INTERNATIONAL STANDARD

ISO/IEC 20006-1

First edition
2014-07-01

Information technology for learning, education and training — Information model for competency —

Part 1: Competency general framework and information model

Technologies de l'information pour l'apprentissage, l'éducation et la formation — Modèle d'information pour les compétences —

Partie 1: Cadre général des compétences et modèle d'information

Reference number
ISO/IEC 20006-1:2014(E)

© ISO/IEC 2014



COPYRIGHT PROTECTED DOCUMENT

© ISO/IEC 2014

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

Foreword ... **iv**

Introduction ... **v**

1 Scope ... **1**
1.1 General ... 1
1.2 Exclusions ... 2
1.3 Areas not addressed ... 2

2 Conformance ... **2**

3 Normative references ... **3**

4 Terms and definitions ... **3**

5 Symbols and abbreviated terms ... **5**

6 Competency general framework ... **6**
6.1 Introduction ... 6
6.2 Information architecture view to support the management and exchange of competency information ... 7
6.3 Competency organization ... 9
6.4 Elements of competency ... 9
6.5 Semantic elements in competency expressions ... 10

7 Competency Semantic Information ... **11**
7.1 Architecture of competency information ... 11
7.2 Competency semantic information model ... 12
7.3 Types of Competency Semantic information - Competency Meaning Information ... 15
7.4 Types of Competency Semantic Information - Competency Situation Information ... 20

Annex A (informative) **Cases and relationships between ISO/IEC 20006 and ISO/IEC TR 24763** ... **23**

Annex B (informative) **Examples for competency information architectures** ... **26**

Annex C (informative) **Patterns of competency organization by HRMLs** ... **29**

Annex D (informative) **Previous use case on Japanese National Skills Standard (ETSS)** ... **31**

Annex E (informative) **Application to Japanese National Skills Standard (ITSS)** ... **32**

Annex F (informative) **Application to Canadian Learning Management System Desire2Learn** ... **34**

Annex G (informative) **Application to Canadian National Occupational Classification (NOC) and Canadian Nurses Association Canadian Nurse Practitioner Core Competency Framework** ... **40**

Bibliography ... **43**

© ISO/IEC 2014 – All rights reserved

Foreword

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

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

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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

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

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

ISO/IEC 20006 consists of the following parts, under the general title *Information technology for learning, education and training — Information model for competency*:

— *Part 1: Competency general framework and information model*

— *Part 2: Proficiency level information model*

— *Part 3: Guidelines for aggregation of competency information and data*

 © ISO/IEC 2014 – All rights reserved

Introduction

From the late 1990s, some industrial and academic organizations have developed information technology standards in the skills and competency domain, such as human resources, on a global level to address the interoperability requirements and environmental complexities of management and sharing of competency information amongst different organizations. Some examples include work spearheaded by the following organizations: the IMS Global Learning Consortium Inc., HR-XML Consortium, IEEE-LTSC, OMG, CEN TC353 and also ISO/IEC JTC 1/SC 36 itself. Some typical problems encountered by stakeholders as well as ITLET systems dedicated to the management and exchange of competency information and where these issues may be encountered are provided in examples below:[2]

Example 1: Technical - Competency and associated information cannot always be selected and shared between different ITLET systems (e.g. learning management, HR, and other related platforms);

Example 2: Organizational - Competency and associated information is not easily used in human development activities, because skills and competency information may be detailed or expressed differently in various ITLET systems (e.g. learning management, HR, national occupational classification, and other related systems);

Example 3: Information exchange - Skills and competency proficiency information, such as individual status or degrees acquired, cannot be shared easily amongst different ITLET systems (e.g. HR, learning management, national occupational classification, and other related systems);

Example 4: Individual learner - Individual developmental learning, education, and training paths cannot easily migrate or be exchanged amongst ITLET systems;

Example 5: Systems perspective (where systems include individuals, organizations, and the technologies that support them) - Individuals and organizations cannot easily design and integrate informal and formal learning, education, and training opportunities to support life goals, career strategies, and career paths using existing common dimensions within ITLET systems;

Example 6: Practical analytics - The ability to access, extract, and analyse competency and associated information can provide evidence as to whether learning, education and training information needs are being met in order to analyse lifelong learning, thus where competency information must be drawn from different systems and where non-interoperable format and definitions are used;

Example 7: Assessment and evaluation - ITLET systems (e.g. acknowledgement and consideration are needed regarding evaluation biases in human assessment, the use of varying methods and metrics to evaluate human performance, and the need to conduct accurate skill gap analysis), where ITLET systems that use different competency digital schema are involved; and,

Example 8: Overarching goals and outcomes - Human assessment and support for the development of human potential requires ITLET systems that provide a more flexible, holistic integration and exchange of competency and associated information beyond individual learning opportunities, everyday operation, and work performance. Competency data must be generated.

Some of these identified problems have been addressed on a limited basis by the standards and specifications produced by the organizations mentioned above. Not only is it difficult to use these standards and specifications, however, but also the unsolved problems are still critical. It is still confusing for stakeholders to implement and use these standards and specifications. Also, various problems associated with ITLET related systems, which should be solved by or supported with information technology, still remain.

Currently, organizations, such as schools, universities, institutes, and companies, use different ITLET systems to support the use of learning content, to enable and enhance various learning activities, and to provide other services. To meet their mission and goals, such organizations may rely on in-house developers, others such as ITLET vendors or suppliers, or a combination of both to provide and operate IT systems to support LET. This means ITLET operations and other organizational systems that deal with skills and competency information, such as interrelated human resources (HR) information

© ISO/IEC 2014 – All rights reserved

systems, need to be interoperable to allow for communication between organizations, their employees, and outsourcing ITLET providers or suppliers.

The purpose of this multi-part International Standard is to provide a framework, models, system architecture used for competency and proficiency information, and a way to aggregate competency information. This standard will provide a general framework and information model to manage and exchange information about knowledge, skills, ability, attitude, and educational objectives. Especially this International Standard will focus on extending the concepts contained within ISO/IEC TR 24763 by providing more detailed information regarding competency information and its information aggregation. This multi-part standard may be used by software developers and implementers, instructional designers and test designers, and others to ensure that learning, education and training environments satisfy learners' and organizations' competency needs. In addition, this International Standard will provide definitions of several types of competency information aggregation, which will provide guidance for all stakeholders to better understand and support the development of interoperable systems that will enable competency information exchange.

 © ISO/IEC 2014 – All rights reserved

Information technology for learning, education and training — Information model for competency —

Part 1:
Competency general framework and information model

1 Scope

1.1 General

This part of ISO/IEC 20006 provides:

— a general framework for dealing with competency information in information technology for learning, education, and training (ITLET) contexts;

— a system architecture for managing and exchanging competency information and its related objects;

— an information model for expressing competency and its related objects that includes an introduction to the composition of competency;

— use cases used to support the development of the general framework and competency information model.

This standard is for those who design and use learning systems and human resources systems to support management and exchange of competency information using ITLET systems.

NOTE This International Standard is related to the Conceptual Reference Model developed in ISO/IEC TR 24763. Information regarding the relationships between the ISO/IEC 20006 and ISO/IEC TR 24763 is provided in this standard.

This multi-part International Standard also includes the following parts:

ISO/IEC 20006-2:—, *Information technology for learning, education and training – Information model for competency – Part 2: Proficiency level information model*, which provides

— information model for expressing semantics of competency proficiency and its levels, and

— use cases used to support the development of the competency proficiency level information model;

ISO/IEC TS 20006-3:—, *Information technology for learning, education and training – Information model for competency – Part 3: Guidelines for aggregation of competency information and data*, which provides

— guidelines and a data driven architecture for the development of specific data models managing aggregation of competency information and related objects,

— ways to aggregate competency information and its related object data, and

— use cases used to support the development of the guidelines for aggregation of competency information and competency data.[1)]

1) The terms competency information and competency data will be defined in ISO/IEC TS 20006-3.

© ISO/IEC 2014 – All rights reserved

1.2 Exclusions

The scope of this International Standard does not include an in-depth technical review of issues related to:

— adaptability to culture, language, and human functions;

— security;

— authentication;

— privacy;

— accessibility.

1.3 Areas not addressed

This International Standard currently does not address the following items:

— e-Profiles, which are a set of records that pertain to an individual (e.g. personnel records, student information system records);

— evidence information;

— assessment methods and metrics information

— ISO/IEC 20006 has been developed to support competency information and data management and exchange based on IT systems that are currently in use in Asia, Europe and North America. It is based on standardization that has occurred at transnational, national and regional levels in IT systems that are used to support human development including but not limited to:

  — university, college, secondary school curricula development;

  — learning activities supported by IT systems such as LMSs;

  — IT systems that support LET and Human Resources that are based on a National Occupational Classification system (e.g. learning activity development, job banks, etc.);

  — sector specific standardization in the area of IT and embedded skills;

  — IT systems that support LET and human resource quality management and development activities.

Further work may be needed to ensure that these standards support deeper IT integrations across various sectors and in other regions of the world.

It is anticipated that some or all of these requirements will be addressed in future editions of ISO/IEC 20006, or in companion International Standards, Technical Specifications and Technical Reports.

2 Conformance

The objective of this part of ISO/IEC 20006 is to support the management and exchange of competency information in a way that will promote interoperability and integration. To support competency management and development, competency information needs to be structured and described consistently to promote understanding, mutual communication and agreement.

The general framework and information model are based on the Conceptual Reference Model for Competency Information and Related Objects (CRM) (defined by ISO/IEC TR 24763). The CRM provides a toolkit that can be used to abstract and identify concepts used within IT systems to support the management and exchange of competency information across different HR, learning and training contexts. ISO/IEC 20006 builds upon the conceptual and abstract focus of ISO/IEC TR 24763 to

 © ISO/IEC 2014 – All rights reserved

provide a general framework, information architecture, competency information model and additional components.

Competency information should be detailed in a way that is semantically robust and extensible. For the purposes of this standard, competency information is conformant with this International Standard if it adopts the information model and the element notations specified in this International Standard. (The element notations are defined in Clauses 6.4 – 6.5 and Clause 7).

A conforming notation may contain descriptions of meaning and context of competency information. In other words, it is intended to be extensible and may contain additional information elements of ISO/IEC TR 24763. For conformance to ISO/IEC TR 24763, classes for defining a competency in CRM competency are indicated with the following notation [E*n*] where *n* is a number that refers to a class defined in ISO/IEC TR 24763 to assist with understanding the linkages and relationships between the CRM and this standard. For example, as noted in ISO/IEC TR 24763, E1 = Action, E2 = Actor, E3 = Competency, and so on).

3 Normative references

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

ISO/IEC 2382-36 (E/F), *Information technology — Vocabulary — Part 36: Learning, education and training*

4 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 2382-36 and the following apply.

4.1
competency
ability of an actor to perform (a) necessary action(s) in (a) given context(s) to achieve (a) specific outcome(s)

[SOURCE: ISO/IEC TR 24763:2011, 2.2, modified — the words “observable or measurable” were deleted to allow for more general usage and application.]

4.2
competency aggregation
collection of *competency expressions* (4.4) that is in any structure

4.3
competency composition
unit and one of aggregation type that consists of definition and/or structured relationships of elements and attributes used to define contents of *competency* (4.1) as *competency expression* (4.4)

Note 1 to entry: For example, this may include information related to competency such as identification, semantics, context, and supplemental.

4.4
competency expression
any form of digitalized information regarding *competency representation* (4.7)

© ISO/IEC 2014 – All rights reserved