TECHNICAL SPECIFICATION

ISO/IEC TS 20013

First edition
2015-07-15

Information technology for learning, education and training — A reference framework of e-Portfolio information

Techonologies de l'information pour l'apprentissage, l'éducation et la formation — Un cadre de référence pour l'information des e-Portfolios

Reference number
ISO/IEC TS 20013:2015(E)

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

Contents

Page

Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/IEC JTC 1, *Information technology*, Subcommittee SC 36, *Information technology for learning, education and training*.

Introduction

e-Portfolios have been deployed in many contexts that span educational, employment, artistic, and social contexts. In education, they have demonstrated their potential to enhance the development of learners and to support the work of educators, administrators, and others, through streamlining information management processes, developing learner autonomy and metacognition, and fostering the personal and professional development of individuals. However, this broad implementation has also brought with it issues related to interoperability, accessibility, and usability of both systems and content.

This Technical Specification has been developed to support the creation and use of e-Portfolios to support learning, education and training. It can be used to develop more responsive, flexible and modular systems and services that will support learners, instructors, e-learning service providers and other stakeholders in their activities related to e-Portfolio creation and use across various ITLET contexts (such as K-12 education, higher education training, career planning and professional development). With on-going developments in ICT learners have access to an increasing diversity of learning, education, and training opportunities. Production of educational content and services as a consequence of developments in ICT extends the scope of opportunities for learning, providing potential for learners to experience personalized and adaptive opportunities that also may enhance their learning and improve their abilities. Content and services are delivered to or accessed by learners – as well as produced and managed by them. ITLET systems therefore need to be designed to accommodate this. For example, a common feature of *most* e-Portfolio systems is that their owners not only author the content but also control selection and presentation of it. In some jurisdictions this key function is seen as integral to personal development planning (PDP).

A key characteristic of e-Portfolio systems for ITLET stakeholders is the data or information that is utilized for e-Portfolios can provide instructors, trainers, administrators, and employers with an efficient means of appraisal, management, and decision making. This key characteristic also benefits learners through providing opportunities to reflect on their own learning and career development. e-Portfolios thus provide an opportunity to monitor the development of an individual's achievements, skills and competencies within and beyond formal education and training contexts.

One means of delivering such functionality is via a management system, such as an integrated Learning Management system (LMS) or Human Resource management System (HRMS) that can be used to monitor and organize learners' learning; however, unbundled applications and services can also provide such functionality and components of e-Portfolio system functionality can exist in a highly distributed manner.

For these reasons, implementing e-Portfolios has the potential to be an efficient method for tracking learning history, documenting activities within learning, education, and training, supporting peer and self-assessment as well as professional development in the workplace. Consideration of how e-Portfolios may be used within teaching and learning environments has therefore been central to shaping this document.

In order to encourage streamlined management and exchange of participant information and associated data, such as the evidentiary information contained in an e-Portfolio, a standardized approach is necessary. Through the standardization of e-Portfolio system components (that is, IT systems and services that enable e-Portfolios), common underlying structures will provide the potential to share data across and among different applications, thus improving interoperability.

This Technical Specification provides a reference framework for the use of e-Portfolios within ITLET contexts where there are requirements for importing, exporting, and aggregating data. The reference framework has been developed with the aim of supporting interoperability and transfer of information among ICT systems and services where data interchange is required for e-Portfolio systems. It is intended to be used by learners, instructors, software developers, implementers, instructional designers, and others within learning, education, and training environments that are supported by information technology.

This Technical Specification includes six clauses and two annexes. The first clause provides the scope, exclusions, and aspects not currently addressed. The second and third clauses include the normative references and terms and definitions respectively. The fourth clause provides background information regarding e-Portfolios. The fifth clause describes various types of e-Portfolios used in learning, education, and training contexts and provides an approach to classifying them. The e-Portfolio reference framework

is then detailed in clause six. The annexes include use case information that has been submitted by national bodies (Annex A) and study cases of e-Portfolio interoperability (Annex B).

Information technology for learning, education and training — A reference framework of e-Portfolio information

1 Scope

This Technical Specification details a reference framework of e-Portfolio implementation that can be used to inform and support development of ITLET systems that meet the requirements of learners, instructors, e-learning service providers and others in contexts such as K-12 education, higher education, training and development.

The reference framework identifies content and functional components that support e-Portfolio systems and interoperability issues that need to be addressed in data exchange between these components and interoperability issues that need to be addressed in data exchange between the two component types (content and functional) and among the various categories.

This Technical Specification:

— provides an e-Portfolio reference framework;

— provides descriptions of e-Portfolios in terms of components, categories, and elements;

— provides descriptions of e-Portfolios in terms of component types (content or functional), categories, elements, and items;

— identifies commonalities of current implementations of e-Portfolios; and,

— represents the needs of stakeholders (e.g. learners, instructors, etc.).

The scope of this Technical Specification does not include:

— in-depth technical review of issues related to adaptability to culture, language, and human functions;

— security techniques related to the protection of privacy information;

— authentication of the identity of an IT or ITLET system user;

— how e-Portfolios might integrate with ITLET systems; and

— specific requirements of e-Portfolios or e-Portfolio systems to meet jurisdictional domain requirements.

This Technical Specification currently does not address:

— aspects of accessibility.

— the elements required of learner and instructor;

— best practices of e-portfolio use cases in the fields on K-12 education, higher education and training;

— guides to support the use of e-Portfolios in learning, education, and training environments; and

— detailed technical information regarding specific types of e-portfolios (e.g. learning, teaching, assessment, presentation, personal development, career, course, program, institutional, or other).

It is anticipated that some or all of these requirements may be addressed in future editions of ISO/IEC 20013, or in companion International Standards or Technical Reports.

2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

2.1
category
types of *components* (2.2)

2.2
component
set of constituent parts that comprises an *e-Portfolio* (2.5)

Note 1 to entry: An e-portfolio component may be either a content component or a functional component.

Note 2 to entry: A content component makes learner information explicit so that it can be matched to resources. The following are content components for e-portfolio information: identification, synopsis, education, career, outcomes, capability, and experience.

Note 3 to entry: A functional component is used to identify and support interoperability and may include "layers" of entities such as business requirements and processes, technical services, and data sources.

[SOURCE: ISO 16175-2:2011, 3.7 Modified: in the definition, "a digital record" has been replaced with "an e-Portfolio"; the 3 Notes to the entry have been added.]

2.3
e-learning
learning (2.9) facilitated by information and communications technology

[SOURCE: ISO/IEC 24751-1:2008, 2.18]

2.4
element
unit of data for which the definition, identification, representation and permissible values are specified by means of a set of attributes

[SOURCE: ISO/IEC 6523-1:1998, 3.3]

Note 1 to entry: A component can contain one or more elements.

Note 2 to entry: An element is part of the e-Portfolio framework and a label to indicate a layer within the e-Portfolio framework. An example is *Career Planning*, which is an element of the category of *Experience*.

2.5
e-Portfolio
collection of digital items aggregated within an *IT system* (2.7) used for a diversity of purposes to support LET and professional development activities through automated and manual means and is used for a diversity of purposes

EXAMPLE An e-Portfolio may be used:

a) to store personal or professional electronic artefacts;

b) as a personal or professional journal to support reflective learning;

c) as a collation of evidence of learning, experience, and achievement;

d) to support lifelong learning and on-going transitions between education and workplace environments;

e) to support collation and integration of informal learning into formal settings; and,

f) to present selected views of content to prospective and existing employers and educators.

2.6
e-Portfolio system
instance of an *information technology system* (2.7) designed and implemented specifically to support the creation, use, and management of *e-Portfolios* (2.5)

Note 1 to entry: An e-Portfolio system may be coupled (sets of) IT applications and services.

2.7
information technology system
IT system
set of one or more computers, associated software, peripherals, terminals, human operations, physical processes, information transfer means, that form an autonomous whole, capable of performing information processing and/or information transfer

[SOURCE: ISO/IEC 14662:2010, 3.13]

2.8
item
unit of discrete data that comprises an *element* (2.4)

Note 1 to entry: An element can contain one of more items.

Note 2 to entry: An example is a file or a link to a website.

2.9
learning
acquisition of knowledge, skills or attitudes

[SOURCE: ISO/IEC 2382-36:2013, 36.01.01]

2.10
learning management system
LMS
software system designed for the purpose of performing administrative and technical support processes associated with *e-learning* (2.3)

[SOURCE: ISO/IEC 2382-36:2013, 36.03.01]

2.11
personal development planning
PDP
process that makes explicit the learning or professional development goals of an individual and proposed strategies for achieving them

Note 1 to entry: e-portfolios may be used in a variety of ways to support personal development planning, summative assessment, presentation, reflection, and other uses.

2.12
reference model
framework for understanding significant relationships among the entities of some environment, and for the development of consistent standards or specifications supporting that environment; a reference model is based on a small number of unifying concepts and may be used as a basis for education and explaining standards to a non-specialist

[SOURCE: ISO 14721:2012]

3 Symbols and abbreviated terms

The following symbols and abbreviated terms are defined for use within this Technical Specification.

ABEEK	Accreditation Board for Engineering Education of Korea
CBE	Calgary Board of Education
ePEARL	electronic Portfolio Encouraging Active Reflective Learning
HRMS	Human Resource management System
ICT	Information and Communications Technology
IEC	International Electrotechnical Commission
IMS	IMS Global Learning Consortium, Incorporated
IPTV	Internet Protocol Television
ISO	International Organization for Standardization
IT	Information Technology
IT System	Information Technology System
ITLET	Information Technology for Learning, Education and Training
LET	Learning, Education and Training
LMS	Learning Management system
LORFOLIO	e-Portfolio offered by Lorraine Region
PC	Personal Computer
PDP	Personal Development Planning
RPL	Recognition of Prior Learning
QCL	Qualifications, Certifications and Licenses
SDEG	Shanghai Distance Education Group
SMEC	Shanghai Municipal Education Commission
WIL	Work Integrated Learning

4 e-Portfolios and e-learning

4.1 Role of e-Portfolios

The purpose of this Clause is to outline the roles of e-Portfolios, their key characteristics, and their advantages over traditional portfolios.

In the early development of the e-learning industry the LMS occupied a prominent role as the central ITLET system. Developments since this time provide new opportunities to monitor human-computer interactions during learning, such as tools that build on outcomes-based assessment and evaluation that enable process-centred assessment and evaluation. However, wide adoption of e-learning in education has also brought new challenges for instructors, such as how to measure the effectiveness of e-learning and determining what might constitute authentic assessment. Innovations in practice, as well as technology, have meant that there is an increasing diversity of methods for addressing such

issues. Importantly, learners who are engaged in e-learning activities typically have the option to study at their own pace and to access learning materials suitable to their particular situation. To fully support this flexibility, IT and ICT systems need to be responsive to individual requirements in providing appropriate e-learning services.

In education and training contexts e-Portfolios have typically been used as contained environments that stimulate thinking about learning goals, monitor progress toward achieving those goals, and provide an interactive platform to give and receive advice about learning. These processes are sometimes referred to as Personal Development Planning (PDP), particularly when the learning or professional development goals and proposed strategies for achieving them are made explicit. Thus, e-Portfolios typically contain data sets such as a learner's learning history, learning goals, educational activities, outcomes, and related achievements. PDP and learning-based e-Portfolios also typically include evidence of reflection by the e-Portfolio owner. Millis, in Zubizarreta (2009, p. xx), also suggests that "portfolios are highly motivating, because portfolios get learners into a rich and deep knowledge base focused on their own learning experiences. Collaboration with others deepens these individual experiences by allowing probing questions, socially constructed knowledge, and alternative viewpoints".

Despite these opportunities to assist and enhance learning experiences, traditional (non-electronic) portfolios can be seen to have a number of weaknesses:

— data are not durable, may be lost or not easily re-discoverable;

— managing overlapping data are difficult, (e.g. teaching material);

— maintenance can require a lot of time, effort and costs;

— effective use in learning and teaching contexts is typically limited to evidence of achievement; and,

— integrating multiple file types, such as video/audio files, images, and others, is not easily managed.

These weaknesses of traditional portfolios can mostly be overcome by using ICT, although the durability of data are also dependent upon information management practices. e-Portfolios provide a platform for supporting learners and instructors to increase educational effectiveness. By using e-Portfolios, instructors/learners can manage teaching and learning resources and processes, monitor activities and learning status while also enabling feedback for improving learning outcomes.

Three key characteristics of e-Portfolios that overcome limitations of traditional portfolios are:

— **flexibility** in modification, management, and portability. Users can modify their e-Portfolio conveniently and easily. Users also can manage their personal information and easily export this information to other systems and file formats as required.

— **multiple data types** can be managed. Users can show dynamically their outcomes related to their competency through using multimedia files such as audio, video, graphics, images, and others. This capability lends itself to creativity of expression.

— **opportunities to integrate** with other IT systems and the ability to have access anywhere through the use of network technologies.

These characteristics of e-Portfolios facilitate their use in many different situations and contexts, not just in the support of learners. As elaborated below, there are also different types of e–Portfolios.

4.2 Classifying e-Portfolios

This Reference Framework for e-Portfolio Information has been developed to support different types of e-Portfolios that may be used to support learning, teaching, and other LET activities. One approach, is for e-Portfolios to be classified into different types, according to purpose, function, and target audience, as advocated by Stefani, et al. (2007, pp 13-14):

— assessment e-Portfolio: documents individual reflections and presents outcomes that can be used to demonstrate capability.

— presentation e-Portfolio: provides traditional portfolio functions such as enabling users to collate their artefacts to demonstrate achievement and competence.

— personal development e-Portfolio: includes the collection of data and information to support employment and professional development planning.

— learning e-Portfolio: tracks and identifies learning over time.

— informal learning e-Portfolio: allows for the individual to assemble content, evidence and reflections related to informal and personal learning activities not necessarily related to any formal education or training.

e-Portfolios also can be classified depending on the context in which they are applied (Zubizarreta, 2009):

— course e-Portfolios: are specific to a particular course and typically contain information assembled by the student documenting achievement and reflections on achievement of outcomes. In addition, course portfolios are often used for course assessments in part or in whole.

— program e-Portfolios: are specific to an entire course of academic study and document the learners' work completed, skills acquired, and outcomes met possibly as a requirement for graduation.

— institutional e-Portfolios: permits the sharing and assessment of institutional goals and objectives and progress, as well as providing information for re-accreditation, if necessary.

For specific learning and teaching contexts e-Portfolios can be classified as following:

— learning e-Portfolio: has the primary function of supporting the learner but can also be used by instructors for assessment purposes.

— teaching e-Portfolio: has two purposes; (1) to manage teaching skills in order to reinforce and extend the teacher's competency; and, (2) to evaluate teaching competency.

Finally, regional or industry-specific e-Portfolios are used to support workforce development and lifelong learning in geographical regions and industry verticals.

4.3 Benefits of e-Portfolios

When e-Portfolios are used effectively a wide range of e-learning stakeholders (such as learners, instructors, providers, and school managers, parents, employers) stand to benefit:

Learners may benefit by:

— managing their information related to learning such as progression through a course, learning materials, feedback from instructors, and others;

— receiving advice on learning content from instructors and e-learning systems;

— accessing their portfolio from a variety of digital devices such as PC, Smartphone, and others;

— developing learning plans individually or in collaboration with others; and,

— presenting views of all or parts of their e-Portfolios to potential employers, parents, teachers, workplace assessors, or for entry into further education.

Instructors may benefit by:

— managing their information related to teaching such as teaching materials, career progression, evaluation data, etc;

— providing learning contents and other resources to learners;

— tracking learning progress and activities of their students;

— managing learners' skill development and competencies; and,

— managing their own skill development or professional development as e-Portfolios.

e-Learning providers who make and offer e-learning services may benefit by:

— developing learning content appropriate to learner needs; and,

— operating e-learning services effectively.

Moreover, other stakeholders may benefit as follows:

— school managers might evaluate their instructors;

— parents can monitor the learning status of their child; and,

— employers can review the competence in a broader context.

By understanding the benefits that e-Portfolios can bring to different stakeholders, implementers of e-Portfolio systems can therefore ensure that sufficient functionality is provided.

5 Reference Framework of e-Portfolio Information

5.1 Introduction

The Reference Framework of e-Portfolio Information consists of a number of different representations and perspectives. The first is a high-level conceptual abstraction of the domains that e-Portfolio systems interface with (Figure 1). The second presents an analysis of common content categories found in e-Portfolio use cases submitted for inclusion into this Technical Specification (Table 1 and Table 2). The third (Figure 2) is an abstract model representing the content category structure of seven essential categories which map directly to the category and element analysis shown in Table 3. Lastly, Figure 3 is a services model of e-Portfolio functional components depicted in three layers (business process, technical services, and data sources).

As outlined in 4.2 above there are different ways of classifying and conceiving of e-Portfolios. Within this Reference Framework two types of components are made explicit – *content* (with structural and semantic dimensions), and *functional* (with systems and technical dimensions). The content component consists of seven (7) categories and their related items (or elements).The functional component represents an e-Portfolio system which includes (1) business processes; (2) technical services "genres"; and, (3) data sources.

The representation of content (in Tables 1, 2, and 3 and Figure 2) feature three levels of structure: categories, elements, and items. This structure represents a set of recorded information that an ITLET system must recognize as part of an e-Portfolio application or service. Elements are items that are specific to each category. There are currently 30 elements mapped to seven categories in Figure 2. Elements can be further itemized into more granular requirements and referred to as "items". For example, an "identification" element (which falls under the "Profile category") includes "items" such as name, and contact information.

All representations within this framework can be used to inform the design and implementation of e-Portfolio systems that support e-Portfolios in ITLET contexts. As such, they are not intended to serve as a strict technical reference model that might constrain development or innovation in e-Portfolio systems development.

5.2 Conceptual representation of e-Portfolio information

e-Portfolios and e-Portfolio systems can be represented in a number of different, but equally meaningful ways. For the purposes of this document a number of diagrams, models, and tables are used to present key information. For example, Figure 1 presents a high-level conceptual view of e-Portfolios being an interface between three key stakeholders: the learner; the formal educational organization; and, the

employer. Such a model can be *re*presented from the perspective of each of these key stakeholders. In this representation, however, the notion that e-Portfolio systems are interoperable is an ideal situation that is facilitated by standardized approaches in the development of e-Portfolios and e-Portfolio systems.

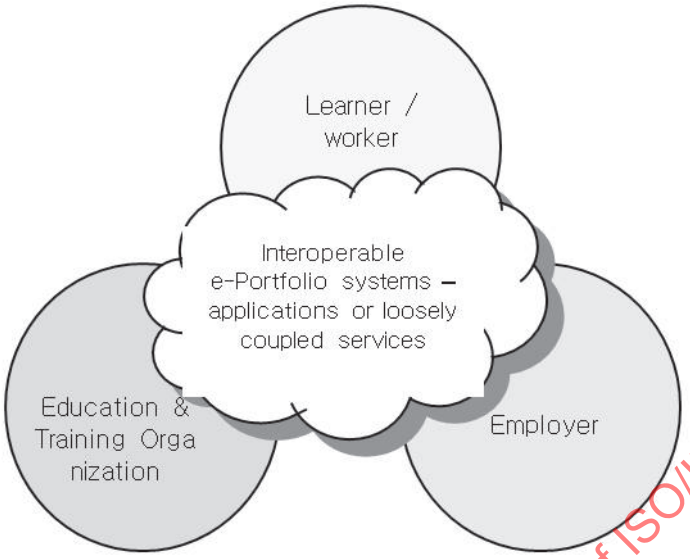

Figure 1 — High-level conceptual model of e-Portfolio systems interfaces

Figure 1 demonstrates that e-Portfolio systems function as an important interface across different contexts (personal, professional, organization and workplace) and also as a key platform that enables the creation, management and presentation of e-Portfolios to different stakeholders over time. For these interfaces to support individuals through their lifelong learning journey it is essential that the information can be migrated easily from one e-Portfolio system to another. For example, an individual may keep a personal e-Portfolio to support reflection and personal growth, and may wish to share part or all of this information within an education or work portfolio. Thus IT systems need to be interoperable and well-designed to support many different contexts in which individuals may participate using e-Portfolios.

5.3 Common categories found in e-Portfolio Use cases

Analysis of 10 use cases submitted has resulted in the identification of a number of common conceptual categories. The results of this analysis are represented in Tables 1 and 2 below. Identifying such categories are important in the development of an abstract model (depicted in Figure 2). Each column in the two tables below represents a different use case. As noted in the column titles there were several countries that submitted more than one use case for analysis.

Table 1 — Common conceptual content categories found in e-Portfolio information based on the use cases

Category	Use cases [a]									
	A.1.1 Australia	A.1.2 Australia	A.1.3 Australia	A.2.1 Canada	A.2.2 Canada	A.3.1 China	A.3.2 China	A.3.3 China	A.4 France	A.5.1 Korea
Identification	Author	Worker / Learner	Learner	Identification	User	Student	Personal Information	Identification	Personal Information	Learner, Instructor

[a] A.5.2 Korea provided items only.

Table 1 *(continued)*

Category	Use cases [a]									
	A.1.1 Australia	A.1.2 Australia	A.1.3 Australia	A.2.1 Canada	A.2.2 Canada	A.3.1 China	A.3.2 China	A.3.3 China	A.4 France	A.5.1 Korea
Overview	Objecitves	Professional Development	Showcase	Personal Profile	Goal		Goal, Interest			
Education	Vocational Training, Credentials, RPL	University	Vocational Training	Enrolment	School		Learning Information	Records of Learning Process	–	–
Career	Career pathways	Competencies WIL		Content, Feedback, Competencies/ Learning Standards, Sharing	–	–	–	–	Career Path	–
Outcomes	Objectives, employability skills, validation	Reflections, Skills, Competencies WIL	Accreditation, verification Assessment Artefact Data Transfer	–	Artefact	–	–	–	–	–
Capability	Evidence, Skills, Competencies. Reflection	Evidence Skills Competencies Reflection WIL	Evidence	–	–	–	QCL	–	–	–
Experience	Experience	Experience	Experience	–	–	–	Activity	–	–	–
Exceptions	–	–	–	–	Class	Teacher	–	–	–	–

[a] A.5.2 Korea provided items only.

Table 2 — Common elements for each category from uses cases

Category	Use cases [a]					
	A.2.1 Canada	A.3.1 China	A.3.2 China	A.3.3 China	A.4 France	A.5.1 Korea
Identification	External users, Address, Name, Contact info, Demographics	Personal Information, Posts (Student), Posts (Teacher)	Address, Name, Contact info	Personal Information, Teaching info, Address, Contact info	Photograph, Identification	Personal info
Overview	Interest, Goal	-	Demographics, Interest, Goal	Essays	Presentation	-

[a] Some cases did not provide Elements or sufficient information.

Table 2 *(continued)*

Category	Use cases [a]					
	A.2.1 Canada	A.3.1 China	A.3.2 China	A.3.3 China	A.4 France	A.5.1 Korea
Education	Enrolments	Course (Student), Course (Teacher)	Online learning record, Offline learning record	Learning time	-	Curricula portfolio
Career	-	-	-	-	Education and Training, Competencies Assessment, Competencies Assessment	-
Outcomes	Reflections, Artefacts, Presentations, Collections, Assessment	Transcript	-	Scores	-	-
Capability	-	-	Qualifications, Certifications, Licenses	-	-	-
Experience	-	-	Activity	-	-	-
Exceptions	Permission Profiles, Comment	-	-	-	-	Survey, Counsel, Subjects portfolio, Record about Counsel

[a] Some cases did not provide Elements or sufficient information.

5.4 Content component structure

According to use cases from several national bodies, certain structures including categories and associated elements can be illustrated as in Figure 2[1)].

In total 11 use cases from five National Bodies were submitted for analysis. However, not all use cases contained sufficient elements and items for analysis. A total of 10 use cases provided the basis for the content categories and of these use cases six provided sufficient information to distil common elements for each category. Based on these use cases e-portfolio content information can be organized in a number of ways. It appears that this information can be organized taking a layered approach. We have represented these content structures using a hierarchical approach as: (1) categories, (2) elements, and (3) items [or elements if used]. Figure 2 illustrates the relationships between categories and elements

1) Individual items are not presented in Figure 2.

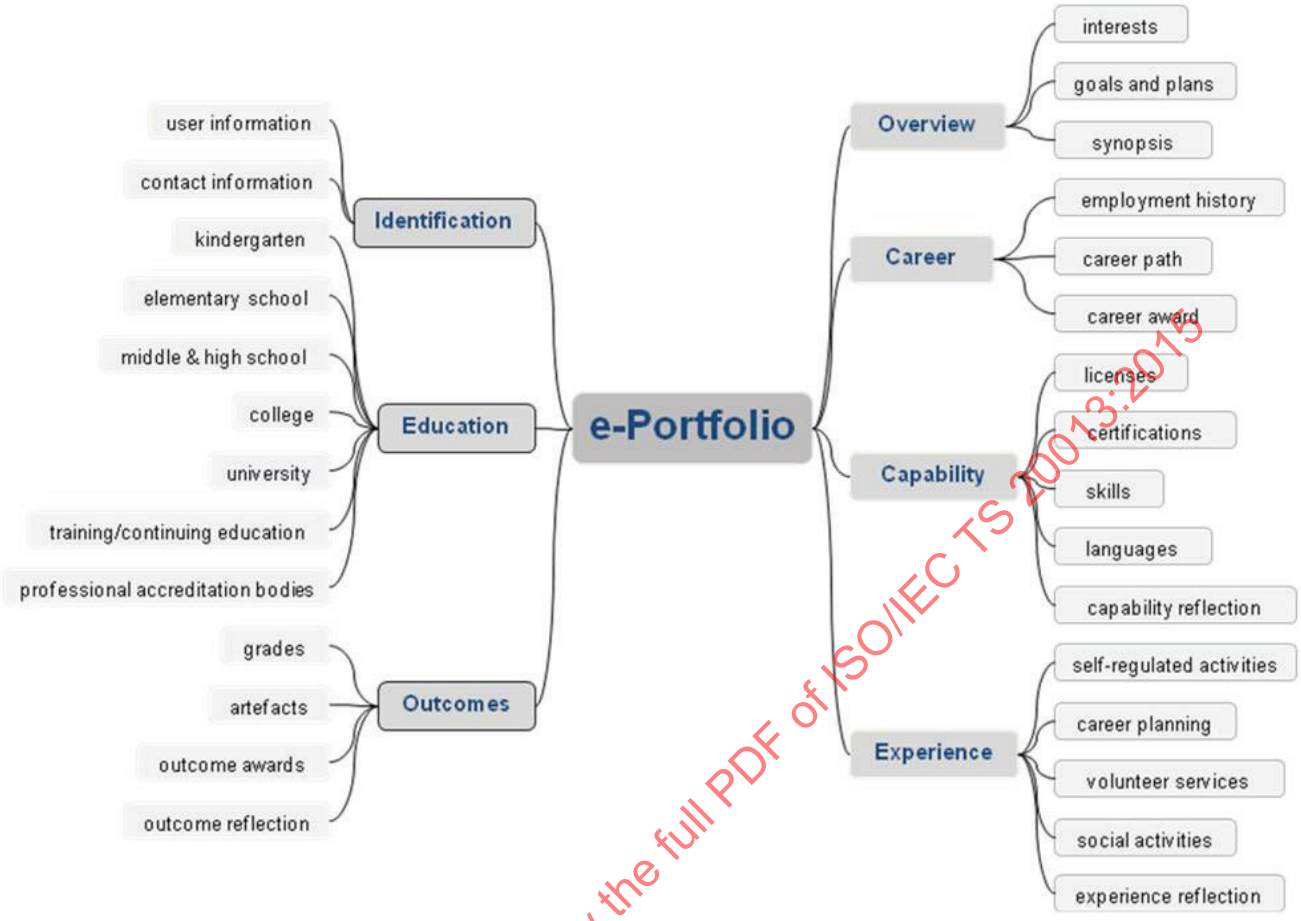

Figure 2 — Abstract model of e-Portfolio representing categories and elements

NOTE Many e-Portfolio systems maintain different types of relationship between e-Portfolio items but the relationship between categories and elements is stable as represented in Figure 2

The structural aspects of the content component of an e-Portfolio can be considered from a number of perspectives relating to teaching and learning. Since e-Portfolios document a set of evidence data in teaching and learning a repository function to store, reference or link to data must be available, either within an application or as a service supporting an application. The structure provided in Figure 2 above does not detail low level requirements (items). For example, the "User information" element of "Identification" category also can be expressed as low level requirements such as e-mail address, name, phone number, and others. Such items are not detailed here because they will vary among ITLET systems, specific needs, and jurisdictions.

The category and element structures of the content component are described in the following clauses.

5.4.1 Identification category

The Identification category provides information about the e-Portfolio owner (such as learners or instructors). The role of this category is to make explicit a user's individual information which can then be matched to resources. This includes information that can prove user identification.

This category consists of two elements – user information, contact information.

— user information – identifies a particular individual and may include name, gender, date of birth.

— contact information –address details on locating a particular individual.

5.4.2 Overview category

This includes summary information of the past, present and future which can describe the owner of the e-Portfolio.

This category consists of three elements – interests, goals and plans, and synopsis.

— interests – details on the voluntary commitments or goals of an individual arising out of social relationships.

— goals and plans – achievements of predefined plans and processes of tangible targets.

— synopsis – narrative text describing an individual's personal background, experiences and aspirations.

5.4.3 Education category

This category consists of information related to schools at all levels that provide regular educational programs, (e.g. kindergarten, elementary, middle, and high school, college, university (including graduate school).

— kindergarten - pre-school educational programs offered to young (pre-school) children.

— elementary school - first stage of formal (often compulsory) education.

— middle and High school - secondary education characterized by teaching of a number of subject areas.

— college - post-secondary education where students obtain degrees or diplomas in specific areas.

— university - post-secondary education offering degrees (and diplomas) in specific academic areas.

— training / continuing education – courses taken all along the career which do not necessarily lead to an academic grade.

— professional accreditation bodies - oversee professional practice and accreditation, e.g. the Australian Nursing and Midwifery Council (ANMC) as outlined in Annex A.

5.4.4 Career category

This category includes career information related to individual professional activity and consists of three elements – employment history, career path, and awards.

— employment history – a summary statement of any employment

— career path – a direction that a person has followed or is taking in order to fulfil his or her professional goals

— career award – designation given by a learning service provider to a learner, in order to indicate a level of performance or attainment, or the completion of a learning program. [ISO 29990:2010, 2.2]

5.4.5 Outcomes category

This category includes information about the outcomes and reflections on those outcomes by an individual in education and training programs.

— grade – measurement of an individual's competency of the materials taught

— artefact – tangible deliverable produced by an individual during the learning process

— outcome award – recognition given to an individual for academic achievement

— outcome reflection – individual review of performance and achievement.

5.4.6 Capability category

This category includes all qualifications, certifications, licences, demonstrated skills, languages acquired overtime and consists of four elements, namely: (1) certifications; (2) skills; (3) language; and, (4) capability reflection.

— licences – authorization issued by an institution to an individual indicating that professional qualifications have been met certifications – voluntarily obtained validation indicating qualification to perform certain tasks;

— certifications – voluntarily obtained validation indicating qualification to perform certain tasks;

— skills – quality of performance in carrying out certain tasks;

— languages – competency in a language other than an individual's mother/native tongue; and,

— capability reflection – individual review and assessment on value of skills, competencies and recognized qualifications.

5.4.7 Experience category

This category deals with information about experiences gained outside of the educational environment. It consists of five elements; namely: (1) self-regulated activities; (2) career planning; (3) volunteer services; (4) social activities, and (5) experience reflection.

— self-regulated activities – process where an individual participates and self-manages activities to achieve desired/stated outcomes or experiences

— career planning – identification of potential career goals involving the planning of steps to achieve those goals

— volunteer services – activities undertaken by an individual or group of individuals designed to help others without remuneration

— social activities – interaction with others in socially defined rules or processes

— experience reflection – individual review and assessment of the value of various social and personal experiences

Table 3 is presented for the purpose of detailing how Categories, Elements, and Items all relate

Table 3 — Examples of items under elements

Category	Elements	Items
Identification	user information	name, gender, date of birth, nationality, identification no., photo, status
	contact information	address, telephone (office, home, mobile/cell), fax, email
Overview	interest	interests, professional interests, hobbies
	goals and plans	goals and plans, professional goals and plans (ex: short-term, mid-term, long-term), description, priority, status
	synopsis	narrative, context, achievements, aspirations
Education	kindergarten	school name, years of study, location - Distinguish secondary schools into middle and high schools. - For higher education, distinguish colleges and universities and Graduate schools belonging to universities.
	elementary school	
	middle and high school	
	college	
	university	

Table 3 *(continued)*

Category	Elements	Items
Career	employment history	employer, role, responsibility
	career path	company, location, years of service, position, responsibilities
	career awards	award, issuer, year
Outcomes	grade	transcripts, assessment, test score, course grade
	artefacts	assignment outcomes, project outcomes, exhibits, research artefacts, presentations, files, links to websites, submitted forms, items from coursework, links to associated content
	outcome awards	award, issuer, year
	outcome reflection	effort, process, satisfaction
Capability	licenses	title, organization, registration number, level, date, description (continued next page)
	certifications	certificates, issuer, year
	skills	area, level
	languages	language, level, valid date
	capability reflection	efforts, process, satisfaction
Experience	self-regulated activities	travels, contest participations, educational experiences, hobbies
	career planning	Internship, part-time job, professional development
	volunteer services	community services
	social activities	club activities
	experience reflection	efforts, process, satisfaction

5.5 Functional Component of e-Portfolio systems

This section addresses the functional component of e-Portfolio systems, making explicit the range of functions. In order to achieve interoperability of e-Portfolio systems it is also necessary to identify the functional (technical) components involved. A number of useful models may be used to depict different representations of these components. For example, a view presented by the Australian Flexible Learning Framework in their (2009) *e-Portfolio Roadmap* identifies four priority activities that need to be supported by a range of ICT services for e-Portfolios to function effectively. This is shown in a high-level view of a "service-oriented approach" that represents functional components in three "layers" of entities (business requirements and processes; technical services; and data sources) within a traditional "stack" representation. These three layers need to be in alignment for optimum interoperability. Through using this approach, technical services that support or enable different business processes can be identified – as shown in Figure 3, a service-oriented approach to identifying business process requirements and aligning them with ICT services and associated data sources. This approach to informing systems design is intrinsically modular and extensible.

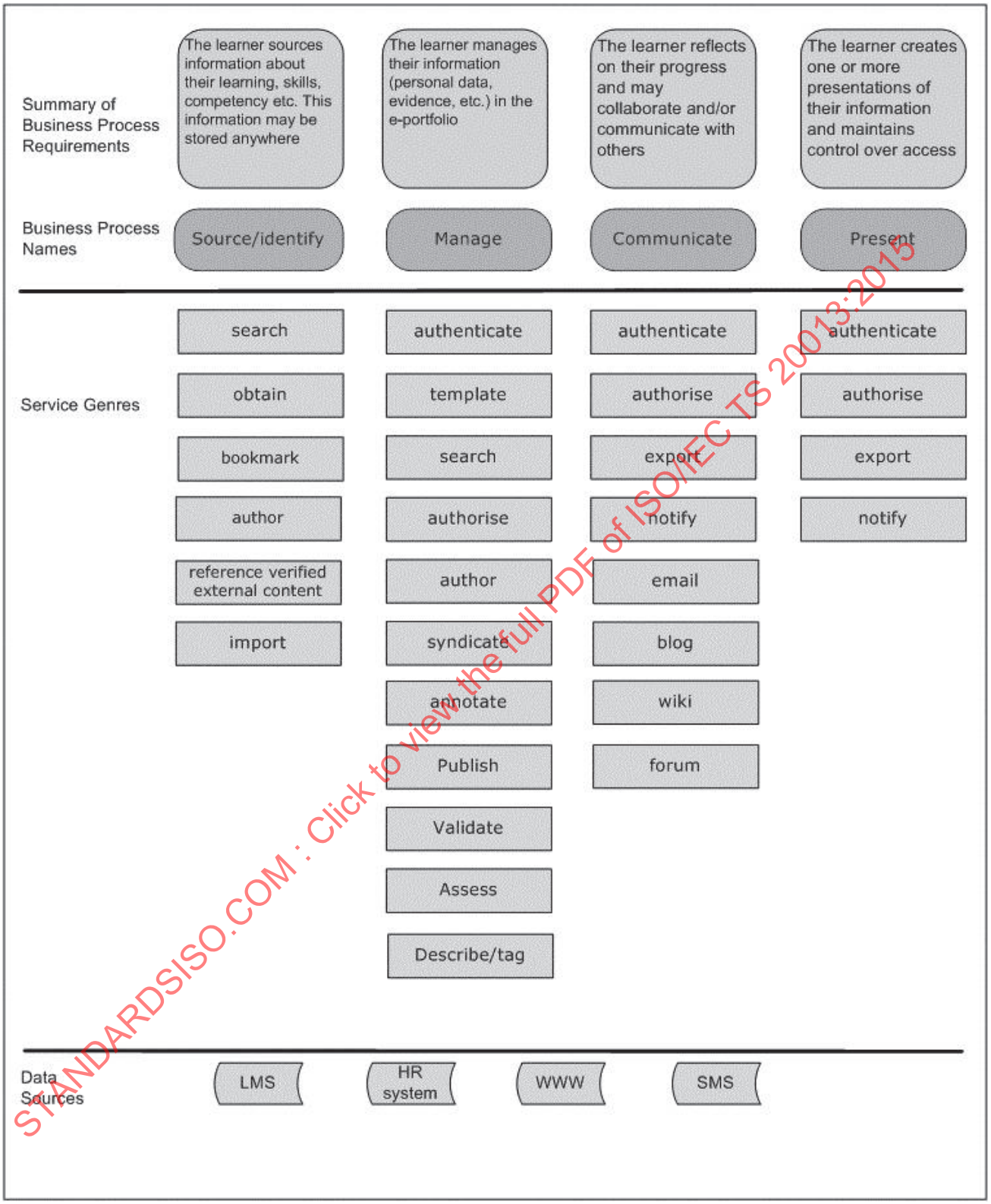

Figure 3 — A Services model of e-Portfolio System functions [Source: Australian Flexible Learning Framework (2009)]

Figure 3 depicts a number of functional category that might be found in an e-Portfolio; however, the e-Portfolio does not need to be a single software application and can consist of a number of services and data stores that exist in multiple locations. Moreover, within this representation there is scope for modular services to be integrated into an e-Portfolio system that might evolve over time.

Learner data, both verified and unverified can exist in many places on the Internet and an e-Portfolio should ideally be able to link to or reference that data. Additionally, functions and services need not be contained within the e-portfolio application and may be called by the application (for example, the IMS Learning Tools Interoperability specification describes some methods for achieving this).

Annex A
(informative)

Use cases of e-Portfolio

The following use cases were submitted to SC36 following a resolution to invite expert contributions from which this Technical Specification could refer to. After contributions were submitted these use cases were analysed and key information then summarized in Tables 1, 2, and 3. The text for each use case has only been edited for typographical errors. Apart from formatting requirements of this document all other content is presented here as submitted. It should also be noted that while the invitation to submit use cases was accompanied by a template that included a data table not all submissions adhered to this template.

A.1 Australia

A.1.1 Supporting skills development and workforce participation

Players (Users):

Learners, parents, careers counsellors, instructors/teachers/trainers, administrators, student services officers, course administrators, RPL (Recognition of Prior Learning) assessors, employers

Definition:

Electronic portfolio designed to support increasing workforce participation. Provide assistance developing career pathways and enrolment into vocational education courses.

Description:

Increasing the skills levels of the workforce is a key factor in growing the local economy. There are however, many individuals that lack foundation skills required to succeed in vocational education courses and also perhaps lack or are unable to articulate employability skills. This e-Portfolio service seeks to support learners and workers in preparing career pathways, articulating and acquiring foundation and employability skills for participation in accredited vocational courses and gaining employment.

There are a number of support services, such as community-based education, adult education etc that offer courses to learners who, for a variety of reasons, may lack the pre-requisite skills and competencies required for accredited VET (vocational education and training) courses. Examples of such learners may include:

— Early school leavers

— Disadvantaged learners

— Learners from linguistically and culturally diverse backgrounds

— Individuals trying to return to or enter the workforce

Adult and community education centres offer many foundation courses that help develop these foundation skills and prepare such learners for vocational training and better workforce participation.

Many of these centres lack the ICT infrastructure and expertise to exploit technology in achieving these objectives however increasingly they have some form of basic access to the Internet. An Internet-based e-Portfolio service can assist these users and processes in meeting their goals.

The e-Portfolio assists users in articulating their skills, experience and objectives, allows them to create pathways to those objectives, and collect and store evidence to validate and confirm their credentials. A regional/public e-Portfolio service will allow users to retain and enhance their portfolios as they

transition between multiple environments (eg school, adult and community education, vocational education, workforce, higher education etc). This e-Portfolio service will support both formal and informal learning.

Transactions:

The following list identifies high-level functions. It serves as a basis for defining what the e-Portfolio service might look like rather than providing a definitive list:

— Administrators/learners. Create, update, delete users

— Administrators. Manage identity

— Administrators. Manage security

— Learners. Define objectives

— Learners. Articulate employability skills

— Learners. Create career pathway, planning

— Learners. Reflection

— Learners. Gather evidence

— Learners. Manage portfolio

— Learners. Manage presentation

— Learners. Manage access

— Career Counsellors. Support development of career pathways

— All. Support development of portfolios

— Instructors/Trainers/Teachers. Validate evidence

— Student services officer. View portfolio

— Parents. View portfolio

— Course administrator. View portfolio

— RPL assessor. View portfolio

— Employer. View portfolio

— All. Collaborate

— Administrators. Import/Export portfolios

— Learners. Import/export portfolios, portfolio artefacts

For purposes of verification of some learner content and claims, integration with external identity providers, accreditation systems and student information/achievement systems should be considered.

NOTE The term Learner is used generically here to denote the creator and owner of the individual portfolio. It equally applies to a student in a formal context, an informal/lifelong learner, person seeking employment etc.

The model assumes the learner is the owner of the portfolio.

A.1.2 Facilitating work integrated learning (WIL) with skill-enabled e-Portfolios in the Australian Nursing and Construction disciplines

Players: Undergraduate students, academic staff, and industry and clinical placement facilitators

Definition: Work Integrated Learning and the issues surrounding associated experiences have recently been in the spotlight within academia due to renewed Government interest in students learning from workplace experiences. *Work Integrated Learning* (WIL) is the term used to describe educational activities that integrate theoretical learning with its application in a workplace, profession, career or future employment (Stephen Billett, 2001; Patrick, 2009). WIL experiences can be off- or on-campus, real or simulated, depending on the discipline area, but must involve clearly stated outcomes, assessment and to be consistent with quality teaching and learning (Stephen Billett, 2010).

Both the Construction and Nursing disciplines in Australia have accreditation bodies that drive competency requirements. For example, Nursing and Midwifery competencies and degree programs are strongly aligned with one accreditation body, the Australian Nursing and Midwifery Council (ANMC) which supply programs with the ANMC Continuing Competency Framework (2009), cited in Andre that is used as a guideline for Nursing and Midwifery competencies. Similarly, Construction Management and quantity surveying degrees are is aligned and accredited by numerous professional bodies, including the Australian Institute of Building and the Australian Institute of Quantity Surveying, the Chartered institute of Building and Registered Institute of Chartered Surveyors. Several Australian universities also seek accreditation from the Australian Institute of Building Surveying, the Singapore Institute of Surveyors, and the Malaysian Board of Quantity Surveyors. Australian Construction degrees are amongst the most having accredited in the country.

In regards to WIL within the disciplines, clinical placements at most universities Australia wide require that students go on placement each year of their program and build upon their knowledge and skills learnt. To encourage assess students learning on placements, universities use a range of processes, such as the use of a Registered Nurse, clinical progression portfolios – (a skill list booklet) while on placement (Cooke, Walker, Creedy, and Henderson, 2009), and the use of laboratories to trial out skills before going on placement (see Levett-Jones et al., 2006).

Construction management placements vary between universities. At most universities students identify and arrange their own industrial placements (Sher and Sheratt, 2010). Students usually complete their placements during University vacations, but some study and work simultaneously. Students may consult university staff about placement opportunities, but staff generally play no further part in placements until students submit evidence of achieving their placement experiences. A range of documentation is called for in this regard, with some degree programs requiring students to submit formal reports, presentations of experiences and others simply require employers to confirm the duration of placements and the nature of the work students completed.

E-Portfolios can be defined as a personal CV for students within the platform which also identifies learning in the course and on placement, and further showcases the student to potential employees. If e-Portfolios are going to be used for WIL they need to be interoperable with life-long learning, for instance, if students are documenting their skills obtained through placement over their degree on their e-Portfolio, this needs to be transportable so they can showcase these skills to future employers at a later date.

Description: The research project was financially supported by the Australian learning and teaching Council (ALTC) and has investigated and reviewed emerging practice for using e-Portfolios for placement facilitation and evaluation of work integrated learning Australia wide in the Nursing and Construction disciplines and further identified any issues and opportunities within this context. The project's outcomes include a design brief and specification for a resource on student competency standards/skills for CM and Nursing that will be readily transferable to other disciplines including case studies of e-Portfolios being used for WIL in varied disciplines (not just Construction and Nursing). In addition, final reports will document the potential of e-Portfolios to enhance industry practice and related theory. A final outcome will be online packages which provide teaching resources to support academics in engaging / incorporating WIL in their formal lessons. The project has also created a 'learning framework' to assist students to make connections between what is taught at university and WIL in order to facilitate links between students on campus learning and their WIL experiences. Furthermore, the project identifies e-Portfolios as a way of guiding students in auditing, reflecting on and illustrating the skills they develop during their work integrated learning. This was achieved by (a) reviewing opportunities offered by e-Portfolios; (b) assessing the potential for students to document and reflect on their placement experiences using e-Portfolios; and (c) to examine the role e-Portfolios have in enhancing student WIL and employability skills. Qualitative data was gathered and analysed,

these being interviews and focus groups with academic staff and students and a student online survey to understand views of using e-Portfolios for WIL. The project is being finalised in July, 2011.

Transactions: The following discusses the qualitative findings from this study to reveal the extent e-Portfolios are be used for WIL in Nursing and Construction Management at Universities who offer these programs Australia wide.

The project found that currently no e-Portfolios are used for Construction Management placement. Nevertheless literature shows that e-Portfolios have been implemented in Engineering placements in Australia and have been successful. In regards to Construction Management, feedback from staff and students showed that this tool would be advantageous and present opportunities to assess WIL. For instance, skills-enabled e-Portfolio platforms such as Mahara and Drupal have sections within the platform on 'competencies' (some platforms being more detailed than others) where the disciplines' accreditation and course competency requirements could be embedded. Within this competency section tags can link to artefacts, such as a document/video/audio of reflecting upon practical experiences which the student uploads to show they have achieved the relevant competency in their placement (Andre, 2010). There are slightly different ways the competency section can be viewed and assessed, such as 'assessor views', the range of competencies, or options where staff create a 'shopping trolley' of competencies (Andre, 2010). WIL facilitators from Universities or industry can then validate the evidence with a comment or request for further work until this competency is completed. The competency lists in some platforms can designed to be generic skills, i.e. ICT skills, communication skills or can be customised especially for WIL and the Construction discipline. These e-Portfolio functions can allow the student to document their ongoing knowledge built up over time of different WIL experiences. Employers and academics can also have ongoing dialogues on students' WIL experiences through the same platforms, through feedback links.

Mobile e-learning technologies could also be used to work towards monitoring students learning while they are on placement. This is through using existing technologies, such as mobile phones, to capture and assess the evidence and information students learned while they are in the moment of an activity on placement or at work.

Feedback from the Construction students who discussed the potential of e-Portfolios for work integrated learning indicated that there positive and negative aspects of using the tool. The following example reveals e-Portfolio opportunities, not only for the student but for industry as well:

Female 1:If you had something like this you could be…I could send it through to somebody in the office… They could download it on the thing and then it's like a real time record of what's going on at the site rather than…I mean some of our sites are a whole day's drive away. So by the time you get back to the motel or back to where you are staying, you have forgotten a lot of things. (Con Mgt Student focus group, 2011)

The negative aspects included potential discontinuities between what is taught at different companies compared to universities methods. Therefore if this process was documented on the e-Portfolios it could go against supporting learning or as a tool for referencing a particular method, such as writing a bill of quantities, for example:

Male 1: The only thing that might be a bit difficult, I don't know if I've completely understood, but like the others said going from company to company different things change. So if you document while you're at uni how to write a bill of quantity but then you go to a company…

Male 1: …and they do something completely different. (Con Mgt Student focus group, 2011)

These excerpts from the data show some of the themes and issues that need to be considered when introducing e-Portfolios within the Construction curriculum.

In comparison Nursing has been quite productive in introducing e-Portfolios into the curriculum, this could be due to the Nursing curricula already having paper-based portfolios as an assessment item for clinical placement. Some of the exemplars of practice and feedback from interviews with academics showed that the Nursing curriculum is slowly introducing e-Portfolios for Nursing clinical placement. The platforms used predominantly in Nursing were 'Pebble pad, Mahara, the Blackboard e-Portfolio tool and university wide e-Portfolio platforms'. The evidencing of skills is predominantly through

assessment evidence from clinical facilitators (such as reports and certificates) and reflective portfolio entries, no filming of skills was documented in the examples analysed. Skills evidenced are then ticked off by the student when obtained and academics can view portfolio assignments. Academics who have set up these initiatives within the clinical setting have indicated both opportunities and issues for using e-Portfolios for evidencing skills. Firstly, the opportunities identified were improved communication between staff, industry and students, easier assessment of students, more recognition of students in the program and reflection blogs enabled students to feel connected with their peers. The issues confronted were teaching other staff to make change in their curricula by introducing e-Portfolios, students need to be taught how to reflect and become IT confident, cumbersome platforms and not enough storage data space for reflective evidence.

Some Nursing students in the study, who had not used e-Portfolios in the curricula or for placement did not feel that the tool would be appropriate for their discipline, specifically in regards to documenting their demonstration of their clinical skills. For example the students felt that the issue of privacy of the patient (an activity of dressing a patients wound would be unethical to record). Furthermore the interview data shows that the physicality of using mobile e-Portfolios on placement are also an issue as Nursing students are not allowed to have their mobile phones while on duty. To overcome this issue, recording of their lab work could be used and documented (such as treating a mannequin). Nevertheless, the students in the study felt that this would be a waste of time and that they would personally not use this documentation again, such as showcasing their skills to employers. However, academic staff stated this documentation would be advantageous for assessment purposes.

Another issue identified by students in the Construction and Nursing focus groups was the issue of not having time to reflect or upload evidence. Students stated that this could be detrimental to their course work when there are so many other demands (assessment, classes and being exhausted from working). These issues and opportunities will be discussed in the final report and outcomes from this project in July (see ALTC website after this date for this resource).

This use case documents how e-Portfolios can potentially be used for WIL by showcasing a research project which has investigated the facilitation and documentation of WIL through e-Portfolios in the Con Mgt and Nursing disciplines in Australia and investigated related opportunities. Both the Construction and Nursing disciplines could benefit from using e-learning technologies to document students' WIL. The current primary facilitators of WIL in Nursing being reflective journals, with minimum uploading of picture or movie files to showcase skills. However e-Portfolios are currently not being used in Construction. Nevertheless the constant emerging technologies could overcome the issues and logistics of implementing e-Portfolios for facilitating WIL in both disciplines, paving the way for a streamlined documentation of skills and evidencing for future students. The final report and outcomes from this project will contribute to this pathway.

NOTE Support for this project has been provided by the Australian Learning and Teaching Council Ltd, an initiative of the Australian Government Department of Education, Employment and Workplace Relations. The views expressed in this (report/publication/activity) do not necessarily reflect the views of the Australian Learning and Teaching Council.

A.1.3 E-Skills Mahara

Featured software:

— **Type of software:** Vocational education and training (VET) e-Portfolio sandpit service – E-skills Mahara

— **Overview of functionality:** The VET E-Portfolio sandpit service is an open instance of Mahara v1.2 which allows VET practitioners to develop their own professional e-Portfolio to manage their own information and/or bring together small groups of learners to trial the use of an e-Portfolio in their training and assessment of VET course.

Example product:

— **Product name:** E-skills Mahara(http://mahara.brightcookie.com/)

— **Supplier:** South Australian Framework Unit

— **Use of product:** E-skills is a not-for-profit business. Its purpose is to offer market driven, affordable e-skills development services to assist organisations and individuals achieve their e-learning and business goals. This e-skills support and assistance is offered in the form of workshops and courses (online, blended and face-to-face), as well as consultancy, technical support and other direct forms of assistance.

  As at May 2011, there are around 850 registered users of the E-skills Mahara.

  The system originally started in 2008 as the VET SA online learning service (coupled with a Moodle instance), and was re-branding in 2010 as part of the E-skills online learning services (coupled to the same Moodle instance).

— **Product information:** A reference model for VET E-Portfolio Systems: VET E-Portfolio Roadmap, Pg 5 (http://flexiblelearning.net.au)

Interoperability scenario:

— **Interoperability scenario:** Examples of use which involve communicating e-Portfolio information to or from the E-skills Mahara:

  1 **Into the E-skills Mahara:**

  — Embedding media code (eg YouTube, Google Video, TeacherTube, SciVee) – enables wider sharing of the user/learner's work on social networking sites while allowing the user/learner to showcase the same work in their individual e-Portfolio without having it in two places – helps overcome problems with the storage of large files; allows for the showcasing other people's work to support user/learner's own work (eg 'referencing) or allows the user/learner to reflect upon other's work.

  — RSS Feeds (from various sites eg blogs, wikis, photo-sharing sites, social bookmarking sites, micro-blogs etc) - enables wider sharing of the user/learner's work on social networking sites while allowing the user/learner to showcase the same work in their individual e-Portfolio without having it in two places and/or participation in collaborative activities while showcasing in the user/learner's work in their individual e-Portfolio; allows for the showcasing other people's work to support user/learner's own work (eg 'referencing) or allows the user/learner to reflect upon other's work.

  — Single Sign-On with E-skills Moodle – enables information about a user/learner from one system to automatically populate the associated system; enables the user/learner to move between Moodle and Mahara without having to login each time.

  — Third party commenting/verification of information – authorized third parties are able to annotate on the pages of the user/learner's e-Portfolio – this would allow third parties to provide feedback, support or verification of information presented by the user/learner in their e-Portfolio.

  — Uploading files – user/learner is able to upload existing files from external sources (eg Computer, USB Drive) – this allows the user/learner to import individual files in various formats eg Word, Excess, JPG etc to demonstrate their abilities or competencies or achievements.

  — In later versions of Moodle-Mahara (Mahoodle) installs eg v1.3-1.4 –

    — importing information from Moodle via e-Portfolio API functionality – enable user/learners to participate in Moodle activities while capturing a copy for showcasing their own records eg contributions to discussion forums or wikis etc.

    — importing 'competency standards' from Moodle Grade Book – Moodle allows assessors to allocate competency standards via the Moodle Grade Book; Mahara accepts this information once a user/learner's 'view or collection' has been marked in Moodle.

- In future versions of Mahara (from Mahara Roadmap and VET E-Portfolio Reference Model) –
  - accepting secure feeds or embedded code from other websites/web services (authentication required) - accepting user/learner attainment data (eg e-Resulting, e-Transcripts, e-Parchments, digitally encrypted parchments) from other systems (eg Student Management Systems, National Qualification Registers), this allows the user/learner's attainment data to remain under the control and management of the issuing/authenticating body for verification purposes while allowing the user/learner to share this information with third parties as desired via their e-Portfolio.
  - accepting persistent identifiers for information related to a user's qualification – this would allow a user/learner to link any the web-based information about their qualification (eg unit/subject codes, descriptors, explanations) at the time of issue, even when this information has been updated or reviewed for newer information or qualifications.
  - selected information could be imported from other systems – this would allow the user/learner to import information from other systems eg importing information from LinkedIn or templates from other system.
  - allow external databases to search user/learner's e-Portfolio for keywords or tags – this would allow the user/learner to authenticate third parties to search their e-Portfolio for a job or joining a special project team or moderating of information for assessment.

2 **From the E-skills Mahara:**

- Single Sign-On with E-skills Moodle - enable user/learner to move between Moodle and Mahara without having to login again.
- Export user/learner content as Leap2A or HTML – allow the user/learner to move their e-Portfolio content between e-Portfolio systems (Leap2A), to a static website (HTML) or as a back-up of their e-Portfolio.
- Email notifications – sending an email to nominated person (eg user, third parties) when an action has occurred in the e-Portfolio system (eg friend request, updated page/blog, forum posting).
- In later versions of Moodle-Mahara (Mahoodle) installs eg v1.3 –v1.4 -
  - exporting 'views/collections' from Mahara into Moodle's Assignment functionality as an assessment – allows the user/learner to create their assessment in their e-Portfolio and upload it into Moodle; this supports the assessor's requirement to track assessments via the Moodle Grade Book.
- In future versions of Mahara (from Mahara Roadmap and VET E-Portfolio Reference Model) -
  - RSS feeds out from the e-Portfolio – allows viewers/mentors/assessors to receive an update notification via an RSS reader when of the user's/learner updates their e-Portfolio or new information (eg updated attainment data) is fed into the user/learner's e-Portfolio.
  - provide transfer of user/learner data to populate third party databases (eg HR Systems, Professional Associations, Occupational Licensing Boards, Course Admission Centres, Recruitment agencies or employment finding websites) – this would allow the electronic transfer of user/learner information from the user/learner's e-Portfolio directly into another database, thereby reducing human input time and error.

- **Information to be exchanged:** Tick the boxes against those item types that this interoperability scenario would need to exchange. If you need more item types, add them at the bottom. If you have any comments on the individual item types, add them in the empty Comment box. You may wish to comment on the way in which the item is likely to be formatted, on the relationships between the items, or on the definition of the item included in the Note column.
- **Other:** For other examples refer to the definition of services from the VET E-Portfolio Reference Model on pg 21/22 of the VET E-Portfolio Roadmap: (http://www.flexiblelearning.net.au/)

— **Current practicability:** E-skills Mahara (v1.2) is able to exchange information as follows:

  — Export/Import contents of e-Portfolio as a zipped file via Leap 2A or HTML

  — Populate user information held by Moodle into Mahara user account (Single-sign on)

  — Exchange information from websites via embedded code and/or RSS/Atom

  — Uploading files from external sources (eg .jpeg, PDF, Word etc)

  — Send email activity notifications

There are numerous implementations of e-Portfolio systems in Australia and a number of key reports and useful resources:

Australian e-Portfolio Project – Stage 2 Final Report (2009)
http://www.apo.org.au/research/australian-eportfolio-project-final-report

VET E-Portfolio Privacy Impact Assessment Research Report and VET E-Portfolio Privacy Draft Guidelines (2010)
http://www.flexiblelearning.net.au/

Australian Flexible Learning e-Portfolio Resources
http://www.flexiblelearning.net.au/

The VET e-Portfolio Roadmap (2009)
http://www.flexiblelearning.net.au/

E-Portfolios for RPL Assessment (2009)
http://www.flexiblelearning.net.au/

A.2 Canada

A.2.1 e-Portfolio supporting Calgary Board of Education Staff and Students (Primary and Secondary, Professional Development)

Players (Users): Students, Staff, Administrators, Parents

Definition: ePortfolios are student-centric tools that include collections of digital resources (artefacts, comments), demonstrate growth, provide opportunity for reflection and metacognition, allow for flexible expression (organization, presentation) and allow access to selected viewers (fellow students, parents, teachers, family members). Paper-based portfolios generally result in a "one-size-fits-all" product, where the actual purpose and audience of a portfolio can be quite varied. An educational portfolio may be used to document the attainment of standards, tell stories of deep learning or showcase student competencies (Wolf, 1999). In an assessment portfolio, work is selected to meet learning standards. In a learning portfolio, the process of learning is documented through the selection and reflection on relevant artefacts. Finally, a showcase portfolio models a student's best work as an exhibition of their accomplishments. The process of selecting and reflecting on physical media, some of which may be unique or original, can be time-consuming and prevent the creation of multiple portfolios for each situation or audience. The flexibility of a digital portfolio allows for reuse of artefacts in a variety of contexts—documenting the learning journey, but then selecting pieces to showcase for different audiences. Additional challenges to the paper-based portfolio model include the creation of media that cannot be represented well on paper (audio, video), tedious editing, difficulty with sharing and collaborating, and long term storage and revision of portfolio artefacts. Enhancing the portfolio model through the use of technology enables a wider range of media and extends the collaboration and sharing possibilities beyond the physical classroom. Paper-based and digital portfolio projects are equally challenged in the area of long-term use. Students transitioning between schools or grade levels may be faced with new portfolio expectations or technologies and abandon their previous work. A consistent tool, used throughout the system, allows students to maintain, revise and add to their previous work throughout their school careers, and possibly beyond.

Description:

The Calgary Board of Education (CBE) currently uses an online learning environment to deliver curriculum online in several different teaching and learning contexts. These include: Full online delivery of courses at CBe-learn, the CBE's online High School; Distributed learning opportunities in traditional classroom settings; Professional development for teachers and support staff.

The Calgary Board of Education is the second largest public school district in Canada serving approximately 100,000 students in early childhood education through Grade 12. In addition, the Calgary Board of Education serves approximately 65,000 adults through the Chinook College programs.

The Calgary Board of Education utilizes an e-Portfolio tool developed by Desire2Learn. This e-Portfolio tool allows users to:

— Create, edit and store learning artefacts

— Organize, sort and retrieve artefacts Share and publish one or many artefacts

— Reflect on their work through methods such as (non-inclusive list) commenting, journaling in a variety of media

— Provide and receive feedback from internal and external users

— Provide both summative and formative assessment opportunities

— Present and share collections of artefacts

— Perform administrative tasks such as monitoring access

Transactions:

Student User 1: A student connects seamlessly to his/her e-Portfolio from the learning management system, without the need to re-authenticate, and checks for any changes to his/her portfolio since last access. The student is informed of any new comments, assessments, edits, and newly available shared items, and can track which users have been viewing shared content. The student creates a new artefact by completing an instructor developed form that prompts him/her to upload a PowerPoint presentation from his/her local machine, and answer questions requiring reflection on his/her learning and submit answers using an online HTML editor. The student then uses a rubric to assess his or her own work, and shares the artefact with peers and family, some of whom are external to the e-Portfolio environment (i.e. not registered users), to receive comments and allow the student to assess the work using the same rubric. As the student has just completed a long term inquiry project, he or she gathers many related artefacts into a single presentation, selecting from pre-defined themes and then further customizing the look and layout of the contents to suit the project. The presentation is shared with project group members who are able to edit the presentation themselves. When completed, the final presentation is shared with friends and family, and submitted to the learning environment for assessment.

Student User 2: A student new to the CBE accesses his/her e-Portfolio and begins to upload content created at a previous school. As each artefact is added, the student includes tags to identify the content. The tags are selected by the student, as well as through suggestions made by the teacher, in order to facilitate sharing and organizing of portfolio contents. Forgetting what has already been included, the student performs a search, using the appropriate tag, in order to locate a multimedia artefact. After creating a number of artefacts relating to math, the student creates a collection of artefacts, automatically generated by a common tag. To share the current collection, the student selects a teacher generated sharing profile that provides the instructor with viewing and assessment privileges. To allow classmates to see the same collection, the student chooses from another shared profile allowing all members in a particular course to view the content. Wishing to share his/her work with former classmates, the student creates a custom permission profile to allow for viewing only, and adds this profile for a number of external users.

Teacher User 1: A teacher connects seamlessly to his/her e-Portfolio from the learning management system, without the need to re-authenticate, and checks for shared artefacts and presentations to

monitor student progress in the current unit. He/she explores items shared with them, and sorts by most recently edited items, leaving comments and providing feedback for students. Needing to find the work of a particular student, he/she is able to search through shared work by student name, and is quickly able to provide feedback. Next, he/she creates a form prompting students to select particular pieces of work displaying evidence of their writing growth, including fields for explanation and self-assessment by rubric. The rubric and form are shared with all students in her writing class. Finally, he/she accesses the learning management system's assignment submission tool and assesses submitted portfolio work, which has been "locked" after submission, and may include forms, individual artefacts, or presentations, by entering a mark and comments which are automatically transferred added to the grade book.

Teacher User 2: As part of a professional learning community, a teacher includes a number of artefacts and reflections on professional reading in his/her portfolio and shares with individual teachers, or when desired, all teachers in the system. The teacher provides feedback and collaborates on artefacts shared by colleagues. Lesson examples, reflections on conferences and workshops attended, as well as progress towards teacher professional growth plan goals are included in the portfolio and shared with colleagues and supervisors as needed. After recently completing an online professional development course, the teacher includes snapshots of their performance and reflects on new ideas. Following up on a recent conference presentation, the teacher posts materials and invites feedback from other attendees, external to the CBE e-Portfolio system. For an upcoming collaborative class initiative, the teacher posts lesson ideas within their portfolio, shares them with a teacher in another school jurisdiction, and permits the teacher to edit the shared work as needed.

System Administrator: An administrator connects seamlessly to his/her e-Portfolio from the learning management system, without the need to re-authenticate. In addition to maintaining a portfolio for his/her own professional learning, the system administrator must maintain and support the use of the e-Portfolio tool for the system. The system administrator creates and manages both group and individual permission profiles to ease the ability for users to share work. The system administrator ensures student safety and privacy through the default and exception configuration of various permissions, including whether or not portfolio contents can be shared with external users, and for how long. . These permissions are automatically assigned as a default on the basis of role identified matched to the Active Directory user information. To ensure compliance with school board policies, and to aid in troubleshooting, the administrator can access all e-Portfolio content across the organization and generate reports on e-Portfolio usage and content. Presentation themes, forms and rubrics are generated by the administrator and shared across the organization to decrease management time needed by teachers and students.

ITS staff: A member of the ITS department is able to retrieve accidentally or intentionally deleted e-Portfolio content. When no longer requiring storage, a member of the IT department can permanently delete unused data. Backups are made regularly, and storage can be added as e-Portfolio usage grows. User accounts created for external users can be tracked and deleted as needed.

Employee User: After an online training course on workplace safety, an employee includes evidence of course completion in their e-Portfolio, along with previously completed work. The employee creates forms for those under his supervision, in order to track and report on their progress towards department goals, and documents their own personal learning by reflecting on professional readings. These reflections are shared with others in the department.

External Users: A family member receives an email inviting them to accesses e-Portfolio content, and is prompted to create their own password, which is then used for future access. The user is able to view, comment, edit and assess shared content, depending on the permissions set by the owner of the content. The user is only able to access content for a period of time specified by the system administrator.

Table A.1 — e-Portfolio Data Table based on Calgary Board of Education's use of the Desire2Learn e-Portfolio

Category	Description	Elements	Items
Identification	Name, age, address, etc of user	Name	first, last, middle
		Address	country, region, city, street, postcode, etc.
		Contactinfo	telephone, facsimile, mobile, pager, email
		Demographics	representation, gender,date, placeofbirth, studentId
Personal Profile	Interests, and personal information about the user	Interest	hobbies, nicknames, favourite music, websites, etc..
Competencies / Learning Standards	Leaner's goal	Goal	typename, description, date, priority, status, goal
Feedback	Comments and assessments through sharing e-Portfolio content	Comment	name, comment
		Assessment	name, rubric, rubric level selected
Content	Information stored in the e-Portfolio	Artefacts	files, links to websites, forms filled out, items from coursework, links to associated content
		Collections	content/tag list, links to associated content, comments and assessment
		Reflections	title, reflection, links to associated content, comments and assessments
		Presentations	title, description, theme, contents of presentation, links to associated content, comments and assessment
Sharing	Users to make e-Portfolio content available to	Permission Profiles	name, members, permissions, comments and assessment provided, items shared
		External users	name, email address, password, comments and assessment provide, items shared
Enrollment	Information on what areas of an organization a user belongs to	Enrollments	orgUnitType name, start date, end date, semester, department, role (permissions)

A.2.2 ePEARL: electronic Portfolio Encouraging Active Reflective Learning (K-12)

Players (Users): Student/Teacher/Parent, Tech Administrator

Definition: ePEARL is designed to scaffold the self-regulation process for students as well as to support the teachers guiding them. Developed in PhP, using a MYSQL database, ePEARL is web-based and available in both English and French. ePEARL is a free, bilingual, web-based electronic portfolio software. Based on sound research evidence, coupled with feedback from the field, ePEARL has been designed to encourage self-regulation in learners within student-centred curricula. ePEARL promotes:

— Goal Setting: Creating general learning goals for a term or year, as well as task goals for a specific artefact.

— Reflection on the process and finished product.

— Feedback from peers, parents and teachers on the portfolio as a whole or on a specific artefact.

Description: The ePEARL Learning Process guides students through the creation process, allowing enough flexibility for truly creative work and just enough scaffolding to keep students on the right track. There is a text editor and an audio recorder for the creation of work. Readings, music pieces, or oral presentations may be recorded. The software also offers the ability to attach work created with other software, so it can accommodate any kind of digital work a student creates in class, including scanned

images of paper-based work. Before work is created, students are encouraged to set their goals for this work, and may attach learning logs, evaluation rubrics and study plans to keep track of their learning process as it takes place. After the creation of work, students are asked to reflect on their performance and strategies, and to use these to adjust their goals for the next work. The sharing of work with peers or teachers is supported so that students may solicit feedback on drafts of work.

Transactions:

— Administrators create/edit/delete Schools, Classes, Students and Teachers

— Administrators select Schools for Teachers and Students

— Administrators link/unlink Teachers and Students to/from Classes

— Teachers link/unlink themselves to/from Classes in their School

— Teachers link/unlink other Teachers to their Classes

— Teachers link/unlink Students to/from their Classes

— Teachers view/edit Students (not everything)

— Teachers view the portfolios of their Students

— Teachers leave comments on the portfolios and Artefacts of their Students

— Teachers export a read only copy of their Student's portfolios

— Students create/edit/delete Artefacts in their portfolios

— Students personalize the look and feel of their portfolio using themes, a welcome image, a banner image, and a welcome message

— Students add/edit/delete Goals

— Students connect associate Artefacts to their Goals

— Students share their work with other Students

— Students view shared work with other Students

— Students leave comments on other Student's portfolios and Artefacts

— Students make their work editable by other Students (group work)

— Students edit group work in other Student portfolios

— Students export a read only copy of their own portfolios

Exceptions: Students and teachers can only be part of one school at a time. Users cannot reimport exported portfolios.

Table A.2 — e-Portfolio Data Table based on ePEARL

Category	Description	Items
User	All information about a user	uid, user_type, language, username, password, first-name, lastname, theme, welcome message, welcome image, banner image, nickname, school
Class	All information about a class	class code, class name, class nickname, students in the class
School	All information about a school	school code, school name, classes in the school, teachers and students in the school
Artefact	All information and content in a work	title, folder, artefact content
Goal	A text goal	goal text, artefacts connect to goal

A.3 China

A.3.1 East China Normal University

Players (Users): Student, Teacher/Assistant, System manager

Definition: e-Portfolio in Higher Distance Education section of East China Normal University acted as the main data source for evaluation. As the main module in the distance learning platform, the e-Portfolio assembles the related information of learner, providing access to the concerning platforms and offering links to some other websites customized by the user. Using this portfolio, System manager and teachers can give students timely evaluation to improve students' learning.

Description: Higher Distance Education in East China Normal University is one of the 68 distance learning experimental unit schools authorized by the Ministry of Education in China. It provides three kinds of programs, including associate degree, Top-up Program and Ed.M, mainly for the in-service teachers and other people who have no opportunity to attend full-time education. Higher Distance Education in ECNU creates a healthy cultural environment and supplies a good platform for these people, they can study on the internet by watching video, discussing with other students and sending email to others, etc. Teachers and system manager will evaluate the student according to his/her participation and test score recorded in the e-Portfolios. When the given courses are all passed and the required credits are all acquired, students can obtain the corresponding certification.

Transactions:

— Learners can edit and store his/her Personal information of the e-Portfolio, such as name, age, ID number, address, CV, and so on.

— Information about the courses that learner has chosen and the process he was in the course will be recorded in the e-Portfolio.

— The time learner spent in the learning process and the result of the following exercises are all recorded in the e-Portfolio.

— The e-Portfolio also records learners' views posted in BBS and other reviews towards these views.

— After finished their learning, learners can inquiry their transcripts, which are stored in the e-Portfolio.

Exceptions: The portfolios are not transferable among different systems, only in this system the records related to information and learning process of students can be seen.

Table A.3 — e-Portfolio Data Table based on East China Normal University

Category	Elements	Items
Student	Personal information	Name, age, address, ID number, CV
	Course	Question, Progress report
	Transcript	Test score, Course grade
	Posts	Main post, Reply post, Post number
Teacher	Course	Test, Question, Progress schedule
	Posts	Main post, Reply post, Post number

A.3.2 Shanghai Citizen's Lifelong Learning Program (Lifelong Education)

Players (Users): Shanghai citizen, Shanghai Distance Education Group (SDEG), Shanghai Municipal Education Commission (SMEC)

Definition: E-Portfolio is a group of electronic files for reflecting the learner's learning process and the learning product according to some purpose. It's the product of the combination of information technology and learning process. The e-Portfolio utilization purpose in Shanghai Citizen's Lifelong Program is to record the learning process and the learning product of the Shanghai citizens who participate in the lifelong learning and help them to review their learning activity. The e-Portfolio also helps the administrative organizations (SDEG, SMEC) get the statistical information about the lifelong learning. The e-Portfolio system is the foundation of the credit bank and the credit transfer system.

Description: Shanghai Citizen's Lifelong Learning Program is run by the Shanghai Distance Education Group(SDEG), which is under the guidance of Shanghai Municipal Education Commission (SMEC). The purpose of this program is to construct the lifelong learning infrastructure and the lifelong learning system in Shanghai. Shanghai citizens would learn anywhere at anytime through this learning system. Shanghai Citizen's Lifelong Learning Program would integrate web learning system (www.shlll.net), IPTV, satellite system, mobile learning system and community school system.

Transactions:

— The personal information of e-Portfolio is input by the registered user himself (herself) or input by the information administrator of the community school or imported from other personnel information database.

— The personal learning records at web learning system, IPTV and mobile learning system would be recorded by the computer system automatically as part of e-Portfolio.

— The works collection, blog and friends list etc are created by the user himself (herself)as part of e-Portfolio.

— The learning records at the community school or other educational institutions are input by the information administrator of the community school.

Exceptions: Some personal privacy information cannot be stored in the e-Portfolio.

Table A.4 — e-Portfolio Data Table based on Shanghai Citizen's Lifelong Learning Program

Category	Elements	Items
Personal information	Name	first name, last name
	Address	district, street, postcode
	Contact info	telephone, mobile, email
	Demographics	gender, date of birth, ID
Goal	Goal	type name, description, date, priority, status, goal

Table A.4 *(continued)*

Category	Elements	Items
QCL	Qualifications	title, organization, registration number, Level, date, description
	Certifications	
	Licenses	
Interest	Interest	type name, comment, product, description
Learning information	Online learning record	course id, course name, start time, end time, test score, test time, comment
	Offline learning record	course id, course name, start time, end time, test score, test time, comment, place
Activity	Activity	time, position, place

A.3.3 K12 Teachers Training System in Shanghai to Improve Their Educational Technology Competency

Players (Users): Primary and Secondary school teachers in Shanghai (learners), Teachers, System manager

Definition: e-Portfolio is a group of reference data to improve learners' educational technology competency. When they learn, the platform records their information like history of learning, products etc. The learners can get the details of the progress they have made from the training platform.

Description: The goal of Primary and Secondary school teachers' educational technology competency training platform is to improve teachers' educational technology competency. There are eight modules in the training system, each module supplies different resources and instructional cases for learners, and support subject discussion, online test, online products sharing and process evaluation. K12 teachers can spend their spare time in online learning. Since they need to teach during work time, online learning is more flexible for them.

Transactions:

— The personal information of e-Portfolio is imported from other Personal Information Management system, here the Personal information management system is part of Shanghai Educational Resources Centre.

— The e-Portfolio can record the time user spent in the learning process of each part, and also offer a recommended time for it.

— The e-Portfolio records the process of learners' products, their self-evaluation and mutual-evaluation, and also records teachers' evaluations.

— The discussion area or learner's blog, articles and other learners replies towards these posts are also recorded in the e-Portfolio system.

— Grade of every module's post-test is also recorded in the e-Portfolio .

Exceptions: All records are only available online, they cannot export.

Table A.5 — e-Portfolio Data Table based on K12 Teachers Training System in Shanghai to Improve Their Educational Technology Competency

Category	Description	Elements	Items
Identification	Information of participant	Personal information	Name, gender, birth tag
		Address	District, street, postcode
		Contact info	Telephone, mobile, email
		Teaching info	Work school, teaching course, teaching age, teacher's professional title, educational history, times attending teachers training, etc
Records of learning process	participant's records of learning process	Learning time	Learning task, recommended time, learning time
		Scores	Self-evaluation scores, mutual-evaluation scores, post-test scores
		Essays	Blogs, discussions area essays

A.4 France

Title: LORFOLIO – the e-Portfolio offered by Lorraine Region(Lifelong Education).

Players (Users):

— All citizens living in the Region after completion of their formal education, eventually assisted by teachers, trainers or job counsellors;

— The Lorraine Region as provider and manager of the system (moderator and administrator).

Definition: Individual electronic filing cabinet progressively filled along the owner's life with information about and documents providing evidences of his/her competencies, whether they are acquired through education and training or through experience.

Description: Any citizen from the Lorraine region, after completion of his/her formal education period, has the possibility to get a personal access to LORFOLIO. On this website, he/she will be able to store personal information, information about his/her career path classified into different categories (Education and training, Diplomas and qualifications, Competencies assessments, Work experience, Language capabilities, Competencies) and information about his/her job-related projects (Targeted jobs, Action plan for personal development, project journal). Documents and web links can be stored and attached as evidences to any piece of information within the system. In addition to the documents management tools, the system allows the user to select parts of the information stored within the system and to generate from the selected pieces of information either a Curriculum Vitae compliant with the EUROPASS format, which can be edited and printed using a word-processor, or to create a personal website.

Transactions: A login and a password are attributed on request (no selection on the home address is made, though this mandatory field can dissuade people living in another region to apply). Once an account is opened, the owner can change the connexion information. He/she can request the deletion of all the data recorded. Normal use of the LORFOLIO account includes:

— entering, sorting, modifying or deleting data in any part of the folder;

— adding, sorting, modifying or suppressing documents attached to any information in any part of the folder;

— generating CVs or a personal website on request after selection of the information the owner wants to see in the CV or in the website. The personal website can be protected by a password if decided.

Exceptions: Undesirable registration like slanderous or even commercial profiles can only be detected if they use someone else's account or upon complaint.