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1. Introduction

With the rapid growth of the Internet, today’s user can readily access resources from many parts of the globe and from many types of information providers. Since its development in 1991, the Web has become a pervasive research source for students, research scholars and faculty members in university and institution campuses throughout the world. However, despite the Web’s popularity and wide spread use and the volume of information available, many academic librarians have reported that students and faculty members often use the Web inefficiently and appear ignorant of its limitations, failing to recognise issues of reliability, validity, or authority of Web resources.

One of the most serious and widespread objections against information found on the World Wide Web is that the quality in many cases is doubtful. Retting rightly points out that every Internet resource is not superior to printed resource because the quality of information available on the World Wide Web varies from excellent to poor. Thus it is librarian’s training and expertise in information selection, value-added evaluation, comparison and efficient presentation of information that is most needed regarding Internet resources. There is much room for improvement and further development in the area of qualitative evaluation of Internet resources.

In this regard, literature survey has been conducted in the area of Internet use, use and evaluation of Web based sources, and use of search engines. In this chapter, an attempt has been made to provide a comprehensive review of related literature on the problem of research. For this purpose the following sources have been used as primary sources of information.
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- Library and Information Science Abstract (LISA) -both hard and soft copy
- Guide to Indian Periodical Literature: Social Sciences and Humanities
- Current Contents: Social and Behavioral Sciences.

The existing literature has been reviewed with an eye towards evaluation criteria for printed, Web sources, use of Internet and Web based sources as well as evaluation of search engines. It is observed that quite a good number of core research articles were found in these areas. The literature survey clearly shows that substantial body of literature already exits in the field of Internet use, use of Web based sources and use of search engines. Several significant authors have carried out many studies on these issues and during recent years there has been a continuous and comprehensive discussion about the criteria for evaluation of World Wide Web information. Thus the collected references have been reviewed and classified under the following heads.

- Evaluation Criteria for Printed Sources
- Extent of Use of Internet
- Extent of Use of Web based Sources
- Evaluation Criteria for Web based Sources
- Studies Conducted to Evaluate Web based Sources
- Use and Evaluation of Search Engines
2. Classification of Reviewed Articles

The studies conducted by different significant authors regarding the above-mentioned issues are classified and the result of the study has been discussed in detail.

2.1. Evaluation Criteria for Printed Sources

There exits a significant literature on the evaluation of printed reference sources. Criteria for printed materials in most cases can be applied to the Internet domain, but evaluation criteria may be more critical in the vanity-publishing environment of Internet. Printed sources involve a series of editorial checks that tends to reduce the appearance of low-quality information. But in case of Internet resources, these editorial checks exit to a lesser degree. Much of today’s discussion on the evaluation criteria for Web based sources has been derived from earlier treatises on the evaluation of printed materials. For example., Retting (1996) employs Stevens’ (1986) criteria for reference book evaluation in his evaluation of Web sites. Thus it clearly shows that the criteria used to evaluate Internet information sources are not different from those used by library and information professionals to evaluate conventional publications. Keeping his view, first an attempt has been made to conduct a literature survey on evaluation criteria for printed resources.

Clarke (1971) discusses early modern European writings on the evaluation criteria for printed materials and illustrates that today’s principles of meeting users needs and providing depth of the subject coverage in academic libraries dates back from the sixteenth century. Another two often-overlooked early articles on the evaluation criteria are those by Cutler (1895) and Cutter (1901). Cutler emphasises sympathy with the popular taste, avoidance of comprehensiveness in subjects and authors and regard to balance of subjects. Cutter also takes a similar stand as he proposes that the library should
acquire quality books which meet the best needs of the community. Another substantial American work on selection criteria for printed materials is by Basom (1915)*, where she lists numerous criteria, including support of both continuing and formal education, meeting community interests, depth of subject coverage, quality, usage, selection in spite of fads or negativity and representative as opposed to comprehensive coverage.

In the same way Evans (1979)^ has made a comprehensive work on evaluation of printed resources by summarising some of the criteria, which were suggested by McColvin (1925)^; Bostwick (1929)^11; Drury (1930)^12; Bonny (1939)^13; Haines (1950)^14; Ranganathan (1952)^15; Broadus (1973)^16; Carter, Bonk and Magrill (1974)^17; and Spiller (1974)^18. Further in his third edition Evans (1995)^19 also updates several criteria for printed sources proposed by Katz (1980)^20; Broadus (1981)^21; Gardner (1981)^22; Curley and Broadrick (1985)^23; Spiller (1986)^24 and Wortmar (1989)^25.

Since the concepts put forth in these books regarding evaluation of printed resources which were proposed by above mentioned authors later were modified for evaluation of electronic resources. It is necessary to duplicate some of Evans's efforts by summarising Katz, whose work is representative of the group as a whole, as well as being a standard text on evaluation. Katz (1980)^26 presents ten evaluation criteria for print materials: 1) purpose; 2) scope and audience; 3) authority, honesty and creditability of author and publisher; 4) subject matter; 5) comparison; 6) timeliness; 7) format; 8) cost; 9) curriculum support and 10) demand. Similarly Stevens (1986)^27 has also identified most significant evaluation criteria for printed sources. Even though there is overlapping
among them, many of the criteria can be ported to reviewing electronic resources, as they are analogs in the digital world.

Thus the criteria which are applicable to printed as well as Web based sources are- accuracy, appropriateness, arrangement, bibliography, comparability, completeness, content, distinction, documentation, durability, ease of use, index, illustration, level, reliability, revision and uniqueness. In recent years another comprehensive work on evaluation of reference sources by Sewa Singh (1997)²⁸ discusses about the criteria for evaluation of reference books viz., dictionary, encyclopedia, glossary, yearbook etc. Some criteria are applied to all reference sources whereas only few criteria are different for some reference materials.

Because of the today's reliance on the earlier scholarship on evaluation of printed materials, a brief review of the printed source criteria for evolution is offered first followed by a review of criteria used for World Wide Web resources.

2.2. Extent of Use of Internet

The number of published studies specifically on faculty use of the Internet so far is surprisingly small. Most of them deal either with specific segments of the university faculty or with specific uses of the Internet. Nearly all of them analyse patterns of use only among the segments of the academic population, which uses the Internet. However, some significant studies have been conducted on the use of Internet by students, research scholars as well as faculty members.

The study of Chu (1994)²⁹ on the use of e-mail as a scientific communication by faculty was conducted at two U.S universities. The study reports that major percent
(92%) of faculty have used e-mail for scientific communication. However, there is a positive relation between e-mail used and variables such as experience with computer. In the similar way Bane and Milheim (1995)\textsuperscript{30} conducted a survey on the use of Internet by academicians who subscribed to 231 randomly chosen discussion groups from a list of Scholarly Electronic Conferences. While they reported the results regarding use of number of Internet services in 17 countries, they did not collect or publish data on the use by discipline, just sector (e.g., commercial, education and government). Among other findings they state that many academicians are still not aware of its resources and possibilities and not all foreign countries have access.

Another study on Internet use in academia (Ashley, 1995)\textsuperscript{31} is a Ph.D. dissertation which examined Network Information Retrieval (NIR) among 888 faculty members at the University of Arizona with Internet-accessible computer accounts. Ashley reports that respondents from various colleges at the universities use between 20% and 39% of available NIR technologies, suggests that NIR is in an early stage of diffusion in all colleges. Another similar Ph.D. dissertation of White (1995)\textsuperscript{32} examined a specific segment of faculty members, but included non-users as well, distributing the survey by mail to faculty members in professional organisations related to the study of mass communication, consumer behavior and advertising and public relations. Unlike previous studies, this study found that the majority (73%) of faculty used computer mediated communication, with younger faculty members and female faculty members showing significantly higher use than the general population.

Further Alexander (1995)\textsuperscript{33} as a part of dissertation work conducted a study on use of Internet listservs as post teleconference support to faculty at Community colleges
and Two-year institutions. The author observes that 47% of Community college teleconference participants have access to the Internet and 30% know how to use e-mail. An Australian study by Bruce (1995) analysed data from two samples of academicians from a wide field of disciplines in 13 Australian Universities, to determine how academicians in Australia use the Internet to enhance their teaching. The data revealed that the Internet for Australian academics, represents a mechanism for overcoming the disadvantages to academic teaching which may arise from institutional amalgamation, geographic remoteness or the under-representation of certain teaching disciplines in Australian Universities.

In 1995 another similar survey was conducted on faculty use of electronic information technologies and resources by the SUNY University center libraries (Adams and Bonk). The survey included respondents from all academic disciplines and measured the use and frequency of use of electronic information resources. Since the questionnaires were distributed by mail, it measured non-use as well. Variations in use among faculty in disciplines is given, but the conclusion states that, in general, the most of the common obstacles to the use of electronic information sources is lack of knowledge about what is available. It is also noted that the user training is considered by faculty to be a high priority need. Faculty readiness in terms of necessary equipment and interest to access electronic information sources is almost universal. In addition, the level of use of available electronic resources is quite high and growing.

In case of Clifford Perry (1995) survey on “Travels on Internet: A survey of Internet users” shows that most of the respondents (55%) had been using Internet for less than one year and 25% of that group had used Internet for less than six months. While
17.9% had been using the Internet for 13 to 18 months and an equal number of respondents had used it for more than two years. When they were asked to rate the difficulty they found in the use of Internet, the majority (57%) of them felt that it was somewhat difficult. This high percentage would indicate that the Internet is not particularly user friendly. The study also shows that almost all the respondents are interested in obtaining textual information (95%). In addition to texts, users also wanted statistics (44%), graphics (13%) and audio (4%), to learn about the Internet and its offerings and respondents indicated that books and periodicals (26.6%) as well as colleagues (25%) were of great help. The most useful popular tools to access information are Gopher (73%) and File Transfer Protocol (63%).

Similarly Rama Vishwanathan's (1997) study on the “Internet as a medium for online instructions” reveals that 60% (81 out of 135) of the participants intended to use the Internet primarily for research work. About 21% (29 out of 135) of the participants rated their Internet expertise as poor, compared to 29% (39 out of 135) who rated their Internet expertise as adequate. About 72% of the participants are frequent users, with about 52% respondents used it daily where as 20% of respondents used it only a few times a week. Study also found that e-mail was most frequently used feature of the Internet, with about 50% (67 out of 135) of the participants said they used it regularly.

Further Lazinger, et.al (1997) conducted a comparative study on “Internet use of faculty members in various disciplines”. The primary focus of the research was to examine and compare the use of Internet among various sectors of the faculty at the Hebrew University of Jerusalem. The survey clearly shows that among the respondents, 80.3% (371 out of 462) used the Internet and out of 371 Internet users 362 (97%) used e-
mail. This shows that users use e-mail service extensively, primarily for correspondence with colleagues regarding research issues and respondents judge it as most important service. Although e-mail is by far the most popular Internet service, there is also substantial use of the other services like FTP (48%) and Gopher (45%). The Internet use rate in general is higher among the Science faculty members than among the Humanities and Social Science faculty members. A study of students at three Southeastern U.S college by Perry, et.al (1998)\(^9\) found that more than 40% of students in the study used the internet at least once a week on regular basis and of these, almost one-half used it to find information.

Followed by Perry and others, the similar comparative recent study was conducted at University of Mysore by Pangannaya and Sujith Kumar (2000)\(^{40}\) on the use of Internet by the academic community. The results of the study fall in the line of Lazinger's study, which shows that the member of academic community belonging to the Social Science and Humanities disciplines are making low use of Internet, where as academic community hailing from Science discipline are making high use. It also shows that when compared with the overall strength of the academic community of the university only a small fraction is making use of Internet facility. Majority of the respondents used Internet for e-mail followed by factual information. In case of the study conducted by Saeed (2000)\(^{41}\) on Internet use in University libraries of Pakistan, which highlights about the use of Internet tools viz., e-mail, World Wide Web, FTP, telnet and Gopher. The result of the study shows that there are very few university libraries in Pakistan with access to the Internet. Even though those who have Internet access suffer from an acute shortage of Infrastructure (e.g. poor telecommunication, limited hardware
and software, library personnel etc). It is because of insufficient funds and this effects on the access of Internet by university library.

In case of study conducted by Schaffner (2001) examines the impact of electronic technology on libraries and scholarship. It focuses on some of the challenges in using electronic resources in research libraries, which include the cost of acquiring electronic formats and effect that such expenditures have on other library services and collection development practices. The article also explores how electronic resources have changed the way of students and research scholars to conduct research. The goal of this study was not to criticise or condemn electronic formats but, rather to illustrate that electronic technology is simply one tool among others, for the dissemination of information. As such, electronic resources should complement rather than replace other formats.

Another comprehensive study of Zhang (2001) on scholarly use of Internet based Electronic Resources shows that e-mail was the most frequently used tools. All respondents indicated that they used e-mail at least once in a week, while 93.6% of them used it almost every day. Web browsers are the second most frequently used Internet tools. Nearly 94% of respondents used Web browsers at least once in a week. Next to e-mail and Web browsers, mailing lists and Internet search engines are third and fourth most frequently used Internet tools.

Another recent study made by Batthini and Madnani (2003) on Web search behavior of LIS professionals of selected libraries of Ahmedabad and Gandinagar clearly shows that 56.25% of libraries are connected with Internet. It also shows the frequency of use of Internet services by LIS professional. Their study found that 31.25 % of them used
it every day. Another similar study of Varalaxmi (2003) reveals that 76.47% of faculty have used Internet at their home, 42.15% accessed it from private cyber cafe and equally good number i.e. 41.17% accessed the Internet from their work place. Further her study also identified the purpose of Internet use and it shows that large number of respondents (78.43%) used it for research and 58.8% and 43.13% of users used it for teaching and publishing purpose respectively.

2.3. Extent of Use of Web based Sources

Articles on use of Web based sources have been collected and presented in chronological order. Regarding use of Web based sources, several studies have found that faculty, research scholars and students who are using the Web for research seems satisfied with what they find. Peter Wie He and Jacobs (1996) studied individuals using Internet terminals at the State University of New York at Albony. The study reported that 97% of respondents felt that Web resources are useful, 45% felt that they could find most of things they need for their research assignments from the Internet and 34% described that Internet as their most important resource. A survey of students by Lubans (1998) at Duke University's undergraduate library showed that the students frequently used Web resources for academic purposes. It is also found that they are confident about their ability to navigate it and generally trust its resources. More than 85% of the students rated the accuracy of Web resources as moderate to excellent.

Further Crane (1998) examined the evaluation practices of two groups of college composition students. One group used a checklist provided by the instructor and the other group developed it's own criteria to evaluate Web documents. Comparing criteria from both groups to standard evaluation criteria, she found that a checklist alone
was insufficient to help the students to evaluate Web site and further, that students needed help in identifying components or elements of Web documents. In an effort to increase effective use of the Web resources for research, Pierce (1998) used pre-and post-test scores to compare the performance of high school students. She found that despite their high opinions of their own abilities, students were quite unskilled in research techniques that effectively used Web resources. She further found that for a variety of reasons, high school teachers in the study were unprepared to help students learn how to evaluate Web sources and to develop search strategies.

Further Gilette and Viedeon (1998) used a case study to examine the sources cited by forty-seven students in a community college. They found that regardless of a wide range in quality, 50% of the students in their study cited other student papers found online. Citations to Web documents were often muddy, with a high degree of faulty links and errors; and students often cited several sections or chapters of one Web site as multiple sources.

In case of Susan Davis Herring (2001) study on “Faculty acceptance of World Wide Web for students research” explores faculty attitude towards the Web as a research tool for their students’ research; their use of Web in classroom instruction; and their policies concerning use of Web by students. In their study the authors found that although faculty members generally feel positive about the Web is a research tool, they question the accuracy and reliability of Web content and are concerned about their students’ ability to evaluate the information found on the Internet.

Another similar study by Grimes and Boeing (2001) on “Worries with the Web: A look at Students Use of Web resources” clearly shows about the use of Web resources
by students. The main purpose of the study was to determine whether students are using unauthenticated resources, whether they are evaluating their resources and whether there is a gap between the quality of resources expected by instructors and the quality of resources used by students. Using the case study methodology the authors interviewed instructors and students and analysed Web resources cited in research papers in two English composition classes. The result of the study shows that the students are evaluating Web resources only superficially, if at all. They went directly to Web resources without seeking help from librarians, even when in the campus library. Their instructors provided little guidance to help them to select resources and it is like the students in Prerce’s study- all were confident in their own assessment of the quality and suitability of the Web sources they found. Unfortunately, the students in the study seemed ill equipped and perhaps unwilling to make the effort to evaluate Web resources. Moreover, they had not been taught in class (or did not learn) which was good and which was not good Web resource.

Kanaujia and Sathyanarayana (2003) study on the use of Web sources shows that the most of the users who used the Web resources belong to 18-24 years age group and the least users belong to 45-65 years age group. Pattern of use of World Wide Web in males is found more than the females. So popularity of World Wide Web use more in youngsters and males. Regarding time spent on World Wide Web, the study reveals that most of the respondents (49.2%) browse Web for more than 2 to 4 hours. About 37% users used it for 1 to 2 hours. In this study users were also asked to mention the purpose of use of Web and the data shows that large number of users (42%) used it for e-mail and 36.6% of users used it to browse e-journals.
2.4. Evaluation Criteria for Web based Sources

The literature on evaluation of Web resources began to appear in late 1990’s. The World Wide Web information resources have created a new challenge and competition for information professionals. These resources provide greater opportunities for transfer of information from one location to another location very easily. The information can be automatically searched in order to locate items of interest and facilitate better and faster access to information through networking.

In the last few years, a number of authors have used more or less same criteria for the evaluation of Internet information sources. They generally take evaluation of print reference sources criteria of Katz (1880) as the starting point for evaluation of Web sources. But Piontek and Garlock (1995) refer to the collection development criteria for Web resources. While Stoker and Cooke (1995) consider printed sources criteria for evaluation of CD-ROM and Online information services. Thus most of the authors agreed that traditional criteria which are used for printed sources can apply, however, there are some particular aspects and concerns in the Internet environment that cause to arrive at some new criteria.

Regarding this issue several significant authors have studied and suggested evaluation criteria for World Wide Web resources. Starr (1994) provides the best criteria for the evaluation of Internet sources in his research paper “Evaluating Physical Reference sources on the Internet”. He classified and reviewed a representative samples of Physical Science reference sources and suggested few important criteria viz., purpose, authority, scope, audience and format for evaluating the Physical Science Reference
sources. Although the focus of the study is on reference sources in Physical Science, the evaluation criteria can also apply to other disciplines as well.

Further Retting (1996) pointed out that criteria could not have been transferred from the print medium to the electronic medium without modification, of course. Even though there is overlapping among them, many of these criteria can be applied to evaluate Web resource. Rettings’ criteria for evaluation of Web resources mainly addresses the issue like information accuracy, authority or it’s creator, appropriateness of links to other resources, quality of organisation and ease of use, graphic design, timeliness, level of treatment, indexing and searchability, appropriateness for Internet medium, comparability to other resources on the Internet or in other media and uniqueness.

Pratt and others (1996) pointed out that with the rapid growth of the Internet, today library users can rapidly access resources from many parts of the globe and from many types of information providers. Meanwhile the Internet sources frequently publish without filtration and without considering the needs of the users- may be poorly maintained and may be only transiently or intermittently available. Thus user or library authority must be aware of criteria for evaluation of Web resources. For libraries, the basic evaluation criteria of quality, credibility, accessibility, scope and cost are still issues but once that must be viewed in new ways. In this regard Smith (1997) made a comprehensive work on evaluation of Internet resources, where he reviewed and proposed a toolbox of criteria for evaluation of Internet resources. The author also made an attempt to evaluate some Internet resources on the basis of some significant criteria.
In this context there are several studies conducted regarding evaluation of Web resources by Grssian (1996), Harris (1997), Tillman (1997). The criteria that suggested by these authors are similar to the foregoing authors although the terminology or wordings varies, but, the concept remains in the line of the previous authors. McMurdo (1998) in his paper “Evaluating Web information and design” has given comprehensive criteria for evaluation of Web resources, which are almost similar to Smiths’ Internet information evaluation criteria. The paper mainly focuses on the methods for critically evaluating the content of Web resources and also focuses on the designing Internet documents. The author also aims to identify and provide a manual of good practices from such sources. Another comprehensive work by Skov (1998) regarding Internet quality states that given the nature of the Internet, where quality resources mix with vanity publishing advertisements and sheer junk, evaluating quality has become essential. Exercising evaluative skills with regard to printed material and traditional databases has always been part of the information professional’s responsibilities. Thus, the author has come to the conclusion that many of the criteria employed at the time of scrutinising traditional sources are still valid.

While Kapoun (1998) in his article “Teaching undergraduates Web evaluation: A guide for Library instruction” has clearly stated that over the last few years, the faculty members are demanding more Web usage from their students. In fact, some faculty members may exclude most printed resources in favour of Web resources. Thus the students or faculty members must be aware of evaluation criteria for Web resources and in this regard he provides best criteria which are most helpful to students and faculty members for the evaluation of Web pages. Thus the suggested criteria of Kapoun include
accuracy, authority, objectivity, currency and coverage of Web document. As Web resources are revolutionising the academic libraries, many librarians believe that these resources have changed the principles of selection radically; some believe that they will virtually eliminate selection. Although it is true that the art of selection is undergoing profound change, the selection of materials is still crucial for libraries. In this context, Holleman (2000) suggests four basic criteria for selection—quality, library relevancy, aesthetic and technical aspects and cost—remain the same in electronic era of information. What they mean and how they are used have changed. But, even quality and cost, the two most controversial criteria, carry great importance for the responsible selection of electronic resources. The criteria that are suggested by the foregoing authors, some of them are also suggested by, Metz (2000), Case (2000), Lord and Ragon (2001).

Further Stoker and Cooke (2000) suggest the techniques and evaluation criteria for information sources available on the Internet. The paper highlights on need for qualitative judgements about library materials and acceptable techniques and evaluation criteria for printed reference works are outlined. The emergence of non-book materials generally and electronic information formats in particular, has created the need for new techniques and evaluation criteria relating to Online services and CD-ROM products. Suggested criteria for the evaluation of network information sources are as follows: Authority, genealogy, scope and treatment, purpose, coverage, currency and method of revision, accuracy, objectivity, audience, format, arrangement, technical considerations, price and user support.

Similarly Cottrell (2001) has identified some important evaluation criteria to teach students to evaluate Web resources more critically. His research paper mainly
focuses on some criteria viz., identifiable-accreditation of source, quality of the source, links to other sites, accessible on older versions of browsers, hyperlinks and navigation, clear directions in the site, credentials of sites, links are updated, information organisation and aesthetic features of the site.

Further Grimes and Boening (2001) discuss the evaluation of Web resources in their paper “Worries with the Web: A look at students’ use of Web resources”. Authors reviewed numerous online guides regarding evaluation criteria and developed a checklist and the authors found a great deal of similarity among the guides, highly reflective of traditional selection criteria used in evaluating print resources in academic libraries. Similarly Biradar and Sampath Kumar (2001) have made an attempt to bring out a comprehensive evaluation criteria for Web and printed resources and authors also made an attempt to compare possible common criteria applicable for Web and printed resources. Study result clearly shows that traditional criteria, which are used for printed sources, will also apply to the Web resources with some modification. Study also suggests some new criteria, particularly for evaluation of Web resources.

2.5. Studies Conducted to Evaluate Web based Sources

The explosive growth of World Wide Web in recent years has an impact on almost every field of human activity, while it’s effect on librarianship is more intensive owing to the information component attached to the profession.

In this context several studies have carried out to evaluate Web resources in different research institutions and university environment. Meanwhile several authors have also looked at the problems faced by faculty and students in using Web resources. According to Floridi (1996) the Web may become a powerful source for disinformation
(defined as propaganda, incomplete or corrupted information, or censorship) unless some
type of quality certification by academic and/or commercial services is instituted.

Knowlton (1997)\textsuperscript{77}, writing in the \textit{New York Times}, noted that many educators feel
that students do not realise how much of vast amount of information is readily available
over the Web is unreliable. He quoted one professor who noticed a decline in the quality
of his students’ papers after they had begun using the Web resources for their research
work. Bruce and Leander (1997)\textsuperscript{78} writing on the use of digital libraries and other
information technologies in education, identified major issues in Internet use as
perceptions of the value of information, questions concerning authority and computer
anxiety. Similarly other researchers [Regan (1998)\textsuperscript{79}, Connel (1999)\textsuperscript{80}] have also focused
on the questions of the accuracy and reliability of Web resources. While Regan (1998)\textsuperscript{81}
noted that poor quality exists even in sites created and maintained by commercial news
organisations. A study by Connel and Tipple (1999)\textsuperscript{82} tested the accuracy of information
on the Web using Altavista search engine. A sample of sixty-reference questions were
chosen for the study and after retrieving information from the search engine, authors
found that only 27% of the pages provided correct answers or mostly correct answers.
However, only about 9% of Web pages provided wrong answers and 64% of the pages
provided no answers to the questions at all.

In case of McBride and Dicksten (1998)\textsuperscript{83}, discussion of how students are using
the Web, wrote that what has really changed with the advent of the Web is that students
no longer get most of their information for class assignments from reputable print sources
in the library. This echoes Bruce and Leander’s concern about students who imagine that
the Internet is the only source worthy of searching and students who believe that sources
have value by virtue of having an electronic link. Further Zhang (1999) conducted a survey on "Scholarly use of Internet based Electronic Resources". The purpose of the study was to construct a baseline of scholarly use of Internet-based electronic resources (e-resources) by surveying a group of Library and Information Science (LIS) scholars. The study focused on researchers' demographic information, frequency of use of various Internet tools and resources, strategies of locating e-sources, opinion on citing e-sources and suggestions for improving scholars' use of e-sources for research. In the study the respondents were asked to rate e-sources according to following features: accessibility, accuracy, authority, availability, consistency, flexibility and usefulness. On the whole, respondents gave a relatively high evaluation to the e-sources. However, the rating of each feature of e-sources varied. Overall, timeliness was rated as the best feature of e-sources. Permanence was rated relatively low with a weighted rank near fair.

In the similar way another study made by Biradar and others (2001) on "use of Internet based information resources" at Indian Institute of Science, Bangalore where respondents were asked to rate the World Wide Web information resources based on Yin Zhang study's features. It is observed that 74.07% of respondents rated the features of e-resources as good, 25.37% of respondents rated the features of e-resources as excellent and only few (0.55%) are rated as fair.

2.6. Use and Evaluation of Search Engines

Web search engines did not come into existence until 1994. The literature covering them has an even shorter span of time. In fact, a survey of the literature indicates that the number of evaluation studies done on Web search engines is small and the majority of those publications (e.g., Shirky, 1995, Taubes, 1995, Wildstrom,
1995\textsuperscript{88} are descriptive in nature. Articles reporting the evaluation of search engines have become popular with readers as the Web has grown. Eventually, people went a step further by starting to evaluate Web search engines in addition to describe them. Some of the significant papers that have appeared are discussed below.

Notess examined Lycos, WebCrawler, World Wide Web Worm, Harvest Broker, CUI and CUSI in one article (1995a)\textsuperscript{89} and InfoSeek in another (1995b)\textsuperscript{90}. Based on online documentation provided by those Web search engines and personal usage, Notess recommended that for single keyword searches of a large database, use Lycos. For multiword searches with an AND, try WebCrawler. For a time-consuming comprehensive search, use CUSI. In addition, Notess also compared InfoSeek with Lycos and WebCrawler in terms of coverage, precision and currency.

Leighton (1995)\textsuperscript{91} conducted a study of Web search engines for course work by employing the evaluation criterion of precision. The findings were not submitted to a journal for publication because of the fast changing nature of the search engines. Leighton evaluated InfoSeek, Lycos, WebCrawler and World Wide Web Worm using 8 reference questions from a university library as search queries. The author found that Lycos and the free part of InfoSeek have the same precision with Lycos just a nose ahead while WebCrawler gave surprisingly bad precision. WWW Worm was good enough that usually retrieved at least one or two hits for the given queries with high precision.

In a recent publication, Courtois, Baer and Stark (1995)\textsuperscript{92} evaluated the performances of about 10 different Web search aids including CUI, Harvest, Lycos, Open Text, World Wide Web Worm and Yahoo. Using 3 sample search questions along with other information available about the search engines, the authors concluded that among
other things, Open Text was the best at the time of their study with its flexible, powerful search interface and quick response. They also concluded, for novices, WebCrawler offers the easiest interface. In a different study, Scoville (1996)^93 surveyed a wide range of Web search engines and suggested that Excite, InfoSeek and Lycos should be added to one’s list of favorites because they can retrieve accurate results from easy-to-use interfaces.

Kimmel (1996)^94 examined World Wide Web Worm, Lycos, WebCrawler, Open Text, Jumpstation II, AliWeb and Harvest based on documentation provided by the search engines along with a couple of single word test searches (e.g., pollution, atlas, computer etc.). The author’s focus was, like many other publications, on describing the features of these various search engines. The author concludes that if the robot-generated databases presented here, Lycos appears to be the strongest system overall.

C-NET, a company specialized in evaluating online products and services, conducted a comparative study of 19 Web search engines on its Web site (Leonard, 1996)^95. The search engines were tested on their accuracy of results, ease of use and provision of advanced options using 15 queries specifically composed for the evaluation. Most of the queries resemble reference questions asked in public libraries. According to the two feature tables generated by the evaluation, Alta Vista seems to be the best choice among individual search engines, while All-in-One Search Page and the Internet Sleuth achieved the highest ranking for meta- or unified search engines.

The reported findings obviously do not appear to agree with one another. The methodologies and evaluation criteria used by those studies differed as well. Can a feasible methodology be developed to help Web users to select a search engine, out of the
great number of choices, that is most appropriate to their specific search needs? The authors of this study are trying to do this by first evaluating the searching capabilities and performance of selected Web search engines currently available.

Chu and Rosenthal (1996)\textsuperscript{96}, like many other researchers, used sample search queries that were based upon real reference questions. These queries were structured to evaluate the search engines' abilities to deal with variety of query syntax, for example different Boolean logic searches. The authors tested the first ten results from three search engines for precision and concluded that Altavista out performed Excite and Lycos in both search facilities and recall, although Lycos had the largest claimed coverage of Web resources. Another factor that was taken into consideration was the response time of the search engines, which perhaps surprisingly did not vary between search engines.

Other researchers have conducted similar experiments using different queries and analysing varying numbers of the results for relevance. Ding and Marchionini (1996)\textsuperscript{97} considered the first twenty hits for precision using five queries. All the search engines searched within twenty minutes. Gauch and Wang (1996)\textsuperscript{98} used twelve queries on a number of major search engines and reported precision figures for the first twenty hits. Tomaiuolo and Packer (1996)\textsuperscript{99} studied the precision of the first ten hits from 200 queries but did not list the query topics or the exact expressions or operators used. Links may not have been visited to check for broken links. Like many other researchers, the criteria for relevance were not given in this study.

Meghaghab and his co-workers (1998)\textsuperscript{100} examined the effectiveness of five World Wide Web search engines: Yahoo, WebCrawler, Infoseek, Excite and Lycos. The study involved five queries that were checked against each of the search engines in
original and refined formats, a total of fifty searches. The queries varied in terms of broadness, specificity and level of difficulty in finding Internet resources. The results of the study revealed that Yahoo had the highest precision ratio for both original and refined queries. Infoseek maintained second place with respect to refined queries and Lycos with respect to original queries. Query refinement resulted in a higher precision ratio. The addition of promising pages, selected by the researchers as likely to be relevant, increased precision in all queries and across all engines.

In an important paper Clarke and Willett (1997)\textsuperscript{101} compared the effectiveness of Altavista, Excite and Lycos using thirty different searches. The paper is important because of the critical evaluation of earlier research that it provides and also because it offers a realistic and achievable methodology for evaluating search engines. The authors developed a method for comparing the recall of the three sets of searches, despite the fact that they are carried out upon non-identical sets of Web pages, because each search engine has indexed a different set of documents. They developed an algorithm for calculating relative recall by checking how many of the so called relevant found by one search engine were present at all in the universe of documents covered by the other search engines. The study clearly shows that Alta Vista is significantly better at retrieval performance than either Lycos or Excite-this is in accordance with the other studies.

Leighton and Srivastava (1997)\textsuperscript{102} evaluated five robot search engines, during 31\textsuperscript{st} January and 12\textsuperscript{th} March 1997. These search engines are compared for precision on the first twenty results returned for fifteen queries. The authors rated the services of each search engine based on the percentage of results within the first twenty returned, that were deemed relevant or useful. Their analysis shows that overall, AltaVista, Excite and
Infoseek performed better on short, unstructured queries, while Hotbot performed better on structured queries.

Schwartz (1998) reviewed the way Web search engines operate and noted the growing body of evaluation literature, much of it is not systematic in nature. She concluded that performance effectiveness is difficult to assess in context of the Web. She also concluded that significant improvements in general content search engine retrieval and ranking performance may not be possible and she also argued that they are probably not worth the effort. However, search engine providers have introduced some rudimentary attempts at personalisation, summarisation and query expansion. She suggested there might be a trend towards smaller resource collections with rich metadata and navigation tools.

In middle of second half year 2002, Biradar and Sampath Kumar have made a comprehensive study on evaluation of major search engines. For the evaluation purpose six major search engines viz., Yahoo, Google, Altavista, Excite, Lycos, Hotbot were considered. Search was conducted for a query with using search strategy, which is given by respective search engines and without using search strategy. It is found that when search techniques were used for each search engines, number of hits reduced and majority of them are relevant to the query.

In recent year Batthini and Madnani (2003) conducted a study on use of search engine by LIS professionals. About two-third of the respondents in this study are dependent on search engines to retrieve information. Of these 60% are depend on them frequently. Study also shows that the professional used Boolean operators (50%) for searching information. Regarding the level of satisfaction, it was found that 70 % of the
users felt that they satisfied with information retrieved through search engine. In the similar way another study by Kanaujia and Sathyanarayana (2003)\textsuperscript{106} reported that Google (97.4\%) and Yahoo (93.4\%) were most popularly used search engines followed by Alta Vista (71.6\%). Regarding the use of search strategy the study shows that truncation, phrase searching and field searching are used most of the times as search strategy on World Wide Web. Boolean searching has not been used extensively as search strategy on Web. Wild card searching is also used sometimes among all other types of strategies. Another study by Panda and Sahu (2003)\textsuperscript{107} also shows that Google (85\%) and Yahoo (75\%) are popular search engines for respondents.

3. Conclusion

This chapter presents an extensive review and analysis of evaluation criteria for printed sources, current use of Internet services, use and evaluation of Web based sources, use of search engines and their search strategies. These studies have been published in an extremely diverse number of conference proceedings, journal publications and also in Web sites.

In this chapter an attempt also been made to compare possible criteria used in printed sources as well as in Web based sources. This comparison shows that traditional criteria will apply for Web based sources with some modification. This literature review and analysis will benefit any researcher for conducting future studies.
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