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Information technology — Learning, education, and training — Requirements for e-textbooks in education

Technologies de l'information — Apprentissage, éducation et formation — Exigences pour les livres de texte électroniques dans l'éducation

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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. 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).

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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 World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

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

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Introduction

In the last few years, there has been a dramatic rise in the popularity of e-books, driven principally by the development of mobile devices including tablets and smartphones. A number of e-book formats have emerged to support this trend, the most prominent of which is EPUB 3, originally developed by the International Digital Publishing Forum (IDPF) and discussed in ISO/IEC/TS 30135 (all parts).

At the same time, standards for digital learning content have not made significant progress. Advanced Distributed Learning (ADL) produced the latest major revision of Shareable Content Object Reference Model (SCORM®) in 2004; the IMS Global Learning Consortium (IMS Global) produced the Common Cartridge specification in 2008; and both of these standards are based on the ISO/IEC 12785 series and the ISO/IEC/TR 29163 series. While the digital learning content area was stagnant, data-driven approach for usage of content has been growing rapidly. Progress in recent years includes the development of the Experience API (Tin Can API or xAPI) version 1.0, a specification released in April 2013 which is commonly considered the successor to SCORM.

While conventional e-books and the ISO/IEC 12785 series both support packaged content installed locally on a user's device or learning management system/virtual learning environment (LMS/VLE) on the web, considerable advances were in cloud computing and Service-Oriented Architectures (SOA). The latter approaches anticipate that much activity will be distributed across different servers accessed remotely using packaged content on user devices.

ISO/IEC/JTC 1/SC 36 has consequently identified a requirement for new standards for digital learning content that

— leverage common standards being used with digital publishing technologies for e-books,

— support packaged content for installation on a mobile device and usable off-line for learning activities, and

— support integration with cloud services, when this environment is available.

At the same time, the popularity of e-books raise a number of challenges for learning, education and training (LET) content. These challenges can be articulated as a series of comparisons (see Table 1).

Table 1 — Comparison major characteristics between e-book and learning content

e-Book characteristics	Learning content characteristics
Interpretation of an actual book as an aggregation of static text, graphics and pagination that can be flipped.[a]	Aggregated content by granularity of learning object, required with dynamic pagination (linear or multiple paths), and interactive digital media and activity such as assessment on the web.
General environment of e-book and player are locally installed and protected by strong copyright protection software such as Digital Rights Management (DRM).	General environment of learning content is on the web, in particular via LMS/VLE. Content is controlled and protected by authorization of the learning platform without using DRM.
Standards are dedicated profile for e-books content based on web specifications, such as HTML5, CSS and Java Script. Currently, EPUB 3 has taken a position as both a de-jure and a de-facto standard.	Standards are very diverse and heterogeneous per characteristics of content, service, or teaching and learning model. However, almost all standards have adopted web specifications including an e-book profile.

[a] "Book" means complete aggregated content bound with a spine.

The purpose of this document is to propose an approach which ensures that the benefits, advantages, and outlooks of both e-books and LET content are maximized. In particular, this document aims to identify the requirements for e-textbooks which are expected to adopt e-book technology in LET. The substantive parts of this document are presented in Clauses 5 to 7.

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Clause 5 investigates LET stakeholder requirements as collected in 2012,

— summarizing information about e-textbook pilots submitted by NBLOs and interested parties, further details of which are included in Annex A,

— summarizing conceptual use cases submitted by NBLOs and interested parties, further details of which are included in Annex B,

— summarizing the LET requirements gathered or collected from the online survey sent to stakeholders, further details of which are included in Annex C, and

— drawing out from these consultations key requirements for e-textbook functionality.

Clause 6 reviews the technology/market capability as of 2013 (with some updates to 2015) by

— reviewing the available standards that support the requirements to functionality listed in Clause 5, and

— drawing conclusions as to the best way to implement the required functionalities for potential e-textbook standards.

Clause 7 makes specific recommendations for future standardization work to support e-textbook.

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Information technology — Learning, education, and training — Requirements for e-textbooks in education

1 Scope

This document makes recommendations that are intended to build consensus on which International Standards for e-textbooks can be developed. This document is a follow up to the collection of inputs from interested parties and aims to

— review the current state of the e-textbook market,

— summarize LET requirements for e-textbooks based on use cases and survey of interested parties,

— review existing data standards that are referenced by potential e-textbook standards,

— describe key terms and concepts that underpin any further discussion on e-textbook standards,

— propose a set of functionalities that will be required for e-textbook reader software,

— make recommendations for any modification to existing data standards, and

— make recommendations for any new data standards that might be needed.

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:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1
aggregation
process of combining e-textbook *components* (3.2) to form new *composite components* (3.3)

3.2
atomic component(s)
smallest unit of content component that can no longer be divided

3.3
composite component(s)
component (3.2) that is composed of at least two other content components

Note 1 to entry: A composite component is one of two types of content components forming part of the content structure of the e-textbook Information Model. The other is an atomic component.

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3.4
digital content
usable information in an *e-textbook* (3.9), either as a single or multiple logical unit(s)

EXAMPLE Text, images, media, interactive items represented visually in digital form.

Note 1 to entry: Digital content will generally depend on appropriate software services that may be required to render or deliver other functionality associated with the digital content.

Note 2 to entry: A logical unit of usable (or re-usable) information is a logical package.

Note 3 to entry: A logical package may contain one or more logical units of digital content.

3.5
digital learning content
digital content (3.6) displayed within an *e-textbook* (3.9) including both static and interactive items for use in LET

3.6
digital content
single or multiple logical unit(s) of useable information in an *e-textbook* (3.9)

Note 1 to entry: A digital resource can be referenced via an unambiguous and stable identifier in a recognized identification system (e.g. ISBN, ISAN, UPC/EAN, URI).

3.7
e-book
structured *digital content* (3.6) in which searchable text is prevalent, and which is often seen as a metaphor of a printed book or pamphlet

Note 1 to entry: An e-book is usually an aggregation of digital content compressed into a single document, and from this perspective is regarded as a content package.

3.8
e-reader
computer hardware with appropriate software capable of loading and rendering an *e-book* (3.7) and providing functional support required to deliver *digital content* (3.6)

3.9
e-textbook
structured *aggregation* (3.1) of *digital content* (3.6) intended to support LET activities and which uses an *e-textbook reader* (3.12)

3.10
e-textbook fixed page
virtual surface of controlled size, and *fixed layout* (3.14), for the purposes of displaying *digital content* (3.6) of an *e-textbook* (3.9)

3.11
e-textbook flowable page
virtual surface whose size and geometrical properties can be adapted to the *e-textbook* (3.9) reader or user choices for the purposes of displaying *digital content* (3.6) of an e-textbook

3.12
e-textbook reader
hardware with the appropriate software capable of loading and rendering an *e-textbook* (3.9) and providing the functional support required to deliver *interaction* (3.14) and *learning support* (3.18)

3.13
fixed layout
digital content (3.6) that is attached to a particular position on an *e-textbook fixed page* (3.10)

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3.14
interaction
behaviour and data exchange within an *e-textbook* (3.9) context that occurs between a user and the *digital content* (3.6)

Note 1 to entry: Substantive changes do not include standard embedded video controls (start/stop/pause/fast forward, etc.) or changing presentation (e.g. increasing font size, highlighting, zoom, etc.).

3.15
ITLET 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 20006-1:2014, 4.12]

3.16
learning device
computer hardware capable of accessing an *e-textbook reader* (3.12) and running an *e-textbook* (3.9)

EXAMPLE Desktop computer, table, mobile phone or smartphone.

Note 1 to entry: Computer hardware used to support learning, education and training capable of accessing an e-textbook.

3.17
learning service
processes or sequence of activities designed to enable learning

[SOURCE: ISO 29990:2010, 2.13]

3.18
learning support
functionality that is initiated by *interaction* (3.14) with an external service or *digital content* (3.6)

EXAMPLE Assignments, reporting of results, learning activities dependent on communication between students and teachers, discussion forums.

3.19
media
digital assets, which may include separately or bundled together, text, audio, video, image, pictures, animation, or graphics within an IT system.

[SOURCE: ISO/IEC/TR 24725-3:2010, 2.4]

4 Abbreviated terms

API	Application Program Interface
CMS	Content Management System
CSS3	Cascading Style Sheets[a, b]
DF	Disk free (UNIX)
DITA	Darwin Information Typing Architecture
DRM	Digital Rights Management
EPUB 3	Electronic publication, a free and open e-book standard by IDPF, also a multipart standard ISO/IEC 30135

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