

# INTERACTIVE ENVIRONMENTS AND EMERGING TECHNOLOGIES FOR E-LEARNING ACCORDING TO INTERNATIONAL STANDARDS

**Jolanta Szulc**

University of Silesia in Katowice  
Institute of Library and Information Science  
Pl. Sejmu Śląskiego 1, 40-032 Katowice  
jolanta.szulc@us.edu.pl

***Abstract:** The aim of this paper is to analyze the international standards on the use of interactive environments and emerging technologies for e-learning. The article presents the most important international standardization organizations. The selected documents and the data models for e-learning environments are presented. The information model, which should be used in interactive environments and emerging technologies for e-learning, was specified.*

**Keywords:** e-learning, interactive environments, emerging technologies, international standards, data models.

## INTRODUCTION

Access to automated tools and teaching materials enables a typical e-learning environment - Virtual Learning Environment (VLE) in the navigation menu and icons. However, there are new interactive environments and new technologies for e-learning. A new kind of student requires an appropriate environment that is individual and provides flexible access to learning. Particularly important are terms such as interactivity (*feedback between student and teaching material, forcing the students to take some action*) (Przybyła, Ratalewska 2012) and interoperability (*the ability of computers to communicate with one another using a common set of protocols*) (Mortimer 2001). The dynamic, interactive and social aspects of Web 2.0 have great potential to promote innovative teaching. Semantic Web enables computers and people to work, 3D virtual worlds expand reality and help to deepen their understanding of the subject, and mobile technologies to increase opportunities for personal development. The application of these technologies in e-learning requires continuous research and determining appropriate standards. These standards

are developed by the relevant groups and institutions. Selected international standardization and the international standards organizations are presented below.

## **1. INTERNATIONAL STANDARDIZATION ORGANIZATIONS AND INTERNATIONAL STANDARDS**

The standardization of e-learning is essential for the development of exchange of courses between institutions and quality control. ISO (International Standards Organization), CEN (European Committee for Standardization) and IEEE LTSC LOM (The Institute for Electrical and Electronics Engineers Learning Technologies Standards Committee) are among the main organizations involved in standardization. List of documents published by the various committees and working groups are presented in the Annex to the article.

### **1.1 ISO/IEC**

International Organization for Standardization (ISO) is a non-governmental organization, which brings together the national standards organizations. It cooperates with the International Electrotechnical Commission (IEC). International standards and guides for conformity assessment, developed jointly by ISO and IEC, to encourage best practices, analyzing the products, services, systems, processes and materials for the rules, regulations or other specifications (ISO/IEC Information Center 2013). These organizations have published many documents for learning and e-learning (a list of these documents is presented in the Annex to the article). Work on the preparation and publication of new documents are also conducted (see Annex to this article).

### **1.2 ISO/TC 232 *Learning services outside formal education***

Technical Committee ISO/TC 232 *Learning services outside formal education* deals with standardization requirements for learning services outside formal education including vocational and professional education and training. Term, and what qualifies as a *formal education* varies depending on the standard user's jurisdictional domain.

Standards developed by ISO/TC 232 are designed primarily for learning services outside of formal education. However, they may be deemed useful by the suppliers of all kinds of educational services. The exceptions are the standards in the field of information technology for learning, education and training. ISO/TC 232 considers the needs of people with visual and/or special needs. It also includes a global policy in regard to the ISO part of the world that are not directly represented in the proceedings (ISO/TC 232, 2013). ISO/TC 232 has published a document ISO 29990:2010 (see Annex to this article).

### **1.3 ISO/IEC JTC 1/SC 36 *Information technology for learning, education and training***

ISO/IEC JTC 1/SC 36 ITLET is a subcommittee of the Technical Committee JTC1, acting within the framework of ISO/IEC, which brings together representatives of the International Organization for Standardization and the International Electrotechnical Commission. The objective of the ISO/IEC JTC 1/SC 36 ITLET is standardization of information technology in learning, education and training to support individuals, groups or organizations, and to enable interoperability and reuse of resources and tools, with the exception of standards and technical reports that define educational standards, cultural conventions, learning objectives, or specific learning content (ISO/IEC JTC 1/SC 36, 2013).

Committee ISO / IEC JTC 1/SC 36 ITLET consists of the following working groups:

ISO/IEC JTC 1/SC 36/WG 1	Vocabulary
ISO/IEC JTC 1/SC 36/AG 1	Business planning and communications
ISO/IEC JTC 1/SC 36/WG 2	Collaborative technology
ISO/IEC JTC 1/SC 36/WG 3	Learner information
ISO/IEC JTC 1/SC 36/WG 4	Management and delivery of learning, education and training
ISO/IEC JTC 1/SC 36/WG 5	Quality assurance and descriptive frameworks
ISO/IEC JTC 1/SC 36/WG 6	Platform, Services, and Specification Integration
ISO/IEC JTC 1/SC 36/WG 7	ITLET - Culture, language and individual needs

Some standards developed by ISO/IEC JTC 1/SC 36 ITLET, was published. Other standards are being developed. The list of published standards are presented in the Annex to the article.

### **1.4 CEN/TC 353 *Information and Communication Technologies for learning education and training***

CEN Technical Board created in 2007 a new Technical Committee CEN/TC 353 to work on the standards in the field of information and communication technologies for learning, education and training. Learning, education and training in Europe are increasingly making use of information technologies and communication. It is expected that the benefits from the use of European standards will include: increasing the quality of European e-learning products, services and processes, enhance interoperability and reduce development costs of e-learning (CEN/TC 353, 2013).

The responsibilities of the Technical Committee CEN/TC 353 also includes: the development of standards for vocabulary, structure, quality and competence, and

collaboration and cooperation with the CEN Workshop on Learning Technologies (CEN Workshop 2013).

As part of this cooperation following documents are prepared: CWA 16655-1:2013 (Part 1-3) (see Annex to this article).

### **1.5 CEN Workshop**

Traditional CEN standardization of work opportunities has been extended to the CEN Workshop. Workshops were created for the needs of the market, creating a bridge between consortia documents and European standards. The CEN Workshop Agreement published CEN Workshop Agreement (CWA), which are less formal documents than the traditional European Standard (EN). CWA meets the market demand for alternative, more flexible and faster solution. Participation in the workshop is therefore open to everyone, even for non-Europeans, and the opportunity to participate is previously announced by the organizers of the Workshop, CEN and its member organizations. CEN/WS LTS - *Learning Technologies operates within this group* (CEN Technical Committees 2013).

Publications CEN Workshop Agreement are owned by CEN. CEN members agreed that some publications CWA may be available on the Committee's website for the electronic download for free. Note, however, that they cannot be modified, re-distributed, sold or repackaged in any form without the prior consent of CEN, and are intended only for the person who gets it (CEN Learning Technologies 2013). The list of papers are presented in the Annex to this article.

## **2. ANALYSIS OF SOME INTERNATIONAL STANDARDS**

The analysis of the selected international standardization Organizations helped to choose publications especially important for interactive environments and emerging technologies for e-learning. ISO/IEC 24751 and ISO/IEC 19778 are characterized below.

### **2.1 Standards ISO/IEC 24751**

ISO/IEC 24751:2008 *Information technology – Individualized adaptability and accessibility in e-learning, education and training* offers a framework and reference model *access for all* criteria for their personal needs and preferences and discusses digital resource description. It is published in three parts (ISO/IEC 24751:2008, 2013).

#### **2.1.1 ISO/IEC 24751-1:2008 Information technology -- Individualized adaptability and accessibility in e-learning, education and training -- Part 1: Framework and reference model**

Part 1 provides a common framework for describing the needs and preferences of the learner and the description of digital learning resources, so that individual

preferences and needs of the student can be matched to the appropriate user interface tools and digital learning resources.

### **2.1.2 ISO/IEC 24751-2:2008 Information technology -- Individualized adaptability and accessibility in e-learning, education and training -- Part 2: "Access for all" personal needs and preferences for digital delivery**

Part 2 defines information model describing the student (learner) or the needs and preferences of the user when accessing digitally delivered resources or services. This description is consistent with the description of the needs and preferences of the users in accordance with education delivery. This section discusses the basic principles of the standards adhered to in the development of this model to describe the needs and preferences of people. It provides a justification for the use of a functional approach to description of the needs, possible ways to create your own needs and policy preferences, the main group needs and preferences under standard rules for the use of different combinations of needs and preferences in different contexts, the principles of scheduling requirements and preferences in terms of priorities and principles of the use of generic and application-specific needs and preference specifications.

### **2.1.3 ISO/IEC 24751-3:2008 Information technology -- Individualized adaptability and accessibility in e-learning, education and training -- Part 3: "Access for all" digital resource description**

Part 3 discusses a common language for describing digital educational resources in order to facilitate matching of those resources to meet the needs and preferences of learners (as described in ISO/IEC 24751-2). This description is consistent with the description of user needs and preferences in accordance with education delivery (as described in ISO/IEC 24751-1). The standard covers the basic rules to be observed in the development of this model to describe digital learning resources. It explains the assumptions, the concept of the notion of an original and adapted resource, the major categories of metadata for original and adapted resources, the concept of mode of access to the resource and adaptability and interoperability. It also describes how these terms should be used in the model information and how ISO/IEC 24751-3:2008 can be extended.

## **2.1 Standards ISO/IEC 19778**

ISO/IEC 19778:2008 *Information technology -- Learning, education and training -- Collaborative technology -- Collaborative workplace* – applicable to common technology used to support communication between students, instructors and other participants. The deployment and use of these technologies creates communication of information relating to groups of participants, as well as collaborative environments, features and tools that are used by these groups (ISO/IEC 19778:2008, 2013)

### **2.2.1 ISO/IEC 19778-1:2008 Information technology -- Learning, education and training -- Collaborative technology -- Collaborative workplace -- Part 1: Collaborative workplace data model**

Part 1 defines the data model that lets you transfer and reuse such data in an integrated form and allows to change them, store, retrieve or being analyzed by different systems. It specifies a table-based approach for defining Data Models. The model specification data is used to determine the data model of cooperation in the workplace.

### **2.2.2 ISO/IEC 19778-2:2008 Information technology -- Learning, education and training -- Collaborative technology -- Collaborative workplace -- Part 2: Collaborative environment data model**

Part 2 defines the data model for a collaborative environment. The collaborative environment Data Model composes collaboration tools, determines their common features and names. These names can be used as a reference for common tools and common function set out in detail in the following specifications or standards. If the specifications are not available or identified, presented interpretations can support the harmonized use of these names.

### **2.2.3 ISO/IEC 19778-3:2008 Information technology -- Learning, education and training -- Collaborative technology -- Collaborative workplace -- Part 3: Collaborative group data model**

Part 3 defines the data model for a collaborative group. The Collaborative group data model is composed of roles that can be played by the participants in the collaboration, declares the intended role holders and assigns participants to owners of these roles. Role names can be used as a reference to the roles defined in the following specifications or standards. If the specifications are not available or identified, presented interpretations can support the harmonized use of these names. Participant identifiers can be used as a reference to the detailed information on the participant and used in the user management.

## **3. RESULTS OF THE ANALYSIS OF SOME INTERNATIONAL STANDARDS**

Issues such as the user interface tools and description of the digital learning resources as a result of this analysis was noted. Works on standards on the framework and reference model for semantic interoperability have been initiated. The notion of an original and adapted resource, the major categories of metadata, the notion of an access mode for a resource, the importance of interoperability was included in the description of the digital learning resources. Types of information that should be used in interactive environments and new technologies in the field of e-learning are discussed below.

### 3.1 Model of the digital resources

Information technology issues were discussed in the context of the individual learner preferences and adaptation of the appropriate user interface tools and digital learning resources. Information technology (IT System) – is defined as *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* (ISO/IEC 24751-1:2008, p. 7). Digital resource (DR) – this is *any type of resource that can be transmitted over and/or accessed via an information technology system* (ISO/IEC 24751-1:2008, p. 5). The abstract model of the digital resources is specified in ISO/IEC 24751-1. This model consists of the following elements: description, digital resources, needs and preferences, and AfA (access for all: AfA content preferences/AfA resources description, AfA contextual description, AfA control preferences, AfA display preferences, individual or AfA agent) (ISO/IEC 24751-1:2008, p. 15).

### 3.2 Data model

The Data Model for a collaborative environment is specified in the ISO/IEC 19778-2:2008. This model composes collaborative tools and declares their collaborative functions by specifying their names. The elements of the model are as follows: assigning a composition of collaborative tools and declaring collaborative functions to a collaborative workplace, referencing a specification of collaborative tools, adopting names of specified collaborative tools, specification or standard for collaborative tools, specification or standard for functions, adopting names of specified collaborative functions, referencing a specification of collaborative functions (ISO/IEC 19778-2:2008, p. VI). If there is a need for greater co-operation, external standards and specifications are required. To define a set of tools for cooperation and collaboration features you have to be able to define their names and describe their characteristics.

### 3.3 Information models

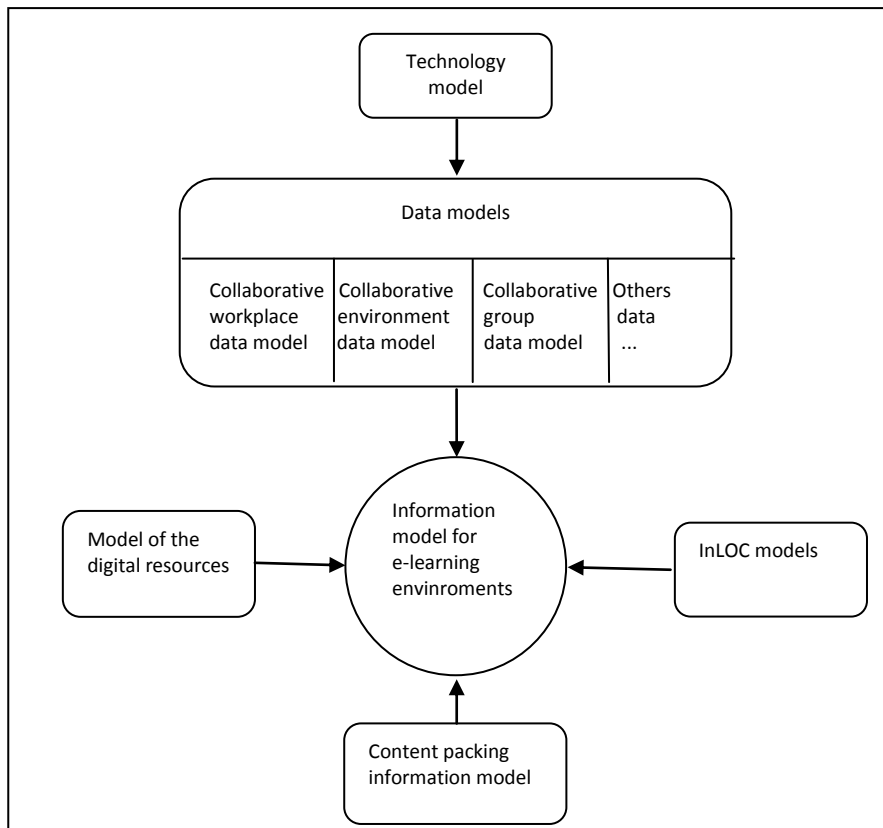
The Information Model specifies in the ISO/IEC 12785-1:2009. This model defines the data structure that can be used to exchange content of language, education and training (LET) between systems that wish to import, export, aggregate and disaggregate of packages of LET content. For those tasks, you need a conceptual model. The Content Packaging Information Model illustrates the conceptual model and defines the following elements: the structural relationships, data-type, value-space, number of occurrences permitted for each kind of information object (ISO/IEC 12785-1:2009, p. 1).

The Information Model for InLoC (Integrating Learning Outcomes and Competences) is defined in CWA 16655:2013. InLoC contains information models that allow you to define both the intended learning outcomes and competences (LOCs). InLoC helps manage and exchange learning outcomes and competences, by

identifying common characteristics of learning outcomes and competences, and molding them into formats that can be shared. There are two main things that are modeled: a learning outcome or competence (LOC) and the structure that contains several LOCs (learning outcomes and/or competencies). Each LOC has a globally unique identifier. The information that is useful to determine the performance or ability to learn includes: name and a description, levels and credit, topic (CWA 16655:2013, p. 4).

## CONCLUSION

The interactive environments and emerging technologies for e-learning are the subject of several standards. On the one hand, we draw attention to user's needs and individual preferences, providing a justification for the use of a functional approach to description of the needs, possible ways to create your own needs and policy preferences.



**Figure 1. Elements of the Information model for e-learning environments**

*Source: Own study*



On the other hand, a description of digital resources, the major categories of metadata for original and adapted resources, the concept of mode of access to the resource and adaptability and interoperability are analyzed. These two approaches offer a common model that can be described as a model of information. Various models of information that should be used in interactive environments and new technologies for e-learning have been defined. The general project of information model for e-learning environments is presented in Figure 1.

This model consists of: various data models, model of the digital resources, content packing information model and InLoC models. The data models include: Collaborative workplace data model, Collaborative environment data model and Collaborative group data model. The data models are also referred to by technology models. The model can be further developed and expanded with new types of data models, objects and competences. It should be remembered that the design and implementation of a large e-learning platform with advanced services requires the use of different standards. Taking into account such standard as ISO/IEC 9126:2001 Software Engineering - Product quality - Part 1: Quality model, ISO 9001:2008 Quality management systems – Requirements and others, as well as new interactive environments and new technologies greatly expand the model used.

## REFERENCES

- CEN Learning Technologies CWAs, available at <http://www.cen.eu/cen/Sectors/Sectors/ISSS/CWAdownload/Pages/Learning%20Technologies.aspx>, (accessed on 15 October 2013)
- CEN/TC 353 - Information and Communication Technologies for learning education and training, available at <http://www.cen.eu/CEN/sectors/sectors/iss/Pages/CEN%20TC%20353.aspx>, (accessed on 15 October 2013)
- CEN Technical Committees and Workshops, available at <http://www.cen.eu/cen/Sectors/TechnicalCommitteesWorkshops/Pages/default.aspx>, (accessed on 15 October 2013)
- CEN Workshop on 'Learning Technologies' (WS/LT), available at <http://www.cen.eu/cen/Sectors/Sectors/ISSS/Activity/Pages/WSLT.aspx>, (accessed on 15 October 2013)
- CWA 16655:2013 - Part 1: Information Model for Learning Outcomes and Competences
- ISO/IEC Information Center, available at <http://www.standardsinfo.net/info/aboutstd.html>, (accessed on 15 October 2013)
- ISO/IEC JTC 1/SC 36 Information technology for learning, education and training, available at [http://www.iso.org/iso/iso\\_technical\\_committee](http://www.iso.org/iso/iso_technical_committee).

[html?commid=45392](#), (accessed on 15 October 2013)

- ISO/TC 232 Learning services outside formal education, available at [http://www.iso.org/iso/home/standards\\_development/list\\_of\\_iso\\_technical\\_committees/iso\\_technical\\_committee.htm?commid=537864](http://www.iso.org/iso/home/standards_development/list_of_iso_technical_committees/iso_technical_committee.htm?commid=537864), (accessed on 15 October 2013)
- ISO/IEC 12785-1:2009 Information technology -- Learning, education, and training -- Content packaging -- Part 1: Information model
- ISO/IEC 19778-1:2008 Information technology -- Learning, education and training -- Collaborative technology -- Collaborative workplace -- Part 1: Collaborative workplace data model, available at [http://www.iso.org/iso/home/store/catalogue\\_tc/catalogue\\_detail.htm?csnumber=46153](http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=46153), (accessed on 15 October 2013)
- ISO/IEC 19778-2:2008 Information technology -- Learning, education and training -- Collaborative technology -- Collaborative workplace -- Part 2: Collaborative environment data model
- ISO/IEC 19778-3:2008 Information technology -- Learning, education and training -- Collaborative technology -- Collaborative workplace -- Part 3: Collaborative group data model
- ISO/IEC 24751-1:2008 Information technology -- Individualized adaptability and accessibility in e-learning, education and training -- Part 1: Framework and reference model, available at [http://www.iso.org/iso/catalogue\\_detail.htm?csnumber=41521](http://www.iso.org/iso/catalogue_detail.htm?csnumber=41521), (accessed on 15 October 2013)
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- Przybyła W., Ratalewska M., 2012: *A handbook for e-learning courses designers*. National Support Centre for of Vocational and Lifelong Education, Warsaw, 2012, p. 13. ISBN 978-83-7789-136-0 [In Polish]

## **Annex: List of selected documents published by the International Standardization**

### **1. The documents published by ISO/IEC**

ISO/IEC 19796-1:2005 Information technology -- Learning, education and training -  
- Quality management, assurance and metrics -- Part 1: General approach

ISO/IEC 19788-1:2011 Information technology - Learning, education and training -  
Metadata for learning resources - Part 1: Framework

ISO/IEC 19788-2:2011 Information technology - Learning, education and training -  
Metadata for learning resources - Part 2: Dublin Core elements

ISO/IEC 19788-3:2011 Basic application profile

ISO/IEC 19788-5:2012 Educational elements\*

\* Other parts of the draft ISO/IEC 19788 are still being developed. These  
are:

ISO/IEC 19788-4	Technical elements
ISO/IEC 19788-6	Availability, distribution, and intellectual property elements
ISO/IEC 19788-7	Bindings (RDF, Turtle, RDF/XML)
ISO/IEC 19788-8	Bindings (RDF, Turtle, RDF/XML)
ISO/IEC 19788-9	Data elements for Persons
ISO/IEC 19788-10	Application Profile for Access, Distribution and Intellectual Property (WIPO compliant) elements

ISO/IEC 24751-1:2008 Information technology -- Individualized adaptability and  
accessibility in e-learning, education and training -- Part 1: Framework and  
reference model

ISO/IEC 24751-2:2008 Information technology -- Individualized adaptability and  
accessibility in e-learning, education and training -- Part 2: "Access for all" personal  
needs and preferences for digital delivery

ISO/IEC 24751-3:2008 Information technology -- Individualized adaptability and  
accessibility in e-learning, education and training -- Part 3: "Access for all" digital  
resource description

Work on the preparation and publication of new documents are also conducted:

ISO/IEC FDIS 20016-1 Information technology for learning, education and training  
-- Language accessibility and human interface equivalencies (HIEs) in e-learning  
applications -- Part 1: Framework and reference model for semantic interoperability

ISO/IEC NP 20016-2 Information technology for learning, education and training --  
Human interface equivalencies -- Part 2: Template for Specifying Levels of  
Semantic Unambiguity

ISO/IEC NP 24751-2 Information technology -- Individualized adaptability and  
accessibility in e-learning, education and training -- Access for all -- Part 2: Registry

ISO/IEC NP 24751-3 Information technology -- Individualized adaptability and accessibility in e-learning, education and training -- Access for all -- Part 3: Application profile

ISO/IEC NP 29187-2 Information technology -- Identification of privacy protection requirements pertaining to learning, education and training (LET) -- Part 2: Guidelines for information life cycle management and EDI of personal information

ISO/IEC NP 29187-3 Information technology -- Identification of privacy protection requirements pertaining to learning, education and training (LET) -- Part 3: Multilingual Vocabulary

## **2. The documents published by ISO/TC 232 *Learning services outside formal education***

ISO 29990:2010 Learning services for non-formal education and training -- Basic requirements for service providers

## **3. The documents published by ISO/IEC JTC 1/SC 36 *Information technology for learning, education and training***

ISO/IEC 12785-1:2009 Information technology -- Learning, education, and training -- Content packaging -- Part 1: Information model

ISO/IEC 12785-1:2009/Cor 1:2013

ISO/IEC 12785-2:2011 Information technology -- Learning, education, and training -- Content packaging -- Part 2: XML

ISO/IEC 2382-36:2008 Information technology -- Vocabulary -- Part 36: Learning, education and training

ISO/IEC 2382-36:2008/Cor 1:2012

ISO/IEC 19778-1:2008 Information technology -- Learning, education and training - Collaborative technology -- Collaborative workplace -- Part 1: Collaborative workplace data model

ISO/IEC 19778-2:2008 Information technology -- Learning, education and training - Collaborative technology -- Collaborative workplace -- Part 2: Collaborative environment data model

ISO/IEC 19778-3:2008 Information technology -- Learning, education and training - Collaborative technology -- Collaborative workplace -- Part 3: Collaborative group data model

ISO/IEC 19780-1:2008 Information technology -- Learning, education and training - Collaborative technology -- Collaborative learning communication -- Part 1: Text-based communication

ISO/IEC 19796-1:2005 Information technology -- Learning, education and training - Quality management, assurance and metrics -- Part 1: General approach

ISO/IEC 19796-3:2009 Information technology -- Learning, education and training -  
- Quality management, assurance and metrics -- Part 3: Reference methods and  
metrics

ISO/IEC 23988:2007 Information technology -- A code of practice for the use of  
information technology (IT) in the delivery of assessments

ISO/IEC 24703:2004 Information technology -- Participant Identifiers

ISO/IEC TR 12785-3:2012 Information technology -- Learning, education, and  
training -- Content packaging -- Part 3: Best practice and implementation guide

ISO/IEC TR 24725-1:2011 ITLET supportive technology and specification  
integration -- Part 1: Framework

ISO/IEC TR 24725-3:2010 Information technology for learning, education and  
training -- Supportive technology and specific integration -- Part 3: Platform and  
Media Taxonomy (PMT)

ISO/IEC TR 24763:2011 Information technology -- Learning, education and training  
-- Conceptual Reference Model for Competency Information and Related Objects

ISO/IEC TR 29127:2011 Information technology -- System Process and  
Architecture for Multilingual Semantic Reverse Query Expansion

ISO/IEC TS 29140-1:2011 Information technology for learning, education and  
training -- Nomadicity and mobile technologies -- Part 1: Nomadicity reference  
model

ISO/IEC TS 29140-2:2011 Information technology for learning, education and  
training -- Nomadicity and mobile technologies -- Part 2: Learner information model  
for mobile learning

ISO/IEC TR 29163-1:2009 Information technology -- Sharable Content Object  
Reference Model (SCORM®) 2004 3rd Edition -- Part 1: Overview Version 1.1

ISO/IEC TR 29163-2:2009 Information technology -- Sharable Content Object  
Reference Model (SCORM®) 2004 3rd Edition -- Part 2: Content Aggregation  
Model Version 1.1

ISO/IEC TR 29163-3:2009 Information technology -- Sharable Content Object  
Reference Model (SCORM®) 2004 3rd Edition -- Part 3: Run-Time Environment  
Version 1.1

ISO/IEC TR 29163-4:2009 Information technology -- Sharable Content Object  
Reference Model (SCORM®) 2004 3rd Edition -- Part 4: Sequencing and  
Navigation Version 1.1

ISO/IEC 29187-1:2013 Information technology -- Identification of privacy  
protection requirements pertaining to learning, education and training (LET) -- Part  
1: Framework and reference model

#### **4. The documents published by CEN/TC 353 *Information and Communication Technologies for learning education and training***

CWA 16655-1:2013 InLOC - Part 1: Information Model for Learning Outcomes and Competences

CWA 16655-2:2013 InLOC - Part 2: Guidelines including the integration of Learning Outcomes and Competences into existing specifications

CWA 16655-3:2013 InLOC - Part 3: Application Profile of Europass Curriculum Vitae and Language Passport for Integrating Learning Outcomes and Competences

#### **5. The documents published by CEN Workshop**

CWA 14040:2000 (withdrawn) A standardization Work Programme for Learning and Training Technologies and Educational Multimedia Software

CWA 14590:2002 (E) Description of Language Capabilities

CWA 14643:2003 Internationalisation of the IEEE Learning Object Metadata

CWA 14644:2003 Quality Assurance Standards

CWA 14645:2003 Availability of alternative language versions of a learning resource in IEEE LOM

CWA 14871:2003 Controlled Vocabularies for Learning Object Metadata: typology, impact analysis, guidelines and a web based Vocabularies Registry

CWA 14926:2004 Guidelines for the production of learner information standards and specifications

CWA 14927:2004 Recommendations on a Model for expressing learner competencies

CWA 14928:2004 Review on SIF Infrastructure, Architecture, Message Processing and Transport Layer

CWA 14929:2004 Internationalisation of SIF and harmonisation with other specs/standards

CWA 15155:2004 Adaptation of SIF (Schools Interoperability Framework) Data Model for a European context

CWA 15453:2005 Harmonisation of Vocabularies of eLearning

CWA 15454:2005 A Simple Query Interface Specification for Learning Repositories

CWA 15455:2005 A European Model for Learner Competencies

CWA 15533:2006 A model for classification of quality approach in elearning

CWA 15555:2006 Guidelines and support for building application profiles in e-learning

CWA 15660:2007 Providing good practice for E-Learning quality approaches

CWA 15661:2007 Providing E-Learning supplies transparency profiles

CWA 15903:2008 Metadata for Learning opportunities (MLO) – Advertising

CWA 15966:2009 Guidelines and recommendations for building metadata application profiles for agricultural learning resources

CWA 16076:2010 ECTS Information Package/Course Catalogue MLO Application Profile

CWA 16077:2010 Educational Credit Information Model

CWA 16078:2010 Curriculum Exchange Format

CWA 16097:2010 The Simple Publishing Interface (SPI) Specification

CWA 16131:2010 Europass Diploma Supplement Application Profile of the EuroLMAI

CWA 16132:2010 European Learner Mobility Achievement Information

CWA 16133:2010 Guideliness on a EU Learner Mobility Model

CWA 16385:2012 Interoperability of registries