Moving Toward M-learning by using WAP Technology

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ABSTRACT

This paper investigates the move to a new era of learning by using mobility technology. M-learning is distinct in its focus on learning across contexts and learning with mobile devices. It takes advantage of learning opportunities offered by using mobile devices and wireless transmission to enhance the existing learning management systems (LMS) that can potentially provide important opportunities for learning and collaborative interaction. Moodle is one of the most attractive LMS around the world due to its outstanding features and reliability. Although portable technology offered anywhere-anytime discussions, the technical problems encountered when using the WAP-enabled phones hindered participation in the e-discussions. In addition to presenting technical aspects of the WAP, the paper also introduce the advantages and disadvantages of using mobile technology in the learning process. Furthermore, this paper discusses the suitability and feasibility of using WAP technology devices for distance learning in real-time.

Keywords: e-learning, m-learning, WAP, LMS

1. INTRODUCTION

M-learning, or "mobile learning", now commonly abbreviated to "m-learning", has different meanings for different communities. Although related to e-learning and distance education, it is distinct in its focus on learning across contexts and learning with mobile devices. One definition of mobile learning is: learning that happens across locations, or that takes advantage of learning opportunities offered by portable technologies.

Using m-learning with LMS means facilitating such learning platforms with portable technologies where the focus is on the technology, and also learning across contexts where the focus is on the mobility of the learner. Interacting with portable or fixed technology and learning in a mobile society with a focus on how society and its institutions can accommodate and support the learning of an increasingly mobile population.

The technology nowadays is making great change in the society and people lifestyle and also the need for continues learning. This calls for a fundamental redesign of the learning environment in education institutions, away from the traditional didactic, tutors-as-fountain-of-knowledge model of instruction, and towards the social constructivist perspective of learning.

As technology rapidly advances, new ideas for learning will also emerge. Computer-mediated communication (CMC) facilitates the development of such learning communities. In the broadest sense, CMC refers to any communication via computers; common applications include e-mail, online bulletin board, and online chat. The most important educational affordance of CMC lies in its connectivity: it connects learners at different geographical locations beyond the boundaries of classrooms; allows learners to exchange information within a short period of time synchronously or asynchronously; and provides the flexibility for one-to-one, one-to-many and many-to-many communication. Connectivity among learners is critical for a learning community.

New technologies such as Wireless Application Protocol (WAP), General Packet Radio Service (GPRS) and 3G (3rd Generation) technologies further augment the educational potential of CMC by allowing learners and tutors access to the Internet, anywhere and anytime, via the micro browser equipped mobile phone.

The concept of m-learning is an evolving trend in education at all levels. Even classrooms with younger children are benefiting from the use of hand-held and laptop computers.

Research into new the technologies that enhance instructional activities will continue to help the educational community as it embraces the idea of anytime, anywhere learning. M-learning is not just about readily accessible information; it opens up the possibility for the delivery of multimedia information, interactive learning and assessment, and real-time distance collaboration.

Recent advancement in mobile and wireless technology as basic requirements of WAP applications has helped to improve commerce [1]-[4] and services [5] [6]. Mobile technology is strategic to many organizations and activities [7] [8]. Education is no exception! The use of mobile technology has not only extended desktop-based online learning environment into the mobile and wireless channel but also enabled education to take place anytime, anywhere. The use of mobile

technology in education is also known as "mobile education" or "m-education".

Mobile technologies have provided unique opportunities for educators to deliver educational materials efficiently, and to support the cognitive and social process of student learning. Educational materials can be delivered to students through mobile devices. Students can communicate and interact with peer students and educators in real-time using mobile technology. Mobile technology can also be integrated into curriculum design to improve interactivity in the classroom.

Applications of WAP technology in education can provide benefits to both students and educators. WAP technology provides greater flexibility in student learning. Students can have access to educational materials through their WAP enabled mobile devices, which enable them to learn as and when the need arises and when the time is right for them, no matter where they are, even when they are on the move. With mobile devices, educational materials are not only readily available to students but they can also be delivered to students based on their needs and preferences [9, 10].

In this paper, the technical overview of WAP technology is presented in section two. A full description of the Arab Open University (AOU) LMS and the using of WAP technology is presented in section three. Section four concludes this paper.

2. TECHNICAL OVERVIEW

Wireless Application Protocol (WAP), a secure specification that allows users to access information instantly via handheld wireless devices such as mobile phones, pagers, two-way radios, Smart phone and communicators.

WAP is designed to make user-friendly and innovative data applications for mobile phones easy and three types of terminals have been defined:

- Feature phones, which offer high voice quality with the capability of text messaging and Internet browsing;
- Smart phones, with similar functionality but with larger display (the Ericsson R380 is a smart phone);
- The communicator, which is an advanced terminal designed with the mobile professional in mind, similar in size to a palm-top with a large display.

WAP supports most wireless networks. These include CDPD, CDMA, GSM, PDC, PHS, TDMA, FLEX, ReFLEX, iDEN, TETRA, DECT, DataTAC, and Mobitex. WAP is supported by all operating systems. Ones specifically engineered for handheld devices include PalmOS, EPOC, Windows CE, FLEXOS, OS/9, and JavaOS.

WAPs that use displays and access the Internet run what are called micro browsers; browsers with small file sizes that can accommodate the low memory constraints of handheld devices and the low-bandwidth constraints of a wireless-handheld network.
Although WAP supports HTML and XML, the WML language (an XML application) is specifically devised for small screens and one-hand navigation without a keyboard. WML is scalable from two-line text displays up through graphic screens found on items such as smart phones and communicators.
WAP also supports WML Script. It is similar to JavaScript, but makes minimal demands on memory and CPU power because it does not contain many of the unnecessary functions found in other scripting languages. Because WAP is fairly new, it is not a formal standard yet. It is still an initiative that was started by Unwired Planet, Motorola, Nokia, and Ericsson.

WAP uses *Wireless Markup Language* (WML), which includes the Handheld Device Markup Language (HDML) developed by Phone.com. WML can also trace its roots to *eXtensible Markup Language* (XML). A markup language is a way of adding information to your content that tells the device receiving the content and what to do with it. The best known markup language is *Hypertext Markup Language* (HTML). Unlike HTML, WML is considered a Meta language. Basically, this means that in addition to providing predefined tags, WML lets you design your own markup language components. WAP also allows the use of standard Internet protocols such as UDP, IP and XML.

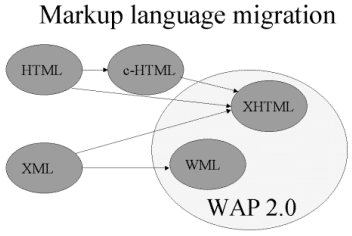

Figure 1. Migration of Markup language

There are three main reasons why wireless Internet needs the Wireless Application Protocol:

- Transfer speed: most cell phones and Web-enabled PDAs have data transfer rates of 14.4 Kbps or less. Compare this to a typical 56 Kbps modem, a cable modem or a DSL connection. Most Web pages today are full of graphics that would take an unbearably long time to download at 14.4 Kbps. Wireless Internet content is typically text-based in order to solve this problem.
- Size and readability: the relatively small size of the LCD on a cell phone or PDA presents another challenge. Most Web pages are designed for a resolution of 640x480 pixels,

which is fine if you are reading on a desktop or a laptop. The page simply does not fit on a wireless device's display, which might be 150x150 pixels. Also, the majority of wireless devices use monochrome screens. Pages are harder to read when font and background colors become similar shades of gray.

- Navigation: navigation is another issue. You make your way through a Web page with points and clicks using a mouse; but if you are using a wireless device, you often use one hand to scroll keys.

WAP takes each of these limitations into account and provides a way to work with a typical wireless device.
Here's what happens when you access a Web site using a WAP-enabled device:

- You turn on the device and open the mini-browser.
- The device sends out a radio signal, searching for service.
- A connection is made with your service provider.
- You select a Web site that you wish to view.
- A request is sent to a gateway server using WAP.
- The gateway server retrieves the information via HTTP from the Web site.
- The gateway server encodes the HTTP data as WML.
- The WML-encoded data is sent to your device.
- You see the wireless Internet version of the Web page you selected.

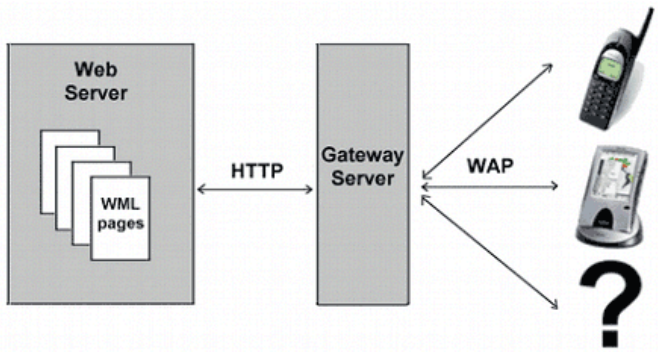

Figure 2. WAP Technology Infrastructure

Although WML is well suited to most mundane content delivery tasks, it falls short of being useful for database integration or extremely dynamic content. PHP fills this gap quite nicely-integrating into most databases and other Web structures and languages. It's possible to "cross-breed" mime types in Apache to enable PHP to deliver WML content. WML pages are often called "decks". A deck contains a set of cards. A card element can contain text, markup, links, input-fields, tasks, images and more. Cards can be related to each other with links.

When a WML page is accessed from a mobile phone, all the cards in the page are downloaded from the WAP server. Navigation between the cards is done by the phone computer (inside the phone) without any extra access communications to the server.

Finally, it is important to know that the availability, mobility, and performance of WAP technology depend on five major areas [14]:

1. Platform, the majority of PDAs nd cellular phones being produced have embedded in them some type of Web browsing technology.
2. Connectivity, the true wireless connectivity is wireless Radio Frequency (RF). The wireless communication categories are Wireless Local Area Network (WLAN), and Wireless Wide Area Network (WWW). Training sites at corporations and students at universities use wireless connectivity to facilitate access to information, information exchanges and learning [15].
3. Wireless Middleware, provides services specific to the world of wireless and handheld computing. Wireless middleware services are secure communication management, synchronization, message processing and management tools [13].
4. Back-End System, handheld and wireless computing extends the reach of corporate data and corporate transaction engines. The data stored on a Web site, mainframe, UNIX server, or an Oracle database.
5. Security, in a wireless world, security includes communication links, integrity of the channel, and accuracy of transactions.

3. WAP TECHNOLOGY USED IN AOU-LMS

AOU has a pioneer experience of developing and integrating the well known learning management system Moodle. It is a free open source LMS that has been used widely in many educational and commercial institutes around the world [ ].
One of our recent integrations of our LMS is the use of WAP technology to mediate the system learning tools such as forums, chat rooms, and announcements. In the next paragraph, we will discuss integration opportunities and limitations of WAP technology for supporting a learning community.

As a component tool of AOU-LMS courses websites, students have the opportunity of using the integrating instructional technology effectively into their classroom practices. There are approximately 25% of face-to-face tutorial lessons for each course and the remainder of 75% of the course time is delivered using online e-learning activities. AOU has adopted Moodle, an online learning delivery and management system that allows students to learn independently and tutors to customize the online learning package according to their students' needs. Students are equipped with WAP enabled mobile phones to participate in the m-learning activities.

A mobile telecommunication service provider provides the mobile phones and the WAP services subscriptions.

Students have the choice of using the e-learning tools via Moodle from their personal computers or via their WAP enabled mobiles using the WAP technology. All e-discussions took place at the class level, consisting of students and a tutor. In-house software developers developed a WAP-based e-discussion application to allow the students in the study to access the e-discussion forums via their WAP-enabled phones.

In this application, the tutor was able to do the administrative function, namely to manage the forums and his group, and to carry the discussion with his students via the WAP-enabled phones. Students logged on to the e-discussion via their phones to discuss with other classmates and the tutor. They created new threads, viewed threads, replied to and deleted messages. There are at least three forums for each course; extra forums can be added as required. One forum of a particular course is on case studies.

During a study of the WAP services, it was observed that students experienced difficulties in using the WAP-enabled phones as a result of slow transmission speed, navigational problems and short battery life. On the other hand, WAP technology offers opportunities for e-discussions in a learning community. It has been observed that WAP technology had helped to build a learning community. We believe that WAP technology have mediated the formation of a closely-knit group where everyone is able to participate and learn from one another. Its mobility is offering the tutor and students anytime-anywhere participation in the e-discussion forums. This opportunity for anytime-anywhere participation might motivate students to participate in the e-discussion forums.

The main limitation of WAP technology is the technical problems of using the WAP-enabled phones. These problems include:

- Short life span of the phone battery,
- Difficulties in logging into the WAP-based forums,
- Slow transmission, failure to send and the need to re-send messages,
- Navigational problems, it is difficult to read and browse the messages on the small screen of the phone.
- Difficulties to key in messages using the WAP-enabled phones.

Technical problems are not the most critical, but the first, hurdle that must be crossed. Improving the technical capabilities of the WAP-enabled phones would encourage more participation in the WAP-based forums, and might even enhance the quality of WAP-based messages.

When comparing the mobile network to the fixed network there seems to be many limitations, as already discussed. The mobile network also provides unique advantages or features such as the position or location of the device and personalization (both user preferences and device capabilities). The WAP language supports these features of Positioning and Personalization. A WAP language component supports User Profiles which contains information on the user preferences and the device capabilities.

Furthermore, current WAP technology makes it best suited to particular aspects of m-learning courses, such as:

- Quick reminders and alerts
- Communication with peers and managers
- Multiple-choice quizzes with immediate feedback
- Daily tips
- Glossary information
- Browsing m-learning course material
- Searching for specific information within a topic
- Links to WAP sites
- Course registration

4. CONCLUSION

This paper has explored the opportunities and limitations of WAP technology in mediating m-learning tools to build a learning community. Although WAP technology offered anywhere-anytime discussions, the technical problems encountered when using the WAP-enabled phones hindered participation in the e-discussions. The complementary use of WAP technology with WEB technology may address some of these problems. The use of a language that is informal helps to address the problems of keying in messages when using the WAP-enabled phones and the short battery life span.
To make WAP-based discussions a more successful online communication technology for education, we must continuously refine our research plans and explore future areas of research. More studies may be conducted to explore the possible ways to make WAP technology a successful social and cognitive tool for facilitating individual learning and enhancing the social construction of knowledge. The technical aspects of the WAP-enabled phones may also need to be considered seriously in the future development of WAP technology with respect to e-discussions and/or learning.
These will then help to establish guidelines for integrating emerging technologies into education.

In conclusion, WAP is suitable for the creation of mobile learning training course material. The optimization of WAP and the handling of the design challenges make it feasible to use mobile handheld devices for distance learning in real-time. The application developer must always be aware of the user and take into account the usability issues if the application is to be a success.

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