TECHNICAL SPECIFICATION

ISO/IEC TS 29140-1

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

Part 1:
Nomadicity reference model

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

Partie 1: Modèle de référence du nomadisme

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Foreword

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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order to decide whether it will be confirmed for a further three years, revised to become an International Standard, or withdrawn.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again after a further three years, at which time it must either be transformed into an International Standard or be withdrawn.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 29140-1 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, 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

The number of people working as "global nomads" has been rising in the last few decades. The traditional nomad (tribal, ethnical, cultural) is a vanishing species, but globalization and the ease of travel has given a real boost to the number of professional nomads. These professional nomads are people who work in a variety of occupations (educators, trainers, learning specialists, sales people, service people, sports professionals, junior and senior managers in international companies, tourism industry workers, disaster relief and aid workers, military personnel, etc.). Information and communication technology (ICT) has the potential to provide learners with increased access to information and learning materials, and to support learning and working "on the go" and from anywhere rather than from a specific location at a certain time. There are many possible ways to approach the situation, two of which are provided below.

First, this part of ISO/IEC TS 29140 focuses on an approach to nomadic learning. In situations where nomadicity is involved, the learner, educator, or other participants may be in transit between different locations or require access to services as they travel to different locations. It is essential that learning, education and training (LET) activities are seamless. The environment must accommodate the needs and requirements of learners who are travelling from place to place. The ever-changing environment of the learner is considered with respect to the context in which LET takes place. The question regarding which devices are employed to support learning will change over time as new innovations and emerging technologies become available. The learner may use mobile devices, stationary equipment supplied at different locations where learning is taking place, or use whatever combination of devices is available locally or through distributed networks. This means that information regarding the learning context will be crucial to enable learning processes. It is recommended that this part of ISO/IEC TS 29140 be consulted in conjunction with ISO/IEC TS 29140-2 when designing ITLET systems that will support nomadicity.

Second, when using the mobile learning approach, emphasis is placed on the technical device that the learner is using. When mobile learning is implemented properly, it has the potential to increase efficiency and productivity within the various sectors (public, private, and voluntary). Mobile technologies have the potential to provide learners with new opportunities to connect, create and explore during LET activities. Where learning, education, and training activities involve mobile devices to support nomadic learning, this part of ISO/IEC TS 29140 and ISO/IEC TS 29140-2 would be consulted. It should be noted that not all LET activities where mobile devices are used involve nomadic learning. For example, mobile devices may be used in a classroom to teach school-age children about disease transmission patterns, in medical education to support students learning about bedside clinical practice, in a desktop Personal Digital Assistant (PDA) system to support people with aphasia. In these cases, it is likely that only ISO/IEC TS 29140-2 would be consulted. More information regarding the use of a mobile learning approach is provided in ISO/IEC TS 29140-2.

There are a number of research teams around the world who are working on nomadicity (nomadic learning) and mobile learning. Additionally, work is already in progress in various countries around the world on related topics such as ubiquitous learning, nomadicity, and learning using smartphones. Work is in progress on some of these issues at the W3C and the ITU-T as well.

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

Part 1:
Nomadicity reference model

1   Scope

This part of ISO/IEC TS 29140 provides guidance regarding learning, education and training (LET) situations in which learners are nomadic (travel from place to place, from one location to another or require access to services as they travel to different locations). It can be used as a reference by software developers, implementers, instructional designers, and others to ensure that LET environments reflect the specific needs of these learners. Specifically, this part of ISO/IEC TS 29140 provides

— a definition of nomadicity within LET,

— a nomadicity reference model indicating the elements required to support learners engaged in activities within LET environments that involve nomadicity,

— a description of the elements and relationships between the elements, and

— an introduction to the characteristics of nomadicity that impact on LET activities.

This part of ISO/IEC TS 29140 also identifies ITLET standards and fields of standardization within ITLET impacted by nomadicity and may be used as a basis for further standardization work and harmonization efforts.

This part of ISO/IEC TS 29140 is intended to support interoperability by providing a nomadicity reference model that can be used by developers, implementers, instructional designers, and others. ISO/IEC TS 29140-2 provides a learner information model specific to mobile learning that can be used as a reference by software developers, implementers, instructional designers, teachers, instructors, and others to ensure that LET environments reflect the specific needs of mobile learners.

It is essential to differentiate between nomadicity and mobile learning approaches because the former is considered to be independent of the ICT involved. A concise view and understanding is needed of how nomadic learners' needs and requirements can be met using standardization efforts. The focus of this part of ISO/IEC TS 29140 is to ensure that not only is the concept of "nomadicity" understood, but that the user needs and requirements have been addressed.

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 nomadic computing domains;

— security;

— authentication.

1.2   Areas not currently addressed

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

⎯ privacy,

⎯ accessibility, and

⎯ detailed information regarding complementary work within other organizations that might be relevant (ITU-T, W3C, etc.).

It is anticipated that some or all of these requirements will be addressed in future editions of this part of ISO/IEC TS 29140, or in companion International Standards or Technical Specifications.

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
learning
acquisition of knowledge, skills or attitudes

[ISO/IEC 2382-36:2008 (2.23.01.01)]

3.2
nomadicity
tendency of a person, or a group of people, to move from one location to another with relative frequency

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

4   Abbreviated terms

LMS   Learning Management System

LCMS   Learning Content Management System

PDA   Personal Digital Assistant

PMP   Portable Multimedia Player

RFID[*]   Radio-Frequency Identification

Tablet PC*   Tablet Personal Computer

UMPC*   Ultra-Mobile Personal Computer

WiBro*   Wireless Broadband

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[*] For further descriptions of these items, see Annex E (Informative).

5 Nomadicity reference model

Where ITLET systems are designed to support nomadicity it is important to consider the range of typical or likely requirements to enable learning. Learners need to be supported by technologies so that they can improve their learning in an efficient and effective manner. The underlying role of technologies is to support learners by enhancing communication, convenience, and connection. There are several components that are essential to supporting learners' requirements within nomadicity contexts as noted in Figure 1.
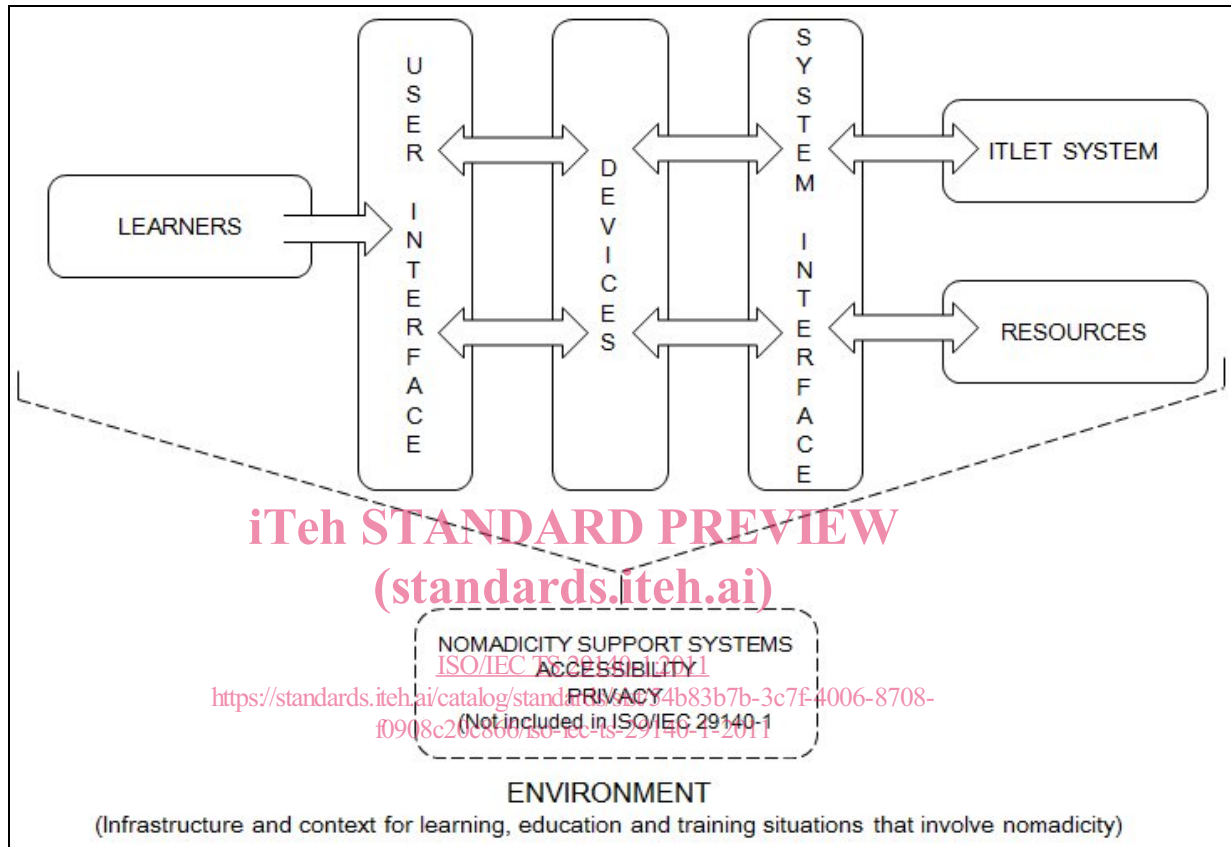
Figure 1 — Nomadicity reference model

· **Learners** - specific contextual information that impacts on the seamless and straightforward delivery of learning, education and training information. This may include information such as current location, estimated geographic coordinates based on mode of transport, learning levels, and specific preferences for display.

· **Resources** - Resources include items or information about items that are required to support learners who are participating in learning, education, or training activities and can be divided into the following:

- content refers to the actual digital items themselves such as text, image, audio, video, and others.

- content also may involve information produced to improve findability of digital items for educational purposes or to support education in nomadicity environments (e.g., metadata for learning resources, pedagogical information, social tagging, etc.). Resources need to be provided in a manner that is consistent with learner requirements given the learners' contexts and surrounding environments including elements such as current network condition, interface characteristics, device functionality and state, etc.

· **ITLET systems** - These include information technologies that are specifically designed to support learning, education, and training and where learning takes place (e.g., Learning Management Systems (LMS), Learning Content Management Systems (LCMS) as well as numerous Web applications and services that can be harnessed for LET purposes).

· **Devices** - Devices are tools that are used by learners to access resources and ITLET systems. Learners can use devices to access learning services and to manage their learning information and personal information. Devices have to support various functions for learning, education, and training in environments that involve nomadicity. This means that they may be used as input or output devices, as well as appropriate storage devices for offline services.

· **Interface** – As noted in Figure 1 above, interface may involve interactions between the individual learner and the device(s) (User Interface) and interactions between the device(s) and the ITLET system or resources (System Interface). Both User Interface and System Interface involve technologies and tools that are used to connect learners to resources and other systems such as LMSs. User Interface characteristics could include interactions defined by personal preference profiles, optimal use of device screen size, audio and video capability, and other functionalities. System Interface characteristics enable interactions between device and resources (e.g., identification and search functionality for the use of resources that are appropriate or required for an activity), and interactions between device and ITLET system (e.g., recording of test responses, delivery of feedback, etc.) Both User and System Interface have to support various functions for learning within nomadicity. It should be noted that the interface components should (where possible) incorporate the most current information related to human factors research. In addition, accessibility approaches (as suggested in companion International Standards such as ISO/IEC 24751) may be integrated within interface components.

· **Environment** - This includes all information on the location; such as time zone, geographical information (if needed), applicable norms and standards for telecommunication. Information is required regarding technical implementation (e.g., firewalls, usable or allowed ports, bandwidth and any restrictions regarding file size and extensions, etc.). This also includes the technical environment such as wireless environment that is required to support nomadicity. Without adequate infrastructure support all learning, education, and training activities that the nomadic learner tries to engage in will be impossible. This means that the environment is a key consideration for learning within nomadicity. Some characteristics that need to be considered for environment include infrastructure support and availability in current and projected locations. Other considerations include current noise levels and other environmental factors that may impact on delivery modes required by the learner.

6 Description of nomadicity reference model elements

6.1 Learners

6.1.1 Who are nomadic learners?

Nomadic learners are characterized by their way of living and learning. They move between different places out of necessity, as a private lifestyle choice, or to fulfil professional commitments. Examples of nomadic learners are people who work in a variety of occupations (e.g., educators, trainers, learning specialists, salespeople, service people, sports professionals, junior and senior managers in international companies, tourism industry workers, disaster relief and aid workers, military personnel, etc.). Their way of living and learning implies that they move between different environments, unique contexts, and using either their own technologies or technologies and connections supplied at the respective locations. Therefore, the context where learning takes place may be more important than the devices being used.

Nomadic learners should be able to study using learning resources easily without regard to specific place and devices. The resources, the interfaces employed, the ITLET system, the environment, and the unique context of the learner, all can play a powerful role to support learner interactions. All of these elements need to work together in a manner that enhances convenience, communication, and connection to support learning, education, and training activities. For example, learners should be able to check the status of their own

learning processes and to manage their learning effectively while travelling between locations by using devices that allow them to connect to an ITLET system (such as an LMS) and related resources in real time.

The five characteristics of learning for learners who move from place to place are as follows: (Jung, 2004)

- The learner is supported in self-directed learning. The Learner is able to process his or her learning resources and choose the technologies as required. This characteristic focuses on the Nomadicity Reference Model (NRM) components Learner and Resources.

- Devices and User/System Interfaces enable exchanges to take place between Learner and Resources. IT systems that enable LET are ubiquitous enabling the Learner to be able to study anytime, anywhere. This characteristic focuses on NRM components Learner and the Environment with the Devices, with User and System Interface enabling activities taking place between these two components.

- The Learner is supported on demand with instant connectivity. The Learner can study when needed and can resume activities while travelling between different locations with devices set up for network connection whenever and wherever he or she requires. The primary focus is on the Learner and the ITLET System (if used) or Resources (if used). Other supportive NRM components are: Devices, User and System Interface, and Environment.

- Learner personalization is supported. The Learner can select suitable resources to meet requirements depending on the interface functionality (e.g., device type functionality), network condition, and environmental characteristics, etc. The focus for this characteristic is on the Learner. The other components are supportive, enabling personalization.

- Learners can form learning communities easily by interacting with other learners, teachers, and mentors using wireless network connections. The primary focus for this characteristic is on linking the Learner to others through an ITLET system or Resources. Other components, such as Devices, User and System Interface, and Environment are supportive.

6.2   Implications regarding resources for nomadicity

Learning where nomadicity is involved implies that there may be potential changes (e.g., context, locale, environment, technical considerations, etc.). This may impact on learning, education and training resources. Some implications for consideration have been provided below including:

- Resources that are time sensitive, like tests at specific times, may not be suitable if the learner is in another time zone. The same applies to resources required for learning, education, and training activities that are based on collaborative learning efforts or require real time communication between learner and another role-player in the learning process. The main Nomadicity Reference Model components involved here would be Learner and Resources. Environment, User and System Interface, Devices and potentially ITLET system could be involved as well.

- Resources that require certain bandwidth or specific data speed may not be suitable in specific contexts. Environment and Resources would be two of the main components from the Nomadicity Reference Model involved in this case.

- In some cases, there may be restrictions on the timeslots available by the nomadic learner. For example, students, who are professional sportspersons participating in a contest or a show event or military people, serving abroad, may have strict schedules. So the duration of a learning unit may not exceed the duration of these timeslots. Additionally, it may be helpful if interactions can be resumed at the same point where learners had to discontinue their activity at a previous point in time. Another restriction may be that the resources the learner needs are available only at given times by the supplier in the specific environment (e.g., open or business hours, etc.). Here Learner, Resources, and Environment are key Nomadicity Reference Model components. The other components potentially may play supportive roles.