

Use of Web based technical data and information in higher education: potential benefits and major concerns

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Abstract

The intensity of World Wide Web (Web) use in higher education has stimulated a number of serious concerns about the potentially dubious nature of Web based data and information and students' ability to evaluate it. Lecturers are also uncertain about the value of the wider information resources on the Web and are concerned about variable information quality and the possibilities of plagiarism. In the past, much effort has been directed to investigate various aspects of the Web use mainly focused on computer-mediated communications, configuration of the electronic resources and development of underlying infrastructure. However, little research has been done on the comprehensive assessment of the overall benefit or deficiency of the use of Web based information in teaching and learning. The author believes that the Web as a source of specific academic information has a great potential but the realisation of this potential requires considerable investment put into the Web structure design, Web literacy curricula and development of the Web literacy skills with a greater focus on a critical evaluation of the Web based information. The paper summarizes major concerns in the use of Web based data and information from a point of view of a final user and will be useful for researchers and professionals working in the areas that contribute to the development of a knowledge-intensive and intelligent service Web in higher education as well as for teachers whose students use online resources in a project or assignment.

I. Introduction

The use of the World Wide Web (Web)¹ in higher education has been increasing at an exponential rate over the past few years. The Internet has become commonplace since most universities had implemented this technology by the late nineties. Apart from communication and teaching tools the Web is also a convenient source of specific academic information, which undergraduate and postgraduate students are increasingly using to complete course assignments and projects (Metzger et al., 2003). Search engines available on the Web such as Yahoo and AltaVista are becoming the main tools for indexing and retrieval of Web resources (Dong and Su, 1997). Results of many studies as well as the author's experience show that students rely very heavily on the Web for both general and academic information, and that they expect this usage to increase over time.

The use of the Internet has been growing steadily in the University of Adelaide with a number of local Web servers providing access to a wide range of information for students. However, there are many concerns among staff about the potentially dubious nature of Web based

¹ Terminology to describe the Internet, Web and other related technologies are often used inaccurately. The Internet refers to the physical infrastructure of interconnected computers, cables, adapters and so on. The Web refers to a system of computers and user interface program providing access via Internet to data, documents, multimedia, and Web sites.

information and students' ability to evaluate it. Lecturers are also uncertain about the value of the wider information resources on the Web and are concerned about the variable quality of information and the possibilities of plagiarism. To address this, the author discusses the educational potential of the Web as a direct learning resource and major concerns connected with the use of the Web based information. The author also offers some suggestions for teachers whose students use online resources in a project, assignment or research paper.

From a general point of view, an information search is a very complex process and it forms a subject of an intensive research in many disciplines, such as cognitive psychology along with human factors, semiotics, and psycholinguistics. From a cognitive framework, some consensus is emerging about how humans think and find meaning in their world, specifically how information is used to construct meaning. The active process of forming meaning from information is the task of the user during the information search process (Kuhlthau, 1991). An information search within a cognitive framework (Ebersole, 1997) is viewed as a non-linear process of construction, which involves the whole experience of the person, feelings, as well as thoughts and actions. Concentrating on cognitive aspects, Belkin et al. (1982) describe the constructive process of information seeking in terms of the Anomalous State of Knowledge (ASK) hypothesis. Briefly, this hypothesis states that an information search starts with the formulation of the user's problem and the realisation that there is the gap between their knowledge about the problem, topic or data and what the user needs to know in order to solve the problem. This gap represents the information need. During the search, the user's state of knowledge changes filling this gap (Hess, 1999). Problems arise when there is a *mismatch* (it is normally always exist excepting some trivial cases) between what the user is looking for (information needed) and the availability of resources that meet given quality criteria.

II. Benefits of the Use of Web Based Information

The advantages of the use of the Web as a source of specific academic information has been discussed extensively in the literature. Major advantages are summarised below:

- Greater information availability: The World Wide Web provides a quick access to a wide range of technical information, standards, specifications, and databases located at geographically removed institutions using various search engines and pointer pages. The sheer volume of technical information on the Web is staggering; it is the equivalent of having access to a number of research libraries on-line. This makes the Web a very valuable and comprehensive source of academic information.
- Better access to up-to-date information: The Web has allowed students better access to technical information, which is more up-to-date than is possible in a traditional university library. The Web can furnish students with specific information on progress in current projects pre-publication via project home pages and bulletin boards. On-line mailing lists alert users to upcoming publications, conferences and on-going projects.
- High level of flexibility and accessibility: The Web offers a greater choice of when to study (since the required information can be retrieved at any time of day or night) and a more flexible place of searching information (where students can move faster through the search if they find easy and spend longer on a more difficult or unfamiliar topic). The Web also allows students a more individual approach to selecting and

using technical information than is traditionally possible. Normally, students do not experience problems of lack of access to the university's computers and the use of home computers doesn't involve them in much financial expenditure.

- Improvement of computer literacy and skills: The greater use of computer and computer-based programs will presumably improve computer skills and literacy. Other advantages of the wider Web usage include accomplishing new or existing information search tasks better and more efficiently, preparing students for the job market and enhancing productivity (Albright and Graf, 1992; Witmer, 1998).

III. Major Concerns

It has been claimed in many studies that the Internet and the Web links it provides can aid the learning process. Potential benefits to students have been discussed above. However, there are a number of serious concerns, which challenge these advantages and in some cases negate all benefits. Among them are:

- Credibility of Web based information: The lack of editorial review, regulatory policy concerning Web-based information and legal pressure constraints result in little social, legal and professional pressure to ensure quality and accuracy of Web information compared to traditional sources of information. The organization of the World Wide Web provides the ease of electronic sabotage and content alteration. The American Library Association and the National Institute for Literacy have called for universities to teach university students Web literacy skills, with an emphasis on evaluating the quality of Web-based information. The lawmakers have yet to establish regulatory policy concerning Web-based information (Alexander and Tate, 1999). This results in both ambiguity for those who are trying to set standards for online material and limited social, political, or legal pressure for Web content providers to ensure accuracy (Metzger et al., 2003).
- Lack of information skills: The Web search requires quite different skills from those that required in a traditional library setting. For example, searching a traditional library is a finite task, calling mainly for an ability to navigate library catalogues and shelf classification systems. Identifying and locating information on the Web may be an infinite task. Many undergraduate and graduate students lack the skills to manage Web based information including: the ability to identify and appraise Web-based sources to, filter and store information and the ability to synthesize Web based information.
- Ease of access to off-topic material: The Web also provides an easy access to inappropriate and irrelevant materials. Whilst this can be a minor irritant in some cases, where students find it difficult to concentrate on the search of the required material, it can also be detrimental to the whole project or assignment. In fact, the presence of unavoidable and unwanted material can present a serious problem as it is often more interesting than the specific academic information required for the educational task being performed.
- Issue of quality of Web-based information: Many students use the Web without formal help and training. This situation has important implications for the quality of

work that students are able to produce based on their Web use. The Web contains millions of sites, which are operated by individuals and businesses that publish a blend of advertising and informational content without clear visual distinction between these components. Such a blend may be problematic for students trying to distinguish between advertising material and information that can be trusted.

Moreover, students tend to be pragmatic when it comes to their assessments and are not necessarily concerned about the Web's potential for misleading information. For example, Lubans (1999) found that although a majority of students feel that the Web-based information helps them find a large number of sources, a minority believe that the Web improves the overall quality of their work. Many students describe the Web as being commercial and *for the layperson*. This finding suggests while students appreciate the Web ability to provide them with an array of information resources, the quality of those resources is not necessarily important to them. In some cases students deliberately use poor quality materials in a perfunctory effort to lengthen reference lists in a research paper or academic assignment as it is a more subtle offence, and one that busy educators are not likely to detect. Such behaviour conflicts with learning objectives, and therefore the issue of the quality and credibility of Web based information is extremely important in the educational context.

- Campus libraries and traditional sources of information: Unfortunately, these days, students are making fewer visits to the campus library to retrieve information. University reference librarians have become expert Web users in order to give students the assistance they need in finding credible information, but students do not always take advantage of librarians' expertise (Lubans, 1998). Furthermore, studies show that librarians believe that student use of the Web is at "an alarmingly uninformed level" (Lubans, 1998). The Web holds more useful information than most university libraries and the information is more up-to-date and relevant to many subjects. To suggest, however, that the Web contains appropriate material for every situation would be wrong. There are many instances where learning is better accomplished through the use of more traditional resources. For example, although many of the academic topics are available on the Web, as a rule, the theoretical aspects are not covered sufficiently well to allow reliance on them as a sole means of reference (Slone, 1997).
- Information overload phenomenon: The search engines available on the Web are becoming the main tools for indexing and retrieval of the networking resources. As a consequence, it is becoming more difficult for students to keep up with the expanding knowledge base. Students having no information skills training often experience so called the *information overload* stemming from the search for specific information. Millions of pages of technical, commercial and ambiguous information is interlinked to form a worldwide resource of information often frustrate and confuse students. The best interpretation of this effect appears to be through a theory of information processing. Information processing theory states that the mind works as a computer, and the mind thinks in terms of a cycle of input of information, storing, and output. Disruption in this cycle occurs when too much information is assimilated at one time, mainly because the individual cannot successfully filter and manage the information.
- Actual use of the Web materials: The general movement away from libraries and towards cyberspace raises further questions about how students actually use this information and what the impact of online academic information is on problem-based

learning. To investigate how exactly students use Web based information, an interesting experiment was conducted at Aberdeen University (Ward and Newlands, 1998). Students were given an assignment on an information search using the Internet. The findings of this experiment are alarming and pretty disappointing. Most students did not appear to use time at the computer to learn; they just printed or copied the documents straight away without editing or even having read them to the end. Moreover, only a minority of students used two or more suggested Web links or went in search of alternative Web sources of relevant information.

- Legal issues: Complex legal rights issues arise with the use of Web based information especially in regard to technical information are nearly always involved² and³. It is sufficiently difficult to secure adequate rights for any particular resource neither assuming that the right positions will remain the same.
- Security issues: In addition, recently emerging Web safety issues put a heavy pressure on the technical personal and increase the running costs through purchasing the corresponding software and fixing damage made by computer viruses.

IV. Discussion and Conclusion

The author believes that the Web as a source of specific academic information which is often difficult or impossible to obtain from traditional information sources has great potential but the realisation of this potential is coupled with considerable investment put into the Web literacy curricula and development of the Web literacy skills with a greater focus on a critical evaluation of the Web based information. Obviously, the use of the information available is variable for different subjects and areas. The following paragraphs are some basic guidelines for teachers wishing to use this resource to supplement learning resources in any suitable subject.

- Development of information skills: From the previous discussion it is obvious that the Web browsing skills must be learned and developed. For example, formulation of the information need must be more precise in an electronic world in order to construct explicit search language, and be more focused in light of increasing information to avoid overload. Students should be taught to use a variety of searching strategies when using the Web. Search strategies are very important and merely browsing sites haphazardly should be avoided. Students should use cognitive strategies that deal with language manipulation, that is, they should know how to narrow down a search by filtering unwanted information using the best search terms in order to acquire specific information (Hess, 1999). Barry, 1997 suggests that training university students in information skills should also take into account the different cognitive and learning styles of individual users.
- Use of credible Web information: Students should be encouraged to use official Web sites of reputable institutions and organizations, official Web sites of respectable international journals and publishers and specialized on the retrieval of academic

² JISC Legal Information Service. Available: <http://www.jisc.ac.uk/legal/>.

³ Papers on Copyright Issues for the Electronic Library. Available: <http://www.jisc.ac.uk/pub/copyright/start.html>

information search engines. Obviously, the more credible Web sites are used, the less likely students are to fall prey to commercial fraud, or to erroneous technical information (Metzger et al., 2003).

- **Training in informational skills:** Training of students in information skills should be directed to on the examining, selecting, filtering and rejecting sources. Students need to formulate strategies for finding information on the Web and how to evaluate the information rather than focus on mechanism of Web tools (Lehman, 1996). For example, students can be taught easy verification techniques such as noting if a Web site has a .com or .org domain name (Lehman, 1996). The practical work could consist of various tasks to access the information resources available on the University network and on the wider Web. Further, the students could be required to locate, describe and justify a Web site (or sites) with specific relevance to the topic. Since the author's experience shows that students very rarely verify Web site credentials, lectures whose students use online resources could request that students provide an additional information when citing a Web site in an assignment, project and research paper or should follow a specified format for Web cited references
- **Use of tailored materials:** For many disciplines where provenance is important, the development of tailored materials might be extremely useful. Students are needed to develop critical selection and analytical skills related to the discipline first, and then they can use these skills for locating, selecting and incorporating relevant information into their studies. Obviously, it is much easier to become familiar with what is required by initially working with sources of the quality relevant to learning objectives rather than with typical search engines. Once this level of familiarization is achieved the knowledge-acquisition process can be significantly speed up (Calverley and Shephard, 2003).
- **Keep students engaged with the learning task:** Although the retrieval of academic information using the Web search as well as any other learning activity cannot be controlled, there can be some ways to influence what the learner does by articulating educational objectives and constructing productive learning tasks appropriate to those objectives (Goodyear, 2002). As learners become engaged in an activity it is important to offer them the option of customising and reconfiguring tools and resources in order to progress toward their goals (Zenios et al. 2004).

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