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

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National foreword

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

Technologies de l'information pour l'apprentissage, l'éducation et la formation — Cadre de référence pour l'information des e-Portfolios

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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.

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) or the IEC list of patent declarations received (see https://patents.iec.ch).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 36, *Information technology for learning, education and training*.

This first edition cancels and replaces ISO/IEC TS 20013:2015, which has been technically revised.

The main changes compared to ISO/IEC TS 20013:2015 are as follows:

— notes to entry have been added to terms 3.3 and 3.8 providing examples of the use of artefacts;

— acknowledgement is given that the term artefact may be used more broadly in some areas of the world when referring to e-Portfolio components;

— minor editorial changes have been made throughout the document.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

e-Portfolios have been deployed in many contexts that span educational, employment, artistic and social contexts. Individuals have new opportunities to accumulate, manage and share their credentials digitally (using badges, micro-credentials, etc.). These digital items can be included in and shared by individuals using e-Portfolios. A key characteristic of these digital artefacts can be verification of the credential by a third party. In learning, education and training (LET), e-Portfolios 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 document was developed to support the creation and use of e-Portfolios in LET. It can be used to develop more responsive, flexible and modular systems and services and is intended to support learners, instructors, trainers, e-learning service providers and other stakeholders. In addition, it is intended to support a wide range of activities related to e-Portfolio creation and use across various information technology for learning, education and training (ITLET) contexts (such as K-12 education, higher education, training, career planning and professional development). With ongoing developments in information and communications technology (ICT), learners have access to an increasing diversity of LET opportunities. As a consequence, production of educational content and services extends the scope of opportunities for learning; providing potential for learners to experience personalized and adaptive opportunities that can also 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 the 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 used for e-Portfolios can provide instructors, trainers, administrators and employers with an efficient means of appraisal, management and decision-making. 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. This key characteristic also benefits learners through providing opportunities to reflect on their own learning and career development.

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, such functionality can also be provided by unbundled applications and services and e-Portfolio system components 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 LET, supporting peer and self-assessment as well as professional development in the workplace. Consideration of how e-Portfolios can 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 document 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.

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This document includes six clauses and two annexes. The first clause provides the scope, exclusions, and aspects not currently addressed. The second clause includes the normative reference. The third clause provides terms and definitions, while the fourth clause provides background information regarding e-Portfolios. The fifth clause describes various types of e-Portfolios used in LET contexts and provides an approach to classifying them. The sixth clause provides details regarding the e-Portfolio reference framework.

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

This document 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, programme, institutional, or other).

It is anticipated that some or all of these requirements will be addressed in future editions or in companion International Standards or Technical Reports.

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

1 Scope

This document specifies 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 personal development.

The reference framework identifies content and functional components that support e-Portfolio systems. It addresses interoperability issues required for data exchange between these components and among the various categories.

This document:

— provides an e-Portfolio reference framework;

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

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

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

This document 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.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

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3.1
component
set of constituent parts that comprises an *e-Portfolio* (3.4)

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 categories for e-Portfolio information: identification, overview, education, career, outcome, capability and experience.

Note 3 to entry: A functional component is used to identify and support interoperability and may include "layers" of entities.

EXAMPLE Business requirements and processes, technical services, data sources.

[SOURCE: ISO 16175-2:2011, 3.7, modified — in the definition, “a digital record” has been replaced with “an e-Portfolio”; the three Notes to the entry have been added.]

3.2
e-learning
learning (3.9) facilitated by information and communications technology

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

3.3
element
unit of data for which the definition, identification, representation and permissible values are specified by means of a set of attributes

Note 1 to entry: There can be one or more elements in each category within a component.

Note 2 to entry: An element is the label assigned to indicate this layer of the e-Portfolio reference framework.

Note 3 to entry: The term artefact (or digital artefact) is sometimes used as the general term to refer broadly to the digital representation of elements, (awards and certificates, photographs, etc.) found in several categories, (overview, education and experience). Artefacts may also be assigned unique identifiers to support various e-Portfolio processes (e.g. management and verification).

EXAMPLE 1 A photograph that is selected and uploaded by an individual to their e-Portfolio for identification purposes could be referred to as an artefact that is a user information element within the identification category.

EXAMPLE 2 An artefact may be associated with an element from the capability category (such as a skills element linked to a skills framework).

[SOURCE: ISO/IEC 6523-1:1998, 3.3, modified — in the term, "data element" has been replaced with "element"; in the definition, the three Notes to entry have been added.]

3.4
e-Portfolio
collection of digital items aggregated within an *IT system* (3.7) used for a diversity of purposes to support LET and professional development activities such as assessment, educational or career guidance.

EXAMPLE An e-Portfolio is in digital form, and can be used a) to store personal or professional digital 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 ongoing 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.

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3.5
reference framework
<e-Portfolio> structure for understanding significant relationships among the entities of some environment, and for the development of consistent standards or specifications supporting that environment

Note 1 to entry: A reference framework 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.

3.6
e-Portfolio system
IT system (3.7) designed and implemented specifically to support the creation, use and management of coupled (sets of) IT applications and services.

3.7
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]

3.8
item
unit of discrete data that comprises an *element* (3.3)

Note 1 to entry: There can be one or more items in an element.

EXAMPLE 1 A file or a link to a website.

Note 2 to entry: An item is the label assigned to indicate this layer of the e-Portfolio reference framework.

Note 3 to entry: The term artefact (or digital artefact) is sometimes used as the general term to refer broadly to the digital representation of items within elements, (e.g. past projects, awards, certificates). Artefacts may also be assigned unique identifiers to support various e-Portfolio processes (e.g. management and verification).

EXAMPLE 2 An item that is selected by an individual can be associated with a digital representation of a certification, (e.g. digital badge).

3.9
learning
acquisition of knowledge, skills or attitudes

[SOURCE: ISO/IEC 2382-36:2019, 3.1.1]

3.10
learning management system
LMS
software system designed for the purpose of performing administrative and technical support processes associated with *e-learning* (3.2)

[SOURCE: ISO/IEC 2382-36:2019, 3.3.1]

3.11
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.

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4 Abbreviated terms

ICT	information and communications technology
IPTV	internet protocol television
ITLET	information technology for learning, education and training
LET	learning, education and training
RPL	recognition of prior learning
QCL	qualifications, certifications and licences
VET	vocational educational training
WIL	work integrated learning

5 e-Portfolios and e-learning

5.1 Role of e-Portfolios

This Clause outlines 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, enabling 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 determine 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 adaptable to individual needs and 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. Reference [34] 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-digital) 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 is difficult (e.g. teaching material);

— maintenance can cost a lot of time and effort;

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

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— 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 is 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 their outcomes dynamically related to their competency 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. Subclause 5.2 outlines the different types of e–Portfolios.

5.2 Classifying e-Portfolios

This reference framework 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 Reference [42]:

— **Assessment e-Portfolios**: document individual reflections and present outcomes that can be used to demonstrate capability.

— **Presentation e-Portfolios**: provide traditional portfolio functions such as enabling users to collate their artefacts to demonstrate achievement and competence.

— **Personal development e-Portfolios**: include the collection of data and information to support employment and professional development planning.

— **Learning e-Portfolios**: track and identify learning over time.

— **Informal learning e-Portfolios**: allow for individuals 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 (Reference [34]):

— **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.

— **Programme e-Portfolios**: are specific to a defined field of academic study and document the learner's work completed, skills acquired, and outcomes met, possibly as a requirement for graduation.

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

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For specific learning and teaching contexts, e-Portfolios can have different functions and purposes, such as:

— **Learning e-Portfolios**: have the primary function of supporting the learner but can also be used by instructors for assessment purposes.

— **Teaching e-Portfolio**s: have two purposes; (1) to document and manage the development of 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.

5.3 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 online or offline; and,

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

Instructors may benefit by:

— collecting and 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 competencies of employees 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.

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6 Reference framework of e-Portfolio information

6.1 Overview

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/worker; the educational and training organization; and, the employer. Such a model can be represented 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.

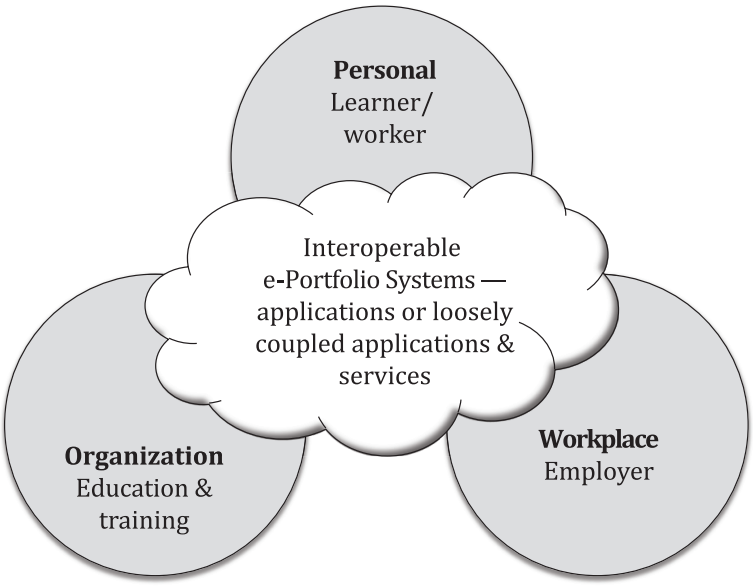

Figure 1 — High-level conceptual model of context for e-Portfolio systems interfaces

Figure 1 demonstrates that e-Portfolio systems function as an important interface across different contexts (personal, 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.

6.2 Content and functional components of an e-Portfolio

The reference framework of e-Portfolio information consists of a number of different representations and perspectives. Figure 2 provides a high-level conceptual abstraction of the domains that e-Portfolio systems interface with.

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