

LIFELONG LEARNING SUPPORTED BY EPORTFOLIO PROCESS

A THESIS PRESENTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE
DEGREE OF
DOCTOR OF PHILOSOPHY
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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

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Publications and Presentations

Peer-reviewed international conferences

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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 (Ojala, 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

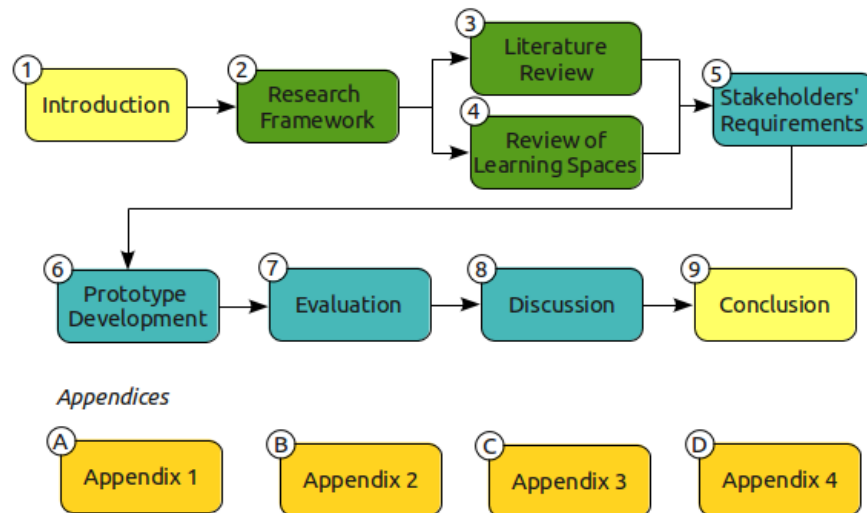


Figure 1.1: Thesis structure

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.

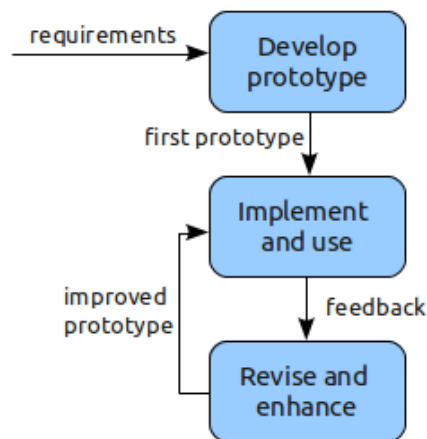


Figure 2.1: Prototyping (based on Sommerville (2007, p. 411))

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 All¹ (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 Learning² (RIP-PLL): 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 (Atwell, 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 the center of this discussion 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. While no explicit requirements have been found in the literature, 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 locating 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 Complete¹, Academic Search Premier², Directory of Open Access Journals³, Google Scholar⁴) 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 important 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 a lack of connection between the areas of lifelong learning theories and learning technology. While a lot of effort is put into developing theories and producing systems that support education and learning, little substantial work exists 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://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 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 occurred less frequently than other forms of education.

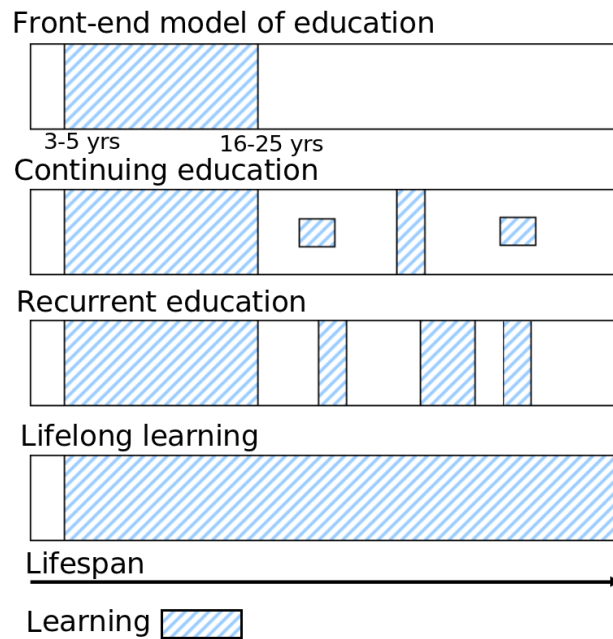


Figure 3.1: Changing concepts of learning (Jarvis, 2004)

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 spend 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' educational 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 underlying philosophy, they both recognized the fact that acquisition 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 this 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* puts 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 rediscovered 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 governments play no role whatsoever. Their role is rather transformed into investment in individuals and creating conditions for them to take charge of their learning (Chen, 2009).

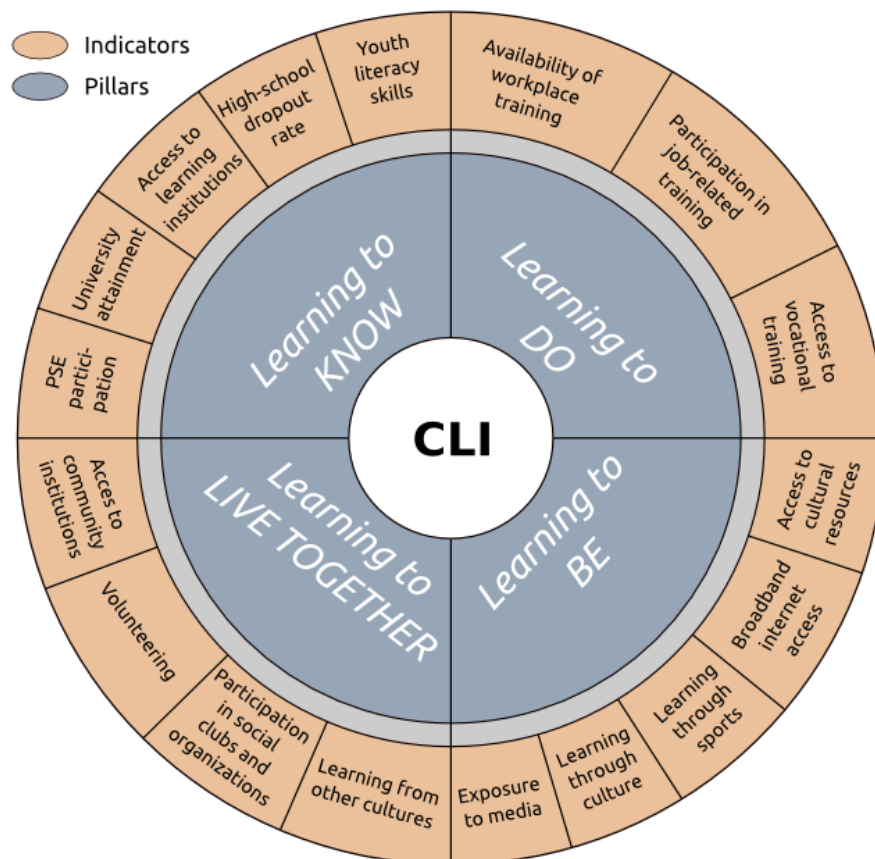


Figure 3.2: The 2010 Composite Learning Index of Canada (Canadian Council on Learning, 2011)

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 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).

In 2006, the Canadian Council on Learning developed the 17 indicators and 26 specific measures (Figure 3.2) called Composite Learning Index (CLI) that are 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 demonstrate learning opportunities that occur outside of classroom settings. In August 2010 the 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.

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.

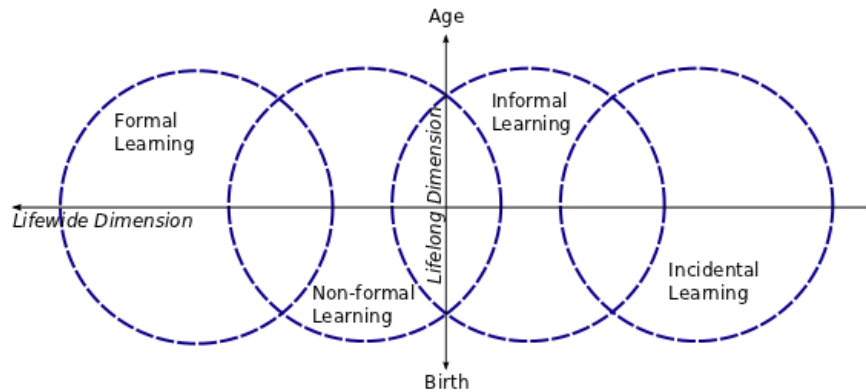


Figure 3.3: Framework for Lifelong Learning (based on Divjak et al., 2004, p. 11)

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 the classroom and is not triggered by textbooks;
- 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 artificial 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 an achievements portfolio.

These characteristics describe lifelong learning as demand-driven, flexible, social and personal at the same time.

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; Ojala, 1997; Pitman and Broomhall, 2009).

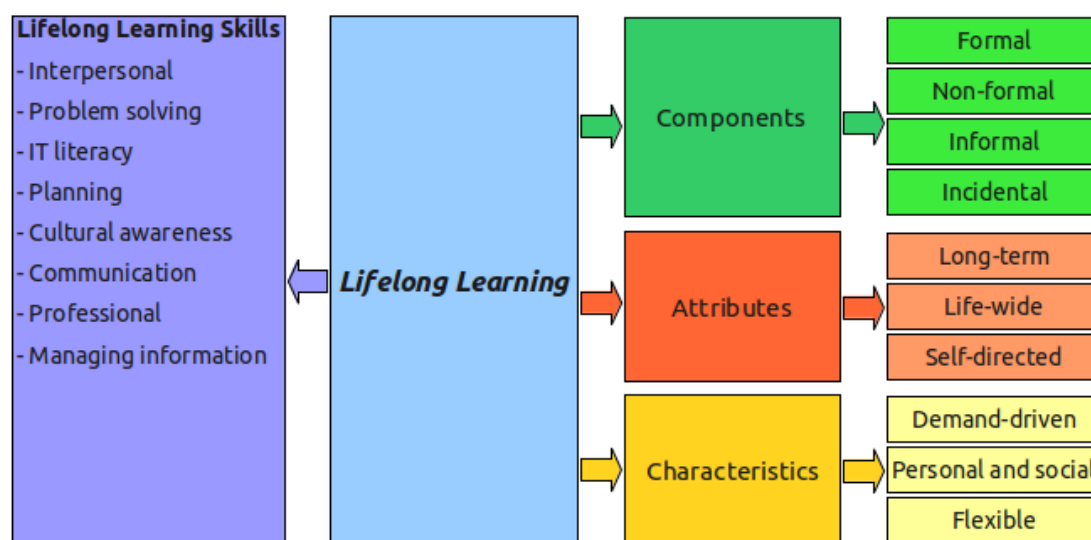


Figure 3.4: Lifelong Learning Dimensions

Figure 3.4 summarizes all concepts mentioned in this section. Hereinafter, any further reference to lifelong learning will be made in terms of these concepts.

3.3 Lifelong Learning in Universities⁵

As lifelong learning includes the concepts of *life-long*, *self-directed* and *life-wide* 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. *Self-directed* learning in academic environment is based on being an active, highly-motivated student acquiring and enhancing new skills and knowledge. The *life-wide* component of

⁵This 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.

learning implies that learning can and should not occur only through 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).

The importance of lifelong learning 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. Ojala (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 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 knowledge on *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. While 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); (REF?)
- Students need guidance on various levels (Leone, 2010);
- Lecturers should be an active facilitators 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 technical solutions available in universities.

3.5 Summary

Following from the discussions in this chapter, it is important to emphasize the following 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 currently 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 perspective will be thoroughly explored.

Chapter 4

Review of Institutional and Open Learning Spaces

In the previous chapter it was shown that many factors need to combine to fully support lifelong learning at universities: changes in the way of thinking of both students and lecturers, support at the department or institutional levels, provision of training for staff, and personal motivation of learners. This chapter looks at lifelong learning support from another angle, such as technical support. It reviews the area of technology and systems available for supporting various aspects of learning, and examines how availability of a suitable e-learning environment can possibly aid to the lifelong learning support required by students in universities.

The virtual learning spaces of universities are dominated by Learning Management Systems (LMS) supporting course-related work. LMSs are often closed systems that require user accounts and access permissions to the learning space. These closed systems contrast to open learning spaces provided by Web 2.0, and social networking tools in particular, which are characterised by open access allowing individuals to participate under their own direction in contributing information. Social networking includes sharing, exchanging and reflecting which provides benefits for learning.

To understand the barriers and issues of utilising closed and open learning spaces within the university environment, this chapter first explores the currently dominant LMSs and then contrasts them with the Web 2.0 virtual social spaces. Finally, it introduces an ePortfolio system as a potential solution that can help to close the gap that exists between the learning environments. ePortfolio characteristics as well as strength and weaknesses of selected ePortfolio systems are reviewed. This chapter concludes with an argument that currently ePortfolio as a system is not mature enough to be a part of

the environment that provides comprehensive support for lifelong learning.

4.1 Learning Management Systems

Higher education institutions, universities in particular, 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 (OECD, 2005). American Society for Training and Development published the results of their 2009 *Learning Circuits* survey according to which 91% of their respondents are using any kind of LMS in their organization or institution (Ellis, 2009). Further indications of uptake can be seen when visiting institutional websites, looking at user statistics provided by system suppliers such as Moodle¹ or Sakai², or by following discussions in the academic literature (Browne et al., 2006; Collis and De Boer, 2004).

According to Chapman (2009), there is no common definition of a Learning Management System. A comprehensive description of LMS provided by Watson (2007) states that LMS is a technology that can handle all aspects of the learning process such as: delivering and managing learning content; assessing learning of individuals and groups; tracking the progress towards meeting learning goals; and collecting and presenting data for controlling the learning process in institution or organization through virtual classroom or instructor-led courses.

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 on-line 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 on-line testing and for submission and return of assignments.

The use of LMS in universities is characterised by a strong institutional focus (Siemens, 2004). Access to the LMS depends 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 tool-set for their course

¹<http://moodle.org/sites>

²<http://sakaiproject.org/community-home>

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.



Figure 4.1: Web 2.0 Landscape (Dawson, 2007)

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

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 university context. But, in light of the lifelong learning skills expected from today's 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 today's 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 universities 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 universities 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 tool-sets 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)³ (cited by IMS Global Learning Consortium, 2005) defines ePortfolio as:

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 artifacts 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

³<http://www.educause.edu>

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 artifacts 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 Figure 4.2.

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;



Figure 4.2: ePortfolio key processes (Malloff, 2010)

- 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 artifacts 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 artifacts 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 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

PebblePad⁴ is a proprietary web-based ePortfolio system. However, its designers tend to call it not just an ePortfolio system, but Personal Learning System that can be used in a variety of learning contexts (Pebble Learning Ltd, 2010). The system is popular and primarily used in the UK Higher Education sector and has been involved in a number of JISC funded ePortfolio research projects including ePistle⁵ and File-Pass⁶.

According to the PebblePad technical specification, the back-end of the system requires Windows and SQL Servers to run. The front-end uses Flash, which can create a challenge for the web application's accessibility, usability and performance.

PebblePad has a customizable user interface which includes user-defined size and style

⁴<http://www.pebblepad.co.uk>

⁵<http://www.jisc.ac.uk/whatwedo/programmes/edistributed/epistle>

⁶<http://www.jisc.ac.uk/whatwedo/programmes/edistributed/filepass>

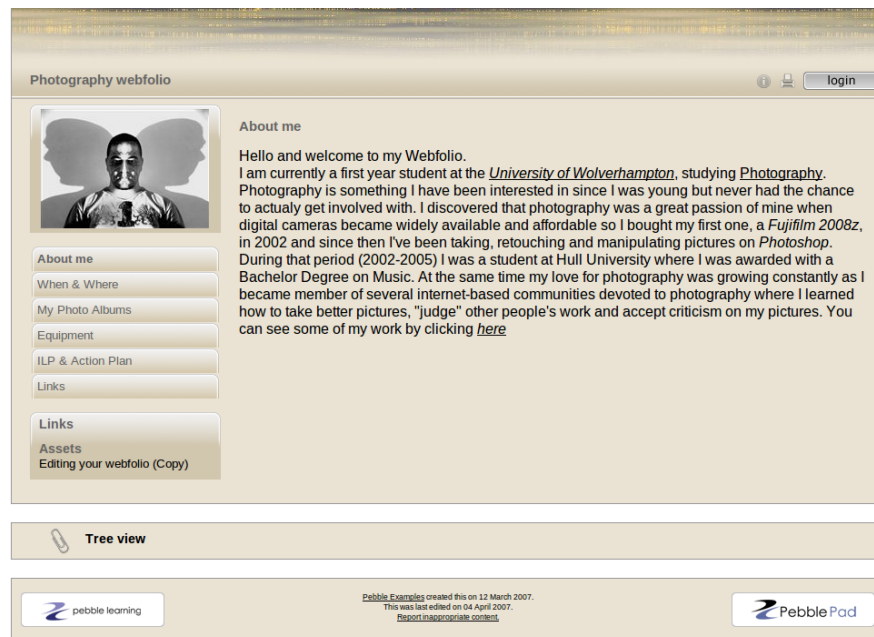


Figure 4.3: PebblePad ePortfolio system example (Pebble Learning Ltd, 2011)

of text and background colours. Institutions can have their own interface that fits in with the institutional branding.

Items stored in PebblePad repository are called assets. There are thirteen asset types that are subdivided into three core types, such as: uploaded files, single assets and aggregating assets. Creation of some assets can be guided by step-by-step wizard. Assets can be shared with others, inside or outside of an institution, for a certain period of time through user-defined permissions. If a person, who needs to see an asset, is not a part of PebblePad community, a temporary username and password will be automatically created allowing them to view a shared asset. Assets allow for setting up a wide range of permissions, which can include commenting and copying rights, collaboration and re-sharing of a shared asset with a third party.

However, working with assets in PebblePad has its disadvantages. Users cannot upload files larger than 10MB. The way system's repository is structured, asset tracking and finding in PebblePad is noted to be not user-friendly (Overton, 2009). Due to poor asset management, users can end up deleting files and breaking links between assets, or forgetting to update the hyperlinks of the changed assets, which results in missing files for someone who is viewing the asset.

PebblePad has an interface with Moodle that allows ePortfolio users to have single sign-on with LMS and also export items from Moodle to their ePortfolio. The system supports Leap2a and IMS eP as well as import from any RSS or Atom compliant

system. After graduation, students can get a free 12-month personal account managed by Pebble Learning.

4.4.2.2 Mahara

Mahara⁷ is an open source 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).

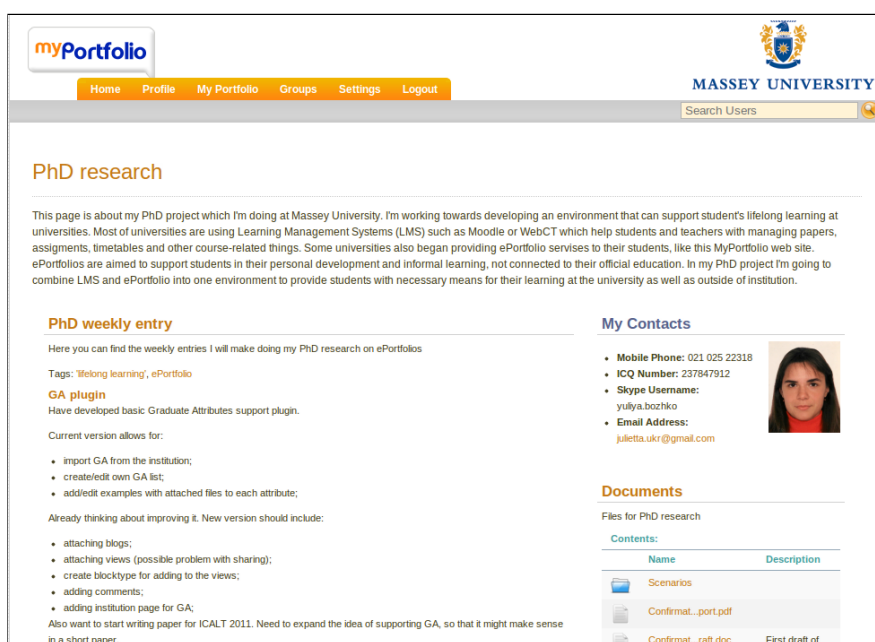


Figure 4.4: Mahara ePortfolio 1.3 example

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

⁷<http://mahara.org>

by another user.

Group portfolio is available for collaboration purposes. Compared to personal accounts, groups have somewhat restricted functionality which includes creating and maintaining pages (views), forums and file repository.

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 road-map of Moodle 2.0 included a repository plugin for Mahara that would allow direct export of artifacts from LMS to ePortfolio. Meanwhile, Moodle 2.1.1 release still does not support this functionality.

4.4.2.3 ELGG

ELGG⁸ 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*.

Most the end-user functionality comes from plugins which can be loaded into system. This review examines a standard installation. ELGG has an extensive community support which contributes a large number of plugins. In general, most of these plugins are aimed to support social networking.

Features available in the standard platform installation include user management and administration, social networking components (like friends list and “the wire”), blogging, message board, file repository, private messaging, pages, and bookmarks. Additional components can be installed by administrator as plugins and can be used within

⁸<http://elgg.org>

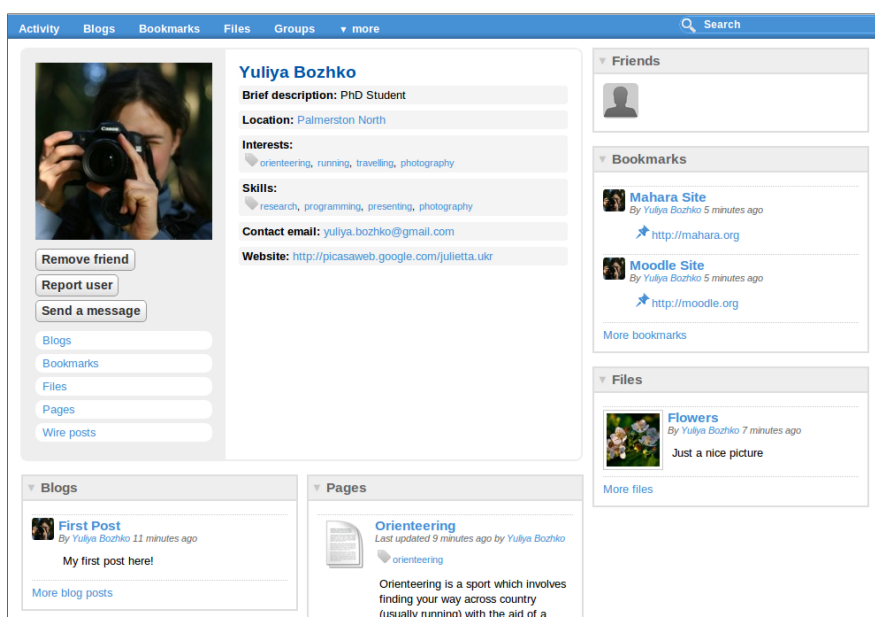


Figure 4.5: ELGG 1.8 example

the entire system.

In ELGG, each account has a profile page which links to all available artifacts created by the user through adding or removing widgets. Except for the profile page, there is no standard way of aggregating artifacts for presentation. The profile page is as well the main option for showcasing as users cannot have multiple ePortfolios.

Unlike other ePortfolio systems, ELGG has a quite limited choice of permissions. Artifacts in the system can be either private/public, or shared with friends or logged-in users. There is no way of having multiple permission settings or user-to-user permissions for artifacts.

Similar to Mahara ePortfolio system, ELGG has groups for collaboration. Groups have the same system components (e.g. blogs, pages, files) as single profiles, and these options can be set up or removed at any time.

ELGG has no reporting system for users. However, minor reporting functionality is available for administrative purposes.

In 2007, interoperability between ELGG and an open source LMS Moodle was established for single sign-on and courses integration. However, since Moodle 1.9 there is no news on plugin updates. Information has been found on the Internet about a proprietary plugin being developed for ELGG-Moodle integration, although no up-to-date documentation is currently available that would describe this plugin.

4.4.2.4 BlackBoard ePortfolio

After merging in February 2006, two popular LMS providers BlackBoard⁹ 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.

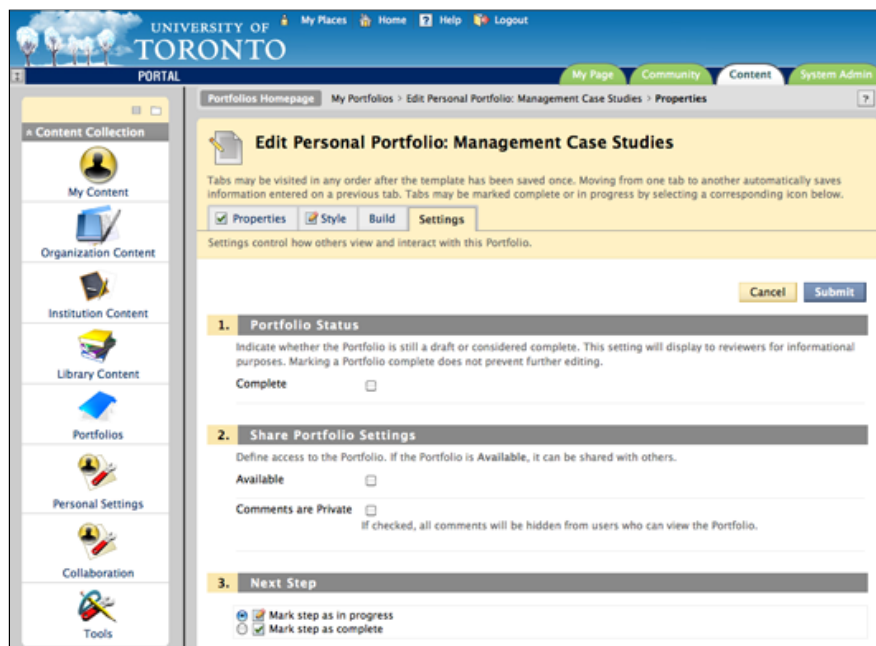


Figure 4.6: BlackBoard ePortfolio example (University of Toronto, 2010)

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

⁹<http://www.blackboard.com/>

are available in form of blogs or threaded topics. Content is separated from portfolios which allows reuse of the artifacts. Although, it has been reported that because of this separation artifact 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

Desire2Learn¹⁰ 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.

¹⁰<http://www.desire2learn.com>

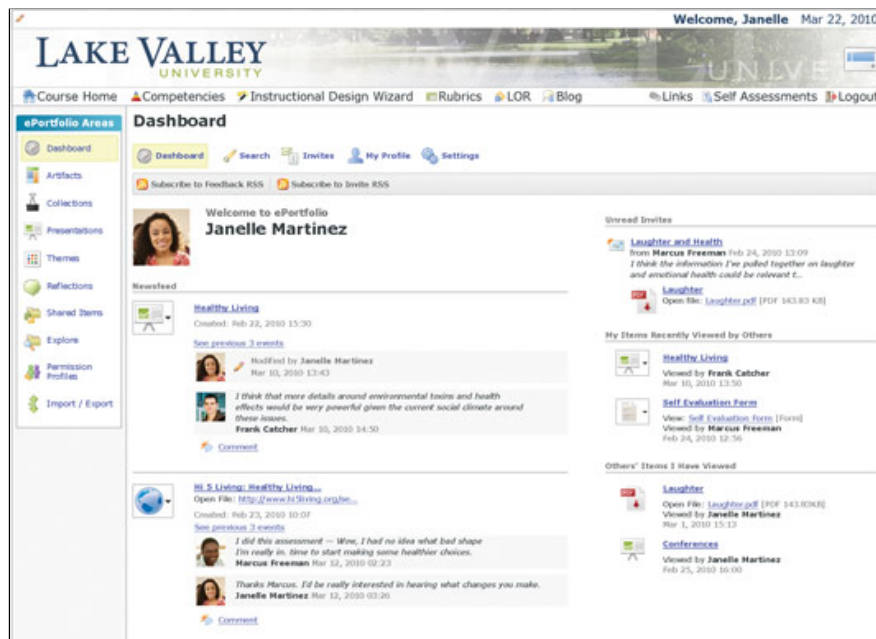


Figure 4.7: Desire2Learn ePortfolio example (Desire2Learn Incorporated, 2011)

4.4.2.6 eFolio

The eFolio¹¹ system is a software service hosted and maintained by Avenet Web Solutions. Developed in 2001 together with the University of Minnesota, eFolio currently has a large user base, the biggest of which are eFolioMinnesota¹² (over 60,000 active users) and eFolioWorld¹³ (over 34,000 active users) (AAEEBL, 2011). Being said that eFolio is a hosted service, it is still possible to get self-hosted solutions for very large implementations.

Every account in eFolio can have multiple portfolios which are organized as sites. When users start creating a site, they can use a wizard under “To Do” category for filling the pages with the relevant content. Latest version of the system has a drag and drop site management interface which makes it easy to create sites and pages. eFolio comes with a number of build-in display and style formats. However, according to the vendors’ comments (AAEEBL, 2011), system does not provide as much page layout flexibility as some users would expect.

Everything saved in eFolio is located in My Content category. Currently, its standard storage capacity is 50MB per user, but this limit can be negotiated. My Content groups items by data types such as artifacts, courses taken, goals, images, URLs, employment,

¹¹<http://www.avenetefolio.com>

¹²<http://www.efoliominnnesota.com>

¹³<http://www.efolioworld.com>



Figure 4.8: eFolio system example (EFolioMinnesota, 2011)

etc. As well, user can add (create) items on a fly while building their sites. User can set up content properties and formatting, add other content related to the item and write multiple reflections.

All sites are by default private, but can be set to public once finished. Underage user sites are always private by default and cannot be made public. Instead owners can invite specific person to review their site. Access to the web site is granted through creating visitors. Each visitor gets an email with login details if the site is private or site URL if it is public. Even users who already have account in the system get a visitor account for each specific site access. Visitors can leave feedback to any item with feedback properties set up. Depending on these properties, feedback can be in the form of Likert scale, question/answer or free-form text.

eFolio does not provide collaboration functionality and all web sites in the system are personal. For assessment purposes eFolio has questionnaires of various types which students can use to address assessment criteria.

eFolio supports IMS ePortfolio standard which allows users to import/export their

ePortfolio content. The system can be integrated with Moodle LMS. However, no detailed information was found on what kind of integration it is.

After graduating or leaving a sponsoring institution, users can continue using their eFolio for an annual fee of 15USD. Prices for institutions depend on numbers of users, and can range between 15USD - 4USD per user (AAEEBL, 2011).

4.5 Summary

Based on the considerations outlined in the previous sections, one can conclude that there is the need for a virtual space that meets the following requirements:

Facilitates the development of lifelong learning skills; Fits with university needs; Is accepted by student learners; Bridges between institutional and personal learning.

This environment has to be safe, secure, long-term accessible to students, and has to facilitate both formal and non-formal types of learning, while allowing also for social networking and for collaboration. Such space needs to put students into charge of their learning and offer them privacy for exploration. It should allow students to continue learning even when they complete their formal courses, and lose access to the LMS artefacts. This space has to provide a long term access and has to be a safe repository for storing artefacts demonstrating achievements. It needs to be a professional space that remains uncluttered from purely social communication.

Following from these requirements, a solution based on combining LMS and ePortfolio into one environment can be introduced. This approach is expected to retain as much advantages of institutional systems as possible, which means providing students with technical support and safe learning environment. This environment will help students to take charge of their own learning, while still guided, but not restricted, from the institutional side. It will allow students to determine the directions of their learning, recognizing what skills and competences are important for their personal and professional development. Due to the nature of ePortfolio systems, students will have a private space protected from others to store the records of their achievements, their analyses of learning experiences, successful and less so, their reflections and feedback provided by others. This will help to develop the sense of control of the data they own, which is not available in institutionally controlled LMS.

Although institutional affiliation is temporary, building a bridge between ePortfolio and LMS will help to connect formal education and learning that occurs outside of institutional environment, supporting long-term and life-wide aspects of lifelong learning.

After graduation ePortfolio content can be used in an institutionally independent related system or its content can be exported by the learner into another system, provided that interoperability standards are implemented.

Connecting ePortfolio system and LMS has already been attempted. On the one hand, there is the example of Moodle/Mahara integration which largely does not go further than providing systems single sign-on. On the other hand, tighter integration as in the Blackboard ePortfolio system integrated with the Blackboard LMS or OSP ePortfolio system integrated with the Sakai CLE can not provide a community independent from the institution. This gives learners no sense of control and does not allow for building their own learning environment. The approach suggested by this PhD project provides rich integration between LMS and ePortfolio systems with an opportunity of smart data flow, resolving confidentiality and ethics issues, involving feedback from the outside of the institutional environment, and tracking long-term and short-term progress. This leaves space for formal education as well as for non-formal types of learning, enriching the overall personal learning experience.

Chapter 5

Stakeholders Requirements for Lifelong Learning Support in Universities

5.1 Lecturers' Perspective on Lifelong Learning Support

5.1.1 Participants Profile

5.1.2 Methodology

5.1.3 Results

5.2 Students' Perspective on Lifelong Learning Support

5.2.1 Participants Profile

5.2.2 Methodology

5.2.3 Results

5.3 Requirements Elicitation

5.4 Summary

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 Artifacts' 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 Demonstration

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

⁴⁴7.3 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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