
**Information technology for learning,
education and training — Nomadicity and
mobile technologies —**

**Part 2:
Learner information model for mobile
learning**

iTeh STANDARD PREVIEW

*Technologies de l'information pour l'apprentissage, l'éducation et la
formation — Nomadisme et technologies mobiles —*

*Partie 2: Modèle d'information des apprenants pour l'apprentissage
mobile*

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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 other circumstances, particularly when there is an urgent market requirement for such documents, the joint technical committee may decide to publish an ISO/IEC Technical Specification (ISO/IEC TS), which represents an agreement between the members of the joint technical committee and is accepted for publication if it is approved by 2/3 of the members of the committee casting a vote.

An ISO/IEC TS is reviewed after three years in order to decide whether it will be confirmed for a further three years, revised to become an International Standard, or withdrawn. If the ISO/IEC TS is confirmed, it is reviewed again after a further three years, at which time it must either be transformed into an International Standard or be withdrawn.

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.

ISO/IEC TS 29140-2 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 36, *Information technology for learning, education and training*.

ISO/IEC TS 29140 consists of the following parts, under the general title *Information technology for learning, education and training — Nomadicity and mobile technologies*:

- *Part 1: Nomadicity reference model*
- *Part 2: Learner information model for mobile learning*

Introduction

This part of ISO/IEC TS 29140 provides guidance regarding the use of a learner information model for mobile learning that can be used as a reference by software developers, implementers, instructional designers, trainers, automated systems, and learning management systems to ensure that learning, education, and training environments reflect the specific needs of mobile participants. In addition, this part of ISO/IEC TS 29140 provides a definition of mobile learning, and it delineates the relationship between mobile learning and nomadicity.

As schools, governments, organizations, and businesses around the world design information for access by mobile devices, there is an increased need to set standards for how information should be designed for delivery on mobile devices to support learning, education, and training. This increased need is necessitated by demand for learning and training materials that can be shared easily between organizations and learners and made available to those in any geographical location. Mobile learning has the potential to provide learners with enhanced access to information and learning materials, guidance and support from anywhere rather than from a specific geographical location at a certain time. When mobile learning is implemented thoughtfully and well, it potentially may increase efficiency and productivity for learning, education, and training within different sectors (e.g. public, private, voluntary). Mobile learning has the potential to provide learners with new opportunities to connect with other learners, to interact with instructors, and to co-create collaborative learning environments. This is a critical issue for learners who live in remote locations lacking wired connections. Learners living in these remote locations can use mobile technologies with wireless capabilities to connect with others in different locations. As a result, remote learners might feel less isolated, which could result in more learners completing their learning, education, or training activities using mobile technologies.

This part of ISO/IEC TS 29140 focuses on a device-centric approach to mobile learning. It acknowledges the affordances and limitations of devices to access resources and to support learners participating in activities within information technology for learning, education and training (ITLET) systems. In contrast, ISO/IEC TS 29140-1 focuses on providing a nomadicity reference model that describes the elements that need to be considered when learners are attempting to access resources and complete ITLET system activities while moving from location to location. It includes a description of the elements of learning environments from multiple perspectives. If mobile devices are being used and learners are nomadic, then both ISO/IEC TS 29140-1 and this part of ISO/IEC TS 29140 would be consulted. If, on the other hand, learning activities solely involve the use of mobile devices, then only this part of ISO/IEC TS 29140 would be consulted.

There are a number of research teams in organizations and communities who are working on mobile learning. Additionally, work is already in progress in various countries around the world on related topics such as learning in different contexts, learning while on the move, and the use of handheld computers in learning. Work is in progress on some of these issues at the W3C and the ITU-T. As this work progresses it is essential to prepare the groundwork to ensure that the design, development, implementation, and evaluation of mobile learning within learning, education, and training environments will take place in a manner that is seamless, flexible, and integrated. In short, mobile technology needs to be seamlessly integrated into teaching and learning activities that are supported by information and communication technology (ICT) in general.

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Information technology for learning, education and training — Nomadicity and mobile technologies —

Part 2: Learner information model for mobile learning

1 Scope

This part of ISO/IEC TS 29140 provides a learner information model specific to mobile learning that can be used as a reference by software developers, implementers, instructional designers, trainers, automated systems, and learning management systems to ensure that learning, education, and training (LET) environments reflect the specific needs of mobile participants. Since these needs impact on other standardization efforts and other work items in LET, a concise view is necessary.

This part of ISO/IEC TS 29140 provides

- a definition of mobile learning that is appropriate for all sectors in LET,
- the description of the learner information model for mobile learning,
- specific learner information that supports learners engaged in mobile learning activities in LET environments.

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In addition, this part of ISO/IEC TS 29140 provides some initial guidance regarding the issue of privacy. This includes ensuring that this part of ISO/IEC TS 29140 does not contravene any privacy requirements.

1.1 Exclusions

The scope of this part of ISO/IEC TS 29140 does not include the following:

- in-depth technical review of issues related to adaptability to culture, language, and individual needs;
- broad or in-depth technical interoperability issues of mobile computing domains;
- security;
- authentication.

1.2 Areas not currently addressed

This part of ISO/IEC TS 29140 currently does not include

- in-depth details regarding privacy,
- accessibility, and
- detailed information regarding complementary work within other organizations that might be relevant (ITU-T, W3C, etc.).

2 Normative references

No normative references are cited.

3 Terms and definitions

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

3.1

learner information

recorded information associated with learners and used by **learning technology systems**

NOTE Learner information may be created, stored, retrieved, used, etc., by learning technology systems, individuals (teachers, learners, etc.), and other entities.

[ISO/IEC 2382-36:2008 (36.07.01)]

3.2

learning

acquisition of knowledge, skills or attitudes

[ISO/IEC 2382-36:2008 (36.01.01)]

3.3

learning technology system

LTS

information technology system used in the delivery and management of **learning**

3.4

mobile learning

learning using information and communication technologies in mobile contexts

NOTE Other definitions reviewed during the development of this definition of mobile learning are included in Annex C.

3.5

nomadicity

tendency of a person, or a group of people, to move from one location to another with relative frequency

EXAMPLE The learner has to access the learning materials from different locations, varying time zones and within another environment during a single learning episode.

[ISO/IEC TS 29140-1 (3.2)]

3.6

ubiquitous learning

learning that is stimulated and supported through diverse channels and always readily accessible

4 Abbreviated terms

DRC digital reference centre

DRR digital reading room

DTPR digital thesis and project room

ESL English as a Second Language

ICT	information and communication technology
IEEE	Institute of Electrical and Electronics Engineers, Inc.
IMS	IMS Global Learning Consortium, Inc.
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
ITLET	Information Technology for Learning, Education and Training
ITU-T	International Telecommunication Union – Telecommunication sector
LET	Learning, Education and Training
LMS	Learning Management System
LTS	learning technology system
W3C	World Wide Web Consortium

5 Examples of mobile learning applications

As the use of mobile devices grows around the world, the infrastructure to support mobile learning is being improved to allow access anywhere and anytime to learning applications, services, and content. In several countries, corporate, academic and government organizations are using existing Learning Management Systems (LMS) to implement and provide support for mobile learning. In some countries connectivity is sufficient to allow learners to access learning resources and participate in teaching and learning activities through connecting to networks using mobile devices. There is a shift from wired to wireless connection that will facilitate the use of mobile technology in learning.

Mobile learning is being used to improve access to learning materials and services that will facilitate individual learning, education, and training from anywhere and at any time. Below are some specific examples of mobile learning applications.

- In large geographically dispersed countries, mobile learning is used to facilitate the delivery of information and learning materials to learners in any geographic location. Universities are developing digital repositories that have courses that link to learning resources, allowing learners to access course materials from anywhere and at any time using a variety of technologies, including mobile technology.
- Mobile learning is being used to train immigrants who require language instruction in a second language while they work at the same time. Organizations are converting courses for mobile delivery. These allow independent learning and the convenience of learning.
- Organizations are converting courses for mobile delivery for the convenience of learning at a time and place that meets individual learners' needs.
- Mobile learning applications are being used to
 - Send daily information from university to student;
 - Gather immediate feedback and response data from students using mobile phones as part of a classroom response system;
 - Assess learner's level of understanding or skills, associated with rich media content;
 - Browse videos of recorded lectures;
 - Support Problem-Based or Collaborative Learning in real situations, such as exploring museums or cities to find out relevant information to solve a given problem;
 - Provide grammar lessons with interactive exercises to anyone with a mobile device that can access the internet, particularly new foreign workers needing ESL training to enter the workforce, adult learners needing skills update and others who might want easy access to grammar training. This project is summarized in Annex D;

- Allow mobile learners to access learning and reference materials from anywhere and at anytime. A Mobile Library (M-library) website, for example, provides a wide range of digital resources and library services, including digital reading room (DRR, e-course reserve), digital reference center (DRC), digital thesis and project room (DTPR), Help centre, search engine, and journal databases. This project is summarized in Annex D;
- Support interactions with an intelligent software agent capable of adapting to the heterogeneous mobile computing environment. The agent can search for a conversion tool according to the desired format and convert the course materials automatically. The agent is able to understand mobile clients' device capabilities. In order for the server to know what type of course material the client wishes to receive, the client needs to provide information on the software and hardware capabilities of the device to the server. However, devices do not normally carry any information about their capabilities. This project is summarized in Annex D.

6 Learner information for mobile learning

Information about the learner is used to determine how required learning materials infrastructure and support are all tailored for mobile learning. Learner information for mobile learning is similar to learner information for e-learning. Additional learner information is required to support mobile learning in different situations that may reflect contextual elements such as the mobility of the learner and the nature of the surrounding environment (e.g., infrastructure to support ubiquitous learning). As noted by several leading researchers in the field, the use of mobile devices to support mobile learning may be considered along different dimensions including the mobility of the learner and the embeddedness of the learner in the real environment or in context. In e-learning with desktop or notebook computers, the learner mobility and embeddedness are low. In mobile learning, learner mobility and embeddedness are high (Lyytinen & Yoo, 2002). To adequately support mobile learners engaged in learning, education, and training activities, information technology systems need to consider the specific context of the mobile learner with respect to dimensions such as mobility, embeddedness, learner preferences, content, device capabilities, and coordination.

Mobile learning provides flexibility for learning since it enables learning facilitated by a diversity of mobile devices. Mobile learning content is delivered in chunks and the mobile device can allow for synchronous, spontaneous interactions. In mobile learning the learner is always connected and learning is networked because of the connectivity of the mobile device (Cobcroft, 2006). Due to the limitations of e-learning where the learner may be tied to one wired location, learning may occur in simulated environments. Mobile learning provides learners with opportunities to learn outside of the classroom since the learner can learn from anywhere and at any time. Organizations use both e-learning and mobile learning; however, mobile learning provides more flexibility to learn and allows improved communications between learners and between learners and teachers. Further information is provided in clauses 6.2 and 6.3 regarding elements that are common to both e-learning and mobile learning and elements that are unique. However, there will be unique learner information elements for mobile learning, which are identified in clauses 6.2 and 6.3.

6.1 Learner information model for mobile learning

During the review of Use Cases provided, certain elements were identified as being minimum recommended elements to support learners and others were identified as optional. A more detailed listing of the use cases reviewed is provided in Annex D. Following the review, common aspects were identified and form the basis for the learner information model for mobile learning (see Figure 1 below). The learner is at the center of the model. Other aspects that are part of the model and impact on learner experience include content, device, coordination, connectivity. Minimum recommended elements have been identified based on the use cases submitted. These elements are identified in clause 6.2. Each minimum recommended element has been included under the relevant aspect of the learner information model for mobile learning. There are also optional elements included in clause 6.3 that have been grouped under the related aspect.

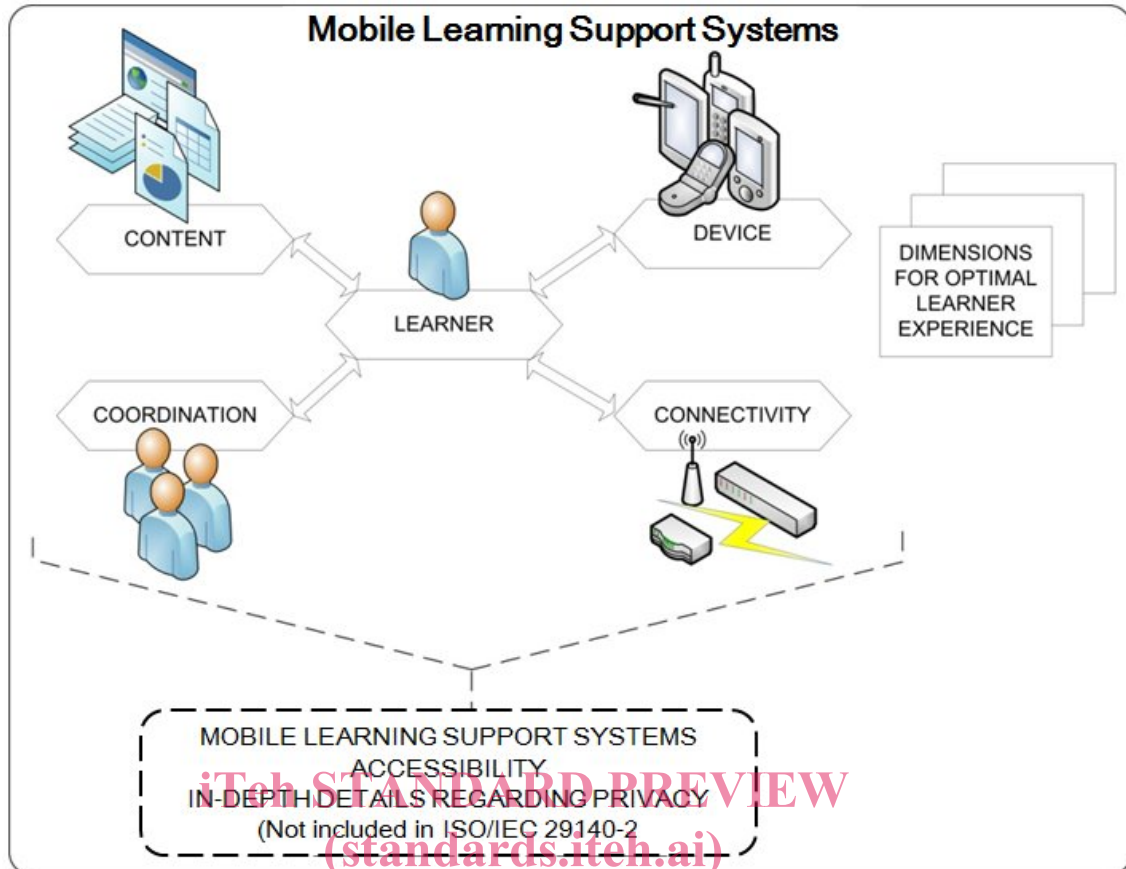


Figure 1 — Learner information model for mobile learning
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It should be noted that the optional elements subclause is not exhaustive, and is further expanded in clause 6.4 Dimensions for optimal learner experience. Ideally, the elements within each aspect of the learner information model for mobile learning may be viewed as dimensions that when considered holistically can assist in providing an optimal experience for learners engaged in mobile learning activities. It should be noted that mobile learning activities are inherently dynamic, connectivity can change during sessions, learner preferences for presentation may change depending on external factors such as noise in the surrounding environment, or internal factors such as fatigue. Although in-depth details regarding privacy are beyond the scope of this Technical Specification, several elements have been noted as possibly having potential privacy issues. Further discussion regarding possible technical solutions to these potential privacy issues currently is not included in this Technical Specification, but may be included in future editions, or in companion standards or technical reports.

6.2 Minimum recommended learner information

Based on a review of use cases outlined in Annex D, there are minimum recommended learner information elements that must be considered in mobile learning systems to support learners. These minimum recommended learner information elements are given in Table 1. The recommended elements with an asterisk (*) are specific to mobile learning. The other elements apply to both mobile learning and e-learning.

Table 1 — Minimum recommended elements — Learner information model for mobile learning

	Minimum recommended learner information	Description
LEARNER		
6.2.1	Learner identification	This includes username and password so that the learner can access the information from anywhere and anytime.
6.2.2	Geographical location of the learner* NOTE: There may be privacy considerations regarding the recommended use of this element. Location settings may be used to determine surrounding infrastructure support for the purposes of coordination of information.	As the learner is mobile, it is important to know where the learner is located so that the learner can apply the information in the appropriate context, and in a manner that is consistent with the specific situation of the learner.
6.2.3	Learner history NOTE: There may be privacy considerations regarding the recommended use of this element. Learner history information is specific information relevant to support adaptive interactions between the learner and the IT system.	Previous learning activities of the learner and the learning levels that were attained.
6.2.4	Learning needs	The learning outcomes the mobile learning is intended to support and the learner would like to achieve.
6.2.5	Learner progress NOTE: There may be privacy considerations regarding the recommended use of this element. The information may be restricted to those who have specific roles within the IT system.	How is the learner progressing in the learning process?
6.2.6	Language of the learner NOTE: There may be privacy considerations regarding the optional use of this element. The information may be restricted to those who have specific roles within the IT system.	The learner should be able to access learning materials in her or his first language or the language that is being learned. If the learning materials are not available in different languages, ideally the system should enable translation of the learning materials to the learner's preferred language.