M-Learning: Understanding the Scope and Technologies

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Abstract

The growing use of wireless technology and mobile devices put forward the use of mobile devices in the teaching and learning process. Mobile technologies offer new opportunities for learning and enable people to collaborate anywhere. A major benefit of using wireless mobile technology is to reach people who live in remote locations where there are no educational facilities are available. This paper discusses the basic aspects of m-learning. Portability, social interaction, connectivity are some of basic parameters of learning. M-learning is impossible without the use of the mobile devices, Smart phone, PDA, Tablet PC today are popular along with common mobile devices. These mobile devices work on operating systems (OS) such as Symbian OS, Microsoft Windows Mobile, Palm OS, iPhone OS, and Android etc. For mobile application development, Sun Microsystems designed the Java 2 Micro Edition (J2ME) , an Application Programming Interface (API) to develop software for small and resource-constrained devices. Scope of Mobile Learning can be found in corporate sector, for education and in rural development. The paper also discusses the M-Learning initiatives in India made by different organizations.

Keywords

M-Learning, Mobile Devices, Smart Phone, Mobile Operating System, Mobile Software, API, MIDP

I. Introduction

There are billions mobile phone users in the world today. The ever-increasing use of wireless technology and mobile devices put forward that training and education sectors cannot ignore the use of mobile devices in the teaching and learning process. Mobile technologies offer new opportunities for learning and enable people to collaborate anywhere. A major benefit of using wireless mobile technology is to reach people who live in remote locations where there are no educational facilities are available [1]. Mobiles are already in use as tools for education on many campuses. New interfaces, the ability to connect to wi-fi and GPS in addition to a variety of cellular networks, and the availability of third-party applications have created a device with nearly infinite possibilities for education, networking, and personal productivity [2].

II. Technologies for M-Learning

There are different types of technologies for M-learning, it includes different mobile devices like tablet pc, smart phone, PDA etc, Mobile operating systems and mobile software.

A. Mobile Devices

M-learning is impossible without the use of the mobile devices. They vary significantly in their abilities, sizes and prices. The common ability which united them is their mobility and possibility to make wireless connections. The main types of mobile devices that can be used in the education process are [3]:

1. Tablet PC

These are one of the newest mobile devices also known as table computer. They also have full range of abilities as personal computers and integrated into a flat touch screen display. These devices mostly use an onscreen virtual keyboard and a digital pen and are relatively expensive.

2. Personal Digital Assistant (PDA)

A personal digital assistant is a mobile device that functions as a personal information manager for the user. It is also known as palmtop computer. User can work will all types of files like documents, images, spreadsheet and medial files. They have small sizes and significant processor power.

3. Cellular Phones

The cellular phones primarily serve for voice communication and sending and receiving of text and Multimedia Messages (SMS and MMS). There are various types of cellular phones that has different features. The basic models are providing mainly communication and messaging facilities. The higher class models have the features like GPRS, Bluetooth, WAP, Audio, Video support etc. These are the phones which are widely used by users as there prices and comparatively low.

4. Smart Phones

They are hybrid devices which combine the abilities of cellular phones and PDA. They have smaller sizes than PDA and bigger than cellular phones. Typically they haven't full sized keyboard and can recognize handwritten text. They use Symbian, Windows Mobile or other operating system. As they have Internet browsers they have potentiality to be successfully used in the mobile multimedia education. Today there are several communication technologies which are used in mobile devices. Their abilities vary vastly as well as data transmission range and range [3].

B. Mobile Software

M-Learning involves creating learning objects for students by using mobile xhtml with CSS, or Java with XML, or video tutorials, or e-books, which are converted to handheld device compatible formats. These learning objects are interactive tutorials, which students can access asynchronously at their leisure on their mobile devices [4].

Sun Microsystems designed the Java 2 Micro Edition (J2ME) , an Application Programming Interface (API) to develop software for small and resource-constrained devices. The key element of J2ME is Mobile Information Device Profile (MIDP) which provides a standard Java runtime environment for popular mobile information devices, such as cell phones and PDAs.

Microsoft Visual Studio 2008 and ASP .NET 3.5 include support for working with XML and creating mobile Web applications. ASP .NET mobile Web pages contain ASP .NET mobile controls, which are server-side controls that send device-specific markup to the client browser. Word processing applications, presentation softwares, pdf readers all these applications are also available today for mobiles [5].

C. Mobile Operating Systems

Operating systems such as Symbian OS, Microsoft Windows Mobile, iPhone OS, and Android are some of the popular mobile operating systems. Many operating system providers have also developed SDK platform compliant to their operating system.

D. Communication Technologies

1. GSM & CDMA

GSM (Global System for Mobile telecommunications) and CDMA (Code Division Multiple Access) are the popular digital air interface standards in the world of communication.

GSM standard set developed by the European Telecommunications Standards Institute (ETSI) to describe technologies for second generation (2G) digital cellular networks [6].

CDMA, another popular standard. used for digital communication, and wireless technology in particular, that involves multiplexing. Whereas conventional communication systems use constant frequencies, CDMA uses multiple access, or multiplexing [7].

2. GPRS, WAP & EDGE

GPRS (General Packet radio service)and WAP (Wireless Application Protocol) allows user to enjoy a continuous wireless connection to Internet and access favorite web sites, entertainment services and other web applications. With WAP, GPRS, user can go online on cell phone.

EDGE (Enhanced Data rates for GSM Evolution), standard is based on the GSM standard. EDGE is used for the purpose of wireless data transfer, such as sharing images, audio, video , streaming or browsing the Internet via a mobile phone connection. This is because the technology offers data transfer rates more faster than ordinary GSM networks [8].

3. Bluetooth, Infrared & Wi-Fi

These are also called as data transmission technologies and used to send data from source to destination without any wired media. These technologies eliminates the need for the cables that connect devices together and are very popular among the mobile users. Infrared has been standardized by the Infrared Data Association (IrDA). For a device to support infrared technology, it must comply with IrDA specifications. Data transmission over an infrared connection takes place over the infrared protocols [9].

Bluetooth is the name for a short-range Radio Frequency (RF) technology that operates at 2.4 GHz and is capable of transmitting voice and data. The effective range of Bluetooth devices is 32 feet (10 meters). Bluetooth transfers data at the rate of 1 Mbps, which is from three to eight times the average speed of parallel and serial ports, respectively. It is also known as the IEEE 802.15 standards [10]. Bluetooth is more suited for connecting two point-to-point devices. Wi-Fi (Wireless Fidelity), is a wireless networking technology used across the globe for wireless communication. person with a Wi-Fi device, such as a computer, telephone, or Personal Digital Aassistant (PDA) can connect to the Internet when in proximity of an access point. The region covered by one or several access points is called a hotspot [11].

III. Scope of Mobile Learning

For Business Professionals: In era of technology, companies always have to update their infrastructure and technology. M-learning can be useful in providing professional training to business employees to make themselves compatible with new technology. Applications can be developed that will provide practical instructions via sms

to the user for certain project.

A. For Education

M-learning as name itself indicate can be useful for teaching learning process. Different applications can be developed for this purpose. For example, application development can be undertaken for child education that will enable learning of primary English education, simple mathematics. Mobile games can be developed that will help to improve logic of student. Similarly M-learning can be also useful in higher education. Third-party educational applications are readily available for the newest mobiles, and educational content is easy to find for almost every discipline.

B. For Rural Development

Today mobile phone have reached to in depth rural area where yet other services have not reached. In this concern M-learning can be useful for rural development. Literacy initiative can be undertaken. Training can be provided to rural people so that they could get the benefits of technology era.

IV. Appropriate Contents for M-learning

A common question have been always asked that what kind of education that can be provided with m-learning or what type of contents that can be delivered through m-learning?. The answer can be ,'depends on need' but we have to consider the facts and have to provide a descriptive answer.

M-learning is new stage of learning. Certainly today the technologies have been increased in last few years. Today we have the Tablet pcs & Smart phones which have great processing and storage capabilities and powerful multimedia facilities. But it is the fact that due to financial barriers most of the peoples among the mobile users use common mobile phone called budget phone which has certain limitations. So, while designing the m-learning system we have consider this fact. Considering this mobile learning and contents can be in form of small audio/video clips or text.

C. Short Learning Contents

Rather than providing lengthy contents, provide short contents so that a particular topic/subtopic can be covered in time span of 05 to10 minutes. It may be audio or video formats like mp3, mp4, 3gp etc which is recognized by any basic multimedia mobile device.

D. Text Contents

Many mobile devices support documents. Contents can be delivered in form of text may through message or text files like doc or pdf.

E. Quiz and Assignments

As a part of course evaluation, questions inform of quiz like multiple choice questions, true false type questions and assignments can be deployed to a mobile device

V. Limitations

Every technology has some limitations and weaknesses, and mobile devices are no exception. Some of the disadvantages of m-learning through mobile devices are:

- The small screen of a mobile device limits the amount and type of information that can be displayed at a given time.
- Budget phones has the limited storage capacity although higher range smart phone , PDA doesn't have such problem.
- Short battery life can interrupt the process and may cause the

loss of important data.. It is important to have fully functional devices and batteries have to be charged regularly.

• Bandwidth may degrade with increasing users when using wireless networks.

VI. M-Learning: Indian Scenario

In India, the mobile phone has revolutionized communication and India is now one of the fastest growing markets for mobile phone services, with growing usage and increasing diffusion. According to TRAI, in Feb-2012, there are 911.17 million wireless subscribers in India.[12]. Also according to annual report of TRAI 346.67 million were capable of accessing data services [13].

The increasing use of mobile phones provides the opportunity for it to be used as a learning tool. It would be a great thing if we were able to leverage it to improve socio-economic conditions in our vast population.

Ministry of HRD, government of India, has launches the "Aakash" an android based tablet PC, which is manufactured by datawind with Indian Institute of technology Rajsthan. Also India's leading public sector telecom operator BSNL has come out with an extremely low cost tablet of its own. Manufactured by Noida based Pantel Technologies, the Penta IS701R tablet has WiFi. Expected that, these devices will be available on reasonable price.

Also, there number mobile devices and table PC from different manufactures are available at affordable prices with good features. Considering India's widespread nature, certainly this scenario can be very useful to utilize the technology for education.

VII. Conclusion

Growing number of mobile phone users and development in mobile technology opens the doors for mobile learning. Mobile technologies offer new opportunities for learning and enable people to collaborate anywhere. Mobile learning can be useful for business, education and rural development. Short learning contents, Text contents , quiz and assignment can be better contents for m-learning. Small Screen size, battery life and bandwidth issue could be turn as obstacles for this paradigm. Efforts are required to solve these issues. In Indian Context, Development of low cost Tablet PC like 'Aakash' , certainly provides the opportunity to boost up the mobile technology uses in education.

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