Evaluating Demographic Websites: Toward Webometric Criteria

Cheng-Zhi Wang
Columbia University
E-mail: cw2165@columbia.edu

Keywords（關鍵詞）: WWW; Bibliographic Review; Citation Analysis; Webometric Analysis; Demography; Population Research; Evaluation; Information Literacy

【Abstract】

The conventional criteria of website evaluation are widely applied in evaluating online information, which is an important component of information literacy instruction in academic institutions. However, mainly from the users' angle and inherently bibliographic, these criteria tend to be general in nature and fail to differentiate the qualities of websites at similar quality levels. Thus, evaluation criteria from webometric perspectives that utilize measurable data and tangible information are needed for more informed assessment. The purpose of this article is to introduce and apply essential webometric criteria to supplement the conventional criteria to improve information literacy instruction. The article first synthesizes the widely used conventional criteria into Six C's for the sake of simplicity and applicability. Then, important webometric criteria of popularity, profundity, luminosity, and error-checking are introduced. Next, the webometric data collected from leading demography research institutions' websites in the U. S. are analyzed. The article concludes that while conventional criteria continue to be convenient and useful, particularly for novel web users, a basic set of webometric criteria can serve as a supplementary tool to provide additional insights into evaluating online resources.

INTRODUCTION

Population research institutions in the U.S. are playing an increasingly important role in creating, collecting, and distributing demographic information and knowledge through websites. Traditionally, population research institutions funded by the National Institute of Health (NIH) are required to share collected data and research findings with a larger scholarly community by establishing population library or population information center. Beginning May 2005, NIH-funded institutions are mandated to enhance public access to research information through PubMed (FR Notice, 2005). Almost all NIH-funded university population research institutions in the U.S. have tried to make the research data associated with major research projects accessible and their research results available online to interested people. Data analysts, librarians, and information professionals rely, to a great extent, upon the websites of population research institutions to provide population data access and information services.

The widely-accepted website evaluation criteria (Alexander & Tate, 1999), though generic in nature, can certainly be applied to evaluating demographic websites. Mainly originated in bibliographic analysis, these criteria are used in information literacy instruction for library users in almost all American school and college

libraries. The Association for Library Service to Children recommended "Great Websites for Kids Selection Criteria" established by its First Children and Technology Committee (1997). The Association of College & Research Libraries, which officially endorsed "Teaching undergrads Web evaluation" (Kapoun, 1998), have helped facilitate teaching and learning of the conventional website evaluation criteria. These criteria have proved to be useful and helpful, especially for inexperienced web users. However, they are incomplete in scope and limited in perspective. Therefore, users may find them inadequate to distinguish the qualities of websites of a similar nature, such as the websites of university population research institutions.

Web log analysis has been used widely to evaluate websites. Web log records, typically "hits" by users registered in web server's log files, have been used to evaluate websites. Yet, the use of log files has led to many questions (Nicholas et al., 1999) such as what constitute web use and how to read log records. Web log files are considered inherently problematic (Vreeland, 2000). For example, one visit to a page with graphics may generate multiple log entries, and keeping logs consumes considerable computing resources. Moreover, it is generally impossible for regular end users such as faculty and students to independently generate and access log files to meet their diverse information needs. Evaluation criteria from webometric perspectives are in need. As a matter of fact, webometric analysis has been applied in evaluative studies in many disciplines such as medical science, health care, biomedicine, and library and information science.

In this article, with information literacy instruction for novel users in mind, we advocate workable webometric criteria for evaluating websites by using demographic websites as examples. These criteria can be utilized by regular end users to evaluate online information. We first survey the literature on conventional website evaluation criteria and synthesize them into Six C's. We then introduce a basic set of webometric concepts and website evaluation criteria, namely popularity, profundity, luminosity, and error-checking. Next, based on the collected data we compare and analyze the webometric information of the leading population research institutions in the U.S. The data were collected with the aid of a popular search engine and a downloadable freeware. Finally, we conclude that while conventional evaluation criteria continue to be convenient and helpful in information literacy instruction, webometric criteria can be used to provide additional measurable information for evaluating websites.

BIBLIOGRAPHIC CRITERIA

The general public started gaining increasingly easy access to the World Wide Web after the middle 1990s, which witnessed the widespread development of Internet infrastructure (Leiner, Cerf, Clark, Kahn, Kleinrock, Lynch, Postel, Roberts, & Wolff, 2000) and the release of important browser technologies such as Mosaic in 1993, Netscape in 1994, and Internet Explorer in 1996. Peer-reviewed journal articles on website evaluation started to appear in 1997. Despite a relatively short history, the literature on website evaluation is rich and diverse.

The evaluation criteria proposed and studied are of a wide array, ranging from an insufficient, limited a few items (e.g., Beck, 1997; Sowards, 1997; Abdullah, 1998; Kapoun, 1998; Snyder, 2001; Dragulanescu, 2002) up to 40 elements (e.g., Clausen, 1999), from user's perspective (e.g., Tillotson, 2002) to designer's and administrator's perspectives (e.g., Eschenfelder et. al., 1997), and from a focus largely on critical thinking (e.g., Green, 2001; Dragulanescu, 2002) to a wider comprehensive scope (e.g., Clausen, 1999; Alexander and Tate, 1999). To a great extent, most of the literature extended bibliographic analysis of traditional print materials to web resources. Bibliographic analysis tackles such core elements as author, title, place of publication, publisher, date of publication, and a designation of the location, or page number of a reference (Walker & Taylor, 1998). Furthermore, the evaluator uses critical thinking to judge the

overall quality of a reference. What is new in the conventional web evaluation is the adoption of the only obviously different element in web resources, the effect of online connection and request, as one criterion for assessing websites.

In information literacy instruction, experience tells that simplistic criteria will make students ill equipped to evaluate complicated information scenarios, and thus does not help meet instruction goals successfully. Complex, less-organized criteria for evaluating websites will bewilder novel, unsophisticated web users. For the sake of simplicity and applicability for both instructors and students, we synthesize these diverse bibliographic criteria into 6 C's as shown in Table 1.

Table 1 Six Cs: Conventional Criteria for Website Evaluation

Criteria	Components
Creator	Author:
	Name, organization, contact information
	Expertise
	Publisher:
	TLD (Top Level Domain Names), including new TLDs
	Creator/Publisher's agenda/policies
Content	Appropriateness
	Review (peer-reviewed)
Currency	Content up-to-date
	Pages up-to-date
	Materials/sources/references used up-to-date
Connectedness	Easy connection
	Easy navigation
	Functional links
Credibility	Accuracy and validity
	Unbiased views
	Good writing, organization, presentation
	References/bibliography
Critical thinking	Doubt
	Rethink
	Constructive searching and usage
	Problem-solving
	Knowledge creation

Except for connectedness, the criteria of creator, content, currency, credibility, and critical thinking are closely related to the conventional core bibliographic elements. Credibility and critical thinking, though not regarded as core bibliographic elements, have been emphasized in the practice of bibliographic instruction (Eengeldinger, 1991; Shirato, 1991) and have been widely accepted as important criteria to access and acquire information and knowledge. Characteristic of the World Wide Web, connectedness refers to the speediness of connection, request, transfer, and download of distributed web resources on the server's part of a web client-server system. The simple, succinct Six C's largely represent the overall picture of website evaluation using the traditional bibliographic criteria.

It is popularly believed that teaching users to apply bibliographic criteria for website evaluation as part of information literacy instruction can significantly improve their web research skills. Used as guidelines and benchmarks, the conventional criteria are particularly useful for inexperienced web users to assess individual websites of different quality levels, such as the International Union for the Scientific Study of Population (IUSSP) at http://www.iussp.org/ and Population.com at http://populations.com/. Yet, to compare websites of seemingly similar quality level, e.g. the IUSSP vs. the Population Association of America (PAA) at http://www.popassoc.org/about.html, or the Population.com vs. the Demographia at http://www.demographia.com/, these criteria would fail to help users to make more meaningful differentiation. More often than not, users need to make distinction among similar websites and evaluate the data and information obtained from multiple online sources. Furthermore, the application of conventional criteria cannot help generate data for users to make in-depth appraisal and analysis based upon both qualitative and quantitative information. Nevertheless, the application of alternative criteria, i.e., webometric criteria, will help solve problems and meet users' additional needs.

WEBOMETRIC CRITERIA

Webometrics originated in bibliometrics. The application of bibliographic criteria through statistical analysis makes up the body of knowledge in bibliometrics. Bibliometrics is often used to describe patterns of different bibliographic elements in a given discipline or interaction between disciplines. An established set of bibliometric concepts and methods have been developed (Diodato, 1994) and widely applied. The world-renowned ISI (Institute for Scientific Information) created by Eugen Garfield in 1958 has made significant contributions to the development of bibliometrics. Webometrics is the extension of the application of bibliometrics to the Internet, so as to evaluate websites and web publications. Webometrics can be defined as the quantitative study of the construction and use of information resources, structures and technologies on the Web drawing on bibliometric and informetric approaches (Bjornborn, 2004). Or simply, it can be defined as the quantitative study of the Web phenomena (Thelwall & Vaughan, 2004). As an emerging research field, it generally covers both the construction and usage side of the Web, normally in four main areas, namely, Web page content analysis, Web link structure analysis, Web usage analysis, and Web technology analysis (Bjornborn & Ingwersen 2004).

Research publications related to webometrics have been increasingly available from the middle 1990s. Though webometrics is considered as part of the discipline of library and information science, the majority of the literature on web evaluation from webometric perspective are evaluative studies of medical and health web resources using a variety of methods (e.g., Risk & Petersen, 2002; Eysenbach, Powell, & Sa, 2002). Some are evaluating library websites (e.g., Chu, He, & Thelwall, 2002). Unlike the nearly standardized disciplinary components in bibliometrics, the concepts and methods of webometrics are still in the making, without uniform consensus reached by researchers. Among others, the data collection tools of webometrics are far from standardized or finalized.

Given the unsettled disciplinary status of webometrics, Bjornborn & Ingwersen (2004) proposed a basic framework for webometrics to define its disciplinary structure and boundaries. In particular, Bjornborn & Ingwersen (2004) conceptualized the terminologies of basic link, basic web node and advanced link, and the diagrams to illustrate their internal structures and external associations at different levels. But the framework is not without limitations. For example, the criterion of critical thinking, an important element of conventional bibliographic criteria was not reflected in their webometric framework. Despite its conceptual consistence and apparent usefulness to researchers, it is hard for end users to apply the framework to evaluating web resources.

An essential, simple workable set of criteria for information literacy instructors and end users, particularly novel, unsophisticated users, is hereby proposed. The set includes popularity, profundity, luminosity, and error checking (see Table 2). Profundity and luminosity comes from Bray's (1996) seminal publication on measuring websites. Critical thinking, the most important component in bibliographic analysis, can be partly represented by error-checking in a webometric approach.

Table 2 Basic Workable Webometric Criteria for Website Evaluation

Criteria	Components
Popularity	Inlink:
	Generally linked by other websites under different domains
Profundity/Fecundity	Internal links within the website
Luminosity	Outlink:
	External links
Error checking	Internal errors
	External errors

Popularity, or "visibility" in Bray's words, of a website indicates the extent to which a website is popular on the Internet. It can be measured by the frequencies the website is linked by others, i.e., the number of other websites that have pointers to it (Bray, 1996). Many researchers use "inlink" to the same effect. For academic and research websites, the extent of popularity among the top level of domain of education is of more interest to users and researchers.

Profundity, or fecundity, indicates the number of internal pages/links within the website. In Bray's words, it is the "size" of a website, "as measured by the number of pages it contains." It indicates the degree to which how rich and resourceful a website is. While popularity reflects the extent of external influence a website exercises, profundity reflects the degree of internal richness a website represents.

Luminosity is equivalent to "outlink," a concept that many researchers have used. It refers to the external links the website has, indicating the frequencies the website links to other websites. It can be "measured by the number of pointers with which it casts navigational light off-site" (Bray, 1996). Luminosity and popularity are bi-directional, equally valued on the Web overall.

As in bibliometric criteria, critical thinking is an indispensable component of webometric approach. Critical thinking may be applied to both the construction side and the usage side of the web as well as to the four areas of page content, linking structure, web usage, and web technologies mentioned previously. Given that linking is crucial in the two sides and four areas of the Web, error-checking is identified as a criterion. Error-checking is checking errors with web linking, particularly for identification of linking errors. Error-checking comprises checking internal and external errors. It is self-evident that more errors are not as desirable as less or no errors at all. Error-checking offers further information on profundity, luminosity, and the website as a whole.

There are many ways to evaluate websites using the above criteria. The typical methods used include downloading the whole website for analysis at a given time. This may help obtain the most comprehensive and accurate data, but consumes tremendous amounts of computational resource, and it is impractical for end users to apply. Using the commonly used search engines such as Google, AltaVista, and Yahoo is practical and convenient. Understandably, the data generated from using these search engines are not

perfectly accurate or consistent. In addition, computer experts can write personalized programs to search the web and obtain the data they want. Normally, it is impossible for general end users to do so. However, some freewares on the Web and PC applications, such as CheckWeb, are readily available to end users who want to use them to search and analyze individual websites.

EVALUATING DEMOGRAPHIC WEBSITES

The websites of 14 leading University Population Centers (UPCs) in the U.S. are selected for evaluation according to the webometric criteria as discussed above (see Table 3). The generic term of UPCs refers to all selected population studies centers, including the research institutes and departments named differently in some universities, such as the Department of Demography in the University of California at Berkeley and the Office of Population Research of Princeton University. These UPCs generally represent the best status quo of cutting-edge education and scholarship of demography in the U.S. Most of them were established with the aid of NIH grants, or funded by NIH grants in one way or another. These UPCs focus on the teaching and research in the discipline of demography and its related fields.

Table 3 University Population Centers (UPCs) Surveyed

	UPC	URL
1	Brown University Population Studies and Training Center	http://www.pstc.brown.edu/
2	Indiana University Population Institute for Research and Training	http://www.indiana.edu/~pirt/
3	Johns Hopkins University Center for Communication Programs	http://www.jhuccp.org/
4	Johns Hopkins University Hopkins Population Center	http://popctr.jhsph.edu/
5	Penn State Population Research Institute	http://www.pop.psu.edu/
6	Princeton University Office of Population Research	http://opr.princeton.edu/
7	University at Albany Center for Social and Demographic Analysis	http://www.albany.edu/csda/
8	University of California Berkeley Department of Demography	http://www.demog.berkeley.edu/
9	University of Michigan Population Studies Center	http://www.psc.isr.umich.edu/
10	University of North Carolina Population Center	http://www.cpc.unc.edu/
11	University of Pennsylvania Population Studies Center	http://www.pop.upenn.edu/
12	University of Texas at Austin Population Research Center	http://www.prc.utexas.edu/
13	University of Washington Center for Studies in Demography and Ecology	http://csde.washington.edu/
14	University of Wisconsin-Madison Center for Demography and Ecology	http://www.ssc.wisc.edu/cde/

The search engine of AltaVista and the freeware CheckWeb were used to obtain data. AltaVista was believed to be more reliable than other search engines in terms of data collection before it was finally acquired by Yahoo at the end of 2003. CheckWeb is an analyzer of HTML links. The program can be used to scan all HTML pages, count them, and examine all the links for http errors. Http errors here are those of 4xx, client errors, and 5xx, server errors, mostly 403, forbidden, and 404, not found. When the scanning is done, CheckWeb automatically generates a log document with all errors listed. The results of the analysis are presented in Table 4.

Table 4 Evaluating University Population Centers According to Webometric Criteria

UPC	Popularity		Profundity	Internal Error	Luminosity	External Error
	(General, linked to all)	(Linked to .edu)				
1	271	43	434	12	2	0
2	NA	NA	135	19	2	0
3	9,651	919	NA	NA	10	0
4	10,683	593	242	44	0	0
5	1651	771	NA	NA	36	0
6	2,269	907	362	0	9	1
7	141	24	126	6	0	0
8	130	20	261	140	0	0
9	572	362	NA	NA	4	0
10	2,917	1,831	>3,500	NA	3	0
11	308	45	482	96	5	0
12	356	217	586	97	1	0
13	264	212	814	201	26	0
14	715	486	611	3	3	0

Note:

NA is used to indicate unavailability, resulted from many possible factors, especially unusual problems of UPC websites or inherent limitations of Checkweb, or both. Visits to and navigation through the websites gave the impression that the NAs result more from unusual problems of the UPC websites.

Using traditional criteria of creator, content, currency, credibility, and critical thinking, end users can make good assessment of these UPCs. Obviously, according to any conventional criterion, all of the UPC websites are reliable, providing good quality data and information on demographic studies. But end users probably cannot make significant distinction among the UPC websites. Additionally, they probably cannot distinguish their speed of connection because generally all these UPC websites, like almost all American university websites, are quick to connect and relatively convenient to navigate. However, as shown in Table 4, the UPCs registered significant variation in terms of popularity, profundity, luminosity, and linking errors.

With NAs excluded, Table 4 shows that the most popular UPC was Johns Hopkins University Hopkins Population Center, with 10,683 links by other websites. In sharp contrast, the least popular UPC was the Department of Demography of the University of California at Berkeley, with only 130 links created by others. The University of North Carolina Population Center was the most popular UPC in the educational domain, with 1,831 links by other educational institutions, as opposed to the Department of Demography of the University of California at Berkeley, the least popular in the educational domain, having only 20 links linked by other education institutions. In terms of profundity, the University of North Carolina Population Center fared the best, having more than 3,500 internal pages. In comparison, the University at Albany Center for Social and Demographic Analysis registered only 126 internal links. In terms of internal errors related to profundity, the University of Washington Center for Studies in Demography and Ecology registered 201 - the largest number of errors -

whereas Princeton University's Office of Population Research registered none. In terms of luminosity, Penn State's Population Research Institute ranked first, with 36 outlinks to others, followed by the University of Washington Center for Studies in Demography and Ecology, with 26 outlinks to others. At the other end, however, most UPCs had few or no links to other websites. There were almost no linking errors for the UPCs' outlinks except for one external linking error registered with Princeton University's Office of Population Research.

DISCUSSION AND CONCLUSION

Using the basic webometric criteria to evaluate the websites of 14 UPCs, we have found that the UPCs are significantly different from each other except that they almost have no external linking errors. UPCs have relatively large number of inlinks, reflecting their relatively high popularity. UPCs have much more links by other websites than links to other websites, indicating they have a larger popularity than luminosity. This can be partly explained by the fact that after the U.S. Census 2000, an increasing number of governmental and NGO departments participated in population studies activities and projects or utilized the data banks and research results released by the UPCs in their websites. Furthermore, as mentioned previously, federal-funded UPCs were increasingly required to open their available data and research findings to the public. However, UPCs have a relatively small number of links to other websites, hence overall, low UPC luminosity. The UPC with the largest number of outlinks is the Penn State's Population Research Institute. But, three institutions have no links to any other. Apparently this was not because few decent research institutes, or governmental, intergovernmental and NGO organizations existed outside the 14 UPCs unworthy of linking. Nor was it because UPCs did not bother to link to other websites, or their webmasters were too lazy to do so. Given the interdisciplinarity of demography, the little or no luminosity of American universities' population research institutions is a puzzling phenomenon in need of further investigation.

Except for the University of North Carolina's Population Center, which had at least 3500 pages in its website, most UPCs had relatively small-size websites. In other words, most UPC websites are not rich, resourceful enough given that many UPCs regularly publish working papers and technical reports on their websites. Each paper or report may be treated as an individual branch page.

All UPCs have almost no external errors. This can be partly explained by the fact that they have little luminosity reflected in their few external links. Yet, their internal errors are relatively high given that they have a generally small degree of profundity. Some UPCs have very high error rates on their internal pages, about one fourth in the case of the University of Washington, or half in the case of Berkeley.

Our findings about UPC websites as above are interesting and significant. Using bibliographic criteria only would have prevented us from obtaining such in-depth, meaningful findings. Yet, we cannot avoid some limitations in applying webometric criteria. The data collection tools may not be perfectly reliable to evaluate all websites, particularly database-driven websites. We have mentioned that the data collected from using the search engine AltaVista, though considered better than others, were not perfectly accurate. The website checking may not be exhaustive, particularly so when Checkweb often failed to check database-driven websites. When there were too many branch pages or when the websites were too big or when unusual errors were too many, Check web ran very slowly or even crashed. This resulted in data unavailability for several cells in Table 4. Furthermore, although the component of error-checking is considered comparable to creative thinking in bibliographic criteria, it is largely technical and limited only to analysis within the checked websites. Thus, a heuristic approach in error checking is expected.

Despite these limitations, users, particularly inexperienced users may use these criteria and

conveniently obtain more tangible data and information, so that they can make more informed evaluation of web resources. Educators of information literacy can supplement bibliographic criteria with these relatively easy-to-apply web metric criteria to improve information literacy instruction.

ACKNOWLEDGEMENTS

The author wishes to acknowledge two anonymous referees for their insightful, helpful comments. The author wishes to thank Jackie Dreary, Head of the Donald E. Stokes Library of Public and International Affairs and Population Research at Princeton University for her support for the author to pursue this study and present the findings at a conference when the author worked at Princeton University. The author also wishes to thank Prof. Zao Liu of Texas A & M University for carefully reading this paper and making valuable suggestions. The author, however, is solely responsible for any errors.

REFERENCES

Abdullah, M. H. (1998). Guidelines for evaluating websites. http://www.ericfacility.net/ericdigests/ed426440.html.

Alexander, J. E. & Tate, M. A. (1999). Web Wisdom: How to Evaluate and Create Information Quality on the Web. Mahwah, N.J.: Lawrence Erlbaum Associates, Publishers.

Beck, S. (1997). The good, the bad & the ugly: or, why it's a good idea to evaluate web sources. http://lib.nmsu.edu/instruction/eval.html.

Bjorneborn, L. (2004). Small-world link structures across an academic web space: a library and information science approach. Ph.D. Dissertation. Chapter 2: Webometrics. http://www.db.dk/lb/phd/phd-thesis-ch2-webometrics.pdf.

Bjorneborn, L. & Ingwersen, P. (2001). Perspective of webometrics. *Scientometrics, 50* (1), 65-82.

Bjorneborn, L. & Ingwersen, P. (2004). Toward a basic framework for webometrics. *Journal of the American Society for Information Science and Technology, 55* (14), 1216-1227.

Bray, T. (1996). Measuring the Web. *Computer Networks and ISDN Systems, 28* (7-11), 993-1005.

Chu, H., He, S. & Thelwall, M. (2002). Library and information science schools in Canada and USA: a webometric perspective. *Journal of Education for Library and Information Science, 43*(2), 110-125.

Clausen, H. (1999). Evaluation of library websites. *Electronic Library, 17*(2), 83-87.

Diodato, V. P. (1994). Dictionary of Bibliometrics. New York: Haworth Press.

Dragulanescu, N. (2002). Website quality evaluations: criteria and tools. *The International Information & Library Review, 34* (3), 247-254.

Eengeldinger, E.A. (1991). Bibliogrpahic instruction and the teaching of critical thinking. In Linda Shirato (Ed.), Judging the Validity of Information Sources: Teaching Critical Analysis in Bibliographic instruction. Ann Arbor, Michigan: Pierian Press.

Eschenfelder, K. R., Beachboard, J. C., McClure, C. R., & Wyman, S. K. (1997). Assessing U.S. federal government Websites. *Government Information Quarterly, 14* (2), 173-189.

Eysenbach, G., Powell, J., Kuss, O., & Sa, E. (2002). Empirical studies assessing the quality of health information for consumers on the World Wide Web: A systematic review. *JAMA, 287*(20), 2691-2700.

First ALSC Children and Technology Committee (1997). Great Web Sites for Kids Selection Criteria. http://www.ala.org/Content/NavigationMenu/ALSC/Great_Web_Sites_for_Kids/Great_Web_Sites_for_Kids_Selection_Criteria/Great_Web_Sites_for_Kids_Selection_Criteria.htm

FR Notice (2005). Department Of Health And Human Services National Institutes of Health

Policy on Enhancing Public Access to Archived Publications Resulting From NIH-Funded Research. *Federal Register, 70* (26). Wednesday, February 9, 2005. Notices. http://www.nih.gov/about/publicaccess/Enhanced_Public_Access.pdf.

Green, T. (2001). Teaching Students to Critically Evaluate Web Pages. *Clearing House, 75*(1), 32-35. http://144.16.72.189/is213/213-2000-2001/webeval/undwebev.html.

Kapoun, J. (1998). Teaching undergrads WEB evaluation: a guide for library instruction. *College and Research Library News, 59*(7). http://144.16.72.189/is213/213-2000-2001/webeval/undwebev.html

Leiner, B. M., Cerf, V. G, Clark, D. D., Kahn, R. E., Kleinrock, L., Lynch, D. C., Postel, J., Roberts, L. G., & Wolff, S. (2000). A brief history of the Internet. http://www.isoc.org/internet/history/brief.html

Nicholas, D., Huntington, P., Lievesley, N. & Withey, R. (1999). Cracking the code: web log analysis. *Online & CD-ROM Review, 23*(5), 263-269.

Risk, A. & Petersen, C. (2002). Health information on the Internet: Quality issues and international initiatives. *JAMA, 287*(20), 2713-2715.

Shirato, L. (Ed.) (1991). Judging the Validity of Information Sources: Teaching Critical Analysis in Bibliographic instruction. Ann Arbor, Michigan: Pierian Press.

Snyder, B.A. (2001). Seeking value on the Internet. *THE Journal, 23* (6), 66-69.

Sowards, S.W. (1997). Save the time of the surfer: evaluating websites for users. *Library Hi Tech 15* (3-4), 155-158.

Thelwallm, M. & Vaughan L. (2004). Webometrics: An introduction to the special issue. *Journal of the American Society for Information Science and Technology, 55*(14), 1213-1215.

Tillotson, J. (2002). Website evaluation: a survey of undergraduate. *Online Information Review, 26*(6), 392-403.

Vreeland, R. C. (2000). Law libraries in hyperspace: a citation analysis of World Wide Websites. *Law Library Journal, 92*, 9-25.

Walker, J. R. & Taylor, T. (1998). The Columbia Guide to Online Style. New York: Columbia University Press.