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

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

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Foreword

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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 of the voluntary nature of standards, 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 www.iso.org/iso/foreword.html.

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

This first edition cancels and replaces ISO/IEC TS 29140-1:2011 and ISO/IEC TS 29140-2:2011, which have been technically revised.

The main changes compared to the previous edition are as follows:

— ISO/IEC TS 29140-1:2011 and ISO/IEC TS 29140-2:2011 have been combined as a single document.

— New terms and definitions and use cases have been added.

— The referencing explanatory report has been removed.

— Minor editorial changes have been made throughout the document.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document provides guidance on the use of a learner information model for mobile technology in learning, education and training (mobile learning). It can be used as a reference by software developers, implementers, instructional designers, teachers, trainers, automated systems, and learning management systems.

Since ISO/IEC TS 29140-1:2011 and ISO/IEC TS 29140-2:2011 were published, there have been many technological innovations and increasing use of mobile technology in learning, education and training as indicated in many of the review and meta-analysis studies on mobile learning.[4],[6],[8],[9],[14],[17] The growth in active mobile-broadband subscriptions has increased significantly, with penetration rates increasing worldwide from 4,0 subscriptions per 100 inhabitants in 2007 to 69,3 in 2018.[13] The number of active mobile-broadband subscriptions have increased from 268 million in 2007 to 5,3 billion in 2018.[13] In addition, almost the entire world population, or 96 %, now lives within reach of a mobile cellular network. Furthermore, 90 % of the global population can access the internet through a 3G or higher speed network.[13] This is placing a sense of urgency to revise the standards for the use of mobile technology in learning, education and training.

At the same time, the technology and the application of the technology is changing at a fast rate. For example, 3D glasses are being used for virtual reality, augmented reality and mixed reality; and voice input and output are being used for language training. In 2017, an analysis of 233 refereed articles from 2011 to 2015 from peer-reviewed journals was carried out based on the research themes, methods, settings and technologies in the research.[14] The results were compared to three previous literature review-based research studies that were conducted between 2001 and 2010 to identify similarities and differences. The findings were that: (1) mobile learning in higher education is a growing field as evidenced by the increasing variety of research topics, methods, and researchers; (2) the most common research topic continues to be about enabling m-learning applications and systems; and (3) mobile phones continue to be the most widely used devices in mobile learning studies, however, more and more studies work across different devices, rather than focusing on specific devices.

As schools, governments, organizations and businesses around the world design information for access by mobile devices, there is increased need to set standards for how information should be designed for delivery on mobile technologies 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 and 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 has the potential to increase efficiency and productivity for learning, education and training within different sectors (e.g. public, private, voluntary).

A meta-analysis and research synthesis of the effects of integrated mobile devices in teaching and learning analysed 110 experimental and quasi-experimental peer-reviewed journal articles published from 1993 to 2013.[17] Results revealed that the overall effect of using mobile devices in education is better than when using desktop computers or not using mobile devices as an intervention, with a moderate effect size of 0,523. An analysis of 144 refereed journal articles from the top six major educational technology-based learning journals listed in the Social Science Citation Index database found that most mobile learning studies reported positive outcomes and the smartphone is the most widely used device for mobile learning.[6] Mobile learning has the potential to provide learners with new opportunities to connect with other learners, to interact with teachers and trainers, and to co-create collaborative learning environments. This is a critical issue for learners who live in remote locations lacking wired connections.[5] 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. An analysis of 90 articles that studied the qualities of mobile learning reported that the educational properties of mobile collaborative learning include: supporting ubiquitous learning, allowing more interpersonal social interaction, facilitating context-based learning, cultivating self-regulated learning and self-reflection, and fostering cross-

cultural interaction.[9] The conclusion was that, compared to internet-based learning, mobile-based collaborative learning is better able to serve as cognitive, metacognitive and epistemological tools for students' understanding and concept transformation.

There are a number of research teams in organizations and communities who are working on mobile learning. Many research studies and projects have been completed on the use of mobile technology in education and training. 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. This is evident by the nine use cases that are included in Annexes A through I. In addition, 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. A review of models and frameworks for designing mobile learning experiences described different learning strategies for using mobile technologies in learning.[11] These include: (1) context-aware learning where learners can learn in their own context using wireless connection, global positioning systems, satellite connection and mobile apps; (2) seamless and ubiquitous learning on the go and learning from anywhere because of the portability of mobile technologies – learning strategy is important for the nomadic learners who move from one location to the next; (3) game-based learning where learners are presented with different scenarios and challenges during the learning process; (4) mobile computer-supported collaborated learning where students use mobile technologies to interact to complete learning activities in groups.

In the past, use of mobile technologies, because of their small size and portability, have been beneficial to nomads; however, the current mobile technologies are more powerful and they are being used in different locations and different contexts for learning. For example, mobile technologies can 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 an industry to train employees how to maintain a piece of equipment; in a museum to give students a virtual presentation of a historical event; in a college to give students a virtual tour of an archaeological site, and so on. The potential use of mobile technology is unlimited, its use will depend on the creativity of the instructional designer, teacher or trainer. An analysis of 113 research studies on mobile learning in pre-kindergarten to Grade 12 levels found that 62 % of the studies reported positive outcomes, meaning that the majority of studies found that the use of mobile devices in a learning activity resulted in increased student learning.[8] It also reported that the majority of the studies (50 %) took place in formal educational contexts while a setting composed of both formal and informal settings accounted for 27 % of the educational contexts, and the remaining 23 % of the studies took place in informal settings.

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1 Scope

This document provides a learner information model specific to mobile learning to enable learning, education and training environments to reflect the specific needs of mobile participants.

This document provides:

— definitions of mobile technology and mobile learning appropriate for all sectors in learning, education and training;

— a description of the learner information model for mobile learning;

— specific learner information that supports learners engaged in mobile learning activities in learning, education and training environments.

— a description of the learner interaction model with mobile systems;

— consideration of learner interactions specific to nomadic learners who move from place to place;

— initial guidance regarding the issue of privacy.

This document does not include:

— 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 or accessibility considerations;

— in-depth details regarding privacy;

— detailed information regarding complementary work within other organizations that might be relevant.

2 Normative references

There are no normative references in this document.