

Investigation of M-Learning Components and the Vital Features that affects the Design, and Deployment of M-Learning Process Workflows

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Abstract: Mobile learning (m-learning) allows learners to access services from anywhere irrespective of time using internet-enabled mobile gadgets and related technologies. To assess the extent to which m-learning workflows have affected the learning process, it is imperative to evaluate the components and features of mobile learning and the level of interactions between the various components. The aim of this paper is to investigate m-learning components and the vital features that affect the design, development and deployment of m-learning process workflows. The paper follows a systematic review augmented by the object-oriented analysis and design process modeling. Following the process workflows modeling, the paper evolves and discusses an implementation-ready model that could be adopted by m-learning system integrators in their bid to implement cutting edge mobile solutions for flexible and efficient e-learning

Keywords: Mobile learning, components of mobile learning and features of mobile learning.

1. General Introduction

Teaching and learning in the past were conducted majorly on the basis of both the learner and the teacher being present at a designated place called a class room for the purpose of carrying out teaching and learning activities. As technology advances, mobile gadgets are developed with some specific features that aid teaching and learning. The term "mobile learning" came at a point where teachers and educators saw the need to explore the features embedded in mobile technologies in teaching and learning processes in order to obtain an efficient and effective teaching and learning environment. According to UNESCO (2012a), there were few projects in the early 2000s that were conducted in both developed countries and developing countries. Mobile learning is a type of learning in which students of various strata can improve their potential through online interaction in the form of asking questions to the teacher and providing answers to questions using mobile gadgets (Lahore 2015). The integration of mobile computing into electronic learning enables students' and lecturers' access to university courses and makes the process of accessing lecture materials easier as a number of students and lecturers have access to mobile gadgets. With the emergence of mobile gadgets, students can easily access their materials, both written lectures and video lectures. Mobile learning has made institutions of learning aware of learning tools that play significant roles in teaching and learning processes. Such learning tools include IPADs, laptops, and tablets, among others. Due to the availability of mobile learning gadgets, most institutions and learning centres now deliver relevant information such as lectures and content online. According to Lan and Sie (2010), mobile learning is a kind of learning model that allows learners to access learning materials over the internet using mobile technologies anywhere and anytime. In the same way, Brown (2005) posits that mobile learning makes assessment of learning materials flexible and allows students the freedom to access materials of their choice. Yi, Liao, Huang & Hwang (2009) posited that mobile learning is mostly considered a tool that increases the performance of learners by bridging the gap between learners

and learning materials. The introduction of mobile learning technologies has drastically eliminated the geographical differences existing between foreign groups and provided a collaborative learning environment.

2. Empirical Analysis

Adnan (2015) conducted a survey (Mobile Learning) with the aim of highlighting mobile education and mobile electronic learning using tablets, PDAs, and smartphones. The study employed the use of previous and most recent research (survey) methodology. The investigation of mobile learning in universities and educational institutions has been discussed. The study revealed that mobile learning provides a lot of benefits to students at the moment. The study concludes that students can easily learn through mobile phones, Smartphones, and PDAs using an internet connection.

Samsiah & Azidah (2012) carried out a historical overview of the mobile learning concept and its evolution. The study further discusses mobile learning adoption and applications in the education industry. The study confirmed the significant use of mobile learning in the education industry. The study concentrated on the influential factors that contribute to mobile learning utilization. The study concluded that the factors of mobile learning have led many scholars to further research on mobile learning due to its potential in making teaching and learning more attractive and promising.

2.1 The Importance of Mobile Learning

It is obvious that mobile devices in recent times have completely affected our ways of life. The use of mobile devices has drastically changed the way in which things are done and our attitudes towards attending to our daily activities such as booking of cars, ordering of food online and other gadgets. Huang & Hung (2010) Mobile devices have also affected the way people communicate with their family members, friends, and other relatives across the globe. None the less, the way we learn has also been affected as people can now access the same learning materials online at different times and different locations. Canning & Callan (2010)

The following are the basic implications of mobile learning:

2.2 Quicker Learning

According to Cordin Huang and Hung (2010), mobile Mobile learning provides learners with different modes of learning, which enables them to retain lecture content. Going online through mobile devices allows learners to access lecture content in the form of pictures, audio, and video. These mobile devices allow learners to cover more ground in a very short time. When using mobile devices such as multimedia, tablets, smartphones, etc., it increases the level of engagement of learners that have an interest in it. Hence, learners at different levels tend to retain and sustain information far better when using mobile devices as a result of the different modes of learning materials made available to the learner. Mobile devices also come with some level of applications that enable users to reuse certain materials offline without the consumption of data, which helps the learner during emergencies when there is a shortage of data to access internet services (Cook, 2010).

2.3 Personalized Education

Mobile learning became popular and personalised learning gained its roots from learning & development professionals who adopted the learner-centric approach to learning. This approach gave learners some level of prerogative in determining what to learn. Learning & Development professionals were able to understand the need for adopting and executing a plan for a learner-centric approach to learning that offers learners the freedom and accessibility to what to learn. Personalized learning is one of the learner-centric approaches, which conforms to mobile learning courses and simultaneously provides the type of learning that is designed to suit each learner's strengths, the learner's needs, the learner's skills, and the learner's interests. This

learning approach is achieved through the learners' unique learning styles that respond based on their progress, internal and external motivations, and the aim, which is majorly determined by the selection of accurate and appropriate data.

2.4 Increased Course Completion Rate

The rate at which online courses are being completed by students is quite faster than their in-class counterparts (Crescente & Lee 2011). Students who study in the normal four-cornered class rooms tend to be slower in covering lessons or course content. The reason for this slow rate of learning is that in-class students rely almost entirely on the teacher, who determines the pace at which learning materials are delivered to the students.

The use of mobile devices in learning provides learners the opportunity to learn at their own pace regardless of their location. According to Fezile and Nadire (2011), students finish their classes faster when they do them on mobile rather than in-class.

2.5 Increased Rate of Students' Participation

Mobile learning does not place any restriction on the number of learners that can undertake a particular course in a particular period of time. Regular in-class learning is constrained by some conditions that make it impossible to accommodate every student who has an interest in undertaking a course. For instance, a student who wishes to undertake a particular course which is far from his/her location may drop the interest if the financial strength is not enough to handle the distance problem. Distance is no longer a barrier when it comes to mobile learning. Learners can access their learning content from any part of the globe where they find themselves at any given time.

2.6 increases the recall of information and the retention of knowledge.

Just like the saying goes, "What I hear, I forget, but what I see, I never forget." Mobile learning has incorporated features that allow learners not only to hear but also to see what they are taught during classes. The inclusion of videos, pictures, and other learning functionalities that aid learning has given mobile learning an advantage over in-class learning. According to Fezile and Nadir (2011), studies have indicated that most students improve their test assessment scores when using mobile learning. This is because the brain builds a memory that allows linking with new knowledge and relating to what is already existing. Mobile learning helps in making these connections faster than in-class instruction because of the introduction of multimedia capabilities.

3. Components of Mobile Learning

Figure 1 below shows the components of M-learning and their relationship with each other. The figure indicated a high level of connectivity between the components of the system, which implies that none of the components can successfully function independently.

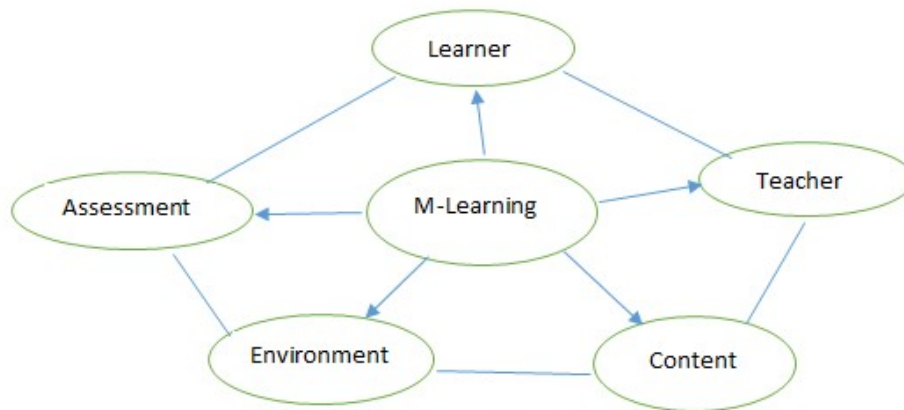


Figure 1: Components of Mobile Learning

Description of figure 1

As illustrated in Figure 1, the learner is one of the components of the M-Learning system. The learner remains the focal point of every teaching and learning process. As such, the teacher, lesson content, and learning environment are positioned in a manner in which the purpose of the teaching and learning system is achieved through evaluation and assessment of the learner. The teacher present in the M-learning system was in contrast to the traditional in-class teacher. The teacher is becoming gradually silent in M-learning as its physical presence is no longer noticed as it was in the traditional class. In the M-learning system, information is technologically stored and accessed by students using mobile technologies.

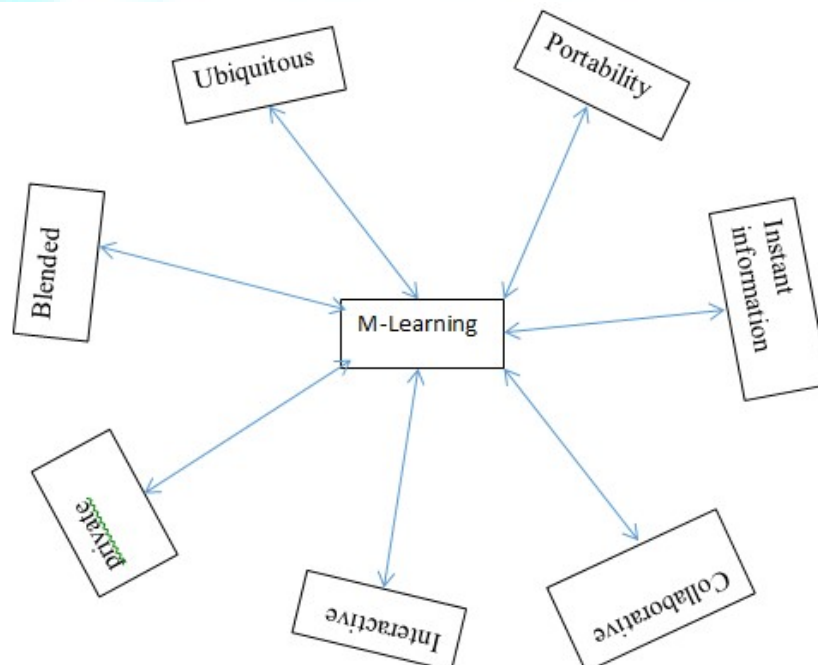


Figure 2: Characteristics of M-Learning

Figure 2 above shows the major characteristics of M-learning. The major characteristics of mobile learning include the ubiquitous and portable size of mobile tools; blended learning; private; interactive; collaborative;

and instant information. This set of characteristics positions the user (learner) on how to purposefully make use of the M-learning system. These attributes give the learner the opportunity to locate and make apt use of the resources made available by the teacher or tutor.

4. Design and Development of M-Learning

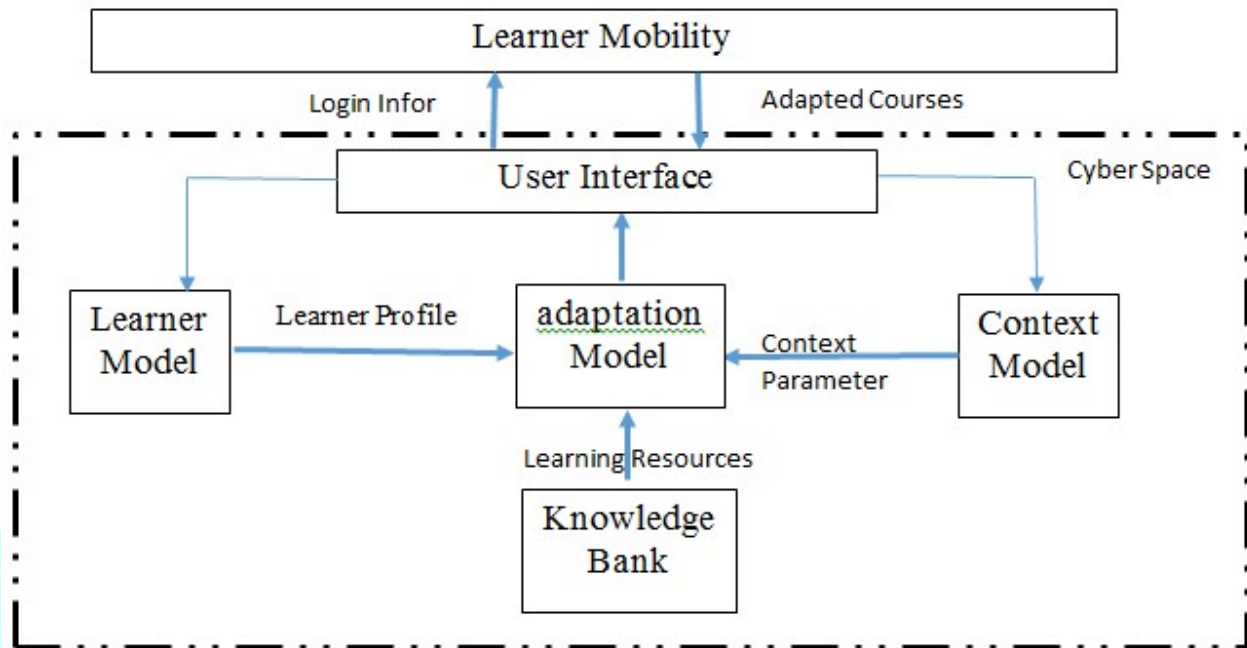


Figure 3: Architectural Design of Mobile Learning System

Source: https://www.researchgate.net/figure/Mobile-learning-system-architecture_fig1_331253759

As shown in figure 3 above, a mobile learning system (MLS) must have in its built-in functions the ability to provide users (learners) with access to learning without restriction of time and space. An MLS has an access gate that allows users to communicate with the system via the user interface.

The MLS constitutes different sub units that perform specific tasks but communicate constantly for the purpose of accomplishing the aim. The MLS's basic units are as follows: user interface (a means of providing the user with ease of operation); learner model (an organised representation of the learner's knowledge, misconceptions, and difficulties); context model (communication tools specifically designed or used to represent the learner's situation or state); knowledge bank (a collection and storage of information that controls the total premises of the system); and adaptive model (an adaptive wand).

5. Mobile Learning's Future

The future of mobile learning depends greatly on its main project potential. These main potentials that determine the future of M-learning are strictly linked or tied to the technological advertisement of mobile devices.

The introduction of technology has drastically changed the mode in which humans operate, previously unimaginably. Technology at present has granted us the enablement of carrying out our daily activities in such a manner that information can be accessed in an unparalleled manner. The steady growth of technology is a clear indication that the best of M-learning is yet to come as it has moved from desk-top to mobile devices.

The future of mobile learning will be greatly determined by two major variables known as: device usability (DU) and technological changes (TC). The ability of the learner(s) to make appropriate use of the features provided by mobile devices; ownership of a mobile device; and integration of mobile technology into the classroom are all aspects of DU. These three variables constitute the components of DU. The second variable that will also play a major role in the future of M-learning is technological changes.

Following the current trend in technology, in the year 2030 m-learning will become better than its current state. The M-devices that provide M-learning activities will tend to have the following features:

1. An improved power capacity (battery saving capability)
2. Accessibility to mobile devices
3. The affordability of mobile devices
4. No language barrier.
5. A large number of datasets will be analysed using M-devices.

Conclusion

M-learning designers must be adequately informed of the characteristics and components of M-learning and its future for effective inclusion of M-learning in the hub of education. M-learning should take into account components and attributes such as the cost of purchasing a device, the ability of the learner to use the device, and the inclusion of other languages not previously provided for. These are the areas researchers must consider in their continuing quest to improve the design characteristics of M-learning and its implementation with the aim of establishing effective criteria for M-learning design.

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