Possibilities and Challenges of deploying effective learning materials in mobile learning

Rogers Phillip Bhalalusesa  
School of Computer Science  
Universiti Sains Malaysia  
Penang, Malaysia  
rpb_11com071@student.usm.my  

Muhammad Rafie Mohd Arshad  
School of Computer Science  
Universiti Sains Malaysia  
Penang, Malaysia  
rafie@cs.usm.my  

Abstract:

Mobile learning (M-learning) has demonstrated the potential to enrich learning experiences in higher level education. The effectiveness of the mobile learning is brought about by the learning materials that can be shared across Institutional information systems and allow learners to continue learning when they are away from classrooms. However, most of the available information systems cannot provide effective learning materials in an m-learning environment due to technological, pedagogical, and financial challenges posed in mobile devices. With the advancement of mobile computing, semantic web and reusable learning objects (RLO), many opportunities exist to integrate the learning information systems to deploy effective m-learning materials. The paper discusses the compilation of effective m-learning materials through RLO and presents the possibilities and challenges of developing information systems for deployment of effective learning materials in m-learning.

Keywords: Mobile Learning, Reusable Learning Objects, Learning Materials

I. INTRODUCTION

The development of Information and Communication Technology (ICT) industry has removed the constraints of classroom space and time by making it possible to access the learning materials and learning activities wherever the learners are. When ICT is integrated into learning activities, an e-learning environment is achieved. E-learning can be referred to as the design, development, and delivery of instructional materials by electronic devices, such as computers, mobile devices, CDs, and DVDs[1]. Mobile learning (m-learning) is a part of e-learning environment that allows learners to continue learning while they are on the move using mobile devices[2]. M-learning is a learning model that provides ubiquitous, mobile, and anytime access to educational and university resources empowered by mobile technology in its connected or disconnected form[3]. By assisting the learners to continue learning outside the classroom, m-learning drives the learners to understand the concepts better as they make the learning activities part and parcel of their lives[4].

The centre of activities in the learning environment is the learning materials. The learning materials can be presented to the learners in accordance to the learners preferences. Since m-learning is a part of e-learning, most of the learning materials created in e-learning environment can be used in m-learning. However, it
becomes difficult to create effective learning materials that can be used in m-learning environment due to the nature and limitations of mobile devices that make it very hard to capture all the characteristics of effective learning materials. Effective m-learning materials are characterized various things including but not limited to principles of Instructional System Design (ISD), use of learning materials of small size that can be deployable on mobile devices and the information surrounding the learning materials that make the learners use them effectively.

Effective learning materials require the use of principles of ISD so as to capture the learning theories, learning metrics, learning styles and learning preferences [5]. ISD makes it possible to develop standard learning materials based on these guidelines. Learning style and preferences include the three learning spaces (individual, collaborative and situated learning space) that will be used by the learner at different times during his learning activities [4]. The learning metrics include lesson plans, learning objectives, maps, goals and pre-post condition of the learning contents. All these have to be considered to make learning materials effective.

Reusable Learning Objects (RLO) is the current trend of developing the learning materials (learning instructions) in E-learning [6]. RLO are context independent, transportable and reusable pieces of instruction that are digitally managed and delivered [7]. RLO can cover partial, full or multiple learning objective and they can be edited to suit the need of another environment, learning objective, or the user [8]. RLO can be found in many forms. They can be texts, visuals, audios, videos, interactive components, etc. [9]. Given their characteristics of accessibility, modularity, interoperability and reusability RLO can be extended in the m-learning environment and provide effective learning materials [10].

The learning materials on their own will not be enough to be effective. They have to be surrounded with important information to direct the learner on how they will use the learning materials [6]. In RLO this information is contained in metadata. Metadata is the information describing the RLO [11]. RLO are housed in repositories with Metadata for the purpose of enhancing their effectiveness as learning materials [12]. The metadata can be used by the information systems to aggregate the RLO in sound pedagogies and ISD principles and come up with effective learning materials.

Knowledge Management System (KMS) can be used to combine all the above components (RLOs, ISD and Metadata) and model them to develop effective learning materials in any learning environment [13]. According to Lauf et al universities can ensure the right information as well as knowledge gets to the right people at the right time to make the right decisions using KMS [14]. In this case the right information is the reusable learning object, metadata and ISD principles the people are the lecturers and the decision is the learning material.

KMS is the concept behind which semantic webs and ontologies work to capture information and knowledge about a subject [15]. So far semantic webs have been used in the e-learning management systems to allow machine to understand the information entered in computers by human beings [16]. Semantic webs use ontologies to model educational domains and to build, organize and update specific learning resources (i.e. learning objects, learner profiles, learning paths, shared repositories etc.) [17]. Although semantic webs and RLO are being used in elearning but they have not been extended in the mobile device technologies [18].
because semantic webs have not been well developed in mobile technologies then effective learning materials can not be deployed in mlearning environment.

To be able to develop information system that deploy RLO as effective learning materials that can be used in m-learning environment the KMS technologies that have worked well in computer systems have to be extended to mobile devices. As mobile technology is still new, assistance in developing information system in this field is vital to help institution develop effective m-learning materials. Therefore, there is a need to review the technological opportunities that can make the deployment of effective material a possibility and also make the institutions aware of all the challenges that exist in trying to use mobile devices to access effective learning materials. Section two discusses the related work in m-learning and section three describes the possibilities for developing these systems while section four describes the challenges for deployment of effective learning materials by the m-learning systems.

II. RELATED WORK

The use of mobile devices in e-learning has been going for the past decade. In 2002 m-learning was launched in European universities by European Fifth Framework programme to try to bring the young generation (digital age) to get involved more with education. [19]. The project announced a success when it gave a report that the students were able to participate aggressively in the learning activities when subjected to using the mobile devices. Mobile devices have been used in a range of other activities in m-learning. Mostly, they have been used administratively to communicate the necessary information to students. In South Africa, Short Message Service (SMS) have been used to communicate important information for distance based students of the UNISA [2]. There has been a similar adoption of Mobile devices into administrative learning activities in the Open University of Malaysia (OUM) and University of Makerere. [20-22].

There have been frameworks that have been developed to address the issue of increasing access of the learning materials in m-learning. Muyinda presents a framework in his PhD study of things to look when deploying RLO in mobile phones[2] and later uses the framework to create a prototype that can allow learners to obtain RLO from Content Management System[22]. The mobility dimensions identified by the study are mlearning cost, m-learning process, m-learning object and m-learning context. The framework provides a guide to implementation of applications that can deploy RLO in mobile devices but lacks the technological aspect of how those guides can be implemented mobile learning.

Another framework extends the semantic webs and ontologies into mobile devices using Semantic Web Mobile Learning Object Repository (SWmLOR) [18]. The focus on this paper was how ontologies are used to model RLO in e-learning. The framework then shows how those RLO modeled by using ontologies can be deployed to learners and educators with mobile devices. Although the framework gives a clear picture on how the RLO can be shared in mobile devices it lacks the principles of ISD and does not surround the RLO with metadata and therefore the learners may end up getting access to many RLO but fail to use the learning materials since there is no information surrounding them.

All the studies presented above have shown the promise of the increase in the participation of the learners when using mobile devices but so far no studies have shown if the learners will get access to effective
learning materials using the mobile devices. The institutions are therefore still left with challenges of how they can deploy effective learning materials in mobile devices.

III. POSSIBILITIES OF DEPLOYING EFFECTIVE LEARNING MATERIALS

The institutions opting to harness the power of mobile devices to access effective learning materials are presented with many possibilities in the current trend of Information Technology. Intelligent systems can now make a lot of computer resources not only sharable in computer systems but also extend their access into mobile devices.

Semantic webs can now be easily developed by institutions using Open Sources, Software Development Kits (SDK) and other tools that can model the RLO, metadata and ISD components without using advanced ICT skills [23]. This means that the institutions will not be in need of very high ICT experts in order to develop information systems that use semantic webs.

Mobile device technology is improving everyday[24]. The storage and processing power of mobile devices is increasing and some of them can access electronic resources with the same application and features like a laptop or personal computer [25]. This increases their capabilities of accessing learning materials including the multimedia RLO which have higher impact in the learning process.

With the business industry understanding the value to invest in education activities it is much easier now to get the mobile phone companies on board to invest and support the learning activities in mobile devices[26]. The companies could be persuaded to provide packages, services and plans for internet connectivity, text and voice communication in order to improve the learning experience in the m-learning environment. In this way mobile device users will be able to access the learning contents affordably and reliably.

Mobile devices are interoperable to computer devices. The deployment of m-learning materials should not limit the learner to use mobile devices only. The system should be designed so that the learners can receive the learning materials designed for mobile phone by using a computer and vice versa[27]. This way the learners will be able to get access to learning materials even when they do not possess high end mobile phones.

IV. CHALLENGES OF DEPLOYING EFFECTIVE LEARNING MATERIALS

The limitations that the mobile devices have make it very difficult to deploy effective learning materials that usually have high technological, pedagogical and financial requirements. Technologically the mobile device can not save and transmit large amount of learning resources. The mobile devices have limited processing power, limited display size as well as low transmission, storage and power [28].

In addition to that, it requires the learning contents to be small and use less processing power. In addition the display area of the mobile device can accommodate little information at ago which renders the mobile device very ineffective in deploying the learning materials[29].

Pedagogically it may be hard to deploy effective learning materials in mobile devices. As detailed in section 1 effective learning materials requires the adoption of ISD principles together with learning styles and learner preferences[6]. M-learning field is still young and therefore pedagogical factors have yet to be fully
merged into mobile devices. It will then pose a huge challenge for the institutions to develop effective learning materials with all the pedagogical features in the mobile devices.

With the introduction of new applications and mobile devices everyday, learners are bound to spend a lot of cash to obtain powerful mobile devices to be able to participate in the m-learning activities[30]. In addition to that the pervasive access to internet resources requires learners to spend more on getting internet access in their mobile devices so that they can access the resources. This calls for the both the education and industry stakeholders to rethink on how they can assist the participant of m-learning to spend less when accessing the learning materials in the m-learning[27].

The culture of using mobile devices for other activities other than normal communication is still new to many people[31]. Most people perceive mobile devices as social gadgets and do not entirely make contents transferred in mobile phones official. Change is always hard to be adopted and this may be the case when it comes to direct people to use mobile devices to access learning contents. The culture of the people has to be well studies and see how best they can incorporate mobile devices in their learning activities.

V. CONCLUSION

Learning should not be confined in classrooms. Rather, learners should be encouraged to conduct learning activities in and outside the classroom. With the efficiency and opportunities that m-learning has the institutions should try their level best to embrace it. M-learning will work well as part of e-learning to allow for learning without limitations of time and place to be achieved well. The challenges presented in this paper should not be seen as a limiting factor but rather should be seen as a motivation for most of the institutions that want to use mlearning. The possibilities give room to tackle the challenges so that the institutions can develop m–learning initiatives that can deploy effective learning materials to students. Future work by the authors will involve using the possibilities presented above to build up a framework that will guide the development of the information systems that will deploy effective learning materials in mobile devices. The framework will integrate the existing online RLO repositories and information systems that house teaching templates that adhere to ISD principles using semantic webs so that the lecturers can be able to develop effective m-learning materials automatically.

REFERENCES


