Website Design Principles: Researching and Building a Website Evaluation tool.

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Submitted to the School of Communications and Information Management,

Victoria University of Wellington

in partial fulfilment of the requirements for the degree of

Master of Communications

2002

ACKNOWLEDGMENTS

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'Website Design Principles: Researching and Building a Website Evaluation tool'

(hereafter referred to as 'The MComms Research Project')

being undertaken by

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2002

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ABSTRACT

This project addresses the need for tertiary education institutions to have a straightforward way to evaluate their public website by the development of a software tool that enables analysis based on best practice principles.

Documents containing human computer interface guidelines, Internet marketing guidelines, and web design guidelines were reviewed to identify assessments of best practice relating to the design of institution websites. From these documents close to 1,200 quotes were collected, collated using a database, and refined to identify key principles. These principles were further refined into 35 testable principles and developed into an interactive Flash™ based website evaluation tool. This tool allows for a simple, yet effective, measure of tertiary education websites covering – layout, navigation, users, site design, and content.

Also developed as part of this research is a searchable on-line database containing the collected quotes that provides another useful resource for website developers.

Keywords: tertiary education, website development principles, analysing websites, internet marketing.

C h a p t e r   1

INTRODUCTION

OBJECTIVE

The objective of this research project is to develop a tool suitable for use in evaluating tertiary institution Internet based websites. This objective is to be achieved by collecting and collating existing views of best practice and adding value by identifying key principles and in turn developing a tool for assessing them.

The website evaluation tool needs to cover aspects of Human Computer Interface guidelines, Internet Marketing guidelines, and Web Design guidelines. It should contain a checklist of primary functions relating to principles within each of these areas.

The developed tool will be used to evaluate the UCOL® – Universal College of Learning's website.

DEFINITIONS

The Internet and Websites

According to the University of Georgia's, Center for Continuing Education (1998):

> *The Internet is a 'network of networks' that links computers around the world.*
>
> *These computers range from PCs and Macs to supercomputers, but they all*
>
> *use a set of rules called TCP/IP to exchange information.*

In other words, the Internet is a network connecting millions of computers into a very large inter-network that uses common protocols to communicate. The Internet can be likened to the system of roads connecting cities and towns where more than one way exists to get from one town to another. By using consistent *road* rules, information stored in computers connected to the Internet can be moved anywhere in the world allowing all sorts of documents to be exchanged and viewed.

Within the framework of the Internet are collections of documents that can be viewed using a computer software application called a browser. These documents are commonly called world wide web (www) pages. A group of world wide web pages, normally associated with a single

institution, is referred to as a website. The pages in each website contain buttons and text *links* that enable people to view other web pages within that website or on another website that may be in a different city, country or continent. Boon and Kurtz (1999) outline the concept of accessing web content as follows:

> *Web sites provide hypermedia resources, a system allowing storage of and access to text, graphics, audio, and video in so called pages linked to each other in a way that integrates these different media elements. When a user clicks on a highlighted word or picture (icon), the browser converts the click to computer commands and brings the requested new information-text, photograph, chart, song, or movie clip-to the user's computer. (p. 31)*

The Internet makes it possible for people to view the information contained in a website from most places in the world. The way a site is constructed, how it looks, works and what it contains, may be the first or only view a person has of an institution. In many ways, an institution website is like its front door. The perceived quality of that front door will be influenced by how well it has been constructed.

Human Computer Interface

Using a mouse or similar input device and a keyboard enables a person to communicate with a computer. Information, and the way it is delivered by the computer, provides the feedback communication from the computer back to the person. Most computer-based activity involves aspects of communication between humans and computers. That communication, both human to computer and vice versa, is the primary role of what is termed the "User Interface" or the "Human Computer interface". This communication includes "many areas of information transfer: data entry; system response; usability: understanding; usage; [and] clarity of display" (George, 1998).

The way the computer operates, called its operating system (such as Microsoft® Windows, Mac™OS, UNIX®, or Linux), the browser software that accesses web pages (for example Microsoft® Explorer or Netscape® Navigator), and the computer itself (such as IBM® compatible, Apple® Macintosh, or Sun® workstation) are all part of the user interface.

Aspects of the user interface of interest to this research project include areas that can be modified by a website designer. The operating system, browser, and computer hardware need to be considered, and allowed for, in website design however, they are aspects of the user

interface that cannot be controlled. The human computer interface areas that can be controlled are the ones relating to the way human computer communication happens when users interact with a website using their browser.

Although seemingly simple, the user interface has to create a virtual world for the user where they feel comfortable, engaged, and in control.

One user interface designer compares the concepts involved in the interface design with those used in magic (Tognazzini, 1993):

> *Perhaps no field other than magic is tied so closely to the field of graphical interface design. ... Both software designers and magicians create virtual realities. We bring ours alive on computer displays; magicians bring theirs alive on the stage. ... We depend on our knowledge of the 'mechanics' of computer technology, the aesthetics of graphic design, and the science of psychology. Magicians depend on their knowledge of the 'mechanics' of their tricks, the aesthetics of showmanship, and the science of psychology.*

User interface areas that can be controlled by website designers to create this virtual reality include the way the user is expected to move from place to place within the website (navigation), how well the site assists them to achieve their goals (usability), and how effectively the site communicates visually (semiotics).

Navigation

The concept of navigating within a website is a little misleading. As Boon and Kurtz (1999) indicate in the earlier quote, what actually happens when a link is clicked is that the web page referred to in that link is transferred from a computer somewhere on the Internet to the computer the user is operating. The user is not moving around in a website, but is getting various parts (web pages) of the site to appear on the computer they are sitting at. Nevertheless the use of a navigation metaphor does provide a concrete view of a rather abstract concept. In discussions about websites it is not unusual for talk to include comments about visiting a website in France or being in an American site and using a link to go to a site in China. This perceived ability to move around in virtual space requires familiarity, signposts, and landmarks in a similar way to how they are needed for a physical space. The website designer has a responsibility to provide the navigation so that the user does not get lost or confused. When designers get caught up in the look of a site and overlook the navigation needs the user can begin to feel lost and *go* somewhere else. One research report on e-commerce found that "39 percent of test shoppers failed in their buying attempts because sites were too difficult to navigate" (Speigel, 1999). If over a third of the people viewing a website don't even find what they are looking for, an assumption can be made that good navigation is a key requirement of successful web design. As Lohse (1999) says, "No amount of 'sparkle' in the presentation of products can overcome a site design with poor navigation features."

Usability

Usability is a concept involving the consideration of who the users are and providing help for them to achieve their goals. Flowers (2000) identifies that usability relates to how usable or user-friendly the product, service, or system is. Sweden Canada Link (2001) put it this way: "Usability is about making the visit to your website as effective as possible for the users." The focus of usability is on enabling users, whatever their interests and needs, by removing barriers and making the system as easy to use as possible. Barriers such as difficult navigation and oversized graphics can prevent users from being able to easily use the website. Nielsen and Norman (2000) identify that for users,

> *As soon as they discover that the site is filled with bloated graphics and little useful information, they go elsewhere. Worse, they're unlikely to return. If a site crashes their browser, they just don't go there again.*

> *If they can't find the product they want, they will go elsewhere—and they're apt to stick with the site they know works.*

The focus for website designers and developers is often about meeting the perceived needs of the institution rather than meeting the needs of the users accessing the site. Abrahamson (2000) suggests that, "Prospective students who find a Web site disappointing are quick to associate their e-experience with the quality and functioning of the institution itself and may terminate all inquiries about the college." Like navigation, usability appears to be an obvious requirement. If a user is unable to effectively make use of the website to achieve something it is supposed to do for them, then the website is not functioning as it should.

Semiotics

Semiotics can be considered as the study (or theory) of signs. "It involves the study not only of what we refer to as 'signs' in everyday speech, but of anything which 'stands for' something else" (Chandler, 2000). Semiotics focuses on the way that somebody producing something creates signs and the way audiences understand those signs (Littlejohn, 1999, p. 330).

As computer systems have become more capable and images more prevalent, quality graphic design has enabled systems to achieve their potential to communicate (Marcus, 1995, p. 425). One example of the application of semiotics is the way that communication is improved by the use of metaphors. Some research has shown that the application of metaphors can improve the speed of learning a system, even with naive users, by making it easier to preserve a mental model of what is happening (van der Veer 1990, p. 146; Gardiner 1987, p. 229).

Any design principles, like the use of metaphors, that can improve the site communication will have an obvious benefit, after all, "most visitors come to a website to obtain information and not to admire the fancy design" (Sweden Canada Link, 2001). Basically the semiotics of a web page includes the way that the text, graphics and layout communicate to the user. If this communication is effective then the website will be effective.

Internet Marketing

According to the American Marketing Association (1985), "marketing is the process of planning and executing the conception, pricing, promotion, and distribution of ideas, goods, and services to create exchanges that satisfy individual and organizational objectives." This definition of marketing encompasses the key economic factors in most businesses. Often the view of marketing is limited to the *promotion* and *price* aspects and the other two of the four *P*s of marketing, *product* and *place*, are not included.

For tertiary institutions the product is the delivery of education and it is an equally valid part of the marketing mix. Boon and Kurtz suggest that, "production and marketing of goods, services, and causes are the essence of economic life in any society. All organizations perform these two basic functions to satisfy their commitments to society, their customers, and their owners" (1999, p. 8). If an institution is not able to convey the quality of its product then promotional material will not be enough.

The Internet allows for the power of the place marketing factor to be reduced for those institutions offering forms of distance delivery of their courses. As mentioned earlier, the Internet allows for the distribution of information all around the world. A student with a connection to Internet delivered courses does not need to be in the same location as the institution providing the courses, they could be in a different country. In this instance the place of the institution has minimal marketing effect.

If an institution is primarily focussed on classroom delivery, as opposed to distance delivery, then the place issue remains a strong factor. The Internet still impacts on the opportunity for promotion of the classroom delivered product, but the potential clientele would more likely be national than international.

With a third of the population of New Zealand on-line (Tapsell, 2000) the Internet and websites have become an important promotional marketing tool. The problem is that like many commercial organisations tertiary institutions do not have a strategy to make appropriate use of the Internet.

As organizations stampede to the Internet, they find there is not a systematic way to examine opportunities and relate them to available Internet tools. What is absent, in particular, is a cohesive marketing strategy that applies Internet technologies. (Watson, Zinkhan & Pitt, 2000)

Internet technologies need to be considered carefully along with the market forces. "Most people generally think of higher education as public enterprise, shaped by public policy and actions to serve a civic purpose. Yet market forces also act on colleges and universities" (Duderstadt, 2000). The most obvious market force relates to the number of students available to the institution. The impact of a global economy is that institutions are not only competing with local education providers but have to compete with well-established international providers.

Educational institutions need to remain commercially viable like any other professional business. Without a well-marketed profile an institution is likely to find it difficult to operate in a progressively more competitive environment. Internet marketing for educational institutions needs to take into account a range of principles including traditional (non-Internet) marketing theory and aspects of electronic commerce (e-commerce).

Traditional Marketing

Aspects of traditional marketing can have significant impact on the way that websites need to be created. In broad terms traditional marketing has focused on attracting customers. "The goal was to identify prospects, convert them to customers, and complete sales transactions" (Boon & Kurtz 1999 p. 32). In the same way web pages have a role to play in turning visitors into customers. The process is different but the outcome is the same.

There has been some change in the mechanisms of marketing over the last few decades. The advent of mass marketing technology, such as television and radio, enabled a mass market focus. More recently the marketing focus has changed to a target oriented approach. The Internet has taken target marketing a step further by allowing for a personalised one-to-one marketing relationship. This approach is different in that it involves building relationships over time. Boon and Kurtz (1999) put it this way:

As marketing enters the twenty-first century, a significant change is taking place in the way companies interact with customers. The traditional view of marketing as a simple exchange process — a concept that might be termed transaction-based marketing — is being replaced by a different, longer-term approach. (p. 32)

and

Relationship marketing, involves long-term, value-added relationships developed over time with customers and suppliers. (p. 14)

The Internet is a perfect tool for this personalised relationship marketing. When a user connects to a website they can be given the impression that they are in control and are getting what they personally want rather than the non specific information contained in a television, radio, or newspaper advertisement. Users are connected to the institution directly and can interact on a personal level. In some cases the user can be given control over how an institution site looks when they connect, like a personalised directory of the site.

A key for website developers is to make use of the strength of personalising the relationship between the user and the institution, and to implement mechanisms to exploit it.

E-commerce

E-commerce is a relatively new term applied to marketing and financial transactions that occur electronically or on-line. Even though the Internet has not been in place for a long period of time, there have been changes in the way that marketing, particularly promotional activities, have been implemented. Pollack (1999) comments, "It wasn't too long ago that 'Internet Marketing' meant a banner ad[1] and a Website that replicated the marketer's print brochure or catalogue."

The Internet is a technology without significant precedent. Marketers initially attempted to apply existing marketing schemes to their web presence, which was partially successful, but it did not make use of the unique strengths of the Internet. As experience grew it became clear that the Internet was "a distinct medium from print catalogs, and to succeed online, you need to adapt

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[1] A banner ad is an advertisement in the form of a banner on a web page. The banner normally contains a hyperlink to another web site and by clicking the banner you are provided with further information about the advertised product or service.

your print book to take advantage of its benefits (immediacy, unlimited space) and downplay its drawbacks (poor visual quality, potential for technological snafus)" (Chiger, 1999).

Due to the newness of the Internet and the opportunities perceived, lots of companies rushed to get on-line. It appeared to be a powerful and affordable way to reach customers anywhere, anytime (Boon & Kurtz, 1999, p. 32-33).

The threat that companies would loose out if they were not on-line was also a strong motivator to get an Internet presence. Like the adoption of any technology the feeling was that, "in an era of accelerating technological development, the firm that fails to improve its products and services continually is likely to lose market share to competitors and maybe even disappear" (Watson, Zinkhan & Pitt, 2000).

What began to emerge were considerably more complex marketing tools as well as marketing that had been adapted for the special functionality and strengths of the Internet. It is these design strengths that need to be considered for the development of a website.

Web Design

Web design is an umbrella term for a range of areas. The focus of web design is comparable to semiotics in that it concentrates on the visual message but it also relates to the "hidden" message such as the way that the eyes are drawn to particular colours or blank spaces and follow the contour of graphics. Web design has a key role, similar to the way that posters are designed to motivate a reader, improve readability, and to draw the reader's eye to the key content. Web design issues involve improving the clarity and form more than its intended function. Strategies for web design include guidelines in areas such as graphic design, typography, and layout.

Graphic Design and Typography

Web pages are generally a visual medium and can benefit from the lessons learnt in paper-based graphic design, CD-ROM development, and television. Rules about the use of colour and avoiding all capitals text can be easily recognised as design principles. The book "Graphics: A New Zealand Approach", states that, "excessive or inappropriate use of colour can defeat its purpose and turn the viewer away" (Coulson 1998, p 9). On a web design page the same sentiment is echoed: "Also, too much color on a web page can be distracting and counterproductive" (Grantastic Designs, 2001). Similar fundamental design rules can be applied to web design that are already applied to print design. Once again, it is the deployment of the best of these design rules that will cause a website to be more effective.

Layout

Layout is another design issue for quality website development and simplicity seems to be one of the keys. Carter (1999) puts it this way, "but the important thing learned by GUI[2] designers from the Web is that screens do not have to be complicated to be useful - if the form solves a need and is easy to use, then people will use it." Simple layout requirements such as white space and composition are based on the way people react to visual stimulus that can motivate or discourage interest. White space provides a visual balance for successful design (Coulson, 1998, p. 97) and balanced composition improves the visual attraction of a page (Swann, 1989, p. 65). The value of a well designed layout is already applied to both printed pages and television, and must be considered when developing pages for the Internet.

The combination of all of these areas (user interface, internet marketing, and web design) and the key principles from each, form the foundation for any website project.

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[2] GUI is an abbreviation for a "Graphic User Interface" on the computer. Early computers used a text-based interface operated using only a keyboard. With the advent of the mouse came menu-based, non-graphic interfaces that subsequently evolved into a graphic user interface (GUI) that includes such things as windows, pull-down menus, buttons, scroll bars, and iconic images.

C h a p t e r   2

BACKGROUND

PROJECT BACKGROUND

As an ex-schoolteacher I have always been interested in the importance of effective communication. My specific interest in Human Computer Interface design goes back to 1986 when I received an Apple® Software Development Award and began software development as a hobby. Even at that stage I investigated the importance of creating effective communication between the computer and user. The software was being developed for children so I put in extra effort to make it visually appealing and easy to use.

Through involvement in another Apple® project in 1989 I began developing HyperCard™ software. Teachers had been asked to submit ideas for developing software for schools and a small group of us were invited to develop our ideas under the watchful eye of an Apple® sponsored facilitator. My project involved the development of an interactive adventure game for schools, incorporating Marae protocols, called "The Adventure of the Lost Tiki". The development process included considerable peer review and extensive reading about human-computer interface design. We also considered one of the origins of hypertext dating back nearly fifty years, which was Vannevar Bush's "Memex", a non-computer based system.

> *A memex is a device in which an individual stores all his books, records, and communications, and which is mechanized so that it may be consulted with exceeding speed and flexibility. It is an enlarged intimate supplement to his memory. (Bush, 1945)*

[An animated explanation of the Memex is available from http://www.dynamicdiagrams.com/design/memex/model.htm].

The Memex was a microfiche based system designed to let the operator build his or her own links between related items. The article entitled "As we may think" (Bush, 1945) describes the way that the memex was built around the idea that people do not think in a linear way but jump from idea to idea. Though the system was never implemented, Bush is considered the

grandfather of hypertext (Fluckiger, 1995). Apple[®]'s HyperCard[™] was also built on that concept allowing people to build hyperlinks between ideas.

Other key figures in the development of hypertext such as Ted Nelson[3] and Doug Englebart[4] were not extensively studied as we concentrated more on the human computer interface than on hypertext itself.

Much of the guidance for the HyperCard[™] project came from Apple[®] Computers, who have consistently led the way in human computer interface design. According to Carter (1999) Apple[®] has been very committed to its graphic user interface (GUI) spending millions of dollars to research and implement enhancements that resulted in an interface that was widely acclaimed. For me, the development of HyperCard[™] software provided a platform for numerous discussions about what does and does not work for interface design.

On the basis of this HyperCard[™] experience I subsequently developed and published a further nine internationally distributed software packages for education. In each case I carefully considered interface and usability issues.

Over subsequent years I was involved in developing computer animation, touchscreen digital video projects, and CD-I (Compact Disk Interactive) development, all of which required an understanding of human-computer interface design built up over that time. I was fortunate to have spent so much time looking at principles of navigation, layout, and interaction before I encountered the Internet or Web pages.

In 1996 - not long after taking up a position at the Universal College of Learning (UCOL[®]), a tertiary education provider in Palmerston North, NZ, then called Manawatu Polytechnic - it was decided that the institution needed a website. I took on the webmaster role and was responsible for getting the initial website up and running. The focus of the website was not completely clear at the beginning of development but included supporting courses with web material, and providing a marketing opportunity for the institution. Once again I needed to spend time reviewing human-computer issues and also spent time investigating issues relating to on-line course development and on-line marketing.

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[3] Ted Nelson was an early pioneer of hypertext with his Xanadu system, a networked hypertext system, which was designed in 1965 and partially implemented in the late 1980's. His idea was a universal hypertext system interlinking all the literature that anybody has ever written (Fluckiger, 1995). He envisioned a universal document database (docuverse) that would allow addressing of any substring of any document from any other document. It was Ted Nelson that coined the terms "hypertext" and "hypermedia" (Feizabadi, 1998; Fluckiger, 1995; van Dam, 1987).

[4] Doug Englebart introduced the NLS (oN Line System), an interactive multiuser hypertext system demonstrated in 1968 (Feizabadi, 1998; Fluckiger, 1995; van Dam, 1987)

Having a software development background and a teaching background provided a good foundation for Web development and I was involved in developing a wide range of on-line activity including fully on-line courses. This experience led to an invitation to present a paper at the national "Technology for Learning '98" conference at Massey University. The focus of that paper (Sherson, 1998) was the development of an on-line environment suitable for learning. One section of that paper covered design principles including the importance of using default colours, the need to have a consistent look, making sure pages load quickly, and keeping pages no more than three clicks[5] away.

Developing from that presentation was a further paper called the "Semiotics of Web Design" (Sherson, 1999) written as part of a Victoria University of Wellington, Master of Communications degree, that comments on communication components in human-computer interface design. In particular the paper looks at the use of metaphor. The theme of the paper is the art of quality user interface design, which is seemingly forgotten with the advent of browseable web pages. The paper identifies the progress that standard non-Internet based software has taken. "Interface design appears to have followed a development sequence from initial text based screens, through graphic enhanced, picture and icon rich screens, to highly developed, metaphor based interfaces" (Sherson, 1999).

The paper also indicates the considerable acceptance and implementation of the use of metaphor in software and then suggests "with this level of commitment to the use of metaphor in interface design, it is an obvious expectation that the Internet would follow suit" (Sherson, 1999). However the paper observes that, anecdotally,

> *It is surprising to note that metaphor is not much of a communication tool in the*
>
> *hands of web page developers. Even the software development companies,*
>
> *heavily into metaphor when it comes to their CD development, have overlooked*
>
> *the use of metaphor on their web sites. (Sherson, 1999)*

Examples are given of the outstanding interfaces provided in some company's CD software that stand in stark contrast to the same company's website. Metaphor use is not the only component of good interface design but it exemplifies the way traditional design guidelines appear to have been overlooked in the development of many websites.

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[5] Several web design documents refer to this as the 'three click rule'. The concept is that no matter where a user is, in a website, they should be able to navigate to any other content with no more than three clicks of the mouse.

This lack of application of quality design principles to website development provided the motivation to research good design more thoroughly. An education component was added to the mix, reflecting my current work in an education institution.

EDUCATION AND THE INTERNET

The field of education is entering an information world that De Diana and Aroyo (1999) term "educational infospace" where "networked education with all related processes is taking place." Information technology is altering many aspects of education — from the way it is delivered to the way it is marketed. According to a New Zealand Education Review Office (ERO) report (1997), "change driven by information technology is having a significant impact on every aspect of life and is an increasingly critical issue for education." New Zealand, like many other countries, is caught up in the move toward a more information technology based and educationally digitised society. Boon & Kurtz (1999) identify the changes in relation to marketing:

> *The technology revolution is changing the rules of marketing at the dawn of the twenty-first century. The combined power of telecommunications and computer technology create inexpensive, global networks that transfer voice messages, text, graphics, and data within seconds. These sophisticated technologies create new types of products, and they also demand new approaches to marketing existing products. (p. 7)*

One area in particular, where information technology is having a major impact on education, is the use of the World Wide Web. Studies in the United Kingdom have identified the increasing awareness of, and access to, educational institutions by home users of the Internet (Addison, 2000). A similar trend is reported in an American study where eighty percent of students who have web access, "check colleges' Web sites to find admissions information, course catalogues, and descriptions of programs" (Guernsey, 1998). This increased interest in the websites of educational institutions can be seen as a major aspect in the developing use of the Internet for education.

The importance of the Internet to New Zealand education can be identified by the high number of schools and children with Internet access. Ninety-nine percent of secondary schools in New Zealand have some form of access to the Internet in the school, and eighty-nine percent of lower secondary students, enrolled in schools that use computers, are able to access email and the Internet (ERO report, 2000).

By applying the results of the American study (80% of students with web access) to the number of lower secondary school students with web access (79% of lower secondary students, enrolled in schools that use computers), it can be estimated that seventy percent (80% of 79%) of New Zealand's lower secondary school students, attending schools that use computers, are likely to check out institutional websites to find out information about what is offered. Even though this is only an estimate – American behaviours may not fully translate into the New Zealand context – with that many potential students open to web based marketing, an on-line presence provides an important communication channel for education institutions. The value of that channel is increasing all the time. Progressively more students are accessing institution websites to find information that will help them make, what they perceive to be, informed decisions.

EDUCATION AND GLOBALISATION

There is a globalisation effect of technology on many aspects of society including education. The Tertiary Education Advisory Commission (TEAC) in New Zealand recognised this in one of its recent reports. "Globalisation is a complex, interactive mix of elements spanning political, economic, technological, social and cultural dimensions. It is beginning to influence all aspects of society" (2001, p. 15). Globalisation means there are world markets rather than only local or national markets for education. "Worldwide communication networks have created an international market, not only for conventional products but also for knowledge professionals, research, and educational services" (Duderstadt, 2000).

Historical market constraints are being challenged. Information technology has removed the barriers of space and time and there are even virtual universities such as the Swiss Virtual Campus [http://www.virtualcampus.ch] and Lansbridge University [http://www.lansbridge.com/] with no physical classrooms at all, vying for students. This potential globalisation was recognised by Carol Twigg (1997): "Students will be more likely to select educational institutions based on offerings, convenience, and price than on geography. This competition will not be limited to the United States or North America; it will be global."

The globalisation issue is not limited to tertiary institutions. There are now training institutions run by corporations such as Cisco[®] Systems, 3Com[®], Oracle[®], and IBM[®], and the number of them in the United States "has increased from 400 to 1,600 in the last ten years. ... But now these corporate institutions, under growing pressure to become self-supporting, are bringing their 'branded' education into competition with mainline higher education" (Talbott, 1999).

There are also few limits for off shore providers as the TEAC (2001) commission puts it, "trans-national providers can operate in New Zealand with no restrictions other than those related to all foreign investment" (p. 16). On-line providers not needing to have a physical presence in New Zealand have even fewer restrictions.

Under the current funding arrangements, the resources received by tertiary providers are largely dependent upon the numbers of students they can attract. An institution will begin to have difficulty if its student numbers begin to dwindle. This creates strong pressures for education providers to compete with each other across a wide range of disciplines and activities (TEAC, 2001, p. 8). The current funding creates "an incentive to focus on quantity rather than quality, and expenditure of significant resources on advertising and marketing" (TEAC, 2001, p. 8).

An institution website that adheres to best practice design and marketing principles will have a better chance of making effective use of that channel for recruiting potential students and establishing a desirable image in this increasingly global age.

A growing number of students use institution websites during their hunt for campus information. According to an American study of 500 high school seniors, "about 78 per cent reported that they had used colleges' Web sites during their hunt for campus information last fall-up from 58 per cent in the 1997 survey and only 4 per cent in 1996" (Guernsey, 1998). Abrahamson (2000) asserts, "among online users, the Web ranks second only to campus visits as the most important source for researching colleges."

The importance of the increased information seeking activity, and the greater value attributed to web based information, suggests that making best use of an institutional website is an essential consideration for any tertiary institution.

One difficulty arising from the rapid growth of the Internet is that many websites have been developed quickly with a focus on the needs of the institution rather than the needs of the users. The institutional goals have often been very different from what is actually needed on its website. In the rush to establish a presence in cyberspace some of the design work has been left to the technical staff who do not have the design skills to build an effective website interface. The site is technically sound but the user interface is weak. As George puts it (1998), "the user interface is often (especially in academic exercises) an afterthought."

Another issue for institutions is that not only have websites been put in place with minimal planning, they have not gone through any testing. It is the testing that can make the difference

between a poor website and a good website. The problem that this research attempts to solve is the lack of a simple yet effective tool to test with.

TESTING

Institution sites have not appeared to be very different from many of the commercial sites that Jakob Nielsen (2001) suggests, "still under-invest in usability testing." Often testing has been seen as an afterthought.

In many ways, the testing of websites requires a similar process to the testing of traditional software. The need for interface and usability testing along with bug testing can be applied to websites. Compared to traditional software development there has not been the investment in making sure that web development is of a high quality before publishing. Traditional software testing is normally a huge investment. According to Boris Beizer (1990) in his "Software Testing Techniques" book, "testing consumes at least half of the labor expended to produce a working program" (p. 1). Institution web designers have not invested that amount of time testing their websites.

Another issue facing web developers in tertiary education institutions has been the lack of information covering their design requirements. Generic web design principles are around for those who want to look, such as the guidelines from the Yale Center for Advanced Instructional Media (Yale, 2001), the International Business Machines "Ease of Use Guidelines" document (International Business Machines [IBM®], 2001), "Web Page Design for Designers" pages (Gillespie, 2001), and Jakob Nielsen's "Alertbox" articles like the "Top ten mistakes of Web Design" (n.d.). There are some common elements in these guidelines but they do not provide a clear list for developers of tertiary institution websites. Tertiary sites need to adhere to the general web design guidelines and they also need to combine those with marketing guidelines and human computer interface guidelines. Design guidelines ought to be mixed in with best practice information about on-line sales and e-commerce — and the full set of guidelines requires a multi-disciplinary exploration of principles, something that is generally not applied to institutional web development.

Choosing a Checklist Test

The choice of a checklist-based test for this project reflects the research done in the area of information quality assessment, and usability testing. Checklists are already used extensively to measure the quality of information on websites and assess website usability (Byrne, 2000; Elkordy, 2000; Everhart, 1996; Kirk, 1996; Oliver, 1998; Rettig, 1996; Smith, 1997a; Smith, 1997b; Stanger, 1996).

Sullivan (1996) also verifies that the use of a checklist for testing is effective:

> *One of the most effective forms of inspection-based user testing involves the use of a 'usability checklist.' (. . .) Checklist-based user testing is extremely inexpensive to implement, and requires a surprisingly small*
>
> *number of testers to be effective. It's also easy to schedule; it can be used at virtually any time throughout the development cycle, from the earliest prototype screens to a full-blown Web site.*

Sullivan (1996) also suggests that, "even a single tester can probably uncover the most common usability problems on your site."

Combining the information quality and usability experience suggests that a simple checklist is a suitable format for the website evaluation tool planned for this research.

C h a p t e r   3

METHODOLOGY

The website evaluation tool (*Site Tester*) needed to be built on recognised best practice. The first step in building this tool involved identifying existing research and opinion on interface design, marketing, and web design. Locating this material involved Internet searches, journal searches, book searches, and the searching of on-line journal databases (see Figure 1).

Figure 1: Examples of resources containing quotes.

The various searches looked for content that mentioned graphic user interface design, GUI design, software design, user interface design, usability, usability guidelines, internet marketing, web marketing, marketing education, graphic design, web development, web development guidelines, website design, principles of web design, web page evaluation, and web navigation.

In spite of the relative newness of the Internet, there was no shortage of opinion about what makes websites effective. Initially, a review of between thirty and fifty documents was thought to be sufficient to establish a set of principles that were widely regarded as important. However, the searching identified hundreds of sources containing one or more of the key phrases. At this point no limit was set for the number of documents to be reviewed.

Each of the several hundred resources was skimmed to identify its potential for inclusion in the design of the site tool. Web page documents showing potential were saved on computer. As a step toward categorisation they were sorted into folders with labels such as "User Interface" and "Internet Marketing". Documents from on-line journal databases such as "Proquest" (http://www.proquest.com) were also sorted with the web pages. Where possible books and journals were borrowed from libraries or else sections were photocopied to allow for subsequent analysis. As with the electronic resources these were grouped together as a precursor to the analysis. The number of documents turned out to be considerably more than initially intended.

The review of this larger number of documents was not only due to the number located but also the belief that the wider the range of documents, the greater the validity of the resultant list of design criteria. In other words the more authors involved, that have the same opinion, the more reliable would be the principle they agreed on.

EVALUATING THE QUOTES

A content analysis approach was adopted to isolate relevant quotes within the documents. As characterised by Miller (n.d.), the content analysis was used for "describing content." The content analysis was "a research tool used to determine the presence of certain words or concepts within texts or sets of texts" (Colorado State University, n.d.), in this case numerous texts. Where a section of text had something to do with the quality of websites, it was typed, scanned, or copied into a word processor document and the reference noted. Documents that contained a concise summary of design principles were likely to have the whole summary included. For topical books, the contents and index pages were checked for the key words and phrases. Sections or pages of the books were read and relevant quotes, along with their reference, were added to the quote documents. Books specifically concerned with designing web sites were analysed cover to cover.

Multiple documents were created as a continuation of the initial sorting process. These documents were quite substantial in their raw state. For example, the text assembled primarily from sections of documents about Web design had sixteen references but contained close to 35,000 words.

Each of these collated documents was carefully read and content that was not relevant to the principles of web site design was removed. The result was a collection of quotes that contained relevant principles. The Web design document eventually ended up with 11,000 words including headings.

An issue identified by other research using content analysis also applied here. It was important to make sure that the length of the quote was not so short that it left no idea of the context and also not so long that it contained more ideas than would be manageable (Buston, 1997). Even with this in mind some quotes were included that were part of a bulleted list or a short descriptive statement, for example "avoid black backgrounds" (Flanders & Willis, 1998, p. 111). These quotes were seen to stand on their own and were included, even without elaborated context.

Once the quotes had been initially aggregated into word processed documents the citation was added to the end of each quote to allow accurate referencing. Sets of quotes were grouped together, for example quotes relating to GUI design. The quotes from different sources were colour coded to match their references, which were then added to the bottom of the documents (see Figure 2). The colour coding was used so that if part of a quote was cut and pasted, separating it from its citation, the colour could be used to identify where it came from by finding the reference with the same colour. Document by document, sets of referenced quotes were assembled.
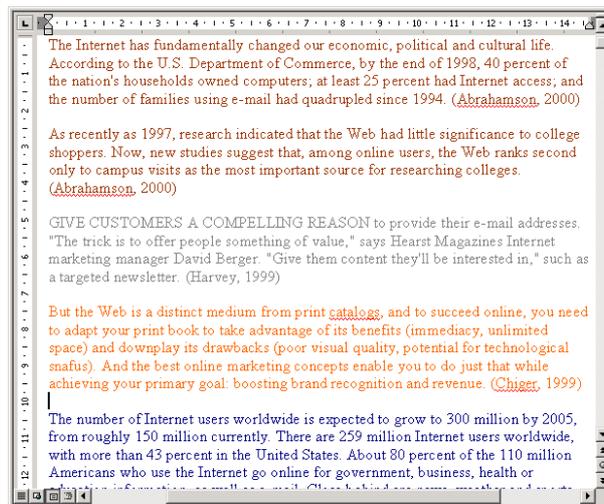

Figure 2: Assembled, colour coded quotes.

Each of these quote collections were further analysed, and each quote was moved under category headings within the word-processed documents (see Figure 3).

Figure 3: Sorted quotes in Microsoft® Word.

The plan was that by grouping the comments from the wide range of sources it would be possible to see which categories were common and subsequently to identify principles relating to each category. As Corbitt (2000) suggests, "without classifying data we have no way of knowing what it is that we are analysing."

New headings were added where required, and each quote was cut or copied and pasted under one or more categories. Much of this work was done with multiple open documents and as quotes were added these documents became quite large and required considerable scrolling to move the quotes around. It became clear, by the time sixty or so categories were identified, that managing the quotes in a word processor was too cumbersome. Other options for managing the data were considered.

NUD*IST was one option for collating the quotes. NUD*IST stands for Non-numerical, Unstructured, Data: Indexing, Searching and Theorising. It is a piece of software designed to work with textual documents, it helps when indexing text components of documents and it allows the construction of a hierarchically structured tree to order index categories (Buston, 1997). It was decided that using NUD*IST would still be cumbersome and the ability to report on the different aspects of the data would be restricted.

The better option was to transfer the quotes into a relational database. To achieve the transfer, each quote had to be put with its category and citation, and a code assigned so that the citation could match with a related file of references. A "search and replace" was done in the word processor inserting a tab between each quote and citation to allow the documents to be imported into Microsoft® Excel. The file was then massaged to get four columns with headings of Quote, Category, Citation, and Reference (see Figure 4). An identification number (QuoteID) was assigned to each quote to help work with the data.

Figure 4: Conversion of data to database ready format.

A second Microsoft® Excel file was developed by listing the references and assigning an identification number (RefID) to each one. The full reference in the quotes file was replaced with the reference identification number so that the quotes file and the references file could be linked together. Where multiple categories were assigned to the one quote, the category column was made to list all categories for that quote. This combining of information was achieved by sorting the quotes, eliminating duplicates, and adding any extra categories to the list.

FileMaker™ was chosen as the relational database as it was a simple platform for development and was very familiar to the researcher. The Microsoft® Excel files were imported into FileMaker™ and checked to see that the citations matched the references. The basic structure is shown in Figure 5.

Once the existing information had been imported, the process of analysing quotes continued. Microsoft® Word was still used to collect sets of likely documents and trim the text to just the relevant quote, citation, and reference. The information was then transferred to the database where a category was picked for the quote.
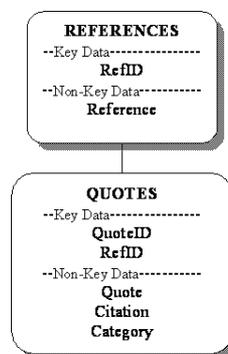
Figure 5: Related FileMaker™ files.

As the database grew, some categories became too broad and heavily utilised, so sub categories were added as a way to divide the data into logical groupings. For example Navigation comments could be split into subcategories like "Navigation – Metaphor" and "Navigation – Search".

A field in the quotes file contained the category heading and allowed for multiple categories to be listed for each quote. The database was set up to display the category options in the form of checkboxes allowing for a more simple category allocation (see Figure 6).
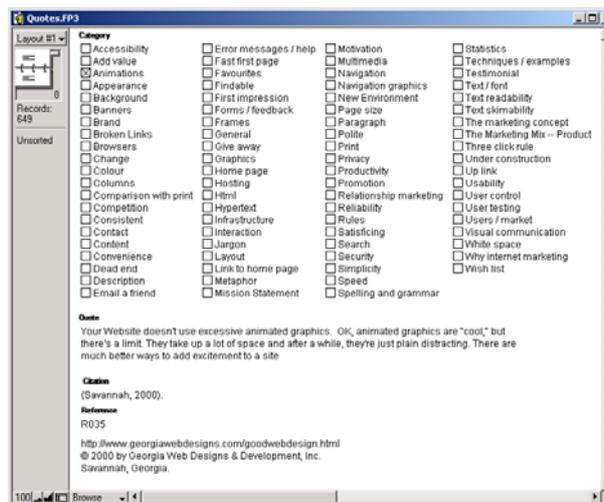
Figure 6: Checkbox field for assigning categories.

In this way each of close to 1,200 quotes was identified, trimmed, imported, and assigned to at least 1 of the 160 categories.

Coding rules were established for each category and each quote reviewed again. The coding rules were designed to be specific enough that, in principle, anyone repeating the categorising of the quotes would end up putting them into the same category. For example the category "Accessibility - ALT tags" has a coding rule "Comments relating to disability; blind, visually impaired, (or implied by terms - screen readers or assistive technology) that also mentions ALT tags, Alt text or Alt =."

As well as the reliability of the categorizing provided by the coding rules, reviewing each quote was needed to allow for the assigning of quotes to multiple categories, including some categories that did not exist early on in the process. As new categories had been added, some of the already categorised quotes needed to be added to these new categories. The adding of sub categories also meant that some quotes assigned to a general category needed to be moved into a more specific sub category.

The resultant database could easily be searched by category and a list of relevant quotes displayed. The ability to search the database to find opinions on web design was not considered to be a goal of this research although it was put to good use when answering questions about web development. It was extremely valuable to be able to make suggestions based on information contained in the database. The value of this database in its own right led to an unplanned step to create a browser based (searchable) version published on the Internet. To make the categories searchable via a web page, a new table needed to be added to allow for the building of a many-to-many relationship between the categories and quotes (see Figure 7).
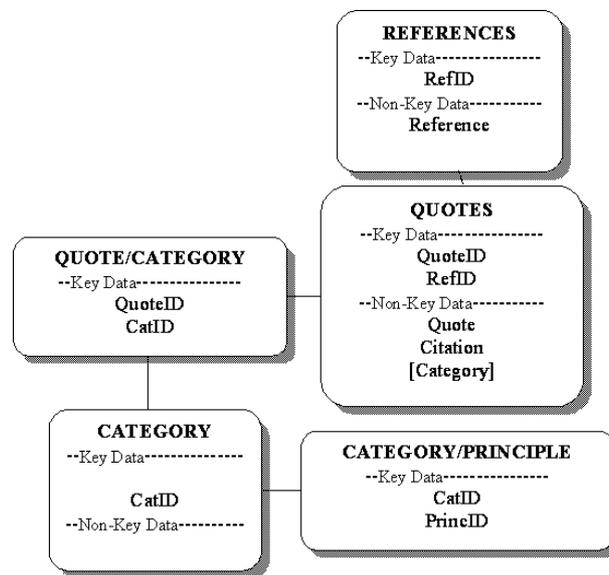
Figure 7: Adding the related category file.

A many-to-many relationship was needed as one quote could be listed under several category headings, whereas one category could contain several quotes. To be able to identify each permutation an intermediary file was created shown as "Quote/Category" in Figure 7, containing one record for each pairing. The rebuilding of the database was undertaken using a similar process to the initial conversion to FileMaker™. Firstly a list of the category records was exported. This list was opened in Microsoft® Excel and duplicates removed. A file was built listing these categories and an identification number (CatID) was assigned to assist referencing. The intermediary file was also exported and imported into a separate file and the file relationships established. The category field in the main file was then redundant. The input page of the database now looked like Figure 8.
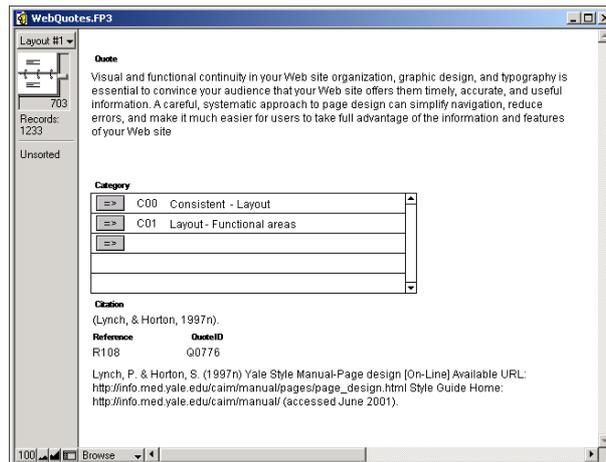
Figure 8: Refining the category list.

As categories were built up, a new understanding was developed as to the significance of some of the comments and this revealed a potential flaw in the research process. Initial comments about a particular concept may not have been deemed of significance in early readings and therefore not included only to find that they should have been, as further reading stressed their importance. Without the full list of categories from the start, some of the comments at the early stages may have been overlooked. One example of this is the concept of "satisficing" that was not even thought of as a possible issue. The following quote explains the concept (Krug & Black, 2000):

> *We don't make optimal choices. We satisfice. When we're designing pages, we*
>
> *tend to assume that users will scan the page, consider all of the available*
>
> *options, and choose the best one. In reality, though, most of the time we don't*
>
> *choose the best option-we choose the first reasonable option, a strategy known*
>
> *as satisficing.*

This concept was not identified as specifically in other documents but is likely to have been referred to, or alluded to, in the context of the discussion of other navigational issues. Krug & Black's book was not one of the early documents reviewed and had the satisficing category been in place from the start there may have been more quotes added relating to that concept.

On the other hand, the method of iterative development, employed by the researcher, did have the advantage of being able to incorporate concepts not considered important at the outset of the research. In this case the concept of satisficing was included rather than being ignored completely.

IDENTIFYING THE PRINCIPLES

The initial plan was to take the identified categories and assign a simple principle to each one thus producing a list of principles that would provide the basis of the Site Tester tool. For example a category like "Navigation - Three click rule" could be given the principle "Users should be able to find what they are looking for in a site within three clicks." The assumption was that once a principle was assigned to each category a list of quotes associated with that principle could be displayed.

Matching each category with a principle appeared to be a simple exercise. Without looking through the quotes, but focussing on the categories, a principle was assigned to each category. The problem with this approach appeared when the principle was compared to the quotes it was supposed to represent. In some cases a quote mentioning the value of a concept was lumped in with a quote identifying the weakness of the same concept but the quotes were allocated to the same principle.

It was clear, when listing the quotes used to identify the principle, that the quotes did not all support the principle identified. The principle had been assigned based on the category but in a few cases the quotes had no relevance to the principle or even were at odds with the principle.

For example the following two quotes came from the same document, one quote suggesting that the use of frames assists navigation and the other suggesting that the use of frames hinders navigational usability:

> *[Frames] present usability problems for tasks such as printing, bookmarking, searching, and using the browser back button. (IBM, n.d.)*

and

> *[Frames] allow the user to scroll through content without scrolling the navigation and identification areas out of sight; navigation and identification areas are always available. (IBM, n.d.)*

These two quotes were put in the same category but could not be reconciled into a common principle.

This problem revealed that the process of categorising the quotes did not lead effectively into building the list of principles. Ultimately the categories could not be used as a basis for identifying common principles.

To address this problem, each quote was reviewed again, one by one, and principles assigned matching the quote. This was managed in the same way that the original categories had been assigned with additional principles added when required. The principles had to be general enough to encompass quotes with a similar meaning and yet specific enough to be able to have significant value.
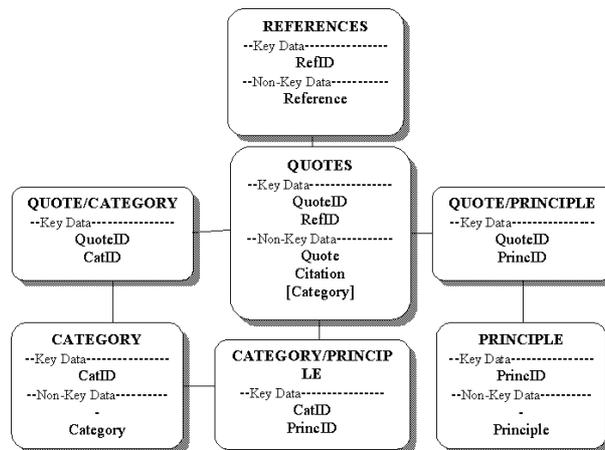
Figure 9: Adding the principle relationships to the quotes.

New related files were added to the database (see Figure 9) containing the principles and an intermediary many-to-many file "Quote/Principle" to provide the relationship between the quotes and the principles.

Building the list of principles, like much of the work up to this point, was a laborious exercise and had to be carefully reviewed. The development of a principle generally started out as a copy of the quote it represented and then as more quotes stated similar things the principle was revised to reflect the range of meaning from all of the related quotes. Some of the quotes, although relevant to web design, could not be easily assigned to a principle. The quote earlier in this paper is one example: "No amount of 'sparkle' in the presentation of products can overcome a site design with poor navigation features" (Lohse, 1999). The quote states an important design point, but does not lead to a specific principle. A general statement like "good navigation is more important than flash visual design" could be made but the value is lost because there is no definition of what good design is. Other quotes requiring specific situations to be relevant could not be converted into a measurable principle. For example, in research tracking the eye movements of users, there is a statement that, "our users were more likely to

35

investigate areas outside the Center Area when they spent more time searching for the correct link, or when they visited the page for the second or third time in a task" (Schroeder, 2001). This quote is of value when considering layout, but it can not easily be translated into a key principle of web design unless you can be sure all site visitors are repeat visitors or are likely to spend time searching for appropriate links. These quotes were not assigned to a principle but were left in the database so they could still be found under their category headings in the on-line database.

Once the quotes that could be assigned, had been, the principles were listed with their relevant quotes and reviewed again. Like the reviewing of the category headings, the reviewing of the principles allowed for moving quotes to more appropriate principles or sub principles.

In the context of building the website evaluation tool, the initial sorting of quotes into categories has little value. As a complementary resource for website developers it still has huge potential and provides a balanced view of concepts involved in web design. Building the list of principles, on the other hand was an essential step on the way to designing and building the Site Tester tool.

DESIGNING THE SITE TESTER TOOL

The plan for the Site Tester tool was to build an interactive checkbox-style programme that would provide feedback about the quality of a website. A checkbox based tool was chosen to simplify the analysis. As previously mentioned, checklists already exist to measure the quality of information on websites and website usability (Byrne, 2000; Elkordy, 2000; Everhart, 1996; Kirk, 1996; Oliver, 1998; Rettig, 1996; Smith, 1997a; Smith, 1997b; Stanger, 1996); Sullivan, 1996). The Site Tester tool is a development of this existing methodology.

The design intention included the use of Macromedia Flash™ as the environment for the checkbox Site Tester tool. A fair bit of time and effort went into reviewing Flash™ including experimenting with checkbox quizzes plus using external text files as question banks to allow the tool to link in with the on-line database. Having developed the on-line quote database, and finding it to be a useful tool in itself, led to the belief that including it in the tool was important.

Investigating Flash™ gave the impression that it would allow for a standalone and user friendly package, but that strength was also seen as a weakness. The value of the existing categorized quote list could not easily be incorporated into a Flash™ tool especially if it was a stand alone package. As development progressed, the project had mushroomed into a system using multiple relationships in a complex database. A lack of Flash™ experience also acted as a barrier to its use at this point.

Based on a limited awareness of the capabilities of Flash™ and a belief that the quote database needed to be an integral part of the tool, a database solution was judged as the way forward for the test tool. Further fields were added to the FileMaker™ database, containing the quotes, to allow for a question bank to be included. The realization that the final product could remain on-line raised an issue in relation to the choice of database. The initial database had made use of FileMaker™ based on the researcher's familiarity with it and the powerful yet simple way that FileMaker™ allows for database development and web deployment.

However, an issue that was encountered related to the use of FileMaker™ on the UCOL® – Universal College of Learning's – web server. A standard license of FileMaker™ can be used as a web server but does not run as a "Service" under Microsoft® NT Server. This means that whenever there is a problem with the server and it is restarted, FileMaker™ must be restarted manually and each database file re-opened manually before being accessible. The potential for the tool to be off-line without the developer being aware of it and for the extra maintenance needed meant that this was not a suitable option. The solution to this problem could have been to buy a server version of FileMaker™ — a considerable cost for just one database. Another solution was to rewrite the database using Microsoft® Access and deliver it using active server pages. The advantage of this option was that the database would conform to the environment of the UCOL® web server and would therefore be potentially more reliable. A decision was made to head down this track.

With little experience using Microsoft® Access and no experience building active server pages this conversion involved a steep learning curve. Each data file was exported as a TAB delimited text file and then imported into Microsoft® Access.

Once imported, the relationships between the files (or tables) were established (see Figure 10).
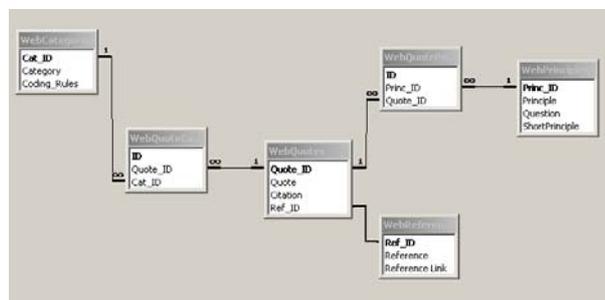
Figure 10: Access file relationships.

The active server pages were then built to refer to the tables in the new database. Active server pages use javascript or visual basic script to extract information from a database and

then build the page to display it. Having been spoilt by the ease of web publishing using FileMaker™ this was a challenging exercise.

The important part of this new development was to preserve the integrity of the database while maintaining the functionality developed in the previous system. Through considerable trial and error and a fair bit of manual reading, the database was created with minimal changes. One of the modifications required was the creation of a shortened version of the identified principles so that it could be included in a dropdown list. The idea was to abbreviate even further the principle statement, but include the full principle in the displayed results.

The building of a set of questions in a checklist using active server pages (.asp) was seen as the next step.

IDENTIFYING THE QUESTIONS.

Even with the database converted to Microsoft® Access, the FileMaker™ database was used for analysis. Each of the of the principles in the database was reviewed and adapted into a draft question requiring a yes/no answer that tests a site against that principle. For example the principle "The navigation scheme must remain constant throughout the site" was simply turned around to say, "Does the navigation scheme remain constant throughout the site?" The list of questions was then added to the Microsoft® Access database.

The full list of one hundred and thirty principles, listed in Appendix A, included some with only one associated quote and others with over thirty. The Site Tester tool needed to test a subset of these principles. The process of selecting which principles should be included in the Site Tester tool was visited several times. Various cut-off points were considered including an initial list of one hundred and one principles selected by identifying principles with more than five associated quotes.

This was a fairly comprehensive list, but it would take a bit too long to assess, and all but the most determined web designers would consider it a little excessive. Looking through the number of quotes assigned to each principle it was possible to apply a cut off point for thirty principles. Once again this was based solely on the number of related quotes, in this case twenty. The reduction of the list to a more manageable size was based on the view that a smaller list was more likely to be attempted and those wanting to review the full list of principles could still access the on-line list rather than be expected to answer over one hundred questions in a Site Tester. With the thirty top principles identified, the draft questions associated with each of those principles were assembled into a web page. The web based question page was an active server page and the questions came directly from a file in the database.

Two other pages needed to be built to provide a recording mechanism for the results and some feedback to the test user. The first web page the user sees asks them to identify the website being evaluated by putting in its URL (website address). There is also an optional field for the person doing the evaluating to add his or her name. When that page is submitted, a second page appears containing the set of questions with yes/no buttons to click (Appendix B). Once that is submitted a feedback page is shown giving a total score out of thirty for the questions and displaying a list of the questions with a percentage for each based on how many other users have selected "yes" for that question. The information submitted is added to the database providing extra statistics for the next user.

With the basic web based test tool created and tested, other feedback options were considered. When reviewing these options it could be seen that the relationship between the questions and the quotes was not direct enough to provide further feedback. In fact, there did not appear to be any other relevant feedback possible from the database driven test tool specific to the data collected.

A bit of a dilemma was revealed at this point. Here was a site testing tool that looked flat and uninteresting and, as a tool, lacked the appropriate visual form to go with the fairly limited function. A single page of thirty questions with checkboxes did not convey the feel of a professional website test nor did it model the qualities identified in the principles it was testing. Even some prettying up such as adding colour to each line and including a more visually appealing header and footer, would not have made much of a difference to the tool.

The process of building the draft questions had also shown that although the material related strongly with the on-line database, there was no longer a direct relationship with the full set of original quotes. The identification of questions from those principles meant that the link from the questions back to the quotes would have required a manufactured relationship rather than a realistic one. Some of the quotes still related directly but others related only indirectly. As the ability to relate to the data was a key reason for using an on-line database test tool, the tool development environment was reassessed and Flash™ was reconsidered as the environment for the Site Tester tool.

The key barrier to using Flash™ earlier in the project had been the inability to connect the Site Tester tool with the related quote database. Having found that there was no need for that connection to exist, it made sense to return to a Flash™ based tool, and put the .asp learning down to experience. Another factor in this return to the original plan was increased understanding about the use of the Flash™ software since the initial evaluation. The web page

had lacked visual form and also had limited function. It was important for the Flash™ tool to add to the function as well as provide a higher level of visual appeal.

The draft questions and top principles were reviewed again now that they did not have to be generated from an on-line database. Once again the review process allowed for a refinement that may otherwise not have happened. Some of the principles that were high scorers, as far as the number of quotes involved, needed to be left out of the final top principle list. For a principle to be considered a top principle it not only had to be referred to by the most quotes, it also had to identify something that could be uniquely measured using a yes/no question. For example the principle with the highest number of related quotes (76) was, "The site must be focussed on the target users." Although this is a key to good design, it is hard to measure objectively with a question requiring a yes/no answer. Reading through the other top principles, it was clear that they would provide adequate measurement of the "target users" principle, so it did not need to be included as a separate question. Although this refining could be seen to be arbitrary, considerable time was spent going over each principle, reviewing the related quotes, and considering the related principles and their quotes. The level of familiarity gained through the repeated reviewing of the quote database, up to that point, meant that this was a considered refining of the principles.

Early in the design process there was a desire to be able to provide feedback that was more than a simple score. A possible way to support this was seen to be identifying the areas of strength and weakness of a website. In other words it would be valuable for a designer to be given scores for more specific areas of his or her website, such as navigation.

The refined principles were examined to see if they could be broken down into areas or sub sections. Each top principle (and question) was grouped with other like principles and five themes of website development stood out – Layout, Navigation, Users, Site Design, and Content. With the questions grouped within these themes it could be seen that there was not an adequate balance of questions. To provide balance, five extra questions from the top of the principles list were added so that each theme consisted of seven questions covering thirty-five key principles (Appendix C).

At this point "yes" was the correct answer for each question so part of this process included the rewriting of the questions so that there was a mixture of "yes" and "no" answers that correctly matched the principles. A further part of the process was editing the questions so that even though the principles were referring to multiple quotes and in some cases an aggregate of other principles, they included only one main idea in each item as suggested by McKenna & Bull (1999).

The questions also needed to be objective enough so that if different people applied the test or if the test was run on multiple occasions, the results would be the same. The reason for this requirement is one of reliability. According to Colosi (1997), "Reliability estimates the consistency of your measurement, or more simply the degree to which an instrument measures the same way each time it is used in under the same conditions with the same subjects." Questions were also checked to see whether they used negatives sparingly and whether statements were unequivocally true or false as suggested by McKenna & Bull (1999).

The last issue relating to the questions was identifying the sample to be used with each question. Some of the questions cover aspects of the whole website being analysed whereas others focus on pages with information or content. It was important to group the questions according to the type of pages they analyse and a decision was made to use three samples. The first nine questions are focussed on the content pages within the site so the suggested sample is three random content oriented pages. The next twelve questions have more of a navigational, layout and user focus with a suggested sample of the home page, one top level navigation page, and a random content page. The last fourteen questions relate to the whole website rather than specific types of pages and can be answered based on a general overview of all pages. Appendix D lists the questions with the samples to be used.

BUILDING THE FLASH™ SITE TESTER TOOL

The new development was not an easy exercise as the tool needed to reflect good interface design practice and provide a level of interaction, while being functionally effective. As an advocate of the use of metaphor, time was spent trying to identify a suitable visual metaphor and as this was a type of tester the choice was made to use a multimeter or multitester concept.

Graphics were collected from website catalogues of multimeters. The main look of a multimeter came from the picture of an insulation tester used to test electronic insulation (Sunshine Instruments, 1996). The tester image was appropriate because it is used to test inputs against a standard scale, with the results displayed on a small screen.

The initial graphics were created as paint images using Adobe® Photoshop® based on the insulation tester, and pasted into Flash™. The left hand picture in Figure 11 is the initial paint image created for the Site Tester.
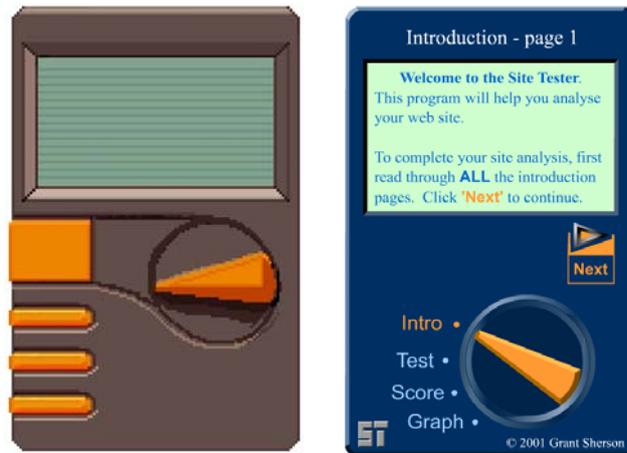
Figure 11: Developing the Site Tester interface.

As the tool was developed, all of the tool's graphics were redrawn using vector-based images within Flash™ to allow for interactivity and also because vector graphics require less time to load. The layout changed to better reflect the function of the tool. The key colours chosen were changed to the UCOL® branded colours so that the Site Tester could be included in a UCOL® branded website if need be. The right hand picture, Figure 11, shows the final look of the tester.

The questions section, called "Test" on the Site Tester, was the first part of the tool to be built (see Appendix D for the list of questions in the order they are asked). Each question was entered and a value assigned to "yes" and "no" responses. For example, if the question was, "Did you encounter any errors or broken links?" the answer that matches the principles is "no", so a "no" answer is given a value of one, and when "no" is selected one is added to the final score. Selecting an answer of "yes" gets a zero value and does not add anything to the score. As the principles being assessed are all key principles, no special weighting was included to account for the different importance of each principle.
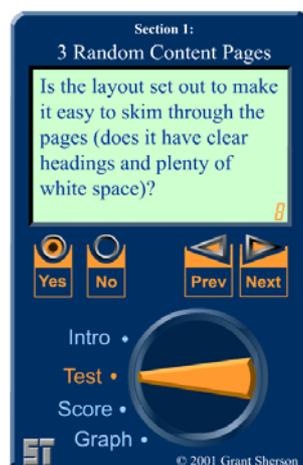
Figure 12: The Test section of the Site Tester.

The navigation for the test section uses simple "next" and "prev" (previous) buttons (see Figure 12). Radio buttons are used for the "yes" and "no" choices that use a similar look and feel to the navigation buttons and attempt to match the look and feel of a multimeter. A question number appears for each question to help keep track of which question is being answered and this uses the same digital font developed for the score (see below).

The main navigation is in the form of a dial similar to that which is normally found on a multimeter. It can be clicked, using the mouse, to move to the next section or the section heading can be clicked to go to that section (see Figure 12). The dial rotates to reflect the choice made. The initial design included three sections, the questions, a score, and a feedback section.

It is important that the person using the tool is able to move in and out of the test section and yet have the test section remember how many questions have been answered, the total value of the responses, and what choices were made for each question. Background programming using variables allows the user to skip questions or change answers and the information displayed will keep track of his or her responses. For each question two variables are set, the answer given (yes or no), and the value of that answer (one or zero). When the user returns to a question the programme looks at those variables and sets the yes/no button to the user's choice. If the user alters his or her choice the variables are updated to the new values.

To build the score page the digital multimeter was again considered and a digital font built to display the numbers. To provide sufficient information the score page displays two numbers (see Figure 13). The visually larger number contains a count of the responses that match the key principles (score) and the smaller number indicates how many questions the user has answered. The calculations are done at the point that the user switches to the score section so they can switch to the score and back at any point and the numbers are kept up to date.
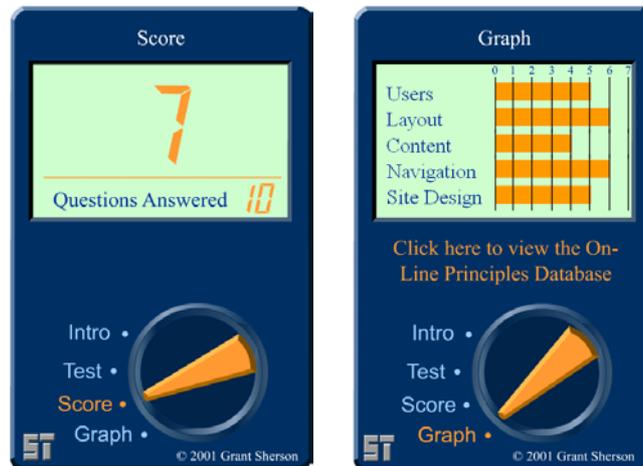
Figure 13: Score and graph sections of the Site Tester.

The results are also added together to provide feedback to the user. The feedback is in the form of a bar graph and is accessed via the "Graph" heading on the dial navigation. When users switch to the Graph page they are shown the number of principles in each theme area where their their assessment of the site agrees with the key principles. Each bar consists of seven sections matching the seven principles (questions) covered in each area (see Figure 13).

Also contained on the feedback page is a hyperlink to the on-line database where the user can search for, and view, the full list of web design principles. This link allows users to take the next step and identify all the principles in the weakest areas and go through them to improve the website.

Working through the tool it was clear that an introduction section was needed. The introduction section was designed to be like an on-line manual, covering how to use the tool. To keep it simple, this was developed as an "Intro" section within the same tool, making use of the navigation buttons designed for the question section and using the same screen area as the Test section. "Intro" was added to the dial navigation to allow users to read and re-read the introduction (see Figure 12).

For some users a little extra information would be needed to answer some of the questions. For example the question, "Can you navigate the three pages with all the images turned off?" would be hard to answer if the user was not aware of how to turn the images off. A small popup screen (see Figure 14) was added providing help to answer these questions.

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Figure 14: Popup screen containing extra information that may be
needed to answer the question.

Effort was put in to model usability issues such as allowing user control and having simple and consistent navigation. The Site Tester was also kept as small as possible to allow it to be accessed via a website. The final size is around 50kb, which should take less than 30 seconds to download even on a 28.8k modem connection (DiNucci, Giudice, & Stiles, 1998, p. 24).

Once all the questions had been checked for errors the Site Tester tool, Version 1, was complete and ready to test the UCOL® website.

Chapter 4

TESTING THE UCOL® SITE

The final part of the project was using the Site Tester tool to evaluate the UCOL® – Universal College of Learning – website.

SELECTING THE PAGES

The first step in the testing process was to identify the pages to be tested. Three randomly selected content pages were needed for the first set of questions. The main UCOL® site consists of a home page and six areas each with between six and thirteen sections. A formula was written in Microsoft® Excel to pick a random number between one and six and a second random number between one and thirteen. The first random number was used to identify the section, and the second random number identified the page within the section to use for the content test. The random number generation was repeated until three content pages were identified. A similar random process was used to identify the top level navigation page and content page needed for the second set of questions (see Appendix E).

APPLYING THE TEST

With the pages identified the test was begun. The test itself took less than 30 minutes to complete and UCOL®'s website ended up with a score of 26 from the 35 questions (around 74%).

The feedback page (see Figure 13) shows the breakdown of the UCOL® results. Layout and navigation areas were the strongest (6/7) and content was the weakest (4/7). The way the test was applied, by using random pages, meant that pages that may not normally be checked, because they did not seem important, or were database generated, were reviewed. The more thorough assessment of a few pages, rather than a general look at all pages, meant that even minor weaknesses in the site were going to be revealed. An example of this was one of the content pages containing over three thousand words, (a list of computing courses and their descriptions), had one word spelt incorrectly and so the question "Look for spelling and grammatical errors. Are there any?" was answered "yes". There was another page with a typographical error, but had there only been that one spelling error the site would still have been marked down.

Timing also came in to play with the content pages. One of the pages analysed was the "Campus Info" section, that contains a bit of an overview of UCOL®. The question "Does any of the content look out of date?" meant that some very recent information about UCOL® taking over responsibility of Wanganui Regional Polytechnic should have been on that page and wasn't.

The News release (UCOL, 2001) found elsewhere on the UCOL® website says the following:

> **Wanganui Regional Community Polytechnic (WRCP) to be incorporated into the Universal College of Learning (UCOL).**
>
> *The Associate Minister of Education (Tertiary), Steve Maharey, announced on December 4 that Wanganui Regional Community Polytechnic (WRCP) will be disestablished and incorporated into the Universal College of Learning (UCOL). A distinct campus will operate in Wanganui with Wanganui representation in the decision-making bodies of UCOL.*

Had the test been completed two weeks earlier, the Campus Info page would have been considered up to date.

Other missing principles revealed by the Site Tester included:

- Ability to navigate with the images turned off.

- Contact information on every page.

- An easy way to provide feedback to the Institution.

- Recent changes highlighted.

The test, although short, resulted in a good evaluation of the UCOL® site's strengths and weaknesses based on the identified principles. Answering a few simple but targeted questions about the UCOL® website provided a good place to start in relation to what changes would make the most difference to the quality of the website.

For anyone needing a place to start the Site Tester tool provides "more than meets the eye" in so far as the few questions provide a good measure of the principles of web design.

C h a p t e r   5

DISCUSSION

The process of developing the tool has been an extremely rich learning experience. The numerous reviews of the data mean that much of the design information has been imprinted in the mind of the researcher. The various false starts with the development from a word processed list through two different database and web page developments to the final Flash™ Site Tester, have involved significant personal professional development that would not have happened as quickly, or at all, without the motivation of the research project.

The principle information accessible via the on-line database has already been useful to the webmaster, staff, and students at UCOL® who are preparing web material for student learning or as part of industry based projects. The information collated and the knowledge gained has already been applied to a wide range of other projects from the design of a personal website through to the planning of a website for a group of churches in Palmerston North.

THE DATA

As mentioned earlier there was a considerable amount of material available for this research. With an almost endless supply of suitable documents it was difficult to know when to stop collecting. At the point of writing this research report there are another ten or so multi-page electronic documents sitting in the researcher's hard drive that could have quotes extracted and added to the database. A similar number of books have been identified that have material that could be added to the database.

The initial objective of collecting and collating existing views of best practice was not altered with the change in the way the material was collated. The use of a FileMaker® database to sort and analyse the quotes did not affect the basic methodology planned for this project. The evolution to a database format for the quotes was in many ways inevitable in order to manage the significant number of quotes that were found.

One of the strengths of using a database approach also created a problem in that more information was reviewed than otherwise would have been had the quotes remained in word processed documents. Aligned with this problem is the time spent reviewing the quotes, listing them in different ways, and generally playing with the data. Other researchers have

encountered similar problems, for instance in the use of NUD*IST for data analysis (Buston, 1997):

*Had manual methods been used solely it is certain that much longer periods would have been spent doing routine tasks. The flip-side of this ... is that the researcher using a package such as NUD*IST now has time to develop a 'coding fetishism', indexing anything and everything obsessively and unnecessarily - treating indexing as an end in itself and leaving little time for retrieval and 'real' analysis.*

She [Richards] also warns of the danger of 'keeping on going', ignoring common sense signs to limit the size of the data-set, driven on by the almost unlimited storage space, with no concrete limits such as the size of the office floor to act as a warning that an unmanageably large amount of data may be being gathered.

In the case of the Site Tester research, the analysis took extra time, not because it was difficult to do, but more so because it was easier to do in a database format. The size of the resulting list of quotes did mean that the time taken to make even minor alterations to the research was multiplied by many more items. Having made fairly major modifications to the way the quotes were managed added significantly to the time taken for the analysis part of the project. As with the experience using NUD*IST reported by Buston (1997), if the material had been analysed using manual methods, the time would have been taken up on more routine tasks. In this case the time taken making modifications, some of which were not very productive, did mean that the quotes were reviewed so many extra times that the resulting principles and Site Tester tool can be relied on as being thoroughly researched and reviewed. Had a more manual approach been taken, less time would have been spent on analysis and fewer options would have been considered.

In relation to knowing when to stop, the important point about the quotes data is that even if another ten documents meeting the original search criteria were to be added it is unlikely that the key principles would change and the Site Tester would almost certainly not need to be changed. Having skimmed though a number of other potential documents the most common

principles identified by the research seem to be reinforced rather than eroded by the additional literature.

THE PRINCIPLES

The research part of the Site Tester project established an important set of web design principles. The list of principles is of significant value in that it identifies keys for development, design, and marketing. However, any list of principles is unlikely to be complete or comprehensive and does not necessarily identify all of the important issues. The type of documents used for this research have a bias toward the design and marketing areas leaving some other areas understated. One simple example is the lack of information about the infrastructural requirements of a website. It seems obvious that the site will only be effective if the infrastructure it relies on is working. Fleming, (1998, p. 98) suggests, "unless your back-end infrastructure is as good as your content and design, you're not out of the woods." Fleming's comment is one of only two quotes found in the researched documents that mention the importance of the infrastructure (Appendix A) and so a question on infrastructure did not make it into the Site Tester tool. Had the initial document search included documents focussing on site infrastructure, networking, Internet service providers, and bandwidth perhaps the list of key principles would have included infrastructural issues.

Another similar example is the support needs of a website. Only nine of the quotes related to the principle "provide adequate support within the system as well as a helpdesk" (Appendix A). Like the infrastructure issue this is an important area, but the type of documents identified did not mention support and technical issues often enough for them to end up as key principles.

An issue with the data collection, mentioned earlier, is the context of the quotes in the database. Once the quotes were in the database their full context was no longer easily accessible. A few of the quotes had minimal context and some meanings may have been misinterpreted as Corbitt (2000) suggests, "meanings are context-dependent." More text could have been captured to reduce the impact of this problem, but once again the problem is not likely to be significant.

THE SITE TESTER TOOL

Looking at the final Site Tester tool has a tip-of-the-iceberg feel to it. For someone making use of the tester it would appear to have minimal substance when in fact considerable research has gone towards identifying the most important questions to ask. The "simplistic" appearance has both positive and negative connotations in that it will not put people off using it, but may mean that the results are not taken as seriously as they should be. By selecting principles mentioned

by the most web design documents and having refined the questions the way this project has done, means the Site Tester analyses the essential parts of a website, the parts that will make the most difference when altered.

Even small changes can have a large effect on the quality of a website. An institution that makes use of the Site Tester tool will be able to identify components that can be added to turn its website into a more effective web based communication channel.

Chapter 6

CONCLUSION

The Objectives and the On-Line Database

The research project has been effective in creating a suitable tool for website evaluation. This original purpose of the research did not change through the course of the project but the design of the output evolved. The outputs from this research project have turned out to be of greater value than anticipated. The on-line database of searchable principles and categories was an unplanned by-product of the project and could easily have been a sufficient outcome of this research.

The following example outlines the value of the on-line database. People subscribed to an email list about on-line writing (see http://poynter.org/forum/listsmain.htm) were directed to the on-line quotes in relation to a discussion about website design. The response to the database of quotes included comments such as "cool site!" and "many thanks for the link. It's exactly the sort of thing I'm looking for", and also "I think your idea is really interesting and wonderful that you are sharing with everyone." UCOL® staff and students who have viewed the database have responded in a similar way.

The Site Tester Tool

The method of refining the principles and ending up with a usable Site Tester tool has been very successful. The level of analysis did become tedious at times particularly the assigning of quotes to principles. This unanticipated exercise was a weakness in the process but it turned out to be a strength in relation to the eventual outcome. The amount of reviewing means there is a high level of confidence that the principles in the tool are indeed key principles.

There are a few improvements that could be incorporated in subsequent versions of the Site Tester tool. The actual design of the tester could be improved by providing a better way to handle the introductory information. In an effort to maintain a consistent interface the small display screen on the tester was used for the introductory text, limiting the amount of information that could be offered. In some cases this may need to be supplemented with a more thorough help file for those needing assistance using the tool.

Another area of possible improvement could be increased feedback by providing a full report covering the areas tested, identifying the score for each question, and making suggestions specifying how the analysed website could be improved.

To identify other areas for improvement in the Site Tester tool would be best achieved by *user testing* the tool, which would be a research project in its own right.

APPENDICES

Appendix A. Website Development Principles

Preliminary list of Web Design Principles ranked (R) in order by how many times (#) they were mentioned in Web Development Literature.

R	#	Principle
1	76	The site must be focussed on the target users
2	48	The screen should contain functional areas such as grouping navigation in a predictable location
3	41	The site layout should remain consistent to allow users to find what they want, confirm they are still on the site, and add polish to the site.
4	40	Keep navigation and design simple
5	39	Content must be easy to find.
6	39	Aim to have all pages load quickly, preferably less than 10 seconds. At most they should load in 30 seconds.
7	37	Edit graphics to get the best balance of quality for size. Crop, translate and resize to end up with all the images on a page adding up to less than 20 to 30Kb.
8	34	The navigation scheme must remain constant throughout the site.
9	32	Make it interesting, keep users engaged.
10	30	Information needs to be broken up into manageable, concise chunks
11	29	All content must be of a high quality
12	28	Avoid unnecessary animations, they can be a distraction for users
13	27	At all times users should know - where they are in the site, where they can go to and how they can get there.
14	27	The future of the Web is "one-to-one" Web sites.
15	26	Make sure the major search engines can find you
16	25	Logo, graphics and layout convey the brand image. Everything should have a purpose and fit with the brand, to create a unique and distinctive look.
17	25	A site must make a good first impression (within the first 4 to 10 seconds)
18	24	Only include graphics that add value and meaning to the site message.
19	23	Pages need to be able to work on a range of browsers, even if this means having an alternative version for some browsers.
20	23	Good headings simplify finding information on a page.
21	23	Many people print pages so keep the page width within normal print boundaries.
22	23	The site must be usable - in other words the site must assist the user to accomplish the tasks that they set out to complete.
23	22	Content must be kept current and updated regularly
24	22	Wherever possible links should be annotated, particularly when linking to large files or special content

25	22	A shallow (less than 3) but broad (8 to 9 choice) hierarchy provides the best navigation.
26	22	All navigation links should be descriptively labelled, clearly visible and understandable.
27	22	Avoid horizontal scrolling and minimise vertical scrolling
28	22	There must be a high colour contrast between text and background
29	22	Give the user control. Do not have anything that cannot be controlled by the user.
30	21	All graphics should have a meaningful ALT tag
31	20	User testing is essential
32	19	Maintain external consistency by adhering to uniform conventions for link colours, layout, navigation, formatting, typefaces, labelling, etc.
33	19	General appearance of a site should be clean, uncluttered and professional
34	18	Colours should be appropriate and carefully selected. Avoid having too many colours. Avoid using very strong colours.
35	18	Concise contact information should be readily available.
36	18	Site content must add value.
37	18	Make sure the site is reliable, free of bugs and breaks and broken links
38	17	Avoid requiring registration to enter the site. If information is required, only ask for what is essential; explain why it is needed and how secure the information will be.
39	16	Maintain internal consistency of style within a page and between pages.
40	16	Use chunking, headings and layout to increase text skimability
41	15	Every page should have a link to your home page.
42	15	Navigation should be obvious. Avoid using underlined text or buttony images that are not links.
43	15	Although scripting can help make a site more dynamic, currently scripting creates more problems than it solves.
44	15	If you ask for personal information, give an assurance that you will not abuse the information, or let it fall into the wrong hands.
45	14	All important pages should be accessible for users with disabilities.
46	13	Identify or highlight new or recently changed content.
47	13	Pages should include revision dates
48	13	Make sure there is plenty of white space on the page.
49	13	An effective metaphor adds familiarity to a web site
50	13	Make full (but appropriate) use of META tags
51	13	Make use of the special strength of hypertext.
52	13	Use free give aways as a promotion option
53	13	Web pages must communicate visually
54	12	DO NOT use all capital letters
55	12	Text must be readable (big and clear enough)
56	11	A text version, perhaps on an alternate layout, is needed where meaning is encoded in graphics or audio.
57	11	Animation can be used for highlighting important functional areas
58	11	Provide a table of contents as a navigation option
59	11	All navigation should have a text alternative

60	11	Each page should be free of spelling and grammatical errors
61	11	Careful use of audio can be used to provide atmosphere or to add another sensory channel for the user
62	10	Light backgrounds are better than dark backgrounds
63	10	Users must be able to have control of any multimedia on the site. They should also be able to choose whether they want too view it or not.
64	10	The homepage should clearly indicate the purpose of the site
65	10	All pages should have a carefully written title that matches the page contents and preferably contains company name and clear definition for bookmarking.
66	10	Offer Navigational options/alternatives
67	10	Only use fonts likely to be installed on the users computers and preferably the default font.
68	9	There are 216 colours that look good on a variety of platforms and monitors, called web safe colours.
69	9	Pages should not contain jargon
70	9	Original content is important.
71	9	If image maps are used they should fit on one screen, have clearly defined areas that support navigation and load quickly
72	9	Provide a search function on the web site
73	9	Users should be able to find what they are looking for in your site within three clicks
74	9	Provide adequate support within the system as well as a helpdesk.
75	9	Line length should be less than 450pixels / 9 to 15 words per line / 40 to 60 characters
76	9	Make sure the site can be viewed on several platforms
77	8	Author information should appear on all content pages
78	8	Use small video (multimedia) content and then only when it provides extra value to a site.
79	7	Navigation options should be grouped together on the left or top of the page.
80	7	Use quickloading thumbnail images linked to larger images, giving the user the opportunity to view the larger image if required.
81	7	Avoid using frames
82	7	Use frames only when they provide a distinct advantage such as high change content or to keep content and navigation separate
83	7	Pages should use only 2 to 3 type styles, avoid italics and do not use all bold text.
84	6	Pages need to be formatted to allow screen readers to read them
85	6	A mission statement is a good idea but it should be something that can be linked to so visitors can decide for themselves whether they want to read it.
86	6	Promote the site offline and on-line
87	6	Ensure product pricing is accessible.
88	6	Don't use Under Construction signs
89	6	Encourage user feedback
90	6	Site analysis (site statistics, site rating) should be used to improve effectiveness.

91	5	Animation can be used for illustration and explanation
92	5	Avoid textured backgrounds
93	5	Make sure products are simple to find and compare
94	5	Contact information should include a physical address
95	5	Each page must be self contained.
96	5	All graphics should have height and width tags
97	5	Provide a site map as a navigation option
98	5	Use testimonials as a promotion option
99	5	Optimise HTML
100	5	Include the home URL so printed pages identify the source
101	5	Avoid numerous columns but use columns to keep text no wider than a reader's comfortable eye span.
102	4	If a site requires extra software, it should be clearly explained and links and download instructions should be available for download.
103	4	A site should look good and be functional on a low resolution monitor with 256 colours.
104	4	Scripting requires a recent browser.
105	4	A web site must be constantly changing
106	4	Copyright statements should appear on every page
107	4	Error messages should be in clear and offer solutions.
108	4	Use external links rather than duplicating information
109	4	Long web pages require a link to the top of the page
110	4	Use contests as a promotion option
111	4	Users click on the first link that seems worth following, rather than looking through the whole page and making an informed choice
112	4	Make sure the first page loads quickly
113	4	The site should still be functional for users with 14.4 and 28.8 modems
114	4	Splash screens should load quickly, and establish the visual design and identify the purpose of the site.
115	4	Allow for international differences with money, date formats and time, and be consistent.
116	4	The home URL should be the root domain of all pages. It should be easy to remember and find.
117	3	Banner advertising gives the impression of focussing on sales.
118	3	Background images should be small, around 100,00 square pixels.
119	3	Include a FAQ section (frequently asked questions)
120	3	Pages should have a link to the main topic pages on the site.
121	3	Style sheets simplify site modification
122	3	Align text to the left and use centred text only it's needed.
123	3	A site must be convenient to use
124	2	Users quickly learn to ignore advertising on a web page.
125	2	Use discussion lists as a promotion option
126	2	Avoid using sound files
127	2	Make sure your site is linked to from many places
128	2	The quality of the site infrastructure is as important as the content
129	2	Do not use "borrowed" content
130	1	If the website collects or holds sensitive information, the site should be secure.

Appendix B. Web based Checklist

On-line evaluation tool – superseded by the Flash™ Site Tester tool.

UCOL UNIVERSAL COLLEGE OF LEARNING **Web Development Assessment**

Question	Response
Is all content of a high quality?	○ Yes ○ No
Is the site reliable, free of bugs, breaks and broken links?	○ Yes ○ No
Is it demonstrated that the content is kept current and updated regularly?	○ Yes ○ No
Do all main pages load in less than 10 seconds?	○ Yes ○ No
Have graphics been edited to get the best balance of quality for size. Do all the images on a page add up to less than 20K?	○ Yes ○ No
Is it obvious to the user, at all times, where they are in the site, where they can go to and how they can get there?	○ Yes ○ No
Are links annotated, particularly when linking to large files or special content?	○ Yes ○ No
Does the site adopt a shallow (less than 3) but broad (8 to 9 choice) hierarchy for navigation?	○ Yes ○ No
Are all navigation links descriptively labeled, clearly visible and understandable?	○ Yes ○ No
Can content be found easily?	○ Yes ○ No
Is concise contact information readily available?	○ Yes ○ No
Has the content been broken up into manageable, concise chunks?	○ Yes ○ No
Are there good headings that simplify finding information on each page?	○ Yes ○ No
Is there a high colour contrast between text and background?	○ Yes ○ No
Does the screen contain functional areas such as grouping navigation in a predictable location?	○ Yes ○ No
Is navigation and design simple?	○ Yes ○ No
Have unnecessary animations been avoided?	○ Yes ○ No
Do the pages fit on a printed page?	○ Yes ○ No
Does the site avoid horizontal scrolling and minimise vertical scrolling?	○ Yes ○ No
Is the site layout consistent?	○ Yes ○ No
Are all important pages accessible for users with disabilities?	○ Yes ○ No
Does the logo, graphics and layout convey the brand image. Does everything have a purpose and fit with the brand giving it a unique and distinctive look?	○ Yes ○ No
Does the site must make a good first impression (within the first 4 to 10 seconds)?	○ Yes ○ No
Is the site focussed on the target users?	○ Yes ○ No
Has the site been designed to make it interesting and to keep users engaged?	○ Yes ○ No
Does the site encourage 'one-to-one' relationship building?	○ Yes ○ No
Do the pages work on a range of browsers?	○ Yes ○ No
Does the site assist the user to accomplish the tasks that they set out to complete?	○ Yes ○ No
Does the site give the user control with everthing controllable by the user?	○ Yes ○ No
Can the major search engines can find the site?	○ Yes ○ No

Submit

Contact **Grant Sherson** for information on this research.
Email: g.sherson@ucol.ac.nz   **Web:** http://www.ucol.ac.nz/~g.sherson

Appendix C. Questions for Website analysis grouped by theme.

Final Site Tester questions.

Content High Quality

Look at the graphics on each page. Are there any that are there just to make the page look attractive, that do not add value?

Read through the content in the three pages. Does any of the content look out of date? For example listing or advertising past events.

Looking at the text, do you think the content offers something of value on each page?

Did you encounter any errors or broken links?

Can you tell where content has recently been added or changed?

Is there a revision date on each page?

Look for spelling and grammatical errors. Are there any?

Layout - General appearance of a site should be clean, uncluttered and professional

Look at the home page, a key navigation page and a content page. Is the navigation grouped together in a predictable place?

Time each page as it loads. Do a complete reload (shift-F5 in Explorer on a PC). Do any pages take longer than 30 seconds to load?

Look at the properties of the graphics on each page. Add up the size (in Kb) for each graphic. Is the total less than 30Kb?

Print each page. Does the main content of the page width fit within normal print boundaries?

Is there a high colour contrast between text and background?

Is the layout set out to make it easy to skim through the pages (does it have clear headings and plenty of white space)?

Are there big sections of text on the pages that could be broken up into more concise chunks?

Navigation – finding content easily

Is the navigation and design simple, easy to understand and use?

On each page is it obvious where you are in the site, where you can go to and how to get there?

Are there good headings that simplify finding information on each of the pages?

Are links annotated, particularly when linking to large files or special content?

Are there more than three layers of hierarchy to get to key content?

Looking at the navigation are the links descriptively labelled, visible and understandable?

Are the link colours, layout, navigation, or formatting different from most other websites?

Site Design

Go to Google, Altavista and Yahoo - Search for the site. Does it appear in the first 30 entries?

When you look at each page does the logo, graphics and layout convey the brand image?

When you first entered the site did you think it made a good first impression?

Do you have to scroll sideways to view the full width of any of these pages?

Can you get to contact information from each page?

Is the site full of lots of different colours or have strong colours?

Can you navigate the three pages with all the images turned off?

Users - The site must be focussed on the target users

Is the site interesting and engaging?

Do any of the three pages have lots of animations?

Is there an easy way you can provide feedback to the institution? For example a form you can fill in to ask questions.

Does the navigation and delivery work using both Netscape and Explorer.

Look for computing courses (or something offered by this institution), is it easy to find information on possible courses?

Are there parts of the site where your control is taken away? Pages popping up automatically? Animations you can't avoid or stop?

Do all the key graphics have a meaningful 'ALT' tag?

Appendix D. Questions in the order they are asked

Final Site Tester questions.

Questions (1-9) relating to three random content pages.

Read through the content in the three pages. Does any of the content look out of date? For example listing or advertising past events.

Can you tell where content has recently been added or changed?

Is there a revision date on each page?

Look at the graphics on each page. Are there any that are there just to make the page look attractive, that do not add value?

Looking at the text, do you think the content offers something of value on each page?

Look for spelling and grammatical errors. Are there any?

Are there big sections of text on the pages that could be broken up into more concise chunks?

Is the layout set out to make it easy to skim through the pages (does it have clear headings and plenty of white space)?

Do any of the three pages have lots of animations?

Questions (10-22) relating to the Home Page, a Top level Navigation page and a random content page.

Look at the home page, a key navigation page and a content page. Is the navigation grouped together in a predictable place?

Time each page as it loads. Do a complete reload (shift-F5 in Explorer on a PC). Do any pages take longer than 30 seconds to load?

Look at the properties of the graphics on each page. Add up the size (in Kb) for each graphic. Is the total less than 30Kb?

Print each page. Does the main content of the page width fit within normal print boundaries?

On each page is it obvious where you are in the site, where you can go to and how to get there?

Are there good headings that simplify finding information on each of the pages?

Looking at the navigation are the links descriptively labelled, visible and understandable?

Do you have to scroll sideways to view the full width of any of these pages?

Can you get to contact information from each page?

Is there an easy way you can provide feedback to the institution? For example a form you can fill in to ask questions.

Can you navigate the three pages with all the images turned off ?

Do all the key graphics have a meaningful 'ALT' tag?

Questions (23-35) relating to all pages.

When you first entered the site did you think it made a good first impression?

Is there a high colour contrast between text and background?

Is the navigation and design simple, easy to understand and use?

Are links annotated, particularly when linking to large files or special content?

Are there more than three layers of hierarchy to get to key content?

Look for computing courses (or something offered by this institution), is it easy to find information on possible courses?

Did you encounter any errors or broken links?

Are the link colours, layout, navigation, or formatting different from most other websites?

When you look at each page does the logo, graphics and layout convey the brand image?

Is the site full of lots of different colours or have strong colours?

Is the site interesting and engaging?

Are there parts of the site where your control is taken away? Pages popping up automatically? Animations you can't avoid or stop..?.

Does the navigation and delivery work using both Netscape and Explorer.

Go to Google, Altavista and Yahoo - Search for the site. Does it appear in the first 30 entries?

Appendix E. UCOL® Pages for Analysis

UCOL® pages used for Site Tester analysis

Three random information / content oriented pages.	Home, random top-level navigation, and a random content page.
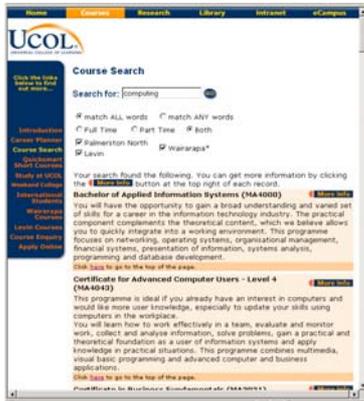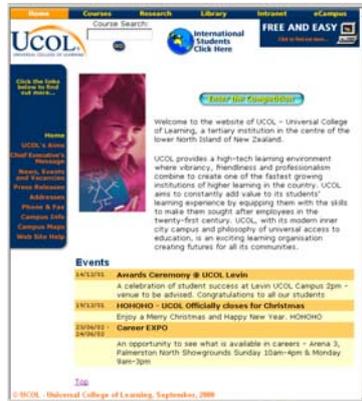
BIBLIOGRAPHY

Abrahamson, T. (2000, Summer). Life and death on the Internet: To web or not to web is no longer a question. *Journal of College Admission, 168*, p. 6.

Addison, D. (2000, November 30). University freshers boots traffic to education category web sites. *Marketing*, p. 12.

American Marketing Association. (1985). *What are the definitions of marketing and marketing research?* [On-Line] Available URL: http://www.marketingpower.com/live/content.php?Item_ID=4620 (Accessed, Jan 2002).

Beizer, B. (1990). *Software testing techniques*. New York: Thompson Computer Press.

Boon, L. & Kurtz, D. (1999). *Contemporary marketing*. Orlando FL: The Dryden Press.

Bush, V. (1945). As we may think, *Atlantic Monthly, 176*(1), 101- 108. Reproduction of this article [On-Line] Available URL: http://www.isg.sfu.ca/~duchier/misc/vbush/vbush-all.shtml (Accessed, Jan 2002).

Buston, K. (1997). NUD*IST in action: Its use and its usefulness in a study of chronic illness in young people. *Sociological Research Online, 2* (3). [On-Line] Available URL: http://www.socresonline.org.uk/socresonline/2/3/6.html (Accessed, Jan 2002).

Byrne, E. (2000). *Evaluation of web resources - checklist* (from WebSerch). [On-Line] Available URL: http://www.clubi.ie/webserch/resources/checklist.htm (Accessed, May 2001).

Carter, P. (1999). *A brief history of GUI*. [On-Line] Available URL: http://prcarter.home.mindspring.com/gui.html (Accessed, May 2001).

Chandler, D. (2000). *Semiotics for beginners*. [On-Line] Available URL: http://www.aber.ac.uk/media/Documents/S4B/sem01.html (Accessed Nov 2000).

Chiger, S. (1999, June). The 10 best Internet marketing concepts. *Catalog Age*, *16* (7), 203-206.

Colorado State University. (n.d.). *An introduction to content analysis.* [On-Line] Available URL: http://writing.colostate.edu/references/research/content/pop2a.cfm (Accessed July 2001).

Colosi, L. (1997). *Reliability and validity: what's the difference?* [On-Line] Available URL: http://trochim.human.cornell.edu/tutorial/colosi/lcolosi2.htm (Accessed, May 2001).

Corbitt, B. (2000). *Qualitative research methodologies*. Notes from Powerpoint presented April 2000 Comms 504 Research Methods paper by Professor Brian Corbitt.

Coulson, K. (1998). *Graphics: A New Zealand approach*. Auckland, NZ: Addison Wesley Longman New Zealand Ltd..

De Diana, I. & Aroyo, L. (n.d.). *Knowledge management for networked learning environments: applying intelligent agents*. [On-Line] Available URL: http://projects.edte.utwente.nl/proo/italo.htm (Accessed, May 2001).

DiNucci, D., Giudice, M., & Stiles, L. (1998). *Elements of web design*. (2nd Ed.) Berkley CA: PeachPit Press.

Duderstadt, J. (2000). New roles for the 21st-century university. *Issues in Science & Technology, 16* (2), p37.

Education Review Office Report. (1997, October). *The use of information technology in schools*. [On-Line] Available URL: http://www.ero.govt.nz/Publications/eers1997/itsch.htm (Accessed, May 2001).

Education Review Office Report. (2000, June). *The implementation of information and communications technologies (ICT) in New Zealand schools*. [On-Line] Available URL: http://www.ero.govt.nz/Publications/pubs2000/implementationICT.htm (Accessed, May 2001).

Elkordy, A. (2000). *Cyberlibrarians' rest stop: evaluating web-based resources: A practical perspective*. [On-Line] Available URL: http://www.thelearningsite.net/cyberlibrarian/elibraries/eval.html (Accessed, May 2001).

Everhart, N. (1996). *Web page evaluation worksheet*. [On-Line] Available URL: http://www.duke.edu/~de1/evaluate.html (Accessed, May 2001).

Feizabadi, S. (1998). History of the world wide web. In *World wide web - beyond the basics.* M. Abrams (Ed.), Prentice Hall. [On-Line] Available URL: http://ei.cs.vt.edu/~wwwbtb/book/chap1/htx_hist.html (Accessed, Jan 2002).

Flanders, V. & Willis, M. (1998). *Web pages that suck: Learn good design by looking at bad design*. Alameda, CA: Sybex.

Fleming, J. (1998). *Web navigation: Designing the User Experience*. CA: O'Reilly & Associates, Inc.

Flowers, J. (2000). *Introduction to usability research*. Ball State University. [On-Line] Available URL: http://www.bsu.edu/classes/flowers2/510/Modules/05_uresearch/5aintrousabilityresearch.htm (Accessed, May 2001).

Fluckiger, F. (1995). Excerpt from *Understanding networked multimedia*. Prentice Hall. [On-Line] Available URL: http://weblife.bangor.ac.uk/rem/kogi/hypHistory.html (Accessed, Jan 2002).

Gardiner, M. (ed.). (1987). *Applying cognitive psychology to user-interface design*. Portsmouth: Wiley.

George, S. (1998). *User interface design considerations and guidelines*. [On-Line] Available URL: http://homepages.feis.herts.ac.uk/~2com0002/UID.html (Accessed April 2001).

Gillespie, J. (n.d.). *Web page design for designers*. [On-Line] Available URL: http://www.wpdfd.com/ (Accessed, May 2001).

Grantastic Designs. (2001). *Print design vs. web page design - part 1*. [On-line] Available URL: http://www.grantasticdesigns.com/printweb.html (Accessed April 2001).

Guernsey, L. (1998, July 17). College-bound students use the web, but value printed information more. *The Chronicle of Higher Education, 44* (45), Washington.

International Business Machines. (n.d.). *IBM ease of use: Web design guidelines section*. [On-Line] Available URL: http://www-3.ibm.com/ibm/easy/eou_ext.nsf/Publish/572PrintView (Accessed, May 2001).

Kirk, E. (1996). *Evaluating internet information*. [On-Line] Available URL: http://milton.mse.jhu.edu:8001/research/education/net.html (Accessed, May 2001).

Krug, S. & Black, R. (2000). Excerpt from *Don't Make Me Think! A Common Sense Approach to Web Usability.* Published by Cue/Circle.com Library. [On-Line] Available URL: http://www.sensible.com/chapter.html (Accessed, May 2001).

Littlejohn, Stephen W. (1999). *Theories of human communication.* (6th ed.). Belmont, CA: Wadsworth.

Lohse, G. (1999, December). Internet retail store design: How the user interface influences traffic and sales. *Journal of Computer-Mediated Communication, 5* (2). [On-Line] Available URL: http://www.ascusc.org/jcmc/vol5/issue2/lohse.htm (Accessed, May 2001).

McKenna, C & Bull, J. (1999, June). *Designing effective objective test questions: An introductory workshop*. CAA Centre, Loughborough University.

Marcus, A. (1995). Principles of effective visual communication for graphical user interface design. In Baecker, M., Grudin, J., & Buxton, W. (Eds.) *Readings in human computer interaction: Toward the year 2000* (2nd ed.).

Miller, M. (n.d.). *Communications 300 chapter 6: Content analysis.* [On-Line] Available URL: http://excellent.com.utk.edu/~mmmiller/c300c6.html (Accessed, May 2001).

Nielsen, J. (n.d.). *Alertbox*. [On-Line] Available URL:http://www.useit.com/ (Accessed, May 2001).

Nielsen, J. (2001, January 21). *Alertbox: Usability metrics*. [On-Line] Available URL: http://www.useit.com/alertbox/20010121.html (Accessed, May 2001).

Nielsen, J & Norman, D. (2000, January 14). Web-site usability: Usability on the web isn't a luxury. *Information Week Online.* [On-Line] Available URL: http://www.informationweek.com/773/web2.htm (Accessed, May 2001).

Oliver, K. (1998). *Evaluation Procedures for WWW Information Resources: A Final Project Report*. Paper Presented at the Annual Convention of the Association for Educational Communications and Technology (AECT), St. Louis, MO. [On-Line] Available URL: http://www.edtech.vt.edu/edtech/kmoliver/webeval/criteria.html (Accessed, May 2001).

Rettig, J. (1996, September). Beyond "cool": Analog models for reviewing digital resources. *ONLINE*. [On-Line] Available URL: http://www.onlinemag.net/SeptOL/rettig9.html (Accessed, Jan 2002).

Schroeder, W. (1998, September/October). Testing web sites with eye-tracking. *User Interface Engineering.* [On-Line] Available URL: http://world.std.com/~uieweb/eyetrack1.htm (Accessed, Jan 2002).

Sherson, G. (1998, June/July). *Developing a web learning environment*. Technology for Flexible Learning Conference. New Dimensions in the Application of Technology for Education, Massey University, Palmerston North, N.Z.

Sherson, G. (1999). *The relevance of semiotics to the internet: How web designers use metaphors in web development* [On-Line] Available URL: http://www.ucol.ac.nz/~g.sherson/papers/semiotics.htm (Accessed, Jan 2002).

Speigel, R. (1999, October). Mistakes could cost e-tailers $6 billion this holiday season. *E-Commerce Times.* [On-Line] Available URL: http://www.ecommercetimes.com/news/articles/991008-2.shtml (Accessed, May, 2001).

Smith, A. (1997a). *Criteria for evaluation of internet information resources. VUW* Department of Library and Information Studies. [On-Line] Available URL: http://www.vuw.ac.nz/~agsmith/evaln/ (Accessed, May 2001).

Smith, A. (1997b). Testing the surf: Criteria for evaluating internet information resources. *The Public-Access Computer Systems Review, 8* (3). [On-Line] Available URL: http://info.lib.uh.edu/pr/v8/n3/smit8n3.html (Accessed, May 2001).

Stanger, K. (1996). *Evaluating internet resources*. [On-Line] Available URL: http://keithstanger.com/ineteval.htm (Accessed, May 2001).

Sullivan, T. (1996). *All things web: Checklist-based user testing*. [On-Line] Available URL: http://www.pantos.org/atw/35317.html (Accessed, May 2001).

Sunshine Instruments. (1996). *Yokogawa 242607 insulation tester*. [On-Line] Available URL: http://www.measurebetter.com/products/y242607.htm (Accessed, December 2001).

Sweden Canada Link, The. (2001). *Website audits and accessibility*. [On-line] Available URL: http://www.swedencanada.com/audit/eindex.htm (Accessed, December 2001).

Talbott, S. (1999, March/April). Who's killing higher education? *Educom Review, 34* (2), p. 26-33.

Tapsell, S. (2000, March). Wooing the wired. *New Zealand Management, 47* (2), 38-42.

Tertiary Education Advisory Commission. (2001, February). *Shaping the system*. Wellington.

Tognazzini, B. (1993). *Principles, techniques, and ethics of stage magic and their application to human interface design*. Proceedings of INTERCHI, 1993 (Amsterdam, The Netherlands,

April 24-29, 1993). ACM, New York, pp 355-362. Also published as Magic and Software Design By Bruce Tognazzini. [On-Line] Available URL: http://www.asktog.com/papers/magic.html (Accessed, May 2000).

Twigg, C. (1997). *A business model for university-corporate collaboration*. Notes for the June 4 - 5, 1997, NLII-ITP Symposium on Creating and Delivering Collegiate Learning Materials in a Distributed (Networked) Learning Environment.

UCOL – Universal College of Learning. (2001). *Wanganui Regional Community Polytechnic (WRCP) to be incorporated into the Universal College of Learning*. Available URL: http://www.ucol.ac.nz/news/news.asp (Accessed, Dec 2001)

University of Georgia Center for Continuing Education. (1998). *Exploring the web: The internet and the web*. [On-Line] Available URL: http://www.gactr.uga.edu/exploring/netweb.html (Accessed, May 2001).

van Dam, A. (1987). Hypertext '87 keynote address. Text extracted from the article printed in *Communications of the ACM, 31* (7). [On-Line] Available URL: http://www.cs.brown.edu/memex/HT_87_Keynote_Address.html (Accessed, Jan 2002)

van der Veer, G. (1990). Metaphors and metacommunication in mental models. In *Cognitive ergonomics : understanding, learning and designing human-computer interaction*. P. Falzon (Ed.) Suffolk: Edmunster Press.

Watson, R., Zinkhan, G. & Pitt, L. (2000, June). Integrated Internet marketing. *Communications of the ACM, 43*(6), 97-102.

Yale. (n.d.). *C/AIM Web style guide*. [On-Line] Available URL: http://info.med.yale.edu/caim/manual/ (Accessed, May 2001).