TECHNICAL REPORT

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ITLET supportive technology and specification integration —

Part 1: **Framework**

Technologie de support ITLET et intégration de spécification —

Partie 1: Cadre

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

In exceptional circumstances, when the joint technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example), it may decide to publish a Technical Report. A Technical Report is entirely informative in nature and shall be subject to review every five years in the same manner as an International Standard.

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

ISO/IEC TR 24725-1 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 36, *Information technology for learning, education and training*.

ISO/IEC TR 24725 consists of the following parts, under the general title *ITLET supportive technology and specification integration*:

— *Part 1: Framework*

— *Part 2: Rights Expression Language (REL) — Commercial Applications*[1)]

— *Part 3: Platform and Media Taxonomy (PMT)*

1) To be published.

Introduction

The purpose of this part of ISO/IEC TR 24725 is to provide a framework to assist with the development and implementation of technology profiles and bundles to support information technology for learning, education and training (ITLET). It presents a framework, objectives and considerations for the development of ITLET supportive technology and specification integration. A profile defines conforming subsets or combinations of base standards that support a specific function, and can be associated with a particular application, community and/or environment. Different profiles can be created and utilized to meet the needs of specific communities (e.g., learning communities, educational institutions, corporate training organizations).

During the development of this part of ISO/IEC TR 24725, a review was undertaken to identify the major components of profile and platform integration relevant to the field of learning, education, and training.

Components of profile development

— are in agreement with the concept of 'open systems' and 'open system environment'. Thus, the development of profiles takes place within an environment that can be viewed as heterogeneous, combining both proprietary and non-proprietary technologies;

— facilitate interoperability and portability of information technology system components;

— provide an infrastructure that is based on identification of base standards;

— create subsets or combinations of base standards to provide specific functionalities, and to provide the basis for conformance tests that are uniform and internationally recognized;

— create description mechanisms that allow for the specification of parameters.

When profiles are developed, choices are made regarding the permitted options for each base standard(s), and regarding the parameter values that can be unspecified in the base standard(s).

In the base standards or profiles, the description mechanism is provided to specify the detailed parameterization. Instead of formal centralized registration, other technologies, such as XSD like schema referencing, could be used to point a file specifying related description (e.g., "<xsd: schema xmlns: xsd = "http://www.w3.org/2001/ XML-Schema">" pointing to the responsible organization) or some alternative mechanism that does not require a monitoring organization.

Following a limited review of the components involved in the development of profiles and bundles, factors that can impact on user needs and requirements were considered and objectives for technology integration development work related to information technology for learning, education, and training were identified. This led to the development of a proposed framework, which was developed to guide development and implementation of profiles and bundles related to information technology for learning, education, and training.

ITLET supportive technology and specification integration —

Part 1:
Framework

1 Scope

This part of ISO/IEC TR 24725 provides a framework and objectives to assist in the development of profiles and platform and media bundles for information technology supporting learning, education, and training. These profiles and bundles will define conforming subsets or combinations of base standards used to provide specific functions in information technology for learning, education, and training (ITLET).

It also provides a proposed architecture that can be used to further the development of profiles and platform and media bundle combinations that are used to accomplish a specific function or purpose. This development work will involve the identification of base standards, together with appropriate classes, conforming subsets, options and parameters, which are necessary to accomplish identified functions or to support a class of applications for learners within various information technology environments.

This part of ISO/IEC TR 24725 also provides specific considerations for the development of ITLET supportive technology and specification integration. Examples regarding how and when profiles related to the use of information technology for learning, education, and training can be used are provided in an informative annex.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 1087-2:2000, *Terminology work — Vocabulary — Part 2: Computer applications*

3 Terms and definitions

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

3.1
base standard
approved International Standard or ITU-T Recommendation

3.2
IT system interoperability
ability of two or more IT systems to exchange information and to make mutual use of the information that has been exchanged

3.3
open system environment
comprehensive set of interfaces, services, and supporting formats, plus user aspects, for interoperability and/or portability of applications, data, or information, as specified by information technology International Standards and profiles

3.4
portability
〈computer programming〉 capability of a program to be executed on various types of data processing systems, often involving recompiling, with little or no manual modification

3.5
profile
set of one or more base standards, and, where applicable, the identification of chosen classes, conforming subsets, options and parameters of those base standards, are necessary to accomplish a particular function

3.6
standard
documented agreement containing technical specifications or other precise criteria to be used consistently as rules, guidelines, or definitions of characteristics, to ensure that materials, products, processes and services are fit for their purpose

4 Symbols and abbreviations

CMI	Computer Managed Instruction
CMS	Content Management System
EML	Educational Modelling Language
ITLET	Information Technology for Learning, Education, and Training
LCMS	Learning Content Management System
LMS	Learning Management System
PMT	Platform and Media Taxonomy
QTI	Question and Test Interoperability
RCD	Reusable Competency Definition
RDCEO	Reusable Definition of Competency or Educational Objective
VLE	Virtual Learning Environment

5 Requirements related to base standards for ITLET

5.1 General

There are a number of factors specific to the Learning, Education, and Training field that impact on user needs and requirements (see section 5.2). These factors should be considered when determining which base standards will be selected for specific profiles. In addition, there are objectives which each profile should meet to ensure it will meet suitable characteristics specific to an open system environment for learning, education and training (see section 5.3). Finally, a framework that outlines component profiles has been created to assist with the identification of base standards and the development of profiles (see section 6).

5.2 Factors Impacting on Needs and Requirements

In addition to interoperability and portability, there are a number of factors that impact on the needs and requirements of those involved in developing, using, and evaluating information technologies for learning, education, and training. Please note that this list is meant to provide an overview of potential factors that impact and does not include all factors.

a) Heterogeneous communities
Information technologies for learning, education, and training may be used by a variety of different communities, each with specific needs and requirements (e.g., corporations (internally and externally), schools and higher education institutions, governmental and non-governmental organizations).

b) Local and global learning contexts
While learning, education, and training activities may take place locally, through information technologies these activities may be made available across domain and jurisdictional boundaries. Policies and rights may differ by culture, context, or legal jurisdiction. In addition, the specific and diverse needs of indigenous peoples necessitate thoughtful, innovative, and inclusive strategies.

c) Learner authoring and collaboration
Within information technology systems for learning, education, and training, learners may be asked to alter or create content either individually or in groups. For example, learners may be asked to create wikis, write and critique blogs, participate in online discussion boards or simulations, take tests, etc. Information technology systems must support these activities.

d) Learning resources
Resources for learning, education, and training may be authored by more than one person. In addition, learning resources may be created by using or combining components of learning resources. Information technology systems need to be flexible and adaptable to support different uses and combinations of learning resources that may have one or more authors.

e) User roles
It is possible for users to have more than one role within an information technology system for learning, education, and training. A person may be an employee who develops learning content, a learner enrolled in an online training module, and an evaluator/certifier for a separate training course. Flexibility and adaptability in relation to user roles is vital.

f) Patents
Preference should be given to standards not subject to patents during the development of profiles to ensure availability at no or minimal costs for research organizations and educational institutions.

5.3 Open System Environment Characteristics

In addition to considering factors the impact specifically on Information Technologies for Learning, Education, and Training, the suitable characteristics of framework development for an Open System Environment for ITLET to assist in the selection of base standards and associated technologies are:

a) Interoperable
Allow for interchangeability, reuse, and ability to interpret data across and within diverse architectures.

b) User-centric
Prioritize user requirements over possible software and/or hardware constraints.

c) Collaborative
Allow different groups (industry, government, other stakeholders) to work together to creatively solve shared problems and innovate new approaches that build on current efforts.

d) Sustainable
Maintain resiliency and balance and address issues in a way that encourages the ecosystem to evolve and thrive.

e) Flexible
Adapt to new information and thoughtfully integrate technologies, procedures and practices into systems and processes.

6 Framework

6.1 Introduction

The subsequent sub-sections provide additional information regarding the components of the framework.

A review of potential profiles of standards and specifications for ITLET was undertaken and areas where works are yet to be done have been identified. From this review, a proposed framework has been developed to guide the development for potential ITLET profiles of specifications and standards. The framework to assist with the development of profiles of specifications and standards for ITLET is shown in Figure 1.

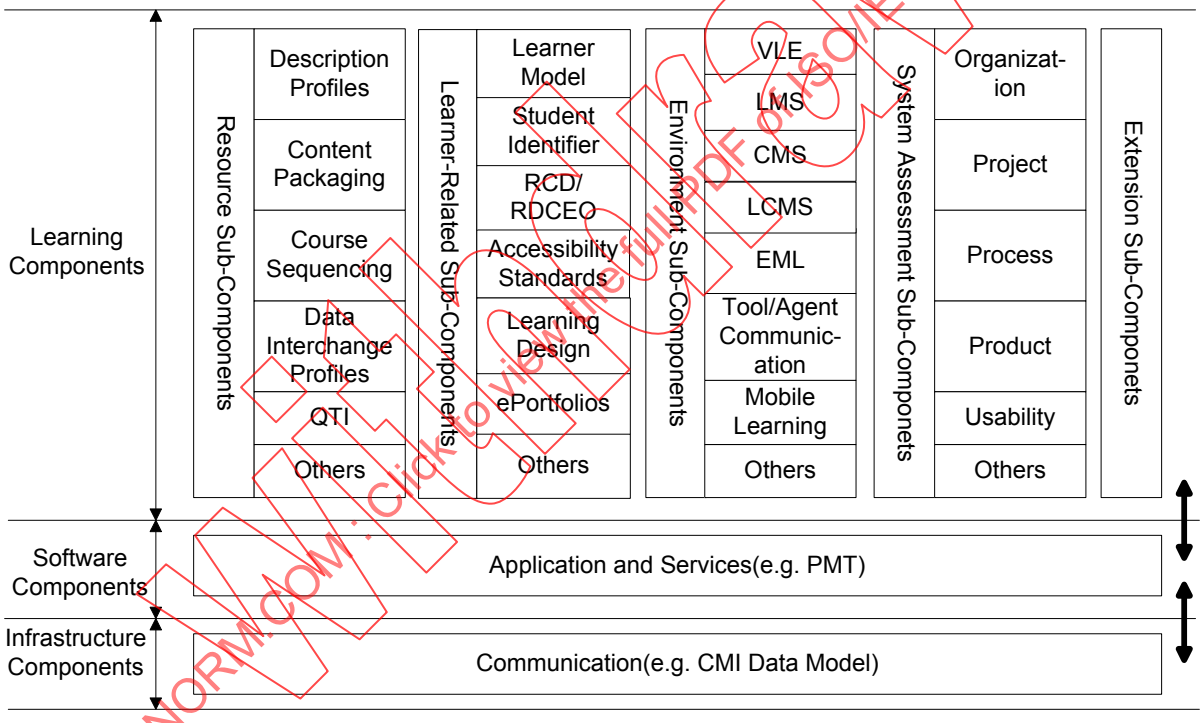

Figure 1 — Framework

Within the framework (shown in Figure 1), if profiles within ITLET already exist, this is indicated by adding the word 'Profiles' to each item, e.g., PMP (Platform and Media Profiles), Data Interchange Profiles. If profiles do not currently exist, but the standard or specification does already exist, then the item has been left in its original form, e.g., Course Sequencing, QTI, etc. without the word 'Profiles'.

It should be noted that profiles are usually developed by different learning, education, and training communities and that standardization efforts in the area of information technology for learning, education and training may progress in a non-linear, organic manner. Some components may be natural candidates for profile development, others may not.

There may be other components that should be included in this section that have not yet been identified. These different components may or may not be candidates for profile development, as profile development is an organic process that occurs within communities.

In addition, the international standardization of profiles is a complex undertaking that may take many years; these efforts may be most successfully realized in communities that have an international scope and a shared sense of purpose.

6.2 Infrastructure Components

These components essentially provide the underlying infrastructure that enables communication. They are used to facilitate the operation and interoperability of software and learning components. There may be other sub-components that should be included in this section that have not yet been identified.

6.3 Software Components

Software components include media and platforms that work closely with the communications infrastructure to facilitate the operation and interoperability of learning components. There may be other sub-components that should be included in this section that have not yet been identified.

6.4 Learning Components

6.4.1 General

Metadata relevant to Information Technology for Learning, Education and Training has been developed extensively, and is used currently in many systems. Efforts are currently underway to bring abstract models and theoretical constructs to concrete realization in the context of communities of practice. International standardization efforts in this area are in progress.

Learning components are grouped within five different types: resource, learner-related, environment, quality assurance and extensions. There may be other sub-components that should be included in this section that have not yet been identified.

6.4.2 Resource Sub-Components

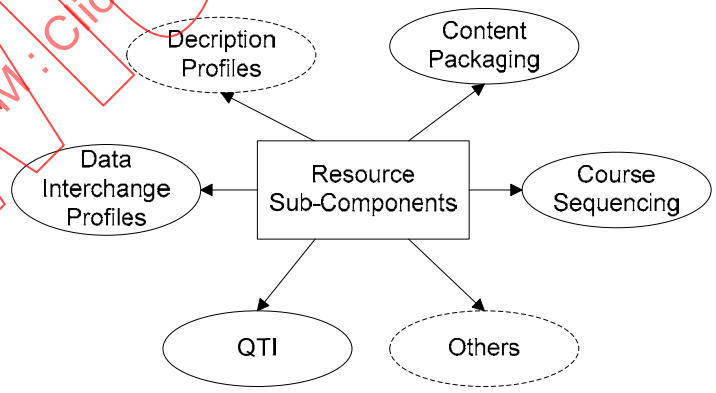

Figure 2 — Resource Sub-Components

Resource content description related profiles are shown in Figure 2, which corresponds to the Resource sub-component section of Figure 1. A broken curve indicates areas where potential development work within ITLET is probably needed. In this area, either profile or base standard can be made to meet the different IT function.

6.4.3 Learner-Related Sub-Components

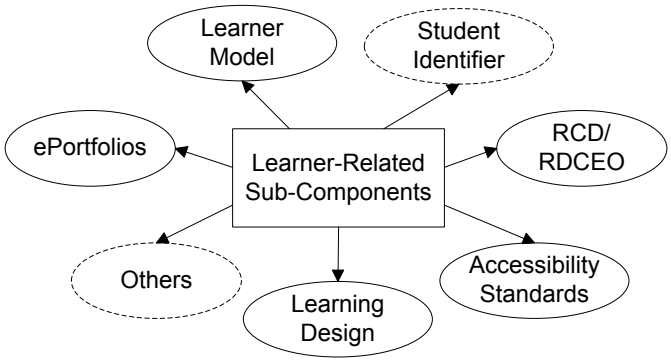

Figure 3 — Learner-Related Sub-Components

Learner-related component profiles are shown in Figure 3, which corresponds to the Learner-Related sub-component section of Figure 1. A broken curve indicates areas where potential development work within ITLET is probably needed. In this area, either profile or base standard can be made to meet the different IT function.

6.4.4 Environment Sub-Components

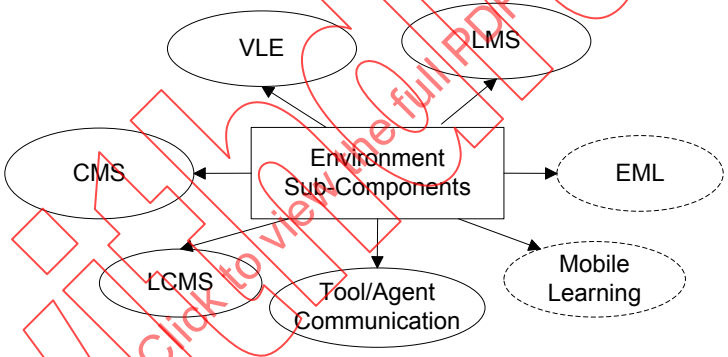

Figure 4 — Environment Sub-Components

Learning environment component profiles are shown in Figure 4, which corresponds to the Environment sub-component section of Figure 1. A broken curve indicates areas where potential development work within ITLET is probably needed. In this area, either profile or base standard can be made to meet the different IT function.

6.4.5 System Assessment Sub-Components

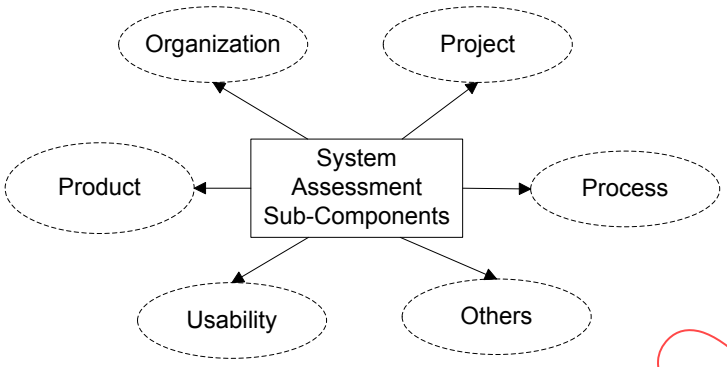

Figure 5 — System Assessment Sub-Components

System Assessment Sub-Components profiles are shown in Figure 5, which corresponds to the Quality Assurance sub-component section of Figure 1. A broken curve indicates areas where potential development work within ITLET is probably needed. In this area, either profile or base standard can be made to meet the different IT function.

6.4.6 Extension Profiles Sub-Components

This sub-component includes all extensions used for profiles. Such extensions are usually made of additional elements and vocabularies.

7 Conformance

It should be noted that it is possible for an IT system to support more than one profile by utilizing the different bundle combinations that include base standards, specifications, etc. It may be possible to negotiate the profile, platform and media bundles used depending on the circumstances, or the IT system may be configured separately to support specific profiles and platform and media bundles.

Annex A
(informative)

The Potential Application of Profiles and Platform and Media Bundles

A.1 General

A standards profile is a technique of referencing (in contrast to defining) technical specifications (e.g., standards and specifications). A standards profile permits the creation of combinations or profiles of standards; each one tailored, extended, or constrained to meet the needs of the committee developing a standards profile. A profile is widely used because 1) it can save work on synchronization issues between different versions of the standard; 2) it can save the work on interpretation work on the newly developed standard or specifications.

In this informative annex, several examples are provided in order to help people to understand the potential application of profiles and platform and media bundles. The examples are designed based on several learning software systems provided by some companies; however, many software systems could be used as samples, the software systems chosen below are only for illustrative purposes. The examples adopt several existing standards in their respective profiles to meet special requirements in certain circumstances. The standards that are being used are not confined to the areas of information technology for learning, education and training.

A.2 Disaster relief, humanitarian aid

In situations in which the teaching and training of populations that are vulnerable to natural disasters and emergencies, the development of early warning systems, and other technologies can be used to instruct people what to do to avoid/prevent loss of life. What is more, the use of a profile specific to this type of application could include specific technologies from ITLET and from other standards being developed (i.e., JTC1 SC27).

A.3 Specific business instruction applications

Profiles and platform and media bundles can also be used in certain business instruction applications that are global in nature. For example, a manufacturer that is based in country X and produces fluid-based products (valves, etc.) has 600 employees around the world. They have created an e-learning system that is used to teach their employees regarding new products, and to provide information to their customers. These are basically training modules that include videos, etc. In order to ensure that these training modules are delivered in a consistent manner in countries around the world, it may be useful to have one or more profiles that outline(s) the specific technologies involved to deliver this type of instruction. A profile that is used for this type of application could include standards hat are developed from within ITLET and related standards (e.g., e-business).

A.4 Area of medicine

There are more and more collaborative training and teaching for medical staff for example in response to health issues such as SARS (Severe Acute Respiratory Syndrome). In such emergency situation, the transfer of knowledge between medical experts, remote teaching of physicians and medical staff, and transfer or exchange of knowledge regarding best practices and procedures must be shared effectively and efficiently. A profile developed to support this type of application could include a combination of standards that have been developed by ITLET (SC36) and Health Informatics (ISO TC215) for example.