

# MOBILE LEARNING FRAMEWORK

Ali Mostakhdemin-Hosseini  
*Helsinki University of Technology*  
*konemiehentie 2*  
*Espoo Finland*

Jarno Tuimala  
*Innoforss Research &/ Development Center*  
*Wanherinkatu 11 3 krs.*  
*30100 Forssa*  
*Finland*

## ABSTRACT

Mobile learning is not learning through mobiles phones or learning over a wireless connection even though the capabilities of running multimedia features has increased in recent years. But mobile learning is the evolution of e-learning, which completes the missing component of an e-learning solution. Mobile learning most suits for those mobile parties in education institutes. So, utilizing mobile devices in education is mainly considered as enhanced tools.

## KEYWORDS

Mobile learning, Prototype evaluation, Mobile learning framework

## 1. INTRODUCTION

Unlike PC, mobile devices have some restriction for displaying content e.g. screen size and resolution. When designing user interface for mobile devices, especially for heterogeneous environments, we have to consider the special user requirements, as well as, the capabilities of the devices (Calvary et al. 2001) and (Roth et al. 2000). As (McClard et. Al. 2000) have stated, the portable devices are not a replacement for the PC. There has been extensive research and study in recent years both from technical and pedagogical points of mobile learning system. Nowadays-mobile devices are equipped with multimedia capabilities and high screen resolutions. Research shows that the multimedia is a promising tool for solving some of the problems but it cannot be claimed that learning with multimedia would be more effective or that it would automatically increase the quality of learning (Mustajärvi, 1998). Even though the new multimedia phones may not guarantee the learning, it is an encouraging factor to mobile phones' users to utilize it in different sectors including in an education institute.

There has been extensive progress in m learning since this study was initiated. Basically, the term has been defined more precisely (Brown, 2003).

1. Ubiquitous Computing- all members of the academic community have appropriate and timely access to the Internet, usually via a computer they own. Access may be either by desktop or laptop or handheld.
2. Portable Computing- same as #1 except computer must be laptop
3. Mobile Computing- same as #2 except laptop must be wireless
4. Very mobile Computing- same as #3 (i.e. wireless) except that the computer is a Palm Pilot, Blackberry or Equivalent.

At the same time the applications of the mobile devices such as Palm Pilot in different education groups, have been increased, such as Palm Pilot Medical Applications.

Almost all e-learning companies are now either already utilizing mobile devices or due to release a new e-learning system enhanced with mobile devices.

## 2. FRAMEWORK OF MOBLIE LEARNING APPLICATION

Based on the users study conducted at Helsinki University of Technology and analyzed the gathered data (Mostakhdemin-Hosseini et.al, 2004) this study defined the framework of the mobile learning system. The Mobile learning system development is based on three main domains, Mobile usability, wireless technology and e-learning system. Figure 1 presents an overview of different domains in the mobile learning system

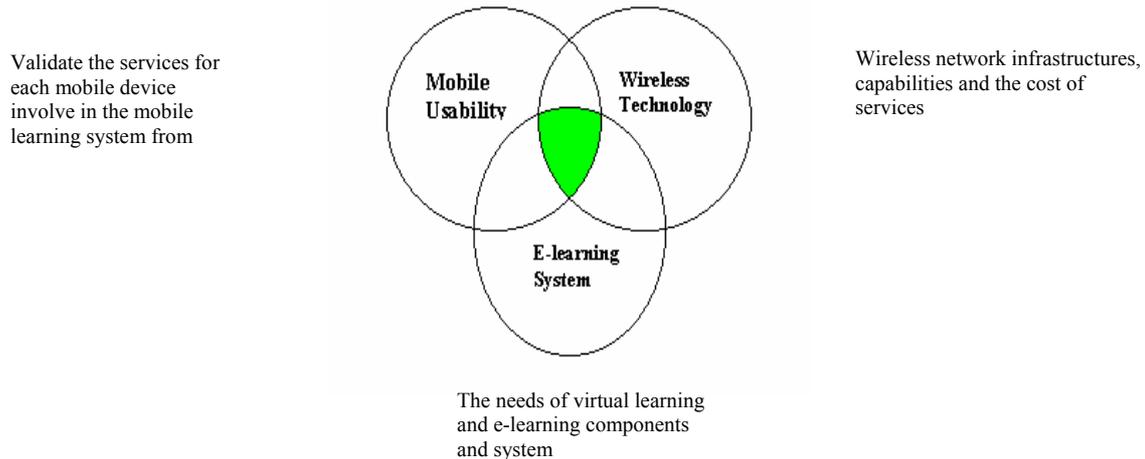


Figure 1. The domain of mobile learning system

The detailed description of each domain and their contributions to the mobile learning system are presented below. Also for each domain the main criteria, which must be considered during developing the mobile learning system, are revealed. Mobile usability is the main domain in the mobile learning system. Issues, which involve mobile devices' usability, are as such as mobile device type, mobile device features and mobile content design methods.

The contributions of mobile usability research to this study assists to identify the requirements of each mobile device capability to offer services in a usable manner. Providing services for mobile devices without considering the usability issues is a useless effort. Users utilize the mobile devices and use the services if they feel that services are usable and do not consume extra time. The main issue, which should be study carefully when developing education services for mobile devices, is the content of the mobile services, the services types, requirement of each service and the service limitations.

The second essential element of mobile learning system is the network connection, especially wireless network technology. Issues, which are related to the wireless networks which directly influence the mobile learning systems, are network infrastructure and operators rolls.

The unique feature of the m- learning system is the mobility. The users utilize the mobile devices if the network provides fast, secure and reliable network connections. Also the users are willing to pay a reasonable amount of money for the services they receive. The network must provide the basic connection as well as the features requirement by the services in order to provide content for mobile devices to enable them to be usable and efficient enough. The existing wireless technologies and the services they provide are presented in the following figure.

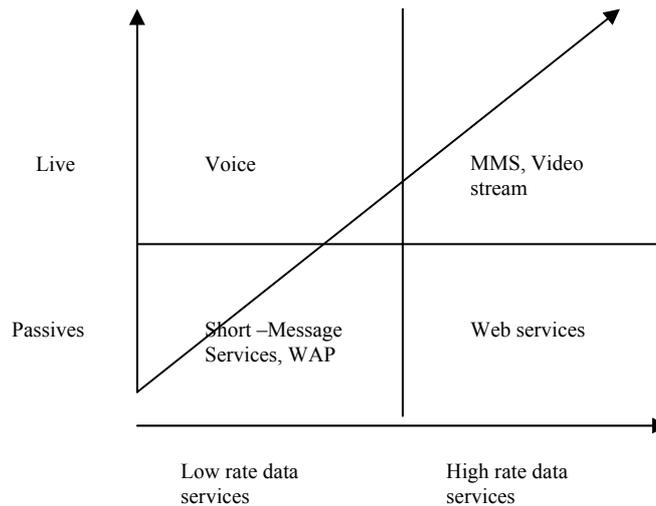


Figure 2. The services and the network capacities

The wireless technology's considerations for developing the mobile learning system are essential to be revealed in advanced. The type of network infrastructure and the cost of the services for the potential mobile learning system are the important factors that effect the overall mobile learning system.

The final domain, which affects the mobile learning system, is the exiting e-learning concept. The mobile devices were enhanced to the existing e-learning systems. Issues related to e-learning, which affects the mobile learning system, is the requirements of the e- learning system and the type of utilized e-learning platform. The e-learning platform will influence greatly the mobile learning system (adaptive system is more complex than the typical e-learning system). And user groups will influence the selection of e-learning types and also the distribution of services to the mobile devices. Besides the recommendations and reminders, the mobile learning system's developer has to consider the following issues for developing the mobile learning system.

- Define the education components and services, required by the mobile learning system. These components and services depend to the type of course.
- Identify the existing wireless network capabilities and boundaries. If there are different networks, select the one, which is most appropriate for the education components and mobile devices capabilities.
- Determine the types of mobile devices, which are intended to be utilized in the system.
- Distribute the education components and services based on network capabilities and usability requirements of each mobile device.
- Write scenarios, which express the mobile learning system. In the scenarios all the components are distributed to appropriate devices with consideration of their capabilities and the usability requirements.
- Design prototype based on the scenarios. It is important to follow the usability guideline for each device very carefully.
- Test and validate the concept and service distributions to different devices.

Mobile learning system development process requires many steps. In the following figure the overview of the steps are presented.

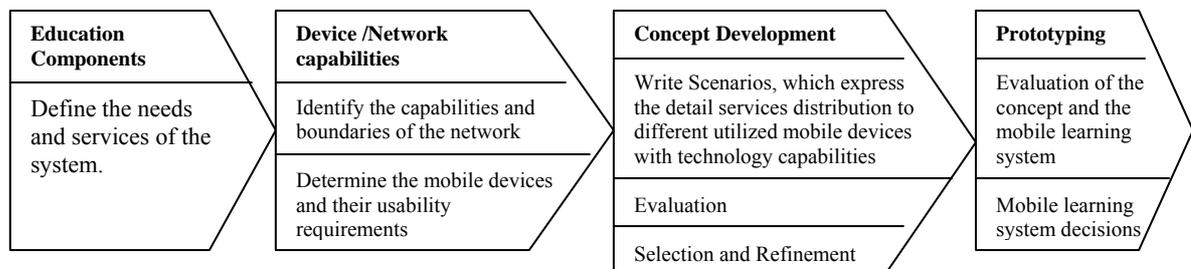


Figure 3. Framework of the mobile learning system development and evaluation

## 2.1. Prototype of the Mobile Learning System

The prototype were designed and developed based on user studied conducted at Helsinki University of Technology and existing wireless technology. The prototype was tested with actual users (students and staff) at Hame polytechnic. Before evaluation of the m-learning system the test users were briefed and then they were given predefined tasks to carry out individually. The gathered data were analysed which the results of the prototype assessment were very promising. The prototype design process (Mostakhdemin-Hosseini et.al, 2004) and evaluation results (Mostakhdemin-Hosseini et.al, 2005) were presented on the IADIS conference.

The following figure shows the use case of the designed prototype.

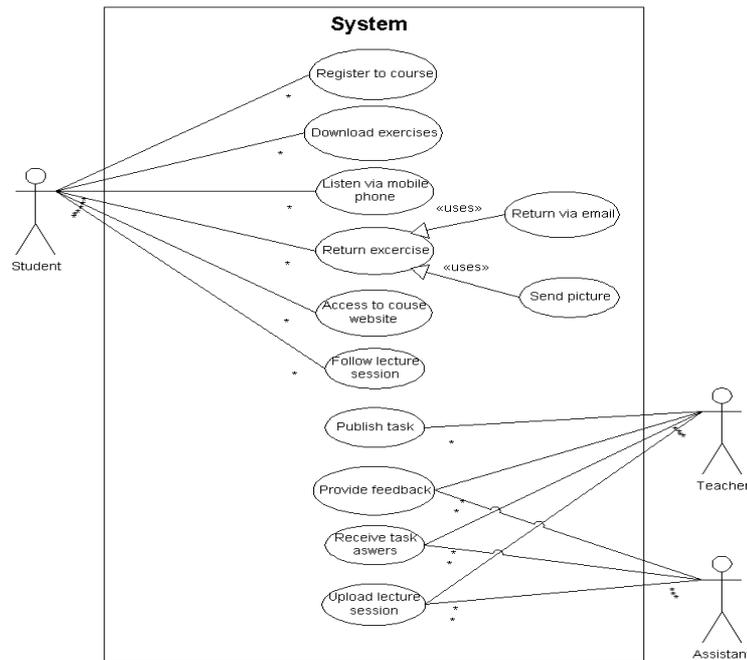


Figure 4. The use case diagram of the designed prototype

## 3. M-LEARNING PROTOTYPE ASSESMENT AND THE MOBILE LEARNING FRAMEWORK

The process of designing and evaluating the mobile learning system prototype revealed the framework of the m-learning system importance. It is obvious that this framework can not be utilized in all type s of the mobile learning system. Answers to the following question clarify the mentioned framework application.

What kinds of courses can be used in this framework?

Mobile Learning is about providing resources to all students regardless of the time and place. By overcoming the current challenges and restrictions such as network coverage, mobile phones memory size and input out facilities etc. the mobile learning system is usable and possible in all kinds of courses offered in computer science departments at Helsinki University of Technology. However, this research has not considered courses like software engineer lab or any other project based courses. Utilizing the framework for the mentioned type courses requires reviewing the framework structures and redistributes the actions and services based on the course requirements. The mobile learning system is usable for those students and employees who are on the move most of the time. In this system all students and teachers have an equal opportunity to have access to the course material and recourses, assignments, presentation and communications including newsgroup, chat and e-mail. Students and teachers do not need to wait for available computers, in order to perform their course responsibilities when they are on the move.

A special value for students is to have instant access to course resources whenever needed, they are able to return assignments and receive feedback, and they are able to communicate with the course staff and other students.

A special value for teachers and course staff, the obvious value is that teachers are sure that the lecture presentation and materials are accessible to all students regardless of time and places. The teachers or the system are able to provide instant feedback to students' assignment; this can be considered as an encouraging reward for students. Teachers and other staff have direct access to students and can solve their problem news group. The teachers are able to inform others of any changes to the schedules almost instantly. By having direct access to the feedback database the teacher can evaluate his / her progress in the course.

#### 4. CONCLUSION

Different factors involve for developing mobile learning system which these factors are classified as mobile usability, network capabilities and e-learning components. In this paper the importance of each factor are argued. Even though this study was conducted during 2002 but still these factors are utilizable in various m-learning applications.

The assessment of the m-learning systems developed based on the mentioned platform shows that the students and staff are willing to enhanced m-learning system in their education process. At the time of the assessment there were many restrictions for implementing the exact functional prototype. The main abstractions for the development of the prototype were the network capabilities and the deficiency of deploying self developed application on mobile devices. Results of the evolution of prototype showed that designing m-learning system required the mentioned platform to be care fully study in advance.

The evaluation revealed that video stream plays an important role in the mobile learning system. The current wireless bandwidth is hardly sufficient enough to enable streaming video over a PDA and mobile phones. However, the proposed 3G network is capable of offering real time, streaming access to archived or live video. It is worthwhile to study and extend the mobile learning framework where the system user is able to have access to the lecture in real-time independent from time and places.

The current wireless network capability (gprs) and the mobile devices such as Nokia smart phones (7710) and Palm Trion provide appropriate combination to assess the above mentioned framework in more detail. The gprs provides faster data exchange connection and the new phones have bigger screen size with higher resolutions. These combinations enable designers to design, deploy and run appropriate m-learning applications to these devices which capable to exchange data in higher rate. The importance of the usability and the e-learning components are considerably differing from the proto design carried out previously.

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