwork and leadership have been established for many degree programme (Davies and LeMahieu, 2003; McAlister and Alexander, 2003). The accreditation criteria for engineering degrees now refer to and demand soft skills (Aller et al., 2005; Muffo, 2001). The need for a holistic education and the development of students beyond technical competency is requested (Brakke and Brown, 2002; Davies and LeMahieu, 2003; Dowling, 2006; Fallows, 2003; Grabowski, 2004; Hernon, 2006).

In order to enact policy academics need to incorporate development opportunities for these skills into their teaching and learning designs. While individual academics succeed in doing so by using techniques such as group work, reflective journals and authentic assessment (Clarke, 2003; Lombardi, 2008), universities are far from achieving the required levels of lifelong learning skills in their graduates for the following reasons.

While graduate profiles express graduate attributes and lifelong learning skills, the individual courses making up the degrees have not been adjusted accordingly. One consequence of this is that students are not presented with a coherent picture across their courses and that it is too easy to disregard the messages given in single courses. Some academics may lack awareness, skills and support to fully incorporate the development of lifelong learning skills into their teaching. Academics who do not consciously practice their own lifelong learning skills development will find it difficult to lead and to inspire their students. Yet, students need guidance in developing lifelong learning skills (Leone, 2010), both to recognise their importance and to acquire the knowledge 'how to' study (Medel-Añonuevo et al., 2001). The currently dominant academic systems are in conflict with the characteristics of lifelong learning skills. Instead of supporting the needs of learning to be self-directed, life-wide and lifelong, these systems are assessment-driven and focus on course content and duration.

3.4 Requirements for Successful Lifelong Learning

Based on considerations outlined earlier in this chapter, this section brings together the requirements for provision of successful lifelong learning support for students. Although, no explicit set of requirements has been found, the literature identifies a number of guidelines and recommendations that have to be satisfied in order to achieve successful lifelong learning support in universities. Some of them have already been mentioned

throughout this chapter.

- Universities should provide support for all aspects of lifelong learning (formal, informal, non-formal, incidental);
- Students need guidance on various levels (Leone, 2010);
- Lecturer should be an active facilitator and promote involving learning experiences (Leone, 2010);
- Learning materials should be organized in the way that would help students learn how they learn (Medel-Añonuevo et al., 2001);
- Communication and collaboration are essential parts of learning process (Schaffert and Hilzensauer, 2008);
- Learning progress should be recorded from various sources and maintained over a long period of time (Kay, 2008);
- Students need to be aware of their personal achievements (Schuetze and Casey, 2006);
- Students should develop understanding and confidence in their knowledge and be able to address higher-order skills (graduate attributes in university context) (Hart et al., 1999);
- Students should be able to evaluate and reflect on their own performance and learning progress (Mourtos, 2003).

These theoretical recommendations will be used to guide further exploration of how lifelong learning can be supported using thechical solutions available in universities.

3.5 Summary

Following from the discussions in this chapter, it is important to emphasize the next key points: lifelong learning plays an important role in current global economics and society; lifelong learning skills have become a fundamental part of personal development; governments and educational institutions, universities in particular, are attempting to promote and support lifelong learning; at this stage, lifelong learning support provided in universities is not sufficient to satisfy the needs of students as lifelong learners.

In order to support this argument, the next chapter will review the world of learning spaces that are currently used in universities and outside of educational sector to support various learning activities. The connection and gap that exists between these systems from the lifelong learning prespective will be thoroughly explored.

Chapter 4

Review of Institutional and Open Learning Spaces

This review focuses on technical aspects of lifelong learning support. Therefore, the following sections examine characteristics of the learning spaces employed in universities and describe the issues related to the use of these spaces in a universities environment. A review of ePortfolio systems is also provided in these sections.

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4.1 Learning Management Systems

Higher education institutions have fully embraced computer systems to support teaching and learning. According to a survey conducted by the OECD Centre for Educational Research and Innovation encompassing universities in 13 countries 89% of responding institutions were using university-wide LMS. Further indications of uptake can be seen when visiting institutional websites, looking at user statistics provided by system suppliers (for example, `http://moodle.org/sites/` or `http://sakaiproject.org/community-home`) or by following discussions in the academic literature (Browne et al.,

2006; Collis and De Boer, 2004).

The systems are referred to as Virtual Learning Environments, Course Management Systems or Learning Management Systems (LMS), the term used in this thesis. A number of online information and communication tools are usually integrated in such an environment into a single virtual location (Morgan-Klein and Osborne, 2007) providing users with an access to teaching and learning materials, such as lecture slides or exercises. A virtual space of LMS is shared by staff and students of a particular course. This space forms a platform for course discussions and facilitate assessment, both via online testing and for submission and return of assignments.

The use of LMS in higher education is characterised by a strong institutional focus (Siemens, 2004). Access to the LMS dependens on current enrolment with the institution and is organised around course structures. This means students have access to only the courses they are enrolled in and only for the duration of these courses. The learning spaces for the different courses a student is enrolled in are separate. LMS is based on a hierarchy of user access rights. The lecturer in charge determines the toolset for their course and sets the parameters that define the involvement of the students. The lecturer has access to all information stored for their course in the LMS, leaving no or only very limited private space for the student. The content and use of the LMS is focused fully on the course requirements. As a course-focused virtual learning space, LMS make a huge contribution to the delivery of both face-to-face and distance courses in today's universities.

4.2 Web 2.0 and Social Virtual Spaces

Outside the higher education sector, in the open Internet domain, the Web 2.0 social networking tools have been firmly established. Tools are available for the sharing of images, photos and video clips. Individuals can communicate with others in synchronous and asynchronous forms, and in access-protected as well as open formats. Individuals can consume information on the widest possible range of topics and can as well contribute. Web 2.0 is characterised by open access, availability to anyone who has an Internet connection, and with the level and kind of participation determined solely by the individual. With freedom comes responsibility, and the responsibilities for taking up opportunities as well as for 'safe' conduct in the Web 2.0 space lie with the individual.

Web 2.0 plays an important role in today's society and is used for social and commercial purposes. Examples from a variety of areas show the popularity and impact of Web

Figure 4.1: Web 2.0 Landscape (Dawson, 2007)

2.0: Virtual sports leagues attract millions of participants (Holahan, 2006); politicians use blogs and podcasts in fighting for voters (Capell, 2006); communication with customers are used to increase revenue (Havenstein, 2007); communication pathways in research communities are changing (Ashling, 2007); video-blogging facilitates new ways of sharing (Library Technology Reports, 2007); the music industry is being transformed (Holahan, 2007); genealogy research has become accessible to the public (MacMillan, 2007).

Certainly not all uses of Web 2.0 are linked to learning, especially when thinking of the higher education context. But, in light of the lifelong learning skills expected from todays higher education graduates, the potential of Web 2.0 for supporting learning becomes obvious. This potential is confirmed by research studies that investigate the links between the two areas: Churchill 2009 examines the use of blogs in support of learning; Wheeler, Yeomans and Wheeler 2008 look at student-generated content using wikis; Boulos and Wheeler 2007 investigate Web 2.0 tools for social communication in a learning context. Yet, when designing education that integrates Web 2.0 technologies the skill levels of students have to be considered. While it is widely assumed that todays student generation is Internet savvy, it has to be acknowledged that quite a number of students have limited Web 2.0 skills. They are either not familiar with the technologies, or have only basic level skills (Kennedy et al., 2008).

4.3 Gap Between Learning Environments

Students in higher education have access to both environments, the institutionally focused LMS and the individually focused Web 2.0. On large, these two virtual worlds remain separate, both in the students and the institutions minds, with a distinction being made between serious learning and play. Many students cannot transfer their technology skills employed in a social Web 2.0 context into academic learning, which is both a motivational and a skill transfer issue (Katz, 2005). The information technology sections of institutions draw a clear line between institutionally provided, controlled and supported LMS services and the wild west of the Web. While they cannot effectively restrict access to Web 2.0 tools they can deny institutional support and responsibility for quality of service. Educational researchers and individual academics have identified the potential of social networking tools for teaching and learning. This has led to the incorporation of open access Web 2.0 tools into some courses in higher education, as we have illustrated earlier.

In response to the popularity of Web 2.0 tools and their potential for learning, LMS system providers have started to integrate social networking functionality into their systems. Discussion forums, blogs and wikis have been added to the toolsets of LMS. Yet, the important Web 2.0 characteristic of open access has been removed as these tools have been bound into the institutional LMS framework. Access is linked to course enrolment and under institutional control. Student generated content is accessible to the lecturers in charge and tool use is directed by relevance to the respective course. This still leaves us with value for teaching and learning, yet confines learning to the boundaries of course content and purpose.

4.4 ePortfolio

For a long time physical portfolios have been used by artists as presentation tools to collect, organize and showcase their artwork. The aim was to convince potential customers of their competence. Two decades ago portfolios were adopted by educators to assess the quality of teaching (van Tartwijk J. and Driessen, 2004). Since then portfolios have been used for many different purposes which defined such types of portfolios as showcase, development and assessment.

Electronic portfolios or ePortfolios are a digital representation of physical portfolios. The EDUCAUSE National Learning Infrastructure Initiative (NLII)[1] (cited by IMS Global Learning Consortium, 2005) defines ePortfolio as:

[1] `http://www.educause.edu`

> *ePortfolio is a collection of authentic and diverse evidence, drawn from a larger archive, that represents what a person or organization has learned over time, on which the person or organization has reflected, designed for presentation to one or more audiences for a particular rhetorical purpose.*

4.4.1 Characteristics of Portfolios and ePortfolio Systems

The term portfolio is used in many different ways. One important distinction can be made along the lines of purpose of a portfolio, namely for development, showcase, assessment or competences. Development portfolios or repositories support the learning and development of a learner. They contain material and artefacts related to learning, reflections and feedback. It is important that the material stored in these repositories is private to the learner. It is up to the learner to decide when and what to share with whom. The learner needs to reflect on the material collected and on his/her development in relationship to criteria or skills. The giving and receiving of feedback are important aspects of the learning processes around development portfolios. Showcase or presentation portfolios allow the learner to present their work and development to others. These presentations contain reflection and supporting evidence. They are composed for a specific purpose and audience, e.g. an assessment committee or a potential employer.

Portfolios are often linked to assessment. Type of portfolio and type of assessment have to be carefully adjusted to each other. Assessment portfolios demonstrate learner's competencies and skills in well-defined areas. They can be used for both formative and summative assessment. For formative assessment the learner documents work and reflects on it, the assessor provides feedback that assists the learner in future development. Summative assessment requires predefined criteria of what is to be assessed allowing the learner organize work examples according to these criteria. In the design of the assessment approach one has to be very careful to specify clearly what is to be assessed: subject specific work, reflections, lifelong learning skills, or presentation.

Development portfolios or repositories support and keep track of the learning and development of a learner over a period of time. They contain material and artefacts related to work-in-progress, reflections and feedback. Reflection as well as the giving and receiving of feedback are important aspects of development portfolio.

Showcase portfolios tend to display examples of learner's best work. These presentations contain reflection and supporting evidence. They are composed for a specific purpose and audience, e.g. a review committee, potential employer or sponsor.

Portfolios for competences combine elements of both development and showcase portfolios and are, to a certain degree, linked to assessment. In professional areas, like health services, teacher education or engineering, the accreditation of graduates and the continuing accreditation of professionals are often linked to the demonstration of competencies. Portfolios have proven to be excellent tools for this process. The candidate collects evidence, reflects on their practice and might invite feedback, all processes covered by portfolio approaches. The accreditation occurs based on the information provided in the portfolio.

Despite these variations, there are several key processes included in most if not all portfolio work, as is displayed in 4.2.

Figure 4.2: ePortfolio key processes (Malloff, 2010)

Similarly, Cambridge (2010) emphasized the importance of the following activities in portfolio process:

- Capture – collecting/gathering information and evidence from various sources;
- Management – aggregating captured evidence, sorting, indexing, ensuring accessibility over time;
- Reflection – making sense of evidence, understanding own experience and achievements;
- Composition – linking up the components together and making them available to others;

- Analysis – understanding if additional evidence is needed, reflecting on feedback, keeping up dialog with others.

While portfolio work can be conducted without the help of electronic systems, such systems assist with many tasks around document collection, recording of information, sorting through data and communicating with others. Many systems, from general Web tools to specialised applications, can be used to support portfolio work. A comprehensive overview can be found at Helen Barrett's ePortfolio site (Barrett, 2008). In our chapter we want to concentrate on systems specialised for portfolio work.

ePortfolio systems focus on the individual. They provide the individual with a space for storing documents of any electronic format. In this space the user creates a repository of artefacts related to all aspects of their learning and professional development. There are tools for reflection, commonly in form of blogs. In contrast to open Web 2.0 systems, access to both files and reflections is by default set to the individual. There is no hierarchy between users in which one higher-level user could see the work of a lower-level user. The individual can select to share their work with others and has full control over whom to share with, for which period of time. ePortfolio systems provide easy to use tools for constructing presentations that combine artefacts and reflections and that can voluntarily be shared with others. The systems allow each individual to form groups and identify partners for exchange. To a varying degree the ePortfolio systems incorporate guidance towards reflection and self-directed learning. ePortfolio systems provide a set of features that in combination are well suited to support lifelong learning. Each of the features looked at separately can be found in other computer systems or Web 2.0, but their combination within one system makes ePortfolios systems so valuable.

4.4.2 ePortfolio Systems Overview

The following sections explore the features and functionality of various ePortfolio systems. Four proprietary (PebblePad, BlackBoard ePortfolio, Desire2Learn, eFolio) and two open-source (Mahara, ELGG) systems are reviewed and analysed. Where possible, proprietary systems were reviewed by accessing demonstration web sites. In case demonstration web sites were not available, the systems were reviewed by analysing user or administrator documentation and external reviews. These specific systems were chosen for their level of success in learning communities and current development status.

It is important to note here that this section is not aiming to find the best system, but

to rather to evaluate ePortfolio systems that are currently available and successful. Examining strengths and weaknesses of these systems can provide a better foundation for understanding and development of an ePortfolio aided environment that could support lifelong learning.

4.4.2.1 PebblePad

PebblePad[2] is a proprietary web-based Personal Learning Environment or ePortfolio system. The system is primarily used in the UK Higher Education sector and has been involved in a number of JISC funded ePortfolio research projects including ePistle[3] and File-Pass[4].

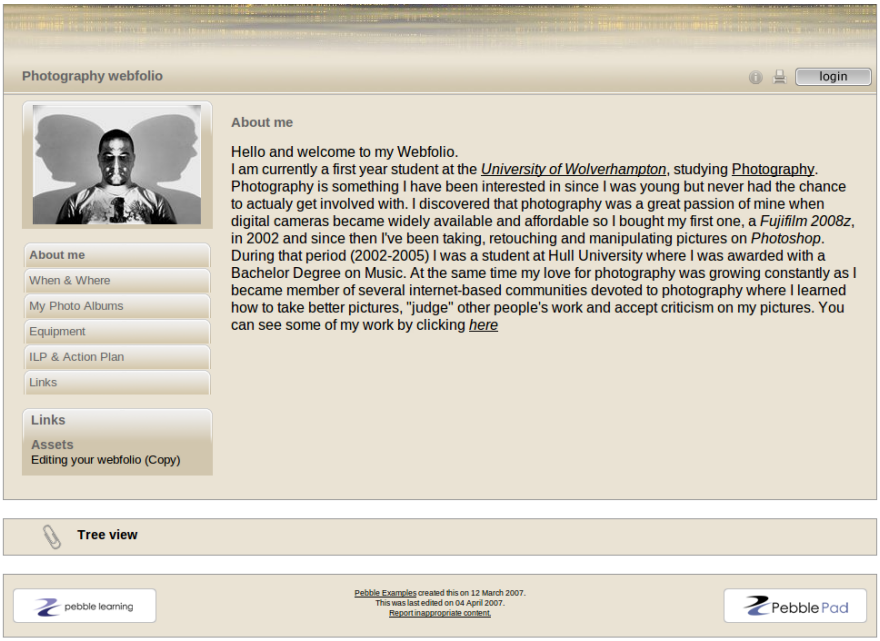

Figure 4.3: PebblePad ePortfolio system example (Pebble Learning Ltd, 2011)

The system provides six structured input forms to record skills, experiences and reflections. Additionally, users can define any file type and add it to their asset store. PebblePad provides an opportunity to aggregate artefacts into WebFolios to share with others, inside or outside of an institution, for certain periods of time through user-defined permissions. This system also supports collaboration allowing collectively creating items for joint projects.

PebblePad has a newly developed Moodle block that allows ePortfolio users to have

[2] http://www.pebblepad.co.uk
[3] http://www.jisc.ac.uk/whatwedo/programmes/edistributed/epistle
[4] http://www.jisc.ac.uk/whatwedo/programmes/edistributed/filepass

single sing-on with LMS and also export items from Moodle to their ePortfolio. The system supports export and import of personal portfolios through LEAP2A export format.

4.4.2.2 Mahara

Mahara[5] is an ePortfolio system started in 2006 and funded by New Zealand Tertiary Education Commission. The system is a standalone web application and does not require any kind of LMS or another system installed. Its big advantage over other ePortfolio systems is in its modular and extensible architecture that resembles the architecture of Moodle LMS. This can be explained by the fact that developer community of Mahara is deeply involved in the Moodle community. The system is claimed to be highly 'pluggable' which allows adding various Web 2.0 web services and establish interoperability with other systems (Mahara Governance Group, 2011).

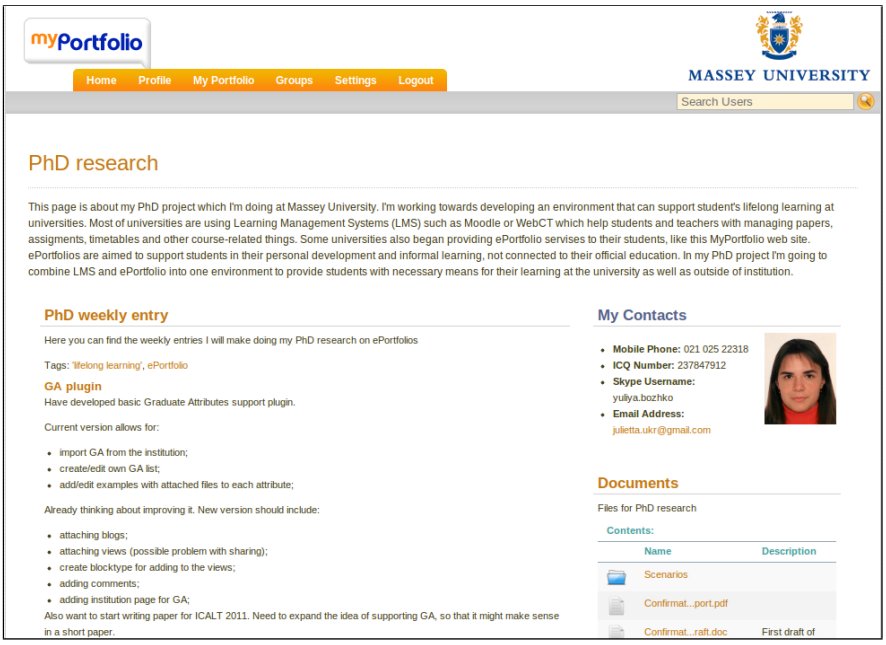

Figure 4.4: Mahara ePortfolio 1.3 example

Mahara functionality includes a number of standard ePortfolio features like file repository, reflection tools in form of blogs, presentation and sharing tools as well as elements of social networking like friends lists, forums, message board and e-mail. Mahara has internal résumé builder which allows users to create their digital CV with various information options. Sharing is done through pages which are called 'views'. Users can

[5] `http://mahara.org`

create single views or collections of views and fill them with artefacts from their ePortfolio repository. Views can be created from scratch as well as from a template developed by another user.

As it became popular in ePortfolio systems throughout the recent years (Waters, 2009), Mahara comes with a user-to-user permissions control. Users can set up three levels of access to parts of their ePortfolios (private, individual and public) which defines what items and information others can see. Currently the Mahara system does allow sharing views with others or making them public, but giving feedback is restricted to registered users.

Mahara supports a complete LEAP2A interoperability which allows to import portfolio to Mahara and export it to another ePortfolio system, provided that this interoperability standard is implemented at the other side. In addition, export can be done in form of static HTML pages.

Latest version of Mahara supports a single sign-on with Moodle, which means that users can log on to both systems using only one account. Unofficial plugins developed by community allow for submitting views as assignments to Moodle. However, this functionality is not included in official release. The roadmap of Moodle 2.0 included a repository plugin for Mahara that would allow direct export of artefacts from LMS to ePortfolio. Meanwhile, Moodle 2.1.1 release still does not support this functionality.

4.4.2.3 ELGG

ELGG[6] is an open source social networking and social publishing platform started in 2004 and released under the GNU Public License v2. It was originally aimed at higher education, but is currently used in many contexts from business to sport. Developers of ELGG call it a 'social engine to empower social environment'.

ELGG comes with built-in features as well as optional plugins. Features available in the platform include user management and administration, social networking components, blogging, message board, file repository, private messaging, pages, and bookmarks. Most the end user functionality comes from plugins which can be loaded into system. ELGG has an extensive community support which contributes a large number of its plugins, although in general most of these plugins are aimed to support social networking.

[6] `http://elgg.org`

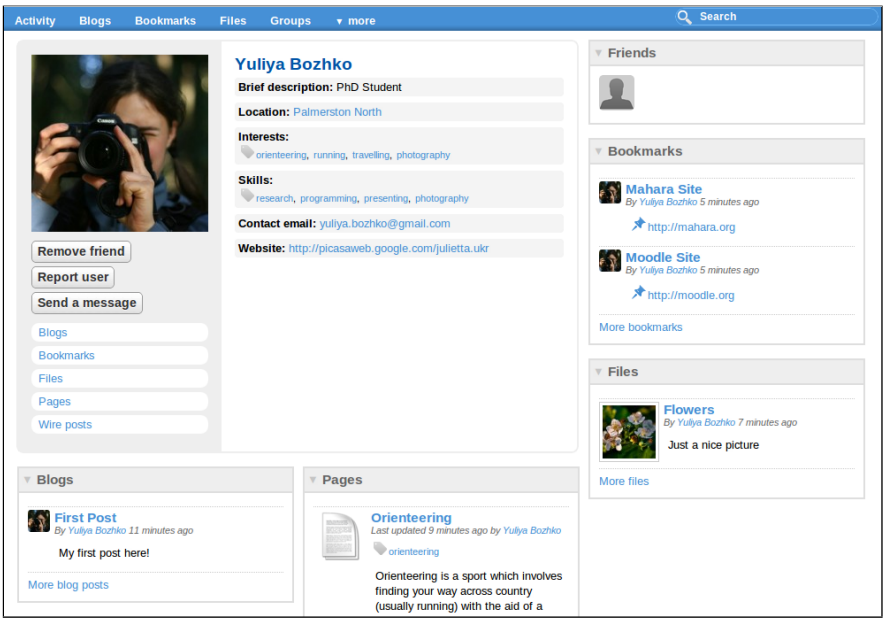

Figure 4.5: ELGG 1.8 example

4.4.2.4 BlackBoard ePortfolio

After merging in February 2006, two popular LMS providers BlackBoard[7] and WebCT developed an ePortfolio toolkit the most recent release of which is currently a part of BlackBoard Learn 9.1. This ePortfolio system is designed as an add-on to the LMS environment and can not be used as a stand-alone product. On one hand, it means that all users must have BlackBoard LMS account to be able to access ePortfolio. On the other hand, it gives some advantages which other ePortfolio systems might lack, such as single sign-on with LMS, direct import of graded materials from Blackboard courses and links to course goals and objectives.

BlackBoard ePortfolio is available in Basic and Personal Portfolio versions. Basic Portfolio has an ePortfolio set-up wizard for learners who need guidance. However, it is largely dependent on functionality available in LMS. Without activation of various features, the repository might be restricted to text and hyperlinks only. Personal Portfolio provides more flexibility and functionality, therefore, it will be reviewed further as BlackBoard ePortfolio.

In the system, ePortfolio owners have control over the content, access, layout and style of their portfolio. Eportfolios can be created from available templates predefined by administrator or lecturer, or they can be created from scratch. A variety of video, audio and text file types is supported as well as HTML editor for creating pages. Reflections

[7] `http://www.blackboard.com/`

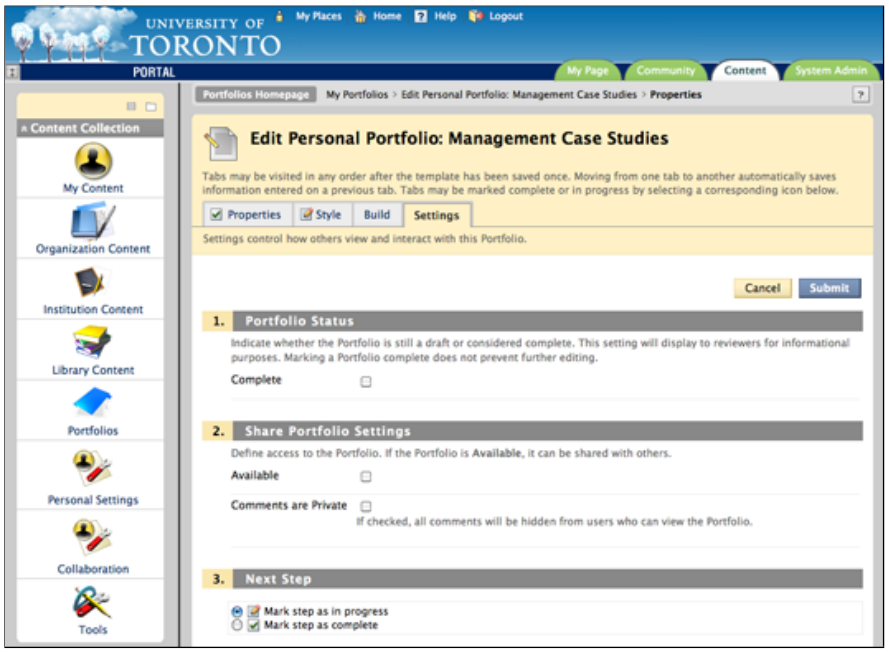

Figure 4.6: BlackBoard ePortfolio example (University of Toronto, 2010)

are available in form of blogs or threaded topics. Content is separated from portfolios which allows reuse of the artefacts. Although, it has been reported that because of this separation artefact management is not intuitive and might be too complex for students for effective use of tools (Clark and Neumann, 2009). In addition, portfolios can be linked to learning objectives defined by lecturers, administrators or learners themselves.

When necessary, BlackBoard ePortfolio can be shared with people inside the institutional community through system username, groups and courses as well as outside – via email or creating a guest account which is by default active for 30 days. However, availability of these sharing options is set up by system administrator who can allow or restrict any of these options. Depending on access level, users can leave their feedback in form of comments. Comments cannot be attached to individual artifacts and are stored within single pages of ePortfolio. BlackBoard ePortfolio system has a basic reporting system where users can enable tracking, and gather basic data about views of their portfolios. At the completion of studies ePortfolio can be downloaded and saved as HTML in ZIP archive.

Overall, BlackBoard ePortfolio is good for creating portfolio of student course or program work and for identification with a course of study (University of Toronto, 2010).

According to Sweat-Guy and Buzzetto-More (2007), the cost of 12 months license for BlackBoard ePortfolio in 2006-2007 was 20,900USD which did not include the cost of prior purchase and adoption of LMS. To date, no information was found on current

development state and future releases.

4.4.2.5 Desire2Learn

Desire2Learn[8] ePortfolio is a part of a proprietary Enterprise eLearning Suite provided by Desire2Learn Incorporated. The system supports rich media artifacts and provides tools for reflection and reporting, presentation templates, import-export capabilities, and a browser-based dashboard. Assessment features are available via integration with other Desire2Learn tools such as Competencies and learning-outcome tools. The ePortfolio system comes with a set of Web 2.0 standard interface components, including artifact repository management, advanced access control, resume creation, collaboration tools, social networking tools. Any collection, artifact, and the entire ePortfolio contents can be imported or exported using its own publishing standard.

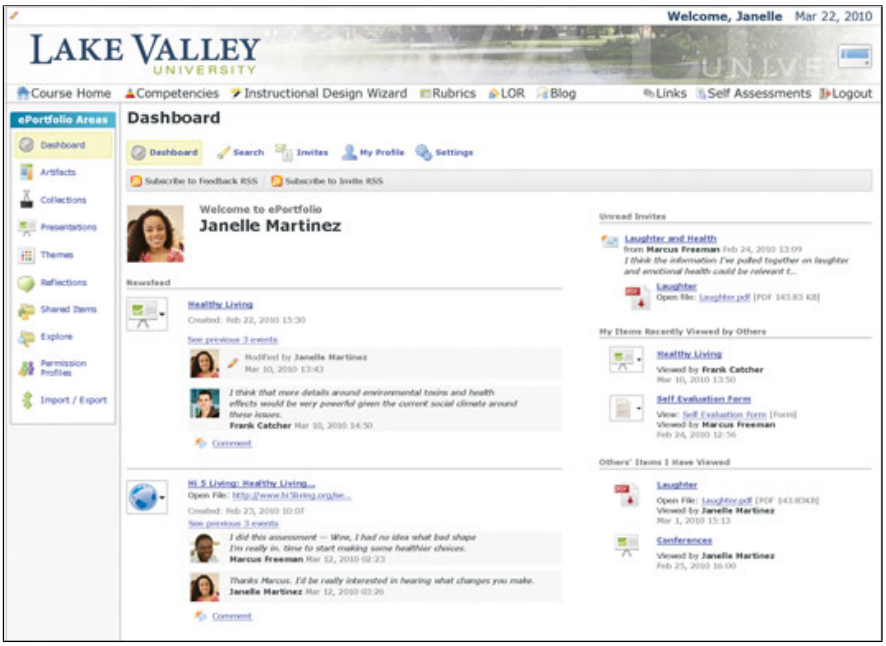

Figure 4.7: Desire2Learn ePortfolio example (Desire2Learn Incorporated, 2011)

4.4.2.6 eFolio

The Avenet Student eFolio[9] is a multimedia web site designed to store and attractively display resumes, academic and career data and documentation, educational and career goals, achievements and other meaningful information. Unlike a one-dimensional

[8] http://www.desire2learn.com
[9] http://www.avenetefolio.com

paper document, an eFolio can "come alive" and provide a "rich" display, including documents, images, audio, video, links, and detailed examples of accomplishments and achievements.

Figure 4.8: eFolio system example (EFolioMinnesota, 2011)

4.5 Summary

This review focuses on technical aspects of lifelong learning support. Therefore, the following sections examine characteristics of the learning spaces employed in universities and describe the issues related to the use of these spaces in a universities environment. A review of ePortfolio systems is also provided in these sections.

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Chapter 5

Stakeholders Requirements for Lifelong Learning Support in Universities

Chapter 6

Prototype - Development and Implementation

6.1 Architecture

6.2 Development Toolkit

6.3 Implementations

6.3.1 Version Control Elements

6.3.2 Concept Map Module

McAleese (1998) formally defines a concept map as a directed acyclic graph that consists of a set of Concept Labels and a non-empty set of Relationships between Concepts. Putting it simply, concept maps are graphical representation of the hierarchy of knowledge concepts and connections between them (Novak and Cañas, 2008).

Concept maps are dynamic, process-oriented and give learners an opportunity to engage in the learning process [7] which is important for lifelong learning [10], [11]. Maps are created over time by the learner who is engaged in a process of reflection, collecting and selecting appropriate examples of their work. With concept maps learners can interpret their personal knowledge and map this knowledge and individual examples against the existing theories. The hierarchical nature of the concept map allows for organizing concepts from the high level abstract concept to the more specific concepts. This property can be used by students for managing and structuring data in their

ePortfolios.

Describing future directions for ePortfolio technology, Cambridge (2010) suggested that visualization in the form of concept maps could be a potential way of generating reflections.

6.3.3 Artefacts' Fragments Extraction

6.3.4 Progress Tracking

6.3.5 Advanced Sharing

6.4 Prototype Iterations and User Tests

6.5 Summary

Chapter 7

Evaluation

7.1 Study One. Exploratory Evaluation by Lecturers

7.1.1 Goals

7.1.2 Research Protocol

7.1.3 Participants Profile

7.1.4 Data Collection and Analysis

7.1.5 Conclusions

7.2 Study Two. Group Experiment - Lifelong Learning Skills Development and Demostration

7.2.1 Goals

7.2.2 Research Protocol

7.2.3 Participants Profile

7.2.4 Activities and Artefacts

7.2.5 Data Collection and Analysis

7.2.6 Conclusions

7.3 Study Three. System Validation by Experienced Students

7.3.1 Goals

Chapter 8

Discussion

Chapter 9

Conclusions and Future Work

> We now accept the fact that learning is a lifelong process of keeping abreast of change. And the most pressing task is to teach people how to learn
>
> *Peter F. Drucker*

9.1 Summary of the Research

9.2 Research Contributions

9.3 Future Research

9.4 Conclusions

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