Using E-learning standards to move towards M-learning

Nuha Sami Muhsin*

Abstract

The exploitation of technological advances in learning has result in an exponential progress in this field through e-learning applications in the last decade, and currently through the emergence of a new concept called m-learning. M-learning is defined as the use of mobile technologies for learning; m-learning must benefit from e-learning technological advances in order to avoid reinventing the wheel. Nevertheless, M-learning, which is characterized by the use of mobile devices, permits, for example, the learners' mobility during their learning, and, as opposed to e-learning, allows a continuous change of the context.

Moreover, m-learning faces some constraints caused by the use of its mobile technologies such as the limited screen size, reduced energy, resolution capacity and location change during an activity. Yet, there is an agreement among most research laboratories interested in e- and m- learning on the parallel use of these two learning environments.

The utilization of standards can offer pedagogical contents some structures which facilitate the interchangeability between e- and m- learning. In order to ensure the interoperability between E- and –M learning platforms and to take into account the specificities of m-learning, we have adopted the already existing standard LOM (Learning Object Metadata) and the specification IMS LD (Interoperability Media Standards –Level Design).

Key words: m-learning, e-learning, interoperability, LOM, IMS LD.

* Baghdad University

1. Introduction

This decade has witnessed a spectacular evolution in E-learning both technically and pedagogically, resulting in a significant increase in E-learning services. Shifting their concern from teaching resources development to course management, these services have played a key role not only in the diffusion and access to electronic resources, but also in managing the interactions among all the participants involved in an E-learning environment. The research tasks of standardization in learning covers several aspects such as the learner's profile and the structuring courses. Also, with the adoption of standard integrating pedagogical aspects, E-learning has reached an undeniable state of maturity.

In parallel, the extraordinary technological progress made in wireless networks and mobile data processing technology have allowed an effective integration of mobile devices in several applications, including those relating to learning. These developments have given birth to a new concept paralleling E-learning M-learning, a new version of E-learning upgraded towards mobile technologies use. Several research laboratories are interested in various aspects of mobile learning. The majority of them begin with research on its relationship to e-learning. Despite the diversity of their visions, there exists a consensus on the coexistence of these two learning environments.

Consequently, the need seems tightly pressing to ensure the exploitation of the pre-existing assets of E-learning and to avoid any unnecessary reproduction. Moreover, it is important to ensure the communication, the exchanges, the sharing of teaching resources and the data between the two environments. Thus, we need to mask the heterogeneity of the devices and in particular the constraints imposed by mobile devices and then allow communication and data exchanges of contents developed on these environments. Also, it is equally important to exploit the existing contents independently of their environments of development and thus create an educational inheritance. In other words, it is necessary to ensure interoperability between these two environments of learning. Our research orientation is articulated around the question of interoperability between e-learning and m-learning.

In this paper, we propose standardization as a solution since the use of a standardized structure will facilitate the exchanges and will allow resources sharing. It has been widely suggested that adopting a standard-based approach to M-learning could be a promising solution. However, in the

absence of any standards peculiar to M-learning, the question as to what extent E-learning standards can be adapted to the needs imposed by mobile technologies use in M-learning seems urgently pressing. This is basically what the present paper attempts to explore.

2. M-Learning vs. E-Learning

The birth of m-learning beside e-learning induces a fundamental question concerning the relation between these two learning environments. Is M-learning a particular case of e-learning or vice versa? Are they two disjoined environments or do they converge on some common points? These questions reflect the different conceptions of M-learning which juxtapose it to E-learning and mobile technologies. In order to answer these questions, we will try to compare E-learning and M-learning. As a preliminary step, these two concepts will be defined to trace the points on which they either converge and/or diverge. Definitions of these two concepts abound in the literature on learning in virtual environments; however, only those which seem most exhaustive will be presented below. E-learning is a learning environment based on the use of information and communication technologies to provide learning activities and services related to online training. It also manages the interactions between the learners, the tutors, the author and the administrator during an online training course. As noted earlier, the exploitation of mobile technologies in the field of online training was behind the appearance of M-learning, a match between advances in E-learning and mobile technologies. [1]

2.1 The common points

While m-learning and e-learning diverge on their “M” and “E”, they obviously have similar characteristics as they are both concerned with online learning. For example, the participants in an M-learning as in an E-learning environment are the learners, the author, the administrator and the tutor. As it is the case with E-learning, M-learning provides teaching contents for training. Similarly, they can both be in real or remote time; thus, making use of the same transmission modes. In also both environments, a virtual tool of learning is required in order to allow a close follow-up of the training and management of the interactions between the various participants involved. [1]

2.2 M-learning Specificities

M-learning is distinguished from E-learning by the use of mobile technologies. Consequently, the concept of mobility appears to have overcome more than ever space constraints. Thus, the learner can keep track

of his learning activities from any location even while moving from one place to another on the condition that a wireless network service is available. This has multiplied possibilities for life-long learning in a more formal and informal setting regardless of space and time constraints. Moreover, mobility has a considerable effect on the nature of activity offered because learners in M-learning can reach and move easily in geographical areas to practice trainings centered on the practical aspects. Indeed, in addition to the traditional ones such as courses and multiple choice exercises, m-learning provides a suitable environment for the training containers of the practical aspects. For example: assistance need, practical work, project realization since the learner can follow these activities in an authentic context. [2]

M-learning seems to cater for certain specialties more than others such as: agronomy, geology, archaeology, etc. If the use of mobile technologies is behind the widening of activities type in m-learning, these technologies impose many constraints. Indeed, on the one hand, mobile devices are characterized by their small size and limited battery that impose the use of more voice, graphs and animation. On the other hand, the major problem encountered with wireless networks which connect mobile devices to the internet is the period of disconnection generally due to the high cost of connection or to the lack of the necessary infrastructure. For this reason, m-learning platforms must envisage services which take account of this constraint by supporting the periods of disconnection.

Although there are several points in common between e-learning and M-learning, the latter is characterized by specificities as discussed above. The pedagogical contents developed in such an environment are likely to be incompatible with the other. So one cannot reach the contents of an E-learning course automatically, nor carry out bidirectional exchanges between e-learning and m-learning in a transparent way. However, we must exploit the existing contents independently of their environments of production and hence create an educational inheritance. It is, thus, a problem of interoperability between E-learning and m-learning. To solve this problem, the existence of standards is essential in order to facilitate the exchanges and to allow the division of resources.

The standardization guarantees the use of the same structure and, consequently, will facilitate the exchange of the contents between the two environments. For this reasons, we will study E-learning standardization field to see to what extent interoperability can be ensured. In what follows we propose a study of these standards in order to satisfy the needs of mobile

learning environment and ensure the portability of the digitized teaching equipment. [1,3]

3. Adaptation of E-learning standards to M-learning needs

E-learning and M-learning finality is using advanced technologies in training. Currently there is a plethora of numerical resources of training which should not remain encapsulated in its environment of development in order to be able to be exploited in m-learning. In other words, one must ensure the profitability and the personality of these already produced matters of training and avoids reproducing contents which exist elsewhere. So as to create an interoperable environment of training allowing the teaching exchanges of contents and data between the two environments of M & E learning, we chose the use of the standards for courses structuring as a solution since the latter will make it possible to offer to e-learning and M-learning contents the same structure which will facilitate the exchange of these contents between the two environments. [4]

Standardization represents so a reliable way to satisfy the need for interoperability. We could rise, starting from the first section, that E-learning and M-learning have several common points but also some divergent points. Thus, the structures used for the courses should not be very different. Our approach consists of studying the structures suggested by the existing E-learning standards and improving them according to m-learning specificities.

3.1 The standards role

The standards play a very important part to make the access easier to the teaching contents and their diffusion and to enrich exchanges and communication between the platforms. They also allow the publication of these contents on heterogeneous environments. Moreover, "in a planetary world of circulation of the resources, only the tools and the standardized resources for teaching will have the possibility of resisting". Thus, in order to create an interoperable m & e learning environment, recourse to the study of the standards is of great importance. Our field of study is based on works of standardizations which have appeared since the advent of E-learning and the mostly used on an international scale in particular: LOM, IMS LD for the structuring of the teaching contents. [5]

3.2 Adaptation of course structuring standards for mobile devices

In this part we will mainly study LOM standard and the specification IMS LD. This choice is warranted because LOM is a standard applied worldwide. As for IMS LD, it is a specification based on an approach directed process and focuses on the structuring of the teaching activities. The choice of this specification is dictated by the fact that it is the single specification which covers all the pedagogical approaches and it is based on LOM. Figure (1) shows the basic architecture of LOM standards.

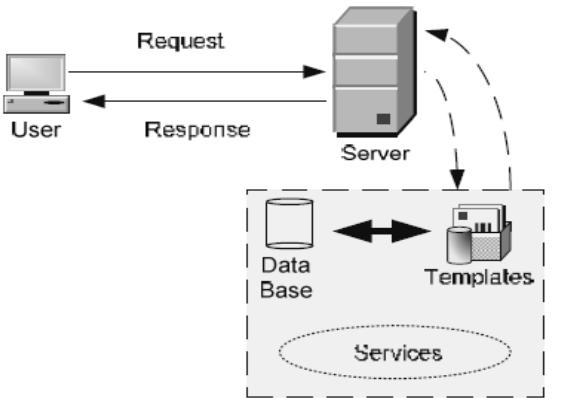

Figure: 1 Basic Architecture of LOM Standards.

3.2.1. LOM [6]

LOM 1484.12.1-2002 (Learning Object Metadata) is a standard of the IEEE approved in December 2002. It is the result of the work undertaken by the LTSC working group (Learning Technology Standards Committee) while being based on specifications produced by standardization organizations such as IMS, ADL, ARIADNE, and DCMI. It offers the most detailed diagram of metadata. LOM includes nearly 80 hierarchical elements in 9 categories.

LOM structuring model presents a structuring model with units (curriculum vitae, course, and lesson) and 4 resources levels of various granularities. We propose here to study how LOM can be improved through the addition of some fields allowing the use of this standard for

M-learning, and the widening of the significance of fields already existing in order to meet the need of m-learning.

a. General

The information contained in this category is used to describe and to identify the teaching object. Among these data we find : the identifier of the object, its title, its description, the list of the languages used, a list of key words, the extent of the resource (time, geography, culture...), the type of structure (collection, linear, hierarchical...), its level of granularity (from 1 to 4, 1 indicating a whole course). The branch "1.6 coverage" may contain information relative to time and geography. In the case of M-learning, when the learner changes his localization, it's important to provide him with contents suitable with the new context by taking into account the information contained in this branch.

b. Technical

This part shows the design features necessary for the execution of the teaching object on an information processing system. Information on this category is: the browser (type, version), the operating system, data type or format (allowing to identify the software necessary to read them), numerical object size (in bytes), its physical localization (URL: Uniform Resource Locator or URI: UR Identifier), information to install the teaching object and the time it requires (in particular for audio files, animation or video). Among the constraints imposed by mobile technologies there is the weak resolution, the small size of the screen, the limited memory size. These technical constraints can be easily integrated in this category by using all the branches. More particularly, one can use branch 4.4 requirement to identify the suitable device for each content. Thus, we propose the addition of a branch 4.4.1.5 device. Moreover, we propose the use of 4.6 other Platform Requirements to add all other requirements which can be drawn from research on mobile devices such as: resolution, graphic quality, battery and the screen size.

c. Educational

This category concerns the pedagogical description of the learning object. Information given here is related to the conditions of use of the standard resource: kind and level of interactivity, type of the resource (exercise, figure, index...), public Target (learner,

teacher, author...), context of use (school, university, in-service training...). The age of learners to which the resource is addressed, the difficulty, the time of training, the user's language and suggestions for use.

We have advanced in the previous section that m-learning offers a better opportunity for formal and informal training since the learner, using mobile devices, can move freely to follow an activity by having the possibility to realize the practical part of training in its real context. This category is very important because it will make it possible to take account of the technical constraints of mobile devices and more particularly of the battery and the periods of disconnection. Indeed, according to information contained in the branch 5.6 context, the most adapted resource in his context will be proposed wherever the learner moves. For example: A learner who is pursuing an informal training and has a mobile device with a weak battery can follow contents not requiring much energy. Branch 5.10 can contain proposals for uses of the resource in a particular environment, for example: the realization of a TP in a well defined context.

d. Relation

The relational aspect relates to the physical relations between the teaching objects. Is the type of relation mentioned as "is necessary for", "is a part of", "is version of", "is format of", "is referred to" etc. As we have indicated before, the use of mobile devices requires the use of more than voice, video and animation. If the format text cannot be replaced, it must be adapted to the small screens available to the mobile devices. Consequently, we think that it's important to make possible the coexistence of several formats of the same contents each one appropriate with a device.

Thus, we propose that this branch can be exploited to express the coexistence of several versions of a resource each one adapted with a device. In spite of the broad use of LOM, this standard is not without gaps. Indeed, it was tender for comment to ISO SC36 WG4 and several gaps were highlighted. We retain those which seem to us most relevant:

- No distinction made between resources, activities and units of training were among these gaps which go against good descriptions.

- Concentration on contents without taking into consideration the teaching approach to apply.

In fact, the implicit choice of the transmissive relation restricted considerably the field of the possibilities: the cognitive step resting on induction (in the case of simulations for example) is not taken into account. Obviously, these remarks remain valid for m-learning. As a conclusion, in spite of the richness of its metadata being used for the description of the teaching object, LOM method is appropriate to some kinds of teaching and not to others. This led us to wonder about the relevance of other specifications especially IMS LD.

3.2.2 IMS LD [7]

The beginning of the last decade was marked by the emergence of the pedagogical current in the e-learning environment. KOPER proposes a point of view which is radically different from the document a list approach by affirming that in fact the objects of knowledge don't constitute the key of success of an environment of learning, but the activities which are associated with it.

IMS LD proposes a conceptual meta-model describing the learning situation by defining the relations between:
(1) the objectives in terms of knowledge or skills, (2) the actors of the learning, (3) the activities carried out and (4) the environment and the contents necessary to the installation of a learning situation. IMS LD was inspired from the Educational Modeling Language (EML). The latter had as objectives to describe a situation of training with the following elements (and their relations):

1. Objectives: knowledge or skills to acquire
2. Roles: actors of learning
3. Activities carried out
4. Environment of training
5. Contents.

The aim of IMS LD is to allow the application of the teaching approaches according to the need and to guarantee the exchange and the teaching interoperating of the learning contents. It defines the structure of a learning unit as a theatrical part gathering a whole of acts made up of partitions where activities are in relation with roles. An activity is located in an environment including (chat, forum, transport...) as well as resources of contents described using the LOM. The strong point of IMS LD lies in its proposal of three levels of implementation:

Level A: Contains the core of the teaching design of IMS (roles, the elementary activities and resources) and their coordination thanks to the elements: method, play, and act. The activities of training are simply ordered in time, to be carried out by learning, by using the objects and/or the services of training.

Level B: It adds to level A properties, conditions, tutorial services, and elements acting together "It provides specific means to create complex structures and experiments of learning. The properties can be used as variables, local or total, storing or withdrawing information for a user alone, an implied group, or even all concerned persons. Through these mechanisms, the process of learning can change during the execution time of the unit. Decisions can be made taking into account dynamic aspects. In M-learning, learners can use several devices during the follow-up of a learning scenario. However, the mobile devices used in M-learning generally present a potential source of constraints relative to their physical characteristics, for example: reduced screen size, restricted methods of entry, limited memory and battery. Moreover, wireless networks present sometimes problems of disconnection caused by the weak cover or the price of connection. Thus, we can consider that among the conditions which make it possible to decide in favor of the evolution of a teaching scenario at a given time, there is the type of networks and the device used.

Level C: The level C adds notifications to the level B which can start another activity making it possible to have dynamic scenarios. Like for the level B, we propose to consider the context during an m-learning activity as being an event which makes it possible to start a new activity more suitable with the new context. For example: The learner, with his mobile devices, can follow activities anywhere. The localization can impose a change in the scenario of learning. We illustrated this idea in Figure (2).

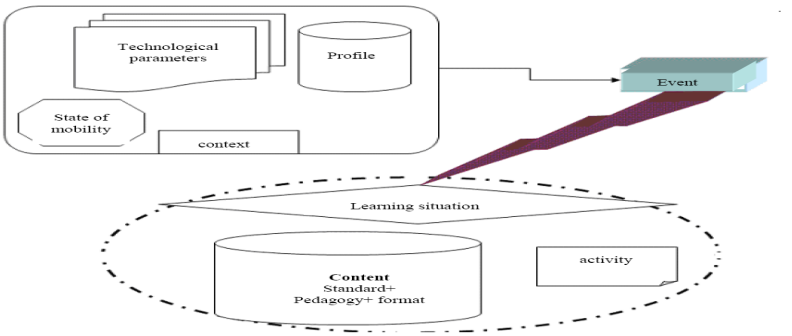

Figure: 2 Model of taking into account of m-learning specificities in IMS LD (B and C).

We think that the context of learning is being aggregated from the technological parameters (mobile device and the wireless network used), state of mobility (which is the level of mobility during learning) and learner profile (its own parameters). The change of these parameters will influence the learning scenario. Consequently, a new activity, more adapted to the new context, must propose to the learner contents under an appropriate format taking into consideration of the technical constraints of mobile devices. A specific teaching approach adequate to the state of mobility will be used. And finally, the contents must be designed according to a standard of course structuring facilitating its exchange when the learner changes his device. [9]

IMS LD Specification presents an undeniable asset for the traditional distant or mobile learning since it proposes a modeling in three levels which remains rather broad and where we can act to take into account M-learning specificities. To summarize our ideas about IMS LD, we consider that IMS LD is the most appropriate specification that answers m-learning needs thanks to the two levels B and C which are not detailed in the specification. Figure (1) proposed a model which represents the taking into account of specificities of the M-learning in the form of event of IMS LD.

4. Conclusion

In this paper, many conclusions we gated. The main parts can be illustrated in the following points:

- In a context marked by the development of communication technologies used in training, we witness the emergence of m-learning, in addition to e-learning which existed before.

- The coexistence of these two environments imposes itself, as e-learning and m-learning both aim at fostering training, hence the need to take advantage of contents already produced by e-learning.
- Thus communication exchanges as well as the sharing of learning subject matters and data between the two environments must be performed. In other words, it is necessary to create an educational heritage exploitable independently of the environment of the teaching matters development.
- To meet the interoperability need, we think it is fundamental to underlie the important role of the standardization of the structure of teaching matters, which will facilitate the exchanges between the two environments.
- In this paper, we have tried to take into account the specificities of m-learning in order to propose a structuring of pedagogical contents according to the LOM standard and the specification IMS LD.
- The results of our study constitute an important stage before Technological parameters context State of mobility Profile Event Learning situation.

REFERENCES

[1] Bull, User, S.: ”Modeling and Mobile Learning. User Modeling “, 9th International Conference. Springer, Berlin Heidelberg, 383-387. Available from: http://www.eee.bham.ac.uk/bull/papers-,2003.

[2] Grasso, A. Roselli, T.: “Guidelines for Designing and Developing Contents for Mobile Learning”, Proc. of the 2005 IEEE Int'l Workshop on Wireless and Mobile Technologies in Education (WMTE’05).

[3] Grohmann, G., Hofer, A., Martin, G.: “ARIS MOBILE: Helping to define the future of mobile learning”, Proc. Of the Int’l Conf. on Mobile Business (ICMB’05).

[4] Hafner, K. “A new kind of revolution in the Dorms of Dartmouth” New York Times, September 23, 2003.

[5] Liu T, Wang H, Liang J, Chan T, Ko H, Yang J.” Wireless and mobile technologies to enhance teaching and learning”, *Journal of Computer Assisted Learnin*g, vol. 19, no. 3, p.371-82, 2003.

[6] Roschelle, J. “Unlocking the learning value of wireless mobile devices”, Journal of Computer Assisted Learning vol.19, no.3, pp 260-272, 2003.

[7] Sharma, S. K., Kitchens, F. L.: “Web Services Architecture for M-Learning”, Electronic Journal on e-Learning Volume 2 Issue 1, P 203-216, February 2004.

[8] Syed F Haider, Waqas Ahmad, Asad Naeem,“ Grooming Awareness via Hi-Tech Media in Pakistan ”, Abs.ICCS-VIII, pp.56, Proceedings of 8th Islamic Countries Conference on Statistical Sciences (ICCS - VIII) Vol.13, pp 367-373, ISBN 969-8858-01-6. December 2005.

[9] Turban, Rainer and Potter “Intro to Information Technology 3/e” Wiley international edition, pp-170, ISBN 0-471-34780-9), 2005.

استخدام معيار التعلم الالكتروني للانتقال الى التعلم خلال التنقل

نها سامي حسن*

المستخلص

استغلال التقدّم التقني في التعليم لَهُ نتيجةٌ في التقدّم الفائق في هذا الحقل من خلال تطبيقاتِ التَعَلّم الإلكترونيةِ في العقد الأخير، وحالياً ومن خلال ظهور مفهوم جديد يسمى m-learning. هذا المفهوم يمكن تلخيصه بفكرة استعمال التقنياتِ النقَّالةِ للتَعَلّم m-learning لكي يتم تجنّبَ إعادة المفاهيم وتكرارها. على الرغم من هذا، m-learning يتميز باستعمال الأدواتِ النقَّالةِ، ، على سبيل المثال، قابلية حركة المتعلّمين أثناء التَعَلّم.

إضافة إلى ذلك، m-learning قد يواجهَ بَعْض القيودِ والتي سببها الرئيسي استعمال تقنياتِه المحدودة مثل حجم الشاشةِ المحدودِ، التَغيّرُ الحاصل بكفاءة العمل عند انخفاض الطاقة أو ضعف إشارة التغطية. رغم ذلك، هناك اتفاقية بين أكثر مراكز البحثِ في مجال أل m-learning على الاستعمال المتوازي في بيئتي التَعَلّم. لذا سَيَكُونُ أكثرَ ملائمة للاتصال والتبادلاتِ، لتَسهيل التَعَلّم لمادةِ البحث والبياناتِ ، وبذلك يتم تفادي إعادةِ إنتاج المعلومات الذي يؤدي إلى توحيد المعرفة وعدم تكرارها. بكلمة أخرى، توفير المعلومات بشكل قابل للاستغلالُ بصورة مستقلة من خلال بيئةِ تطويرية سهلة التطبيق.

البحث المقترح يؤدي إلى استخدام المعايير المعتمدة والتي يُمْكِنُ أنْ تؤدي إلى الحصول على مصادر تعلمَ لها القابلية على تبادل المعلومات بين e-learning و m-learning. لكي يتم ضمان خاصية أل interoperability بين e-learning و m-learning. ولأخْذه في الحسبان، تَبنّيْنا المعيارَ الحاليَ (LOM) وأيضا مواصفات IMS LD.

* جامعة بغداد