Identifying Web Usability Criteria: The 'Scanmic' Model

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Abstract
Evaluation is very important both during the web site development process and after a web site has been published. However, web designers often face problems in identifying the appropriate criteria for evaluation purposes. Despite the growing number of guidelines and other literature on web design and evaluation, each of them varies in terms of quality, coverage, and suitability; and not all criteria can be easily measured especially those that are subjective and difficult to control. The main purpose of this paper is to illustrate the process of identifying web usability criteria from the content analysis of current literature on web design and development. The results of the study include a comprehensive list of the identified criteria, which are grouped into 7 categories - screen design, content, accessibility, navigation, media use, interactivity and consistency. The paper ends with a discussion on the main issues which emerged from this study and its limitations.

Introduction

Web usability is one of the important factors that determine the success of a web site of any type. It is related to the design aspects of web pages that make sense to people who use them. It not only allows surfers to navigate easily and conveniently but also helps them find the information they wanted within a particular web site. Various studies show that web usability problems has caused firms a lot of money as well as potential customers. Rowland's study (Rowland, 2000 March 10), for example, reveals that an online clothing retailer in the United Kingdom suffers huge losses due to low number of site visitors, despite spending millions on advertising. As a result, the company announces job cuts and huge price reductions. Another example is a study by Zona Research (Seminerio, 1998 September 10), which conducts a survey on 239 long-time Internet users' behaviour while shopping on-line. From this study, one in three experienced users finds online shopping difficult and 62 per cent of the participants has given up looking for a specific product online.

This argument highlights the need for designers and web developers to put some effort and money on improving the usability of their web sites. This involves among other things, evaluating key aspects of web design that affect usability. Assessing web usability is not as easy as one would predict. In order to do the evaluation work, designers should consider a lot of things including the criteria to be used for the evaluation. This is where the problem might arise. Although there are abundance of web design guides and usability literature where designers and evaluators can refer to, each of them varies in terms of coverage, clarity, suitability, quality and comprehensiveness. With this in mind, this paper attempts to address the key criteria of web design that affect the usability of web sites with the following objectives:

a) identify the generic criteria of web usability
b) classify the criteria into group of factors
c) differentiate between objective and subjective criteria

Methodology

Content analysis is used as a tool to analyse various literatures on web usability mainly web design guides currently available online. Several guides are selected as well as articles in journals and texts books, some of which are listed in the bibliography section. The content analysis in this study involves 5 steps: first, decide what to analyse, second, decide on the level of analysis, third, decide whether to code for existence or frequency of concept, fourth, code the text, and finally, analyse the results.

Step 1: decide what to analyse

The researcher decides to analyse the selected text that are relevant to web usability. The main objective is to identify as many as possible the web usability criteria within the text. However, the criteria that are too technical will be excluded to allow both technical and non-technical people to use them in web evaluation, for example, 'the frame rate for animation clip should be no more than 15fps'.

Step 2: decide the level of analysis

Since different authors use different writing styles in conveying information, the researcher decides to code for sets of words rather than single words. The main objective of the analysis is to discover web usability criteria, which normally need more than one word for one particular criterion. For example, 'contrast use of colour for background and foreground' (8 words), 'simple language' (2 words), and 'the availability of list of contents' (6 words).

Step 3: decide whether to code for existence or frequency of concept

In this analysis, the researcher chooses to code for concept existence, not concept frequency. This means that any usability criteria identified within the text will be coded only once. This also applies to two or more sets of words that carry the same meaning, where only one code will be used. For example, the criteria 'use short paragraph' has the same meaning as 'the number of sentences within a paragraph should be no more than 6', hence only the former will be coded.

Step 4: code the text

The coding process is done manually and not by the computer programs. Manual coding is more practical because the computer program could not identify different phrases or sets of words that carry the same meanings. The coding process involves readings through the text and writing down phrases or sets of words that relate to web usability criteria.

Step 5: analyse the results

This is the final step and the most difficult one. From the list of criteria that has been finalised in step 4, the researcher analyses each of them and classify them into groups of factors. From the literature review, which will be discussed later, there are at least seven main factors of web usability. Hence, this final step mainly involves placing each criteria into the right category of factors. For example, 'up-to-date links' is categorised under the group 'navigation', which is one of the main factors of web usability. After all criteria have been categorised accordingly, the next stage is to differentiate between objective and subjective criteria.

Factors Determining Web Usability – A Critical Review of Literature

Gathering from various literatures on web design and usability, the researcher has identified many criteria of web usability. These criteria are then clustered into seven main factors, abbreviated by the researcher as SCANMIC. These factors are as follows;
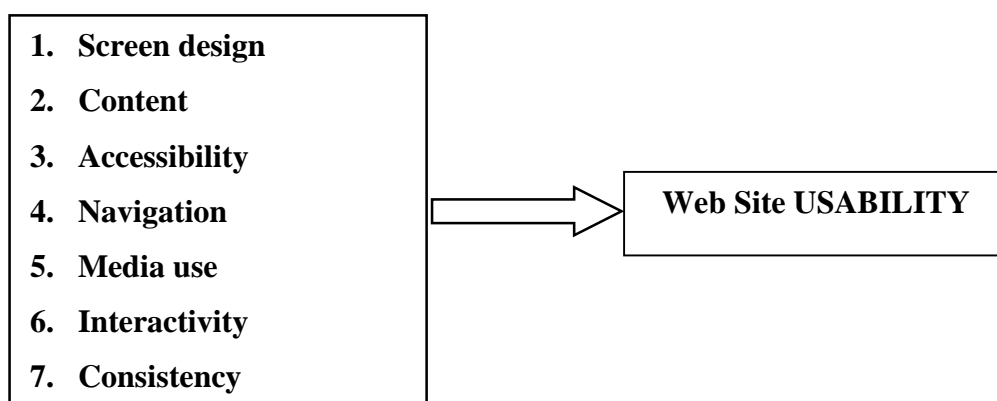

Figure 1: *Seven factors that determine the usability of web sites (these factors are far from exhaustive as there might also be other factors involved).*

a)   Screen design

In her article 'Effective Electronic Materials', Shirley (1999) divides screen design or layout into 3 categories, space provision, choice of colour, and readability. All of these are briefly described below;

Space provision

This refers to proper allocation of space for functions and content display provided in a web page to help users focusing their attention.

Choice of colour

Proper use of colour not only attracts users to visit a web site but also improves learnability and ease of use. In contrast, improper use of colour may degrade usability and thus hinders a first time visitor to revisit a web site. Proper use of colour is emphasised in almost all design guides.

Readability

One of the main objectives of a web site is to provide a readable content. This is not easy to be achieved. The reason is that reading from a computer screen is different from reading from a paper. Therefore, if a designer were writing for a web page by using a conventional paper writing format, the page could be a failure. Nielsen (1997a, March) argues that *users read 25 per cent slower from a computer screen than a paper.*

Readability is related mostly to choice of fonts and text. Hypermedic.Com (1998, July 14), outlines a detail discussion about typography on the web. Issues on type of fonts, leading and legibility, page appearance, word and letter spacing, and typographic colour are explained. However, this guide, as also found in other design guides, fails to clearly argue the difference between san serif and serif fonts in improving readability. Furthermore, the issue of culture, age difference, and environment within which the application is being used that might affect the preference for fonts and text are not specified. To complicate the matter, the issue of readability can be very subjective. A readable text for one person might not necessarily be the case for others.

Unlike most Web Design Guides, Shirley does not include scannability issue in her screen design guide. Designers should not only design for readability but also for scannability.

Basically, *scannability* is indirectly associated with readability. Based on their on-going research on usability, Morkes and Nielsen (1998) states:

"as users find it difficult to read large volumes of information on screen, they prefer to scan text and pick out keywords, sentences, and paragraph of interest while skipping others, which are not related to their interest. In other words, users always skim rather than read web documents".

b)   Content

The question of what should be on a web page depends largely on the goals of the web site. Some intend to sell products and service, some offer free entertainment, some provide government information and so on. However, one should bear in mind that providing content in a web page is not as easy as providing a printed page in a book. Yet, a designer should not run away from the basic elements of a document to ensure a web site's usefulness.

In their 'Web Design Guide', Lynch and Horton (1999) outlines four basic elements of a document which are not complicated, and have almost nothing to do with Internet technology: *who, what, when, and where.*

Who

The first basic element is the question of "Who is speaking?" or "who is speaking this to me?" if we put it in users' perspective. This question is very important because it will determine the owner or originator of a web site. People are looking for information that is reliable and being originated by those whom they can trust. Therefore, a designer must tell the users who initiate a web site, be it an individual, an institution, a company or any other organisation.

What

This is the second basic element that refers to the question of "what is a web site offering?". One thing for certain is that users will not browse a web site without knowing what the site is offering. They must have some kind of ideas of what to browse. In relation to this, every web page should have a proper title to capture reader's attention. The document title is often the first thing browsers of World Wide Web documents see as the page comes up. Additionally,

the page title will become the text of a browser "bookmark" if the user chooses to add his or her page to their list of URLs.

After title, come other important things that include list of contents a web site is offering. This can be presented in a lot of ways such as icons and bulleted list. The list in the main page will give ideas to users of several different categories of information a site is about to present.

When

This third element highlights the need of currency or timeliness of an information in a web page. No doubt that timeliness is an important element in evaluating the worth of a document. Frequent users will look for the date the information is updated. This is not uncommon as people are reading up-to-date newspapers, magazines and articles. One must remember that the aim of a web site is not only to attract first time surfers but also frequent users.

Where

The final element is 'Where' that relates to the need to inform users on the whereabouts of servers they are browsing from. The Web is the place where surfers virtually travel all around the world. Several keystrokes by a user will give connections to servers located in different countries. One moment a user is connected to a server in New York, minutes later, he or she travels to Tokyo. Hence, users should be informed about the country of origin or location of a web server.

Despite lengthy explanation on how to design good content, Lynch and Horton do not clearly emphasise the question of "what to publish?". Apart from title and list of contents, the actual contents and text should also be discussed because they represent the main attraction of web surfers.

Potomac Knowledgeway Web Design Guide(2000) highlights the need for relevant, useful, interesting, up-to-date and accurate information. Whereas, Comber(1996, November) discuss the importance of short page titles, meaningful headings and signed pages. Mounty(1999, May) also includes other elements of good content such as appropriate breadth and depth, challenging and content that evokes emotion.

One thing for certain here is that some elements described above are absolute and some are relative. Up-to-date information for example is crystal clear in its meaning. However, other elements, for example, valuable content is very subjective and they depend on the goals of users. For example, a user looking for a downloadable audio clip of a song might not consider the song's lyric as useful.

c)   Accessibility

One of the goals of having a web site is to attract visitors as many as possible from various locations. The basic way to achieve this is to ensure that the site is accessible to target users. By the word 'accessible', it means that users would not only be able to get connection to a web site but also able to browse all contents available. The higher the degree of accessibility, the higher the level of usability.

Benjamin (1996, August 29) advises web site developer to take into consideration different Personal Computer(PC) platform, network connection, browsers, and browser versions in their design process. There are three elements of accessibility: *loading time, browser compatibility, and search facility*.

Loading Time

Loading time is the time it takes for a network PC to download data and files from a server. In a much simpler word, it refers to how long users have to wait for a browser to download data and files from a web server. Logically, users could not tolerate long loading time. Nielsen says,

"web users are impatient: they want to get their answers immediately and do not want to be slowed down by cool features, mission statements, or self-promoting grandstanding". (Nielsen, 1997b, December)

Yale Style Manual (1999) ranks 'design for speed' as top priority by stating that the threshold of frustration for most computing tasks is around 10 seconds. Loading time is something that cannot be avoided by users and therefore design for speed should be one of the objectives in any web site development.

Browser compatibility

As suggested by CNET Builder Web Design Guide and several others, designers should also consider different browsers used by surfers across the world. Additionally, although users might use two popular browsers of Microsoft Internet Explorer and Netscape Navigator, the browsers might differ in terms of their product versions. If a user has lower browser version, he or she might not be able to view certain graphics and java applets applications.

Search facility

Search facility has become of a necessity for a web site of a larger size. Providing this facility will speed up users search for information in a web site. One of studies run by Nielsen in the Sunsoft usability laboratories in 1994 found that search facility is highly recommended by the participants (Nielsen, 1997c).

d)   Navigation

Some people believe that the best site contains lots of graphics, animation, and colours. However, not many realise that the basic of an effective web site is its navigability. In her 'Designing Electronic Material' article, Parker (1999, November) states that good navigation in a Web site is comparable to a good road map. With good navigation, users know where they are, where they've been, and where they can go from their current position. In short, navigation is the key to making the experience enjoyable and efficient.

CNET Builder Web Design Guide (Benjamin, 1999, August 29) outlines several elements of good web navigation including logical tree-like structure, limited list of contents or menu (not more than 7), limited number of linkages to the desired content (not more than 5) and navigational tools in all pages. Apart from these, other elements such as summary screen, button or text bar for "PREVIOUS", "NEXT" and "MAIN MENU" and unbroken links are suggested by Yale Style Manual (1999). While Comber (1996, November), highlights the need for meaningful link names, index of pages of topics and contextual links.

While these guides are general in nature, the applicability of the navigation elements depends on many factors including user environment, user experience, technology platform, and culture.

e)   Consistency

There is an element of 'fear of the unknown' when users visit a web site for the first time. Although they might be familiar with the browser and hypertext application environment, the design of a web site is different from others. Some web sites might put the menu bar at the top of screen, while others might use a horizontal hypertext button at bottom of the screen. Some web sites prefer using frames to divide functional areas while others merely use colour boxes. Therefore, there will always be some elements of unfamiliarity on behalf of users when the visit a web site for the first time. In considering this, design consistency is important to speed up user's learning.

Yale Web Style Manual (1999) provides good insights on web design consistency. The guide suggests designers to provide consistent layout for title, subtitle, page footers, background, and navigation links and icons in terms of colour, size, space and fonts used.

f)   Interactivity

Interactivity is a broad term and can be misleading. However, the researcher is referring this word *to features in a web site that facilitate a two-way communication between users and site owners or other pre-assigned personnel*. Additionally, the features allow users to give feedback and comments on any issues raised by the web site. The introduction of the interactivity features such as email, guess book, on-line forms and net conference might enhance a web site's worthiness.

However, most web design guides such as NETBuilder, Yale Style Manual, and WCA do not have a good coverage on this factor. They only emphasise the need for web sites to use interactive elements such as online-forms and email for feedback purposes only. Yet, interactivity should be considered among the most important factor that contribute towards a highly usable web sites.

g)   Media use

The use of media such as graphics, images, animation and audio in web pages distinguishes it from information presentation on papers. Studies on on-line electronic materials have shown that the integration of this media keeps users attention and, when used effectively, can enhance usability. However, designers should take extra care when introducing all these elements as improper use of them may distract users and affect usability. Additionally, heavy

utilisation of media elements consumes web site server's hard disk space and lengthens the downloading time. Web Workshop (1999, July 24) provides a good introduction on how to properly manage multimedia elements on web. The main multimedia elements are sound, graphics, images, audio and video.

Sound

Some web sites embed audio as background music, downloadable audio files or on-the-fly audio clips. Sound may also be used in conjunction with animation or video. As with colour, sound can help improve or degrade usability.

Graphics and Images

There are things that cannot be described by words and thus the use of graphics and images is very helpful. Furthermore in certain cases, graphics are used to emphasise text. As the saying goes: "A picture is worth a thousand words." But that's only true if the picture is right.

Animation and Video

The use of animation is normally for drawing the attention of users or assisting with understanding by demonstration. But, heavy use of animation causes long downloading time and use up web servers' disk space. Political web sites should also utilise the benefit of multimedia elements. *Graphics* could be used for banners, logo, charts, and menu icons, *audio clips* could be used for speeches of political leaders and *video* could be used for political forum or discussions.

Main Findings

There are 68 criteria of web usability identified in this study. From this figure, 54 of them are considered objective criteria and the remaining 14 are subjective. These criteria are group into 7 SCANMIC categories summarised in table 1.

Table 1: Number of Web Usability Criteria of SCANMIC Factors

Category/ SCANMIC Factors	No of Criteria		
	Objective	subjective	total
Screen Design	13	3	16
Content	18	5	23
Accessibility	5	1	6
Navigation	6	2	8
Media use	7	3	10
Interactivity	2	0	2
Consistency	3	0	3
Total	54	14	68

Screen Design

The first category, Screen Design, is divided into 4 sub-categories: Space allocation, Choice of colour, Readability and Scannability. There are 16 criteria in Screen Design, out of which 13 are objective and only 3 are subjective. The summary and list of these criteria are presented in Table 2(a) and 2(b) respectively.

Table 2(a): Number of Web Usability Criteria for screen Design

Category/ Factor	Subcategory	No of Criteria		
		Objective	Subjective	Total
Screen Design	Space allocation	2	1	3
	Choice of colour	4	1	5
	Readability	3	1	4
	Scannability	4	0	4
Total		13	3	16

Table 2(b): List of Web Usability Criteria for screen Design

Category/ Factor	Subcategory	No of Criteria	
		Objective	Subjective
Screen Design	Space allocation	• Position of menu/ list of contents on screen (left or right hand site of the screen) • Location of menu bar/ tools bar/ navigation bar (at the top or bottom of the screen)	• Proper allocation of screen spaces for content display, menu bar, list of contents, and advertisement
	Choice of colour	• Sharp colour contrast between background and foreground • Use of colour to differentiate functional area (e.g. tool bar, menu bar and list of contents) with content display area • Use of conservative colour • Use of light colour (white/yellow) colour for background	• Minimal use of colour except for photos and graphics
	Readability	• Use a mixture of upper and lower case for text • Use of all capital letters for captions and labels • Different text sizes to differentiate between titles, headings and texts	• Use of fonts that are easy to read
	Scannability	• Clear titles for each pages • Clear headings, sub headings for text/ document • Short paragraphs (not more than 6 sentences) • Use of typography and skimming layout, for example, bold fonts and highlighted words	-

Content

The second category, Content, is divided into 6 sub-categories: Scope, Accuracy, Authority, Currency, Uniqueness, and Linkages. There are 23 criteria in Content, the highest of all categories, where 13 of them are objective and only 3 are subjective. The summary and list of these criteria are shown in table 3(a) and 3(b) respectively.

Table 3(a): Number of Web Usability Criteria for Content

Category/ Factor	Subcategory	No of Criteria		
		Objective	subjective	total
Content	Scope	3	3	6
	Accuracy	0	2	2
	Authority	4	0	4
	Currency	2	0	2
	Uniqueness	6	0	6
	Linkages	3	0	3
Total		18	5	23

Table 3(b) : List of Web Usability Criteria for Content

Category/ Factor	Subcategory	No of Criteria	
		Objective	Subjective
Content	Scope	• Suitable language for audience • Publication and press release • Archive of previously published materials	• Breadth of subject coverage • Depth of subject coverage • Intrinsic value of information
	Accuracy		• High quality writing, for example, good grammar and no spelling and typographical error • Separation between informational and opinion content
	Authority	• Name of text or documents' authors • Positions or affiliations of text or documents' authors • References or sources of text/ document • Background information of institution/ organisation/ owner of the site i.e. name, address, phone number and email address • Copyright holder statement	
	Currency	• Resource date • Page revision date	
	Uniqueness	• Output/ print format as alternative to HTML format • Viewing format other than HTML, for example, PDF and slides • Choices of language for multi-ethnic audience • Choices of media type for information, for example, text only, audio or video • Hit counter • Information or warnings on file type and size for downloading	
	Linkages	• Links to other relevant sites • Links to state and local branches • Links to supporting or sponsoring organisations	

Accessability

The third category, Accessibility, is grouped into 4 sections: Loading speed, Browser compatibility, Search facility and Web site accessibility. There are 6 criteria in Accessibility, out which 5 are objective and only 1 are considered subjective. The summary and the list of these criteria are shown in table 4(a) and 4(b) respectively.

Table 4(a) : Number of Web Usability Criteria for Accessibility

Category/ Factor	Subcategory	No of Criteria		
		objective	Subjective	Total
Accessibility	Loading speed	0	1	1
	Browser compatibility	2	0	2
	Search facility	1	0	1
	Web site accessibility	2	0	2
Total		5	1	6

Table 4(b) : List of Web Usability Criteria for Accessibility

Category/ Factor	Subcategory	No of Criteria	
		Objective	Subjective
Accessibility	Loading speed		• Acceptable loading time (10 – 20 seconds)
	Browser compatibility	• Compatible contents for all main browsers (Netscape and Microsoft Explorer) • Compatible contents between different versions of the same browser	
	Search facility	• search facility for medium and large web sites	
	Web site accessibility	• Links available in other relevant web sites	-

Navigation

The fourth category is Navigation. Unlike the previous factors, navigation has no sub-categories. The total number of criteria for this category is 8 where 6 of them are objective and only 2 are subjective. The summary and list of these criteria are shown in table 5(a) and 5(b).

Table 5(a): Number of Web Usability Criteria for Navigation

Category/ Factor	Subcategory	No of Criteria		
		objective	Subjective	Total
Navigation	-	6	2	8

Table 5(b): List of Web Usability Criteria for Navigation

Category/ Factor	Criteria	
	objective	subjective
Navigation	• Menu/ list of contents in the main page • Menu/ list of contents in every page • Links to anywhere from anywhere within the site • Minimal number of links to arrive at a particular information • Use of both graphics and text-based menu • Accurate and up-to-date links • Use of sitemap	• Appropriate number of sections/ categories of contents (not more than 7)

Media Use

The fifth category, Media Use, is divided into 3 sub-categories: Audio, still pictures (graphics and images), and moving pictures (animation and video). There are 10 criteria in Media Use, the third highest of all categories, where 7 of them are objective and 3 are subjective. The summary and list of these criteria are shown in table 6(a) and 6(b) respectively.

Table 6(a): Number of Web Usability Criteria for Content

Category/ Factor	Subcategory	No of Criteria		
		Objective	Subjective	Total
Media Use	Audio	1	1	2
	Graphics & Images	4	1	5
	Animation and video	2	1	3
		7	3	10

Table 6(b): List of Web Usability Criteria for Content

Category/ Factor	Subcategory	No of Criteria	
		Objective	Subjective
Media Use	Audio	• Control features for audio where appropriate , for example, replay, control volume and turn off	• Use of audio to suit context, for example, instruction, speeches, and songs
	Graphics & Images	• Use of graphics or/and images for emphasis • Use of graphics or/and images to attract attention • Labelling of all graphics and images • Use of thumbnails to display photos	• Minimal use of cosmetic graphics and images
	Animation and video	• Use of animation and video as guides to users • Control features for animation and video where appropriate, for example, repeat, slow down, turn off • Avoidance of looping animation to prevent users' distraction	• Relevant use of moving pictures media i.e. animation and video

Interactivity

The sixth category, Interactivity, has only 2 criteria, the lowest of all categories. The summary and list of these criteria are shown in table 7(a) and 7(b).

Table 7(a): Number of Web Usability Criteria for Content

Category/ Factor	Subcategory	No of Criteria		
		Objective	subjective	Total
Interactivity		2	0	2

Table 7(b): List of Web Usability Criteria for Navigation

Category/ Factor	Criteria	
	objective	subjective
Interactivity	• Features for users' feedback about the site, for example, web master's email address and on-line form • Features for sharing views and discussions, for example, e-forum, net conference and net chatting	

Consistency

The final category is Consistency with only 3 criteria, where 2 of them are objective and 1 subjective. The summary and list of these criteria are shown in table 8(a) and 8(b).

Table 8(a): Number of Web Usability Criteria for Content

Category/ Factor	Subcategory	No of Criteria		
		objective	subjective	Total
Consistency		3	0	3

Table 8(b): List of Web Usability Criteria for Navigation

Category/ Factor	Criteria	
	objective	subjective
Consistency	• Consistent page layout, for example, screen size for content display, banners, and menu bar. • Consistent use of text in terms of its type, font size and colour. • Consistent use of navigational aids, for example, menu bar, buttons and links in terms of graphics metaphor, size and colour.	

Discussion and Conclusions

The main output of this short study is a comprehensive list of web usability criteria that can be used for evaluation purposes. Apart from identifying the generic criteria, this study also classifies them into suitable groups labelled by the researcher as the SCANMIC factors. The idea behind this is to allow web designers to properly evaluate their web sites according to category and priority.

Content factor, unsurprisingly has the highest number of criteria. This is because most web design guides and other usability criteria give strong emphasis on the issue of web content and how it can be presented in a useful and meaningful way. Besides, the main purpose of surfers visiting web sites is nothing more than to get access to the content, not to enjoy the view of banners with outstanding graphics and animation, not to listen to the web background music, and so on. Equally high in terms of the number of criteria is the Screen Design factor that highlights the need for careful consideration by the designers of screen spaces allocation

for web elements, colour choices, readability, and scannability. Usable screen design will ensure easy access and retrieval of information within a web site.

This study also reveals that 74.4 per cent of the identified criteria can be measured objectively. This will make it easy for the designers to perform the evaluation work as it could raise reliability and prevent bias on the outcome. The remaining 25.6 per cent of the total number of criteria can only be measured subjectively and they are more suitable to be used for usability testing. This is because most of these criteria relate to users' perceived ease-of-use and perceived usefulness of the web sites.

Having discussed this, this study also has its limitations. Content analysis of the literature is based on the researcher's interpretation and judgements in identifying and grouping the usability criteria. As such, the criteria derived in this research should be reviewed and validated by the experts in web design and Human Computer Interaction for more reliability. Nonetheless, the outcome of this study provides some basis for further investigation in this area.

Bibliography

Benjamin, B. (1996, August 29). Web Graphics – elements of web design, *CNETBuilder.com* [Online]. Available: http://builder.cnet.com/Graphics/ Design/index.html. [access:2000, Feb. 2]

Comber, T. (1996, November). Building Usable Web Pages: An HCI Perspective [Online].Available:http://elmo.scu.edu.au/sponsored/ausweb/ausweb95/papers/hypertext/comber. [access:2000, Feb.2]

Hypermedic.com. (1998, July 14). Web Typography [Online]. Available: http://www.hypremedic.com/style/typog/typeindex.htm. [access:2000, Feb. 2]

Lynch & Horton (1999). Interface design for WWW Web Style Guide, *Yale Style Manual* [Online]. Available: http://info.med.yale.edu/caim/manual/interface.html. [access:1999, Dec. 25]

MIT, INTRIA, & Keio. (1999). *Web Content Accessibility Guidelines 1.0* [Online]. W3C. Available: http://www.w3.org/TR/1999/WAI-WEBCONTENT-19990505/. [access: 1999, Nov. 14]

Morkes, J. and Nielsen, J. (1998). Applying Writing guidelines to Web pages [Online]. Available: http://www.useit.com. [access:1999, Nov. 25]

Mounty, G. (1999, May). User-friendly Interface Design, A Literature Review [Online]. Available: http://www.uned_uk.org/toolkits/interfacedesign/interfacedesign.htm. [access: 1999, Dec. 12]

Nielsen, J. (1997a, March). Be Succint! Writing for the Web, *Jacob Nielsen's Alertbox* [Online]. Available: http://www.useit.com/alertbox/991003.html. [access:1999, Dec. 23]

Nielsen, J. (1997b, December). Changes in web usability since 1994, *Jacob Nielsen's Alertbox* [Online]. Available: http://www.useit.com. [access:1999, Dec. 23]

Nielsen, J. (1997c). Report from 1994 Web Usability Study, *Papers and Essays* [Online]. Available: http://www.useit.com/papers/1994_web_usability_report.html. [access:1999, Dec. 23]

Nielsen, J. (1998, April). Nielsen's Law of Internet bandwitdh, *Jacob Nielsen's Alertbox* [Online]. Available: http://www.useit.com. [access:1999, Dec. 23]

Nielsen, J. (1999). Designing Web Usability: The Practice of Simplicity, 1st Edition, USA: New Riders Publishing.

Parker, A. (1999, November). Designing Electronic Materials [Online]. Available: http://www.rockley.com/designin.html. [access: 1999, Nov. 9]

Potomac Knowledgeway. (2000). Creating a Web Presence [Online]. Available: http://knowledgeway.org/living/create-web/homepage.html. [access:2000, Feb. 7]

Rowland, C. (2000, March 10). Usability Matters: What's Usability, Webreview.com [Online]. Available: http:www.webreview.com/pub/2000/03/10/feature/index3.html. [access: 2000, June 4]

Seminerio, M. (1998, September 10). Study: One In Three Experienced Surfers Find Online Shopping Difficult, *ZDNet* [Online]. Available: http://www.zdnet.com/intweek/quickpoll/981007/981007b.html. [access: 2000, June 8]

Shirley, H., (1999, November). Effective Electronic Training, *Designing Electronic Materials : Articles and Papers* [Online]. Available: http://www.rockley.com/designin.htm. [access:1999, Nov. 9]

Shneiderman, B. (1997). Designing Information-abundant Web sites : issues and recommendations, *International Journal of Human Computer Studies*, Vol. 47, 5-29.

Shneiderman, B. (1998*). Designing the user interface: Strategies for effective Human-Computer Interaction*, 3rd Edition, USA : Addison Wesley Longman Inc..

Web workshop (1999, July 24). Improving Web Site Usability and appeal [Online]. Available: http://msdn.microsoft.com/workshop/management/planning/improvingsiteuser.asp. [access: 1999, December 12]

Yale Web Style Manual. (1999). Interface design for the WWW [Online]. Available: http://info.med.yale.edu/caim/manual/interface.html. [access:1999, Dec. 25]