Chapter XVI
Assessing the Benefits of AJAX in Mobile Learning Systems Design

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ABSTRACT

Mobile technologies are rapidly changing our lives with increasing numbers of services supported by mobile devices, including Web-based learning applications, providing opportunities for people to study anytime and anywhere. However, using Web-based mobile applications to present learning resources is a challenge for developers because the performance of the mobile Internet over GPRS networks is often unacceptably slow. A new Web development model, Ajax, may help to address this problem. Ajax (asynchronous JavaScript and XML), is an approach to Web application development that uses client-side scripting to reduce traffic between client and server and provide a seamless user application experience. In this chapter, we address the question of whether mobile Ajax provides measurable performance advantages over non-Ajax mobile learning applications. An empirical study was undertaken to measure mobile learning application performance over a GPRS network, comparing an Ajax application and an active server pages (ASP) application with identical functionality. Our results suggest that mobile Ajax can reduce the bandwidth requirement by around 70 percent, and cut the server’s response time in half. In addition, these performance improvements were noticed by users in our small group usability test.
INTRODUCTION

We live in an information society where learning becomes ever more important, and not all of this learning can take place in a static environment. The mobile revolution is changing our lives and can also facilitate new learning processes, but learners need educational services with a fast response speed and good user interaction if mobile learning systems are to be readily adopted.

An increasing number of people have been using mobile Internet access through wireless networks (Church, Smyth, Cotter, & Bradley, 2007), but due to the limitations of the mobile communications infrastructure and hardware this can still be very problematic. There are a number of reasons, for example: small device screens, high network latency, low bandwidth and interaction complexity (Chakravorty & Pratt, 2002). Such weaknesses can impede the mobile learning process.

The poor performance of commonly used wireless networks such as GSM (global system for mobile communications) and its associated digital packet switched data service, GPRS (general packet radio service) is a major problem for mobile learning systems. There are various reasons for this poor performance, for example high and variable latency, fluctuating bandwidth, occasional link ‘blackouts’ (Chakravorty, Cartwright & Pratt, 2002), packet loss, and link outages. Sometimes, even simple requests can lead to long delays (Stuckmann, Ehlers & Wouters, 2002). However, despite these problems we should recognise that one distinct feature of mobile learning over other learning activities is mobility (Leung & Chan, 2003). The GPRS mobile phone network is the most commonly used network in the world, with the widest coverage, considerably larger globally than 3G (third generation) wireless networks. Using this network for mobile learning can provide services anytime almost anywhere around the world, with extensive international roaming. In addition, although 3G was intended to resolve technological fragmentation in the wireless communications market, this has not happened in practice and there are several competing 3G technologies. Cost is also an important factor, with a large number of low cost GSM/GPRS devices on the market, and in many territories the GSM/GPRS service fee is cheaper than 3G. Therefore, despite their limitations, we will need to continue to work with GPRS systems for some time to come.

Mobile Learning Technical Challenges

The combination of wireless telecommunications and mobile computing is resulting in a transformation of the educational landscape (Alexander, 2004). The growth and rapid evolution of wireless technology have created new opportunities for the ‘anytime and anywhere’ learning paradigm (Seong, 2006) that is mobile learning.

Various researchers have defined mobile learning (m-learning) in different ways. Pinkert et al. (2003) define it as e-learning that uses mobile devices and wireless transmission. Polsani (2003) defines it as a form of education whose site of production, circulation, and consumption is the network. Traxler (2005) defines m-learning as any educational provision where the sole or dominant technologies are handheld or palmtop devices. Sharples (2005) defines it as a process of coming to know, by which learners in cooperation with their peers and teachers, construct transiently stable interpretations of their world.

Regardless, mobile learning is different from our traditional learning experience; it has its own problems and limitations. Mobile learners may feel uncomfortable because they cannot have face-to-face interaction with teachers or other students (Stodel, Thompson, & MacDonald, 2006). There are also limitations on what it can deliver. Berri, Benlamri & Atif (2006) describe it as mainly a time-constrained exercise with lightweight content-oriented instruction.
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