



3 LITERATURE REVIEW

3.1 Previous studies

A review of the literature reveals that attempts to evaluate and improve web site design and features have already been undertaken and published [see, inter alia, Mistic & Johnson (1999); Simeon (1999); Hall (1999); Bauer & Scharl (2000) and Fink & Laupase (2000)]. Mistic & Johnson (1999, p.383) offer an explanation for this phenomenon when reporting the results of their attempts to evaluate and improve the web site for the College of Business (COB) at Northern Illinois University (NIU) by suggesting that it is necessary for those administering web sites to 'know how an organization's Web site compares to other sites and also what new functionality and features are needed to maintain an edge'.

For the purposes of their study, Mistic & Johnson (1999) sought a methodology which would enable them to determine how the College of Business web site compared with the web sites of related schools and professional organizations. After dismissing methodologies which looked at little more than the number of 'hits' on a page as a measure of quality or success, the researchers selected benchmarking in the belief that such a process should enable them to evaluate web sites from a 'strategic perspective' and at the same time identify '.... new ideas for methods, practices, and processes that could be implemented to improve the college's own Web site' (op cit, p.384). In reality, their study had two prongs because while they were benchmarking their College of Business web site against similar sites, they were also evaluating the suitability of their selected methodology to deliver the outcomes they sought - that is, the identification of 'best practices'.

3.2 Benchmarking and best practice identification

According to Campbell (1996, p.88) there is agreement that Xerox was the forerunner of best practices pursuit as contemporary organizations have come to know them and led the trend toward benchmarking studies to achieve this end [see Camp (1989); Geber (1990); Mittelstaedt (1992); Rothman (1992); Main (1992) *et al*]. According to Camp (1989, p.6) - a logistics expert and engineer who worked at Xerox at the time and who assisted with the design, development, and implementation of Xerox's initial benchmarking process - Xerox was more or less forced to go down the benchmarking path to reverse its performance and competitive stance.

Faced with loss of market share, increased and heightened competition from national and Japanese competitors, Xerox sought a methodology for examining unit manufacturing costs and making product quality and feature comparisons. To this end, Camp (ibid.) suggests, the first formal Product Quality and Feature Comparisons analysis took place in Xerox Manufacturing Operations in 1979 when the operating capabilities and features of competing copying machines were compared and their mechanical components taken apart and analysed. (A process referred to as 'reverse engineering'.) The results of this first benchmarking study provided the blueprint for Xerox's future business plans. The rest, as they say, is history. Benchmarking's success in improving Xerox's performance and competitive stance is well documented by external observers.

Camp (1989, p.12) provides a simple definition of benchmarking: 'the search for industry best practices that lead to superior performance'. He also provided the first benchmarking model, which is reproduced in Diagram 3.1 below.

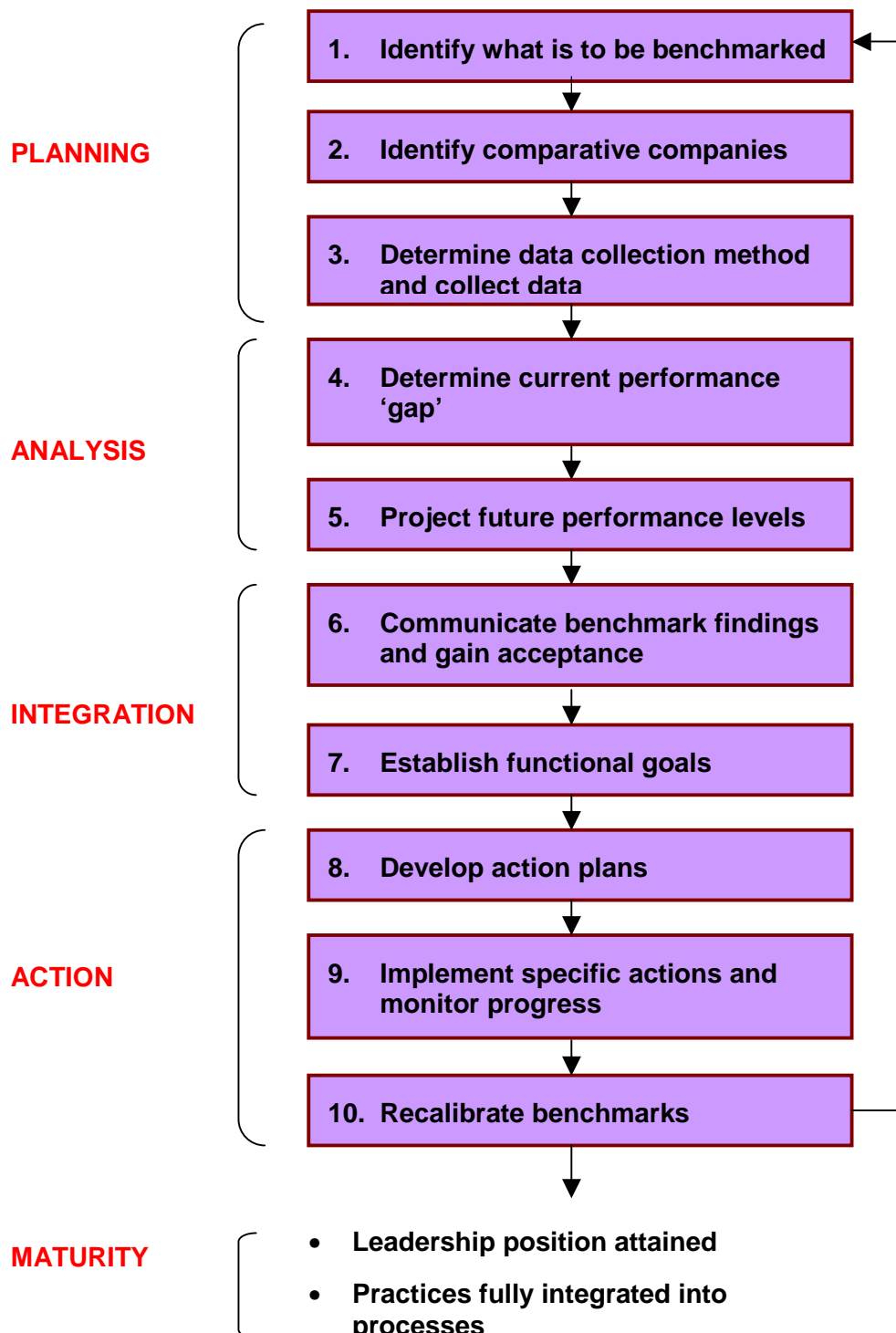


Diagram 3:1 Benchmarking process steps

From: Camp, R. (1989) *Benchmarking: The Search for Industry Best Practices That Lead to Superior Performance*, ASSQC, Milwaukee, p.17.

As a result of their own endeavours and experiences, other people/organizations have used Camp's original benchmarking process steps and developed their own models [see, for example, Mittelstaedt (1992); Watson (1992); and the Australian Government Publishing Service publication *Benchmarking Self Help Manual: Your Organisation's Guide to Achieving Best Practice*].

An overview of some of the methodologies which have been used for web site evaluation, improvement and design will now be discussed. It is anticipated that this discussion will provide an understanding of the procedural steps and processes this selection of methodologies followed and the outcomes they delivered. The first study reviewed will be the benchmarking study undertaken by Misic & Johnson (already mentioned); the second study examined will be that undertaken by Simeon who developed what she termed the AIPD (attract, inform, position, deliver) tool for evaluating the strategic dimensions of commercial web sites; while the third study reviewed will be Hall's instructional web site design model. Because of EdNA's educational focus, other studies which centre on designing web sites with the learner in mind will also be examined. Misic and Johnson's study will be outlined in detail so that the intricacies of a benchmarking study are highlighted.

3.3 Misic & Johnson's benchmarking study

For their study, Misic & Johnson (op cit, p.384) adapted Camp's model to suit their own purposes and in so doing developed a simplified benchmarking process with four main parts:

1. identification of Web sites against which to benchmark
2. development of metrics
3. application of metrics, and
4. development and implementation of new processes and practices.

Using benchmarking for strategic purposes generally involves identifying what it is an organization seeks to improve, then comparing existing practices against the best in the field. Comparisons are not limited to direct competitors or businesses in a similar industry. For example, an organization in one field may choose to undertake comparisons with its competitors, or it may decide to undertake comparisons with a company in a completely different industry but whose service processes have been observed as possessing characteristics or qualities which the benchmarking firm chooses to emulate.

3.3.1 Part 1 - identification of Web sites

Web sites in Misic & Johnson's study were selected 'because they were considered schools against which the College of Business is frequently compared, sometimes competes against because they were schools from where business faculty received their degrees' or because they were affiliated in some way with the college and its stakeholders (op cit, p.384-5). Based on this criteria, 79 web sites were selected against which to compare both the College of Business (COB) and Northern Illinois University (NIU) sites.

3.3.2 Part 2 - development of metrics

Misic & Johnson (op cit, p.386) state that the metrics used in their study included both absolute and relative measures. They explain these terms and their differences as follows:

The absolute measures were those factors and variables related to a Web site which have more universal importance to people who visit a Web site. For example, how fast does the main page of the Web site load? Does the Web site load and function without the need to download any plug-ins? Does the site provide text-based navigation for users who may have a slow connection or poor graphics ability? All of these are examples of metrics which are pertinent whether the visitor to a Web site might be a current student, a faculty member, or a company considering recruiting at a school. Web site assessment tools often focus on these types of measures (Evans and King, 1999).

The relative measures consider the target audience when applying the metric. For example, the ease of finding information on a Web site may be perceived differently by a prospective student compared to a current staff or faculty member. While several groups may have similar perceptions and opinions regarding Web site features, evaluating a Web site from each group's perspective would ensure that subtle differences are not overlooked or ignored².

Table 3.1 on the following page shows the metrics used in the Misic & Johnson study.

² Burch (1999) is another researcher who points out that when benchmarking a web site the heterogeneity of the potential target audience needs to be considered.

Table 3:1 Metrics used in Misisic & Johnson's study

Description	
Functional/navigational metrics	
Finding e-mail/phone numbers	Was finding an e-mail or phone number easy to accomplish?
Finding school main page	Was finding the business school's main page easy? OR Was finding a division's main page for a company easy?
Speed of finding main page	Could the business school's main page be found quickly? OR Could a division's main page be found quickly for a company?
Subpage loading speed	How fast did subpages load?
Uniqueness of functionality	How well did the site offer unique functionality?
Ease of overall navigation	How easy was the overall navigation around the site?
Ease of returning to main page	How easy was it to return to the main page?
Content and style metrics	
Counter	Was a counter provided on main page?
Currency	Was the date of last update provided on main page?
Effective use of color	How effectively was color used on the main page?
Effective use of graphics	How effectively were graphics used on the main page?
Color consistency	How well was color consistently used throughout the site?
Style consistency	To what degree did the entire site have a similar look/feel?
Wording	How professional was the wording of text on pages?
Contact information metrics	
E-mail contact	Was an address to e-mail for additional information on the main page?
Site maintainer	Was a site maintainer address on main page?
Phone number	Was a phone number provided on main page?
Mailing address	Was a traditional mailing address provided?
Locating people	How easy was a contact person to identify on most pages?

From: Misisic, M. & Johnson, K. 'Benchmarking: a tool for Web site evaluation and improvement', *Internet Research: Electronic Networking Applications and Policy*, Vol. 9, No. 5, 1999, p387.

When providing the rationale for the selection of these metrics, Misisic & Johnson (op cit, p.389) comment:

One of the strengths of benchmarking is the ability to customize the evaluation to the organization and situation at hand. For example, the metrics used in this study were identified and selected because they fit with what stakeholders of the College of Business at NIU perceive to be important. The most valuable output from this study is not the ability to

say that our college ranked the best, worst, or average, but to see how we compared to related sites and to identify other strong sites whose ideas and practices could be adopted to improve our site even further. In addition, since Web sites evolve (and typically) improve, the overall ranking would only be valid for the period when the evaluations were completed.

3.3.3 Part 3 - application of the metrics

Misic and Johnson (ibid.) developed an evaluation sheet to record the results of the application of the metrics (Refer Appendix A). As can be seen from this sheet, the evaluator, after recording general information about accessing a particular School/ Organization web site, was required to assess a number of functionalities and features - for example, speed (in seconds) with which the main page loaded; speed (in seconds) with which the main page loaded sufficiently for user to navigate to another page; the load time for subpages; whether an e-mail contact number for the company or school (and other general information) appeared on the main page; date of the last update; the use of colour and graphics; the 'look and feel' of the site; the wording on the pages: professional/ conversational; ease with which user could find her/his way around; ease with which user could return to the main page; as well as identification of any unique functionality - eg, mouse over (op cit, p.388-389).

Because Misic and Johnson (ibid.) were interested in discovering the ease with which a particular site could be located, they were keen to know whether a site could be found using any one of the major search engines. They tested this metric by having a researcher mimic an unsophisticated user's actions - that is, they simply clicked SEARCH and used whatever search engine appeared. They state that this tactic resulted in a fairly even distribution of use across the seven main search engines - viz., (1) AltaVista; (2) Excite; (3) Infoseek; (4) LookSmart; (5) Lycos; (6) Netscape; (7) Yahoo (op cit, p.387).

Basically, in their study, Misic & Johnson (ibid.), used the formal/full name of the organization/school as the keyword in the search. They report that they then examined the top 50 matches to see if the target site was listed. If it was, then its position in the list was noted. If the target site was not listed in the top 50 matches but a site related to the target site was - for example, an academic department - then a match was recorded because it was assumed that the main page would eventually have appeared somewhere on the list even though it had not shown up in the first 50 matches. If neither the main page nor a related page was found in the top 50 matches, then a 'not found' (NF) result was recorded. Once a match was found, the researchers then accessed the listed site and completed the evaluation form.

3.3.3.1 Results

Misic and Johnson (op cit, p.390) summarized their findings as follows.

Table 3:2 Summary of Misic & Johnson's results

Measure	Schools (n=45)	Organisations (n=34)	Total (n=79)	NIU	COB
Found w/search engine (top 10) (%)	24	29	27	No	No
E-mail on main page (%)	47	79	61	No	Yes
Phone on main page (%)	38	35	37	Yes	Yes
Mailing address on main (%)	42	24	34	Yes	Yes
Counter on main page (%)	4	3	4	No	Yes
E-mail of faculty/salesperson (%)	76	50	65	Yes	Yes
Internal search engine (%)	76	53	66	No	No
Load time (avg)a (sec)	22	31	26	22	10
Graphic design rating (avg)a	1.72	1.51	1.63	2.25	1.25
Navigational/functionality (avg)a	2.29	2.02	2.15	2.25	1.00
Professional wording (avg)	1.66	1.43	1.56	1.50	1.00

Notes: a - on a scale from 1 to 5 with 1 being the best/highest

From: Misic, M. & Johnson, K. 'Benchmarking: a tool for Web site evaluation and improvement', in *Internet Research: Electronic Networking Applications and Policy*, Vol. 9, No. 5, 1999, p390.

When discussing these results as a whole, Misic and Johnson (op cit, pp387, 389-391) comment that 'all sites scored fairly well using the metrics defined in this study' and that, relatively, there was only a marginal difference between the highest and lowest rating overall. Picking up on particular aspects of their research, though, they reported the following observations.

3.3.3.1.1 Functional/navigational issues

The criteria and metrics in this component of the study were concerned with speed and ease of navigation (speed for main page to completely load and speed for main page to load sufficiently for navigation purposes).

Misic and Johnson observed that there seemed to be a correlation between loading speed and ease of navigation. Using what they describe as a 'subjective rating system' they comment that typically 'those pages where the whole page loaded quickly were also those sites which were also navigable quickly' and that 'generally sites whose main page loaded quickly also had subpages that loaded fast' (op cit, p.390). To assess 'navigational quality', Misic and Johnson assessed 'how easy it was to navigate around the site, how easy it was to return to the main page of the site, and how easy it was to navigate the site to find the e-mail of a particular person' (ibid). Their results show that overall the

navigational quality of the organizations' and schools' sites was fairly high - just slightly higher for organizations.

3.3.3.1.2 Content and style

Misic and Johnson (ibid.) evaluated content and style in terms of currency, ease of finding people-related information and presentation. To assess the currency of information, they took the date appearing on the main page as the indicator of how frequently main pages were updated. Evaluating currency proved difficult. Not all sites published a date on the main page (they found more sites didn't than did), but of those that did, two-thirds had updated the main page within the last 45 days.

Finding people-related information, which was limited to how easy it was to find an e-mail address for an individual, proved less problematic. Misic and Johnson (op cit, p.391) reported that schools scored much higher than organizations in this category.

Misic and Johnson looked at a number of factors in relation to style:

- the use of colour
- the use of graphics
- the combination of colour and graphics as design elements
- wording

Their findings in relation to style are reported as follows:

- schools and organizations both scored very high with respect to their overall designs and use of graphics
- organization sites were of a slightly higher quality than the school sites
- even though both groups were rated fairly highly, organizations' pages were evaluated as being worded more professionally than schools' pages
- both NIU and COB sites were rated better than the average for all schools and organizations (Misc & Johnson ibid.)

As a result of their study, Misic & Johnson (ibid.) developed a list of the characteristics of the top sites - ie, sites which demonstrated 'unique functionality, design, or combination of the two':

- a search engine within the site
- easy navigation within the site often via a side frame which was present throughout the site
- a contact e-mail address either for the school/organization or at least for the Webmasters maintaining the site on the main page as well as subpages
- use of school/organizational colors and/or design throughout the site
- a text-based option on the main page (for people who are using a browser that does not support graphics or who prefer text-based navigation) and

- graphics which enhanced the site's functionality without overdoing it and detracting from the overall design. (Misic & Johnson, op cit, p.391.)

3.3.4 Part 4 - development and implementation of new processes/practices

As stated in Section 3.3.1, the main purpose of Misic & Johnson's study was to ascertain 1) how the College of Business' web site compared to web sites of schools against which it is frequently compared, sometimes competes against, or is in some way affiliated with; and 2) to generate ideas which could be considered for implementation on the COB site. In relation to the first objective, Misic & Johnson (ibid.) report that the results of the benchmarking study show that the COB web site scored very well.

In relation to the second objective, it seems that the benchmarking process served Misic and Johnson's purposes well. In this regard they comment that the benchmarking process 'pushed us to more closely look at a wide variety of related sites and this review process helped generate new ideas that would have taken much longer to conceive on our own' (op cit, p.392). They also state that their benchmarking study gave them an understanding of what constituted a 'top site' and in so doing gave them ideas about how they could improve the functionality and design of the COB web site, how they could effectively incorporate a search engine within the site, how they could improve navigation by making simple additions to existing pages, and how they could better organize information (ibid.).

Misic and Johnson were also complimentary about benchmarking's future-focus orientation. They assert that in addition to achieving the above objectives, the study also provided the College of Business with a set of tested metrics which could be applied over time in pursuit of continuous improvement. In addition, it highlighted the need for another benchmarking study which would focus on different target users rather than the functionalities of the web site.

3.4 Simeon's AIPD tool for evaluating web sites

As mentioned in Section 3.1, reports of attempts to evaluate and improve web site design and features are easily found in the literature. On a slightly different tack from Misic and Johnson's work, Simeon in her research, for example, attempted an evaluation of domestic and international web site strategies. While Simeon focused on commercial web sites within and across borders - viz., American and Japanese banks - her study raises some points which are worthy of consideration by those planning any kind of web site evaluation and improvement studies in the new millennium. Basically what Simeon did was develop an evaluation tool which she termed the AIPD model or the *attracting, informing, positioning, and delivering* approach to the evaluation of web sites. In support of the model Simeon asserts that 'in order for a firm to develop or maximize the strategic potential of its Web site, it should enhance and integrate the site's overall capacity to attract, inform, position, and deliver' (1997, p.298). In her own words, Simeon says that embedded in this approach are three major goals:

1. to assess the strategic potential of existing Web sites
2. to provide a framework for the development of competitive sites
3. to compare Web site strategies within sectors and across borders.

(Simeons 1997, p.298)

Table 3.3 highlights the strategic dimensions of the AIPD model.

Table 3:3 Simeon's AIPD analysis tool

	Attract	Inform	Position	Deliver
Stakeholders and strategic orientation	customers investors advertisers suppliers affiliates community promotion campaign	customers investors advertisers suppliers affiliates community managers	service provision image creation differentiation public relations	Web technology interactivity reliability security speed flexibility supply networks
Strategic action and strategic factors	internet advertising other media advertising freeware/gifts entertainment search engines portal sites banners, sweepstakes link exchanges	company history guiding vision products/services org. structure financials recruitment/HR surveys executive teams	market reports transaction types layouts/design simulations market targeting community relat. international links auctions	search engines databases forms/reports software, chat e-mail, telephone audio, video animation, Java financial tools

From: Simeon, R. 'Evaluating domestic and international Web-site strategies', in *Internet Research: Electronic Networking Applications and Policy*, Vol. 9, No. 4, 1999, pp.297.

When reading the explanations of the four components in the model, it is obvious that this tool is designed to evaluate the commercial potential and intent of a site because, as Simeon explains, it is her belief that it is the combination of these factors which enables the web site to achieve its strategic outcomes - namely,

profitability and virtual branding³. Virtual branding equity, she suggests, is driven by a combination of three web site characteristics:

1. high level presentation
2. overall site attractiveness
3. customer site recommendation.

Overall site attractiveness, Simeon explains (ibid), is related to the presentation and arrangement of the content, graphics, and delivery mechanisms of a site and their ability to leave the user with the impression that a visit to a particular web site resulted in an attractive and positive online experience and, as a result, the user may recommend the site to an acquaintance or business contact.

Closer inspection of Simeon's strategic dimensions suggests that researchers, whether focusing on commercial or non-commercial sites, are aware that the technical infrastructure of a web site - in other words its functionalities - as listed in the delivery component (some of which have already been highlighted by Mistic and Johnson, 1999) demand the same kind of attention. In this regard Simeon comments:

The delivery capability of the Web site is tightly linked to its technical infrastructure. The extent to which the Web technology provides for interactivity, reliability, security, and speed, helps to determine the strategic potential of the site. To examine the delivery function, we investigate the use of mechanisms such as search engines, databases, online reports, downloadable software, e-mail, audio, video, animation, Java and other Web tools.

(Simeon, op cit, p.300)

3.5 Hall's instructional web site design model

It is apparent from the literature that other researchers are more curious about the overall design components of web sites than their technical infrastructure. Hall (1999), like Simeon, is interested in the attractiveness and presentation elements of web site design. While his study is basically concerned with the design of web sites for delivering training and instruction, the general principles and practices he identifies are not limited to this domain.

Hall (op cit, p.2) provides the following web site design model to explain his views.

³ Simeon (op. cit, p.301) writes that virtual branding refers to the ability of a Web site to gain recognition and establish its presence in the minds of customers and the public at large. Virtual branding should be distinguished from normal branding in the traditional business environment. In this virtual marketplace, gaining and maintaining users' loyalty will be more tightly linked to a Web site's AIPD activities than any pre-existing traditional brand name factors. The benefits of creating virtual brand equity are many. An established brand on the Internet is one that commands higher advertising or subscription fees and one that can also serve as a gateway (through links) to a variety of other sites.

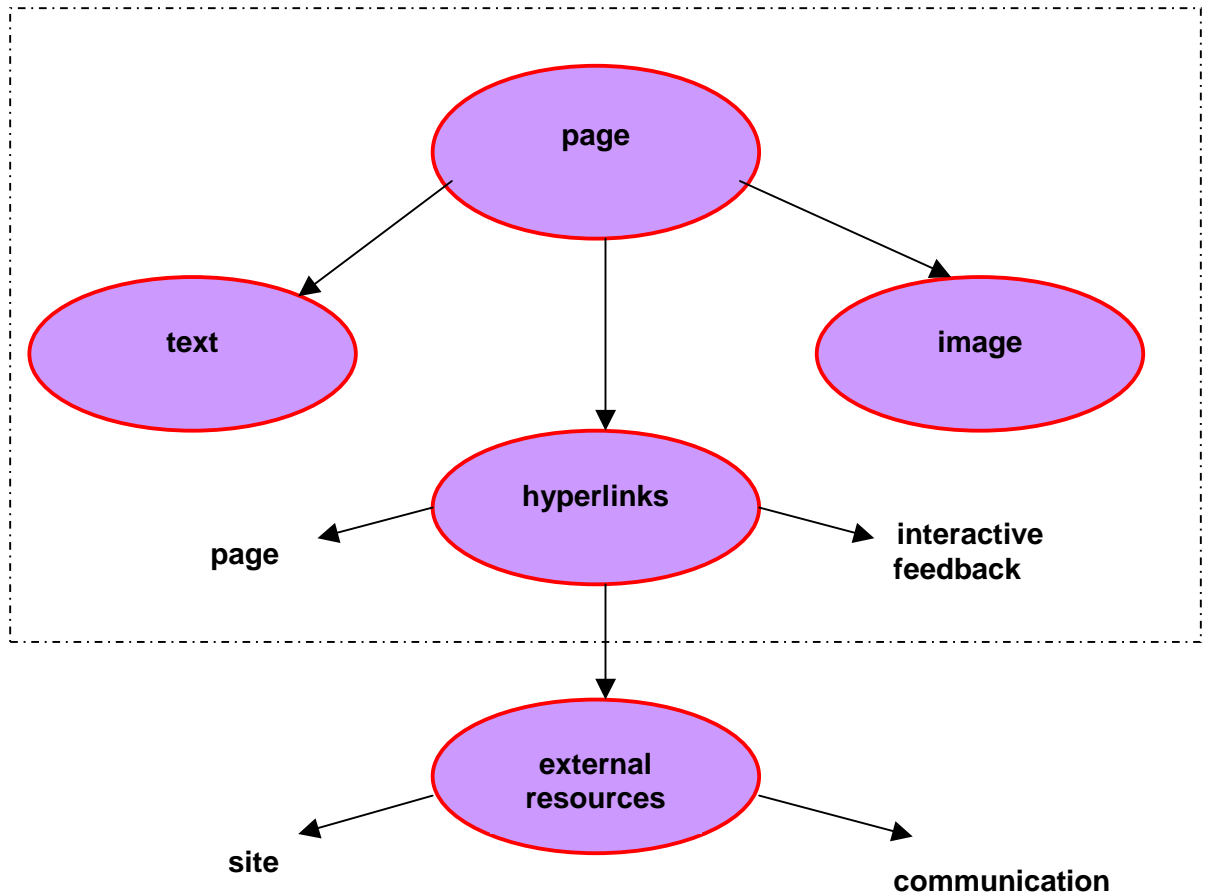


Diagram 3:2 Instructional Web Site Design Model

From: Hall, R.H. 'Instructional Web Site Design Principles: A Literature Review and Synthesis', in *Virtual University Journal*, Vol. 2, 1999, p.2.

As can be seen from the model, Hall uses the page, which is essentially a 'textual and imagic display' as the starting point with all associative links emanating from there. His model also highlights the differentiation between the site, which the given designer contains and controls, and the external web where the resources which support the web-based instruction are located. In essence, Hall's model and his work focus on five components which he suggests must be considered and combined when designing web sites - viz., page design, hyperlinks/site organization, organizational structure, internal links, external resources, communication. Hall's design principles for these components will now be discussed.

It should be noted that Hall developed these principles by reviewing the literature surrounding all of these design features. The taxonomy below was developed from Hall's writing (op cit, pp3-6) and summarizes the principles and practices Hall advocates as well as their proponents.

Table 3:4 Taxonomy of design principles and practices

Design feature	Principles	Proponents
Page design		
<i>Text</i>	<ul style="list-style-type: none"> text presented on a given page should be limited 	Cotrell & Eisenberg (1997); DeBra (1996); Jones & Farquhar (1997)
	<ul style="list-style-type: none"> breaking instructional units into smaller parts can enhance learning and increase motivation 	Cornell & Martin (1997); Keller & Burkman (1993)
	<ul style="list-style-type: none"> breaking the text into individual pages should not consist of simply taking a large, linear page of text and breaking it into a sequential series of pages 	DeBra (1996); Nielson (1997)
	<ul style="list-style-type: none"> linking should be used to allow the learner to be an active participant in choosing hypertext reading 	Kolosseus, Bauer & Bernhardt (1995)
	<ul style="list-style-type: none"> because reading information from a computer screen can be as much as 30% slower than reading from paper (DeBra (1997); Wright & Likorish (1983), the author should write less in general than would be the case with traditional text 	DeBra (1996); Nielson (1997)
	<ul style="list-style-type: none"> important information should be presented in an 'inverse pyramid' structure with important information clearly demarcated at the top of the page 	Cotrell & Eisenberg (1997); Jones & Farquhar (1997); Nielson (1997)
	<ul style="list-style-type: none"> web site pages should mirror traditional text page format - ie, taller than it is wide 	Hall (1999)
	<ul style="list-style-type: none"> use multiple columns on the screen and/or break up the text with graphics to make line length more manageable (learning is more effective with more shorter lines, than with fewer long lines 	Hansen & Haas (1988); DeBra (1996)
<i>Images</i>	<ul style="list-style-type: none"> pictorial/spatial representations in combination with text will produce a more robust 'dual-code' than text by itself 	Hall, Dansereau & Skaggs (1992); Mayer & Anderson (1991); Mayer (1997); Rewey, Dansereau, Skaggs, Hall & Pitre (1989)
	<ul style="list-style-type: none"> graphics, especially dynamic ones, should be used carefully 	Hall (1999)
	<ul style="list-style-type: none"> graphics and multimedia should be used only when they directly support the materials 	Cotrell & Eisenberg (1997); DeBra (1996)
	<ul style="list-style-type: none"> minimize download time as much as possible 	Cotrell & Eisenberg (1997)
	<ul style="list-style-type: none"> a single page should not be cluttered and contain too much information 	DeBra (1996)
Hyperlinks/Site organization		
	<ul style="list-style-type: none"> links should be included on a page only if they serve a clear purpose 	DeBra (1996); Shneiderman & Kearsley (1987)

Design feature	Principles	Proponents
	<ul style="list-style-type: none"> links should be clearly labelled 	Berners-Lee (1995); DeBra (1996); Jones & Farquhar (1997); User Interface Engineering (1998)
	<ul style="list-style-type: none"> overall layout of links on the page should have some organization/structural meaning 	Jones & Farquhar (1997); Neilson, 1997
	<ul style="list-style-type: none"> links on one page to other places within the same page is confusing to learners and should be avoided 	User Interface Engineering (1998); Jones & Farquhar (1997)
Organizational structure		
	<ul style="list-style-type: none"> create a clear and systematic organization scheme for the learning site to combat the 'lost in hyperspace' problem 	DeBra (1996); Shneiderman & Kearsley (1987)
	<ul style="list-style-type: none"> the site should be sensible, clear and clutter free 	Everhart (1997)
	<ul style="list-style-type: none"> the usual/prototypical path through the pages should be obvious 	Goldberg (1997)
	<ul style="list-style-type: none"> information should be presented in a modular fashion within a well-structured hierarchy with main points obviated 	Smith, Newman & Parks (1997); Young & Watkins (1997); Shotsberger (1996)
	<ul style="list-style-type: none"> some sort of advance organizer should be included in the site design so that the learner can easily get an overview of the site organization 	Burbules & Callister (1996); Cornell & Martin (1997); Cotrell & Eisenberg (1997); Dodge (1995); Everhart (1997)
	<ul style="list-style-type: none"> design should be consistent across all pages of a site 	Cotrell & Eisenberg (1997); Everhart (1997); Shotsberger (1996); Young & Watkins (1997); User Interface Engineering (1998)
	<ul style="list-style-type: none"> the organizational structure should provide a clear route back to the starting point 	Goldberg (1997); Hardman (1989)
	<ul style="list-style-type: none"> a site should not include dead ends 	Young & Watkins (1997); Shotsberger (1996)
<i>Internal links</i>	<ul style="list-style-type: none"> include learner-centred activities to enhance metacognitive awareness and active learning 	Reeves & Reeves (1997); Gillani & Relan (1997); Siegel & Kirkley (1997); National Research Council (1996); Bonk & Reynolds (1997); Rankin (1997)
<i>External resources</i>	<ul style="list-style-type: none"> link the exploration of the site to some specific activity to encourage the learner to actively process the information 	Butler (1997); Duchastel (1997); Duchastel & Turcotte (1996)
	<ul style="list-style-type: none"> ensure that the external site and training activities associated with it fit into the basic goals of the instructional module 	Butler (1997)

[Compiled for this study from Hall, R.H. 'Instructional Web Site Design Principles: A Literature Review and Synthesis', in *Virtual University Journal*, Vol. 2, 1999, pp3-6.]

While it is obvious that Hall assembled the principles and practices outlined in Diagram 3.2 to provide guidelines for those designing web sites for instructional purposes, closer inspection of the principles shows that most of them are applicable to web site design generally.



3.6 Designing web sites with the learner in mind

Other studies which focus on the use of the world wide web for instructional purposes cover a range of issues. In their study, Horvath & Teles (1999), for example, sought answers to such research questions as What are the specific and unique capabilities of this new media? What problems and potential benefits may there be in breaking through the traditional three-dimensional learning space and extending it by using high-speed information technology? What specific educational goals can be best fostered through the technological features of the World Wide Web? How do learners react to the 'cyber environment'? Their results highlighted design issues as well as mitigating their pedagogical concerns. For example, they report that 'student responses were most positive when the computers responded predictably and promptly'; there is a subtle relation between content, length and media of presentation (students preferred to print out messages longer than 350 words if they deemed the messages 'factual' or important enough to require a second read. The linked text environment for research purposes in Horvath & Teles' words 'proved the most exciting aspect of our trial' and dismissed their concern about participants' fear of becoming 'lost in cyberspace' (op cit, p.55). They state that this was overcome through the positive impact of the technology. In short, their findings reinforced the design principles already raised by other researchers: response speed; predictability; length of messages; and understanding of user comfort with the technology.

3.7 Where cognitive science and learning theory meet

The notion of understanding of user comfort with the technology is mentioned by a number of researchers. For example, in an article published in 1998, Maule (1998) argues that it is time that a university-level internet studies program was mounted. Topics like internet content design, he further argues, should definitely be covered in baccalaureate and higher awards because a comprehensive understanding of the topic would necessarily demand an understanding of the academic constructs, philosophies and strategies of both cognitive science and learning theory. In essence, he posits that content developers need 'to understand how the mind receives and processes information' which for cyber-classroom purposes, implies that they also need 'to understand how humans interact with computer hardware, software, and online media' (op cit, p.175).

3.8 The secrets of web site design in the commercial environment

The implications of human interaction with the Internet are also taken up by Nel, van Niekerk, Berthon and Davies (1999). Similar to the other researchers already mentioned, this group is interested in unravelling the secrets of good web site design, but in the commercial environment and based on the idea that good design will lead to positive business results. Rather than focus on the technical and creative considerations of web site design Nel *et al* apply '[a] means of evaluation ... derived from Csikzentmihaly's (1975) Theory of Flow which characterises the interaction between humans and computer mediated technologies' (ibid, p.110).

Miller (1973) (cited in Nel *et al*, op cit, p.111) defines 'flow' as:

a multidimensional construct that represents the user's (surfer/interactor) perception of the medium as playful and exploratory. The theory of flow suggests that involvement in a playful, exploratory experience is self-motivating because it is pleasurable and encourages repetition.

From this base, a number of inferences have been drawn by researchers over time:

- individuals who interact more playfully with a web site will view the interaction more positively than those who interact less playfully, and consequently they may be more motivated to engage in interactions in the future (Webster *et al*, 1993).
- because flow is a continuous variable ranging from none to intense [Day (1981); Ellis (1973)] interactions with some web sites may be perceived as more encouraging of exploratory behaviours than others [Trevino & Webster (1992)]
- it is likely that web sites which facilitate high flow will be visited more regularly and for longer duration [Berthon *et al*, (1996)]

(Nel *et al*, 1999, p.111)

Trevino & Webster (1992) suggest that there are four dimensions to flow: control, attention focus, curiosity and intrinsic interest. From this understanding of flow and its elements, Nel *et al* (*ibid.*) describe how they view the optimal online experience and its implications for web site design:

One of the key elements in successful commercial Web site design is that there be enjoyment on the part of the surfer during the interaction with the site. The surfer must feel in control of his/her fate, and the marketer must attempt to encourage or provide the facility for an experience that involves a sense of exhilaration, a sense of enjoyment that is cherished and becomes a landmark of how surfing or interaction should be.

While these 'optimal experience' comments are directed at commercial web site design, there is little doubt that web site designers generally, and surfers particularly, would be well satisfied if the above were a design goal even if it were achieved only some of the time.

3.9 Conclusions

In this section, the results of previous studies focusing on attempts to evaluate and improve web site design were discussed. Benchmarking as a process for best practice identification was introduced, its origins were discussed, and its process steps were outlined. The processes, metrics and results of one study which used benchmarking as a tool for web site evaluation and improvement were highlighted. It was noted that the metrics applied in this study focussed on two main areas: functional/navigational issues and content and style elements.

The results of two studies which evaluated commercial web sites were also reported. The first study centred on strategies for developing or maximizing the strategic potential of a business web site while the second focussed on the implication of human interaction in internet experiences.

Literature Review

A taxonomy of design principles and practices was developed under six broad headings: page design (including text and images); hyperlinks/ site organization; organizational structure; internal links; and external resources. The results of other studies were reviewed and reported and additional issues for consideration in web site design were discussed - for example, the need for the designer to understand how the mind receives and processes information and how humans interact with computer hardware, software, and online media, generally.

The next section will outline the methodology adopted for this study.