Impact Of Web Technologies On E-Learning: A Web Development Perspective

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ABSTRACT

The technological advances and growth of the Internet and electronic media, as well as applications that have subsequently evolved over the past few years, have led to some interesting developments in the area of E-Learning. This has resulted in the academic sector and even students looking at the E-Learning environment as an option to supplement, or perhaps even replace, the traditional classroom environment as a new method to deliver papers/courses.

This paper looks specifically at the impact of E-Learning from a Web Development perspective, focusing on Web Development technologies that are currently required to produce effective course delivery, i.e. web-page automation, multimedia, database integration, etc. This will also include some of the problems/challenges that Web Developers face in developing online training facilities and the roles of the Course Developer and the Web Developer.

1. INTRODUCTION

A great deal of research is being done in the field of online learning, and no doubt this will continue as technological advances in communications technology and Internet multimedia open up new possibilities and further advances for creating online learning environments. Most of the research is done from a trainer/student perspective and not from a web development perspective. This is important because the two approaches cannot be separated any longer. No longer can a web developer simply create a set of web pages with hypertext links to documents and sell the website off as an online learning environment.

Today's demands require a fully interactive online environment where the student can navigate through a series of lessons that are structured in a logical, informative, interesting and fun way. Sawers and Alexander (1998) mention that an important criteria in the selection of a communication tool of E-Learning is simplicity, and that it has to be easy to use for the academics and the students. Shukla, *et al.* (1999) state that "it is well established that textual data when complimented by voice and video would bring alive an on-line learning process." However, to effectively utilise these features the web developer also has to have an understanding of how courses are prepared, taught and assessed.

Likewise, the course developer needs to have an understanding of web development technicalities in order to know how to plan and prepare the course material to optimise course delivery using the available

web technologies. However, it is the web developer that needs to make it happen, and therefore needs to integrate training needs and delivery methods with web technologies. There are a wide range of approaches to follow, and what follows are a few examples - each with its own strengths and weaknesses. An overview and basic comparison of website technologies will be made between two commercial Learning Media Systems and generic web technology format. Table 1 gives a summary of the following discussion.

2. HISTORY

2.1 THE INTERNET AND HTML

According to Williams, *et al.* (1999) the internet was created by the U.S. Department of Defence in 1969 under that name ARPAnet to serve two functions, namely to share research among military, university and industry sources, and to provide a system for sustaining communication among military units in the event of a nuclear attack (p.344). Since then the uses of the Internet has exploded into virtually all areas of society, including education and E-learning.

The technological advances in creating pages that contain communication and information linking between computers resulted in a uniform format called Hypertext Mark-up Language (HTML). Kennedy and Musciano (2000) state "HTML is a document-layout and hyperlink-specification language .... The language also tells you how to make a document interactive through special hypertext links, which connect your document with other documents". Today HTML technology is capable of handling a multitude of multimedia elements; hence it is possible to create an interactive environment conducive to E-learning.

2.2 FIRST CLASS

The First Class software was developed in 1989 by Centrinity and provides a communication platform for the enterprise, government and education markets. "First Class enables educational institutions - from K-12 to higher education - to cost-effectively and securely improve overall communications and the collaborative process among educators, students and the community" (Centrinity, 2002).

This is primarily a business communication tool, but it has a number of useful features which can be used for online learning. According to Centrinity (2002) it includes: "content management, discussion boards, online assessments, chat, and grade book functionality". The First Class system has been used extensively globally and at other New Zealand academic institutions. Examples of such institutions are:

- National College of Design & Technology (NZ)
- University of Technology, Sydney (Australia)
- University of Texas (USA).

2.3 BLACKBOARD

Blackboard was founded in 1997 by Cornell University as a leading edge E-learning company "to transform the Internet into a powerful environment for teaching and learning" (BlackBoard, 2002). According to BlackBoard (2002) it is a " course management system with an advanced architecture that allows for integration with back-office systems." It also is a comprehensive "E-Learning software platform for academic institutions to serve their various constituencies-students, faculties and alumni". Blackboard has also been used extensively globally and at other New Zealand academic institutions. Examples of such institutions are:

- Adelaide University (Australia)
- Denver University (USA)
- Unitec (NZ).

3. COMPARISON OF ADVANTAGES AND DISADVANTAGES

3.1 FIRST CLASS

The Fist Class system had been historically developed as a Windows application utilising different individual windows as a concept to offer communication and deliver documentation within a secure online environment. This, however, proves to be inadequate for the purposes of a fully interactive web-based delivery method. Unfortunately it was not originally designed to deliver a fully customisable interactive web navigation interface. Furthermore, it does not offer full support for Active Server Pages through its server.

As creating a virtual campus environment using First Class does not meet all the interactive navigational requirements, a work-around is to marry

the features of the First Class environment with an HTML environment. The system does have the ability to open an HTML file, so the solution is quite simple: create 2 websites, a normal pure HTML front-end site and a second site with the files on the First Class server. A hypertext link can then be created from the main website to the secure files area within First Class to the secure pages. This HTML page would then be the starting page for the secure site and all the course material would then be contained within a fully interactive secure website run on the First Class server. By integrating HTML pages as a website with the Fist Class communication and security features, the best of both worlds could be achieved.

3.2 HTML

The pure HTML environment online website does not use a system such as First Class, and relies entirely on HTML pages. The obvious difference is the loss of the chat, email, group discussion forum, diary and secure Fist Class server environment. However, the development costs are significantly reduced as First Class licensing fees are absent, plus the technical expertise to set-up and maintain the secure First Class environment is not needed. Instead standard HTML security measures are included with enrolled students being able to access the course material using a username and password.

This does offer less security, but even if someone were to hack into the files it would not matter that much as the actual material (text books, etc) is mailed to the student separately.

The advantage of a pure HTML environment is that the web developer has a great deal more control over the user interface layout, design and features. Other technical issues such as Active Server Page support and database integration are also easier to integrate than with First Class or even BlackBoard.

The weakness of the HTML environment is that it is less secure than First Class or BlackBoard as it is easier to hack into the HTML code, but by integrating this with a secure system such as First Class, the risk can be reduced. Certainly the biggest benefit of HTML is the ability to support a wide range of multimedia features within the web pages and subsequently the online course documents can be developed with this in mind, and elements such instructional videos, sound, animation and graphics can be extensively used.

3.3 BLACKBOARD

According to BlackBoard (2002) it “offers a complete suite of enterprise software products and services that power a total ‘e-Education Infrastructure’ for schools, colleges, universities, and other education providers. Blackboard solutions deliver the promise of the Internet for online teaching and learning, campus communities, auxiliary services, and integration of Web-enabled student services and back office systems.” Similar to First Class, BlackBoard offers a secure environment with similar features (i.e. personal login, email facility, conferencing, assessment management, course documentation, etc).

However, whereas First Class was primarily designed for business communication, BlackBoard has a specific academic focus for online course delivery. Unfortunately BlackBoard has limited multimedia support and interface customisation; hence the creation of fully customised and interactive course pages with video, sound and animation cannot yet be successfully achieved. To make further use of multimedia technology Shukla, *et al.* (1999) mention that “The work-around here would be to create a separate customised interface with another format that does support full multimedia and Active Server Pages, and then link from the relevant BlackBoard course pages.”

4. CONTEXT

4.1 KNOWLEDGE OF COURSE DEVELOPMENT AND WEB DEVELOPMENT

When creating a fully functional interactive E-Learning website today, there needs to be a web development team to design the website, and another that does the course planning and development. The challenges are that the course developers do not always fully understand the technical issues involved in the website development process, whereas the web development team has to have an understanding of the pedagogical issues involved. The entire course has to be broken down into logical lessons that could be delivered online; not just by adding documents that could be downloaded and viewed, but actually offering a fully interactive experience for the student. This means that the course developers and web

	First Class	HTML	Black Board
Secure Environment	Yes	Limited – needs extra scripting	Yes
Server Side Technology	Yes	Yes	Yes
Active Server Pages Support	No	Yes	No
Chat	Yes	No – needs extra scripting	Yes
Assessment Manager	Yes	No	Yes
E-Mail	Yes – secure	Yes - open	Yes - secure
Discussion Groups	Yes	No- needs extra scripting	Yes
Multimedia Elements	Limited – graphics and some sound	Yes – full video and sound	Limited – graphics and text
Customisable Interface	Very limited	Yes	Very limited
Message Auto reply	Yes	No	No
Personalised login	No	Limited – requires extra scripting	Yes
Voice Messaging	Yes	No	No
Conferencing	Yes	No	No

Table 1: Impact of Web Technoloogies on eLearning

developers have to work very closely together and understand both sides of the development process.

4.2 NEW ZEALAND QUALIFICATIONS AUTHORITY (NZQA) ACCREDITATION

Where NZQA accreditation is required to be able to offer a course online, it means that the online version of a qualification has to comply with NZQA quality requirements as well. The challenge is to overcome the obvious differences between a real and a virtual classroom. The obvious absence of a physical classroom environment results in the absence of a trainer to interact with face to face. In order to maintain the quality standards required by NZQA it means that online trainers have to be made available to assist the students through the online interface. Additionally, a mechanism has to be put in place to ensure that secure and reliable quality controlled assessment and evaluation methods are put in place to test the students' knowledge. Usually this will mean that students will have to be tested in a controlled environment under supervision to ensure NZQA quality standards are met.

5. CONCLUSION

It is apparent from the above discussion that each of the three approaches has different advantages and disadvantages. User requirements will determine which approach will best suit the individual needs. Is simplicity preferred or full interactivity? How much control is required over customisation of the user interface? What is clear is that at present none of the three formats seem to be able to deliver all of the features that are required to meet today's online requirements. From a technical perspective, however, the web developer can achieve the desired results by combining the strengths and features of each and integrating them. It is also important for the web developer to have an understanding of pedagogical issues so as to more effectively design the actual online interface.

On the other hand the course developer also has to have a basic understanding of the technical issues involved in the web development process in order to know the limitations and more effectively design and plan the course contents to maximise the capabilities of the online environment. No doubt other methods of online course delivery will become available in the near future, as web technology advances, and

perhaps even replace these existing approaches. This dynamic and very interesting topic of E-Learning remains under constant evaluation and in the author's view has a bright future.

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