Difficulties of Implementing and Maintaining a WorldWide Web Site to Support Instruction

Howard BESSER

Résumé. Cet article décrit une expérience d'utilisation du World Wide Web dans le cadre d'un cours d'enseignement à distance présenté simultanément à l'Université du Michigan et à l'Université de Californie à Berkeley. Les responsables de ce cours ont utilisé des outils classiques (browsers grand public, systèmes standard de gestion de fichiers Unix) pour faire parvenir la matière du cours aux étudiants des deux sites. Tout en attachant une attention particulière aux méthodes utilisées pour fournir un matériel d'enseignement autonome et indépendant de la présence d'un instructeur, l'article s'attaque à un grand nombre de problèmes, y compris : les problèmes de conception, les limitations techniques et la confidentialité. Les problèmes de réorganisation et de maintien permanents d'un site WWW sont examinés en détails.

Keywords: WWW, site maintenance, distance learning.

Mots-clés : WWW, maintenance de site, enseignement à distance.

1. The Course

"Impact of New Information Resources: Multimedia and Networks" was an experimental, graduate-level course taught simultaneously in the Schools of Information and Library Studies at both the University of California at Berkeley and at the University of Michigan. (For further information on the course and technological delivery methods, see Besser: 1995.) The course content aimed to critically examine the new information landscape and was essentially a communications course.

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Impact of New Information Resources:
Multimedia and Networks
Winter 1995 Homepage

The Winter 1995 version of the course "Impact of New Information Resources:Multimedia and Networks" was a distance learning course taught simultaneously in Ann Arbor and Berkeley by Howard Besser.

To get an idea of what this course was all about, read the description, some major course themes and questions, and/or the syllabus. You may also wish to look at the Web documents created for earlier versions of the course.

What We Did In This Course

Of course, we had assignments, including reading newspaper articles and completing term projects.Take a look at our homepages to find out a bit about us. Read our essays for more formal considerations of distance learning and other issues associated with this course. We took part in discussion groups to work in a more in-depth fashion on particular topics. Sometimes, guests came to speak to us.

And now a word from our sponsors:

Funding for the Distance Learning aspects of this class was provided by the Kellogg Coalition on Reinventing Information Science, Technology, and Library Education.

Documents written after the course was over

Updates and evaluation of the course experience

Last but proverbially not least, student assistants were responsible for any number of things from facilitating discussions to designing Web documents like this one.

Fig. 1.

Some Course Themes and Questions

- virtual replaces physical
- disappearance of physical public spaces
- individual experience replacing group experience
- global replacing local
- mass vs. narrow appeal
- information overload
- increase or decrease in privacy?
- information production vs. consumption
- does increasing number of distribution channels lead to increased diversity and choice?
- commodification of information
- skimming
- subsidizing vs. making everything pay its own way
- business and services: consolidation and centralization vs. entrapreneurship and decentralization
- increasing role of experts and specialists
- process of recuperation

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Fig. 2.

In addition to standard class attendance and readings, students were expected to join a focus group which paid special attention to issues related to the course, such as information retrieval, technology and creative arts, critical theory, or the possibility of virtual communities. Each of these groups met weekly and created and maintained an online news group, as well as a WWW page for their group. Students also created a Web page for themselves individually, reviewed a multimedia program and an online service provider, and did a major project or paper on some topic related to the class.

The instructor had taught the course in Berkeley three previous times without the distance aspect. Each time the course was taught, student work from previous terms was used as readings and other resource material, essentially building up a set of resources in this domain. And each time the course was taught, more automation and online resources were added to those of the previous term.

Papers reviewing various aspects of the course, as well as most of the WWW documents that students used in the course, are available at

http://www.si.umich.edu/impact/Winter95/.

2. The WWW Site

Logistical problems in maintaining identical sets of class handouts and reserve reading materials at both sites created a strong argument for distributing these materials online instead of in print. The topical nature of the class also made it nearly impossible to distribute print versions of reading materials to both sites in a timely matter. (Frequently the class would discuss articles from that day's or the day before's newspaper which the instructor would post online.) Providing online course materials also immersed the students in the subject of the class—the impact of new information technologies.

Course materials were all posted as WWW documents and linked on a class HomePage (Figure 1). These materials included the instructor's and students' HomePages, the syllabus, a course description including major themes and questions of the course (Figure 2), assignments (Figure 3), information about guest speakers, readings (updated weekly) (Figure 4), materials from earlier versions of the course (Figure 5), and, as the semester

Impact of New Information Resources: Multimedia and Networks
Winter 1995 Course Assignments

for January 13 (Ann Arbor students):

- Read and be prepared to discuss at least 5 essays plus last long essay (**Myth Today**) from Barthes, Roland. **Mythologies**. New York: Noonday Press, c1972 (1990 printing).
- Read and be prepared to discuss Movies on demand May Significantly Change the Internet From the October 1994 ASIS Bulletin theme issue on Entertainment Technology and Information Services.
- Spend at least one hour browsing through the WorldWide Web pages from previous incarnations of this class.

for January 20 (Ann Arbor students):

- If possible, attend Michael Joyce's lecture ***(Re)Placing the Author: "A Book in the Ruins"*** on January 19 at 1:30 in the Ehrlicher Room.
- Spend at least three additional hours browsing through the WorldWide Web pages from previous incarnations of this class.
- Produce your own home page with links to other resources.
- Begin process of subscribing to commercial online provider.

for January 27 (Ann Arbor students):

- Write and post your first short essay about your impressions of distance learning and of this class
- Read Howard Besser's Elements of Consciousness. (unpublished excerpt from dissertation), Berkeley, 1988.
- Begin looking at potential projects

for January 27 (Berkeley students):

- Read and be prepared to discuss at least 5 essays from Barthes, Roland. **Mythologies**. New York: Noonday Press, c1972 (1990 printing).
- Read and be prepared to discuss Movies on demand May Significantly Change the Internet From the October 1994 ASIS Bulletin theme issue on Entertainment Technology and Information Services.
- Spend at least one hour browsing through the WorldWide Web pages from previous incarnations of this class.
- Begin looking at potential projects

for Feb 3 (Berkeley students):

- Begin process of subscribing to commercial online provider.

for Feb 3 (all students):

- Read and be prepared to discuss: Debord, Guy. **Society of the spectacle**, Detroit: Black & Red, 1983. (**Note:** This is much more difficult and time consuming to read than it appears.)
- Write and post a new essay about your impressions of distance learning and this class. **Please put this (and all subsequent) essays in HTML format.** Michigan students drop these in sryan's public inbox. Berkeley students get these to Alex.

Fig. 3.1.

for Feb 10 (Ann Arbor students):

- Turn in an evaluation of the WorldWide Web resources for this class. Analyze conceptual structure, navigation, and design factors. Note separately concrete suggested improvements and any blind or missing links.

for Feb 10 (all students):

no assignment

for Feb 17 (all students):

- Turn in short paper analysing multimedia program.

for Feb 24 (Berkeley students):

- Turn in an evaluation of the WorldWide Web resources for this class. Analyze conceptual structure, navigation, and design factors. Note separately concrete suggested improvements and any blind or missing links.
- Write and post a new essay about your impressions of distance learning and of this class
- Read Howard Besser's Elements of Consciousness, (unpublished excerpt from dissertation), Berkeley, 1988.

for March 3 (all students):

- Read and be prepared to discuss Howard Besser's The Information SuperHighway: Social and Cultural Impact Chapter to appear in the book Resisting the Virtual Life: The Culture and Politics of Information, edited by Jim Brook, City Lights Press, 1995

for March 10 (all students):

no assignment (yet)

for March 17 (all students):

- Read and be prepared to discuss Howard Besser's The Changing Role of Photographic Collections With the Advent of Digitization Discussion Paper for Working Group for Digital Image in Curatorial Practice, George Eastman House, June 4, 1994

for March 24 (all students):

- Turn in paper analysing commercial online services.

for March 31 (Ann Arbor students):

- Write and post a new essay about your impressions of distance learning and of this class

for April 7 (all students):

no assignment (yet)

for April 14 (all students):

- **Turn in final project.**

for April 21 (all students):

- **Final Project Presentations**

for April 28 (Berkeley students):

- Write and post a new essay about your impressions of distance learning and of this class

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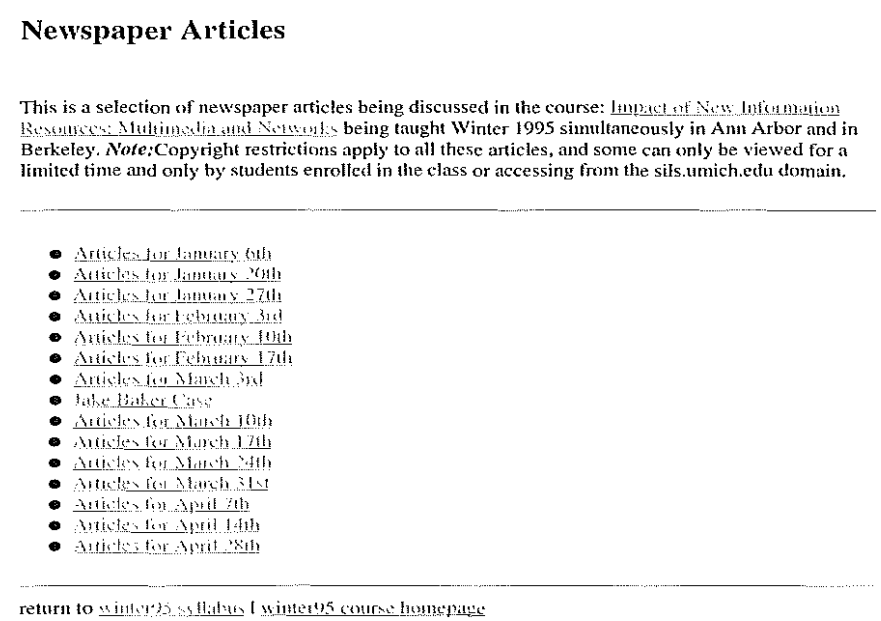
Fig. 3.2.



Newspaper Articles

This is a selection of newspaper articles being discussed in the course: Impact of New Information Resources: Multimedia and Networks being taught Winter 1995 simultaneously in Ann Arbor and in Berkeley. ***Note:***Copyright restrictions apply to all these articles, and some can only be viewed for a limited time and only by students enrolled in the class or accessing from the sils.umich.edu domain.

- Articles for January 6th
- Articles for January 20th
- Articles for January 27th
- Articles for February 3rd
- Articles for February 10th
- Articles for February 17th
- Articles for March 3rd
- Jake Baker Case
- Articles for March 10th
- Articles for March 17th
- Articles for March 24th
- Articles for March 31st
- Articles for April 7th
- Articles for April 14th
- Articles for April 28th

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Fig. 4.

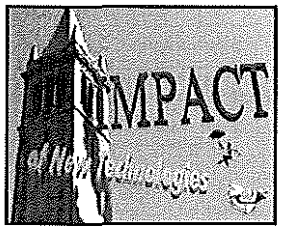
progressed, Discussion Group HomePages (Figure 6) and student essays (Figure 7) and projects (Figures 8–10). The site served both as an online coursepack (facilitating both instructor and student access to readings and assignments), and as a repository of information about the course for outsiders.

3. WWW Management Issues

The construction of a WWW site for this class exposed a wide variety of problems inherent in maintaining an ongoing WWW site with multiple contributors. This included issues of permission control, physical arrangement of files, ownership and maintenance of files, and presentation to end users.

3.1. Multiple contributors/collaborators

Because the content for the WWW site was generated by over 40 different users, it was difficult to maintain a constant "look and feel" between the



Impact of New Technologies

Welcome to the **Impact** WorldWide Web Site!
This site reflects a dynamic view of the discussion and debate in an ongoing course titled "Impact of New Information Resources: Multimedia and Networks," taught by Howard Besser at UC Berkeley's School of Library and Information Studies since Fall of 1993, and at University of Michigan's School of Information and Library Studies beginning in Winter of 1995. This site presents an amalgamation of the wide range of issues concerning the social impact of technology. In addition to information about the students themselves, the Impact server includes the students' work in the form of papers and their participation in the class newsgroups. The course also has consisted of a lecture series by leading visionaries who address the fundamental issues raised in class, and other hopefully interesting and useful information.

Note: This entrance into the "world of Impact" was created by students from the Spring and Fall 1994 Berkeley versions of the course, and is primarily focused upon activities from those versions. It also provides links to other versions of the course. Though much information comes from Berkeley, the overall site "lives" in Michigan, on the http server at the School of Information and Library Studies. Confused yet?

Areas of interest you have the free choice of branching off to:

- Find out about our student presentations at the 1994 ASIS Midyear Conference in Portland, Oregon.
- Impact of New Information Resources Lecture Series
- Meet the students of LIS296A
- Student Focus Groups
- Read student papers
- Fall 94 Class
- Winter 95 Distance Learning Course
- Winter 96 Course

Fig. 5.1.

This WorldWide Web server originated as a short class project by a group of students in the Spring 1994 class. This class has included graduate and undergraduate students from a number of different departments.

If you want to reproduce any of the materials available through our server, please read the following NOTICE .

School of Library and Information Studies
Produced by the Impact Group

Fig. 5.2.

Class Discussion Groups

You will not be able to retrieve newsgroups unless your WWW browser is pointed to a newserver that subscribes to the class newsgroups. If you are using Netscape, to set your browser, choose "Preferences" off the "Options" menu bar, then go to "Directories, Applications, and News". Michigan students should set their newserver to news.itd.umich.edu , Berkeley students should set their newserver to agate.berkeley.edu

If you are using Netscape in a lab, be aware that the software remembers what messages it has seen, not what you specifically have seen. So you might not see messages which you have not yet read. To get around this, look at all of the messages.

Creative Arts netnews discussion
Creative Arts Home Page

Critical Theory netnews discussion
Critical Theory Home Page

Future of Publishing netnews discussion
Future of Publishing Home Page

Internet Media Coverage netnews discussion
Internet Media Coverage Home Page

Information Retrieval netnews discussion
Information Retrieval Home Page

Public Policy netnews discussion
Public Policy Home Page: Berkeley
Public Policy Home Page: Ann Arbor

Virtual Communities netnews discussion

Distance Learning Discussion

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Fig. 6.

Final Projects

Some class members produced individual final projects. Others worked in groups; sometimes corresponding to the class working groups, sometimes not. Here follows a list of projects, individual and group.

- Impact Guide to Museums: Terese Austin, Cathy Rudelich
- sophist (review): Nancy Lin, Sara Ryan, Suze Schweitzer, Tom Turner
- UM East Medical Campus On-Line Information Sources: Shannon Cronin, Randy Horton, Martha Pinto
- Who Owns The Law?: Nettie Lagace
- Potentials of Using World Wide Web Surveys to Analyze Use of Electronic Resources: Sarah Awood, Jolee Perrine, Chantel Smith
- Music Subject Internet Catalog: John Powell
- The Conservatory of Matthaei Botanical Gardens: David Vargo
- Cyberpreneur's Guide to the Internet: Pamela Enyasi Wilkins
- Latin America: Rita Wilson
- Collaboration on the WWW : Ryan Wolfe

Fig. 7.

different student contributions. Pages on the same subject often appeared to come from different WWW sites because their authors gave them such individual looks. This created a jarring impact on the end user. The instructor had intended to develop extensive guidelines for the students to follow, but the person in charge of this never followed through.

This experience made clear the necessity of guidelines for collaborators on a WWW site. Important features for such guidelines include layout, font and sizing, expression and placement of a variety of document parts (site title, links to other parts of the site, document title, document author, etc.), citation formation, etc.

Another key area that requires guidelines is that of filenames and links. Collaborators must agree on file name conventions. The problem of inconsistent naming becomes more acute as sites grow in size and management functions (such as updating, distinguishing file-types [including image file types, compression, etc.], grouping files by contributor, etc.) become more difficult.

3.2. Permission control

Due to restrictions on intellectual property rights, access to many of the files for the course had to be limited. Restricted material had to be identified and isolated into directories which could then be permission controlled.

East Medical Center Project

Randy Horton,
Martha Pinto,
Shannon Cronin

Introduction

- Original description of this project, written by Professor Dave Redders
- Introductory Goals, written by group members
- A Note to Future Developers of this Project

Internet-Based Information on Breast Cancer and Diabetes

- Breast Cancer
- Diabetes

Starting Points for Finding Medical Information

- Medical Reference books to start the search.
- Information available at the University of Michigan
- Online Sources of Medical Information not available at the University of Michigan
- Federal Government Information

Issues and Problems for this Project's Successors to Address

- What We Learned
- Unstable and Disorganized Information Sources on the Internet
- The Role of an Information Workstation in the East Medical Center

Fig. 8.

Common WWW software permits two types of control: by user password or by the user's IP address. Password restrictions posed management difficulties: handing out individual passwords to 40 students and noting all these in each restricted WWW directory created too much overhead; having all students share a single password was deemed too insecure (including the fear of a student posting the password on a bulletin board or newsgroup). Restrictions by IP address faced the problem that many students used a variety of different workstations, many of them in public areas.

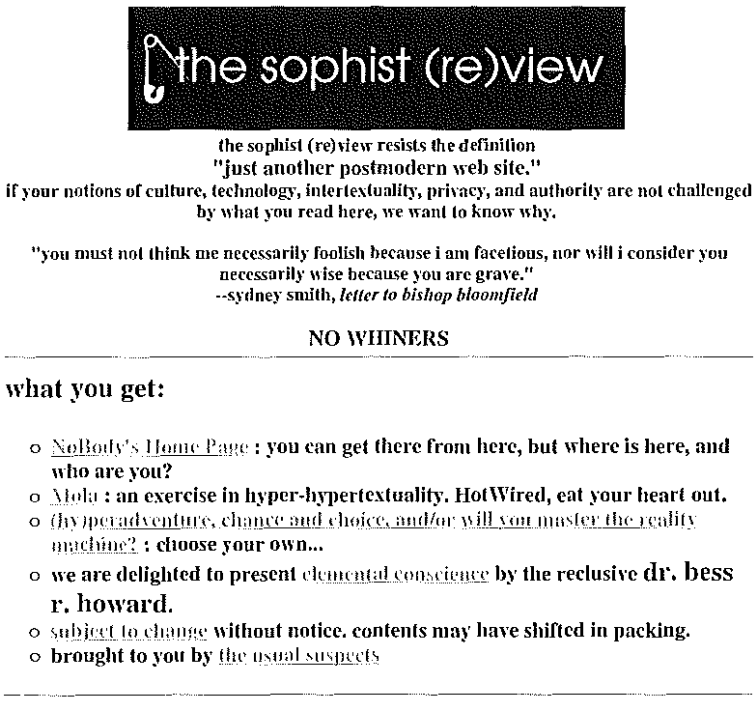

Fig. 9.

A decision was made to control access by IP address, but this approach provided access to a broader population. Approximately ¾ of the students were served by granting permission to IP domains of commonly-used public terminal rooms, as well as to home accounts. But providing access to the other ¼ of the students required a lengthy list of IP addresses (including individual workplaces, spouses' and friends' workplaces, other campus departments, off-campus dial-in services, etc.). In many of these cases a single IP address was not enough (such as for students who didn't have their own workstation at work, and had to rely on borrowing workstations from several different colleagues).

Granting permission to students who dialed in from home was quite different at each of the two campuses. The Berkeley campus gives each student their own personal Home IP address, making it easy to create a list of permissible addresses. On the Ann Arbor campus, on the other hand, IP addresses are assigned dynamically at login. This makes it impossible to

This site is intended to provide a variety of access points for web pages produced by museums -- you can access sites by the indexes provided below, or use the following link to go directly to those museums which offer virtual tours. There are also a few museum-related sites which may be of interest to museum folks. We also keep a list of museums that we have not yet entered into this guide.

✠ identifies those museums with online exhibits and ! indicates museums offering virtual tours.

By Topic

- Archaeology
- Architecture
- Art
- History
- Natural History
- Science & Technology

By Museum Location

- World Map Locator
- Country List

By Regional Content

- Africa
- The Americas
- Asia
- Europe
- The Middle East
- Oceania

These sites were compiled by using existing guides, and by general exploration. Two excellent guides to museum sites are World Wide Arts Resources and the World Wide Web Virtual Library Museum page.

Note: Those museums or exhibits which exist only in "virtual space" are not within the scope of this project.

About this guide

Fig. 10.

create a list of IP addresses for students in the class; instead it was necessary to allow access to all IP addresses that can be assigned by each Ann Arbor dial-in number.

3.3. Physical arrangement of files

Directory structures—how the sets of WWW files are grouped and organized—is of critical importance. Once a WWW site is established, it is extremely difficult to reorganize the relationship of files to one another, as this will require resetting every link in every file that refers to a document that is moved. Any complex WWW site needs to develop guidelines to indicate how files should be grouped.

It is advisable to express hyper-links as relative rather than absolute pathnames wherever possible. (A relative pathname shows its location in relation to the current document [filename defg within the directory abcd in the current directory]. An absolute pathname explicitly states an Internet address [via a URL].) Relative addressing of links allow one to change the site node-name or higher-level directory names without having to update hundreds of links. It also makes it possible to create a mirror site, or to move the entire site to a new location.

3.4. Ownership and maintenance of files

This course exposed several short- and long-term maintenance problems with dynamic collections of digital information. Because most WWW sites are constantly updating and changing, how do we provide a "snapshot" of 1995 information resources to future generations? A key problem the class experienced was that the systems manager was unable to archive the extensive netnews discussions, and the only remnant that now remains is the printed copies of a few discussion fragments.

Another key problem faced by any WWW site is the maintenance of hyperlinks to resources (particularly those at other sites). Any time someone changes file or directory names or rearranges their site, all hyperlink pointers to those files or directories become outdated. From the experience of this class, it is advisable that all links be checked on some kind of regular basis, and some effort must be made to update dead links. Eventually, work on Universal Resource Names (URNs) and Universal Resource Citations

(URCs) (see http://www.ietf.org/) will make this job much easier, as links will reference documents rather than locations.

Collaboratory work on a WWW site poses the question of where files should reside. Files located in personal directory space allow the individual who owns that space to continuously debug and make changes to those files. But files within personal spaces are inaccessible to others, and any collaboration on these is forced to go through the directory owner who must act as a gatekeeper.

Files stored in group or central locations (in theory) permit equal access for all group members, and should encourage greater collaboration. But because most current software does not allow the tracking of individual contributions, collaborations can lead to contentious arguments (particularly when one person edits portions of what someone else has done—and the previous work disappears). Furthermore, current Unix permission structure does not handle "group" permissions very well; each time one edits a file in a group area they must be very careful to avoid the permission for the entire directory reverting back to their own personal account (thus locking out all other group members from being able to write on any file within that directory).

The experience of this class has shown that much work must still be done on operating system and word processing software before collaboratory work can become widespread. Most needed are developments in the areas of permissions, ownership, and tracking of individual contributions.

3.5. Presentation to end users

A key reason for the explosive growth of the WorldWide Web is that this service is available from a wide variety of machines using software that can be obtained without charge. But even though access to the WWW is relatively ubiquitous (at least among computer users with modems or Internet connections), this does not mean that all users can access it with equivalent capabilities or ease. Individual user environments differ in capabilities of displaying graphics or images, compression, and bandwidth.

A good WWW site design must take into consideration the differing end user environments. Users without graphics capabilities should be able to access information in a pure ascii format. This means providing alternate routes to ISMap navigation—navigation where one clicks on an image such

as a map to indicate choices. Design for users with low network bandwidth requires avoiding the delivery of large image files without first warning the user. If one doesn't include warnings such as these, users with low bandwidth connections may wait hours to download an image. Finally, it is also wise to include an indication as to storage format and compression scheme for an image; without this users who do not have the software needed to view these may wait a long time for an image to download before they find out that they cannot view it.

Another serious presentation issue involves what version of the HTML markup language one chooses to use. A number of WWW browsers (most notably *Netscape*) have implemented interesting features which can only be read by that browser. The temptation is great to employ these features, but doing so could be dangerous. These non-standard features will not be viewable by people using other browsers. And these features may change in future editions of the same browser. When considering the employment of such a feature, it is advisable to (1) determine the likelihood of its inclusion in future standards implementations (which today would mean looking through the emerging HTML 3.0 standards documents); and (2) carefully noting any use of non-standard HTML commands so that one can replace these with standard HTML commands when they become available.

4. Social and Policy Issues

The presentation of such a WWW site also raises a variety of social and policy issues. These include concerns over maintaining currency vs. archiving, over privacy, and over developing a dependence upon a set of technological tools.

Currency vs. Archiving

This WWW site served a myriad of functions. It was an archive of previous versions of the course (including student papers, course resources, and the tools and interfaces that students from previous terms had used to view course material). It was a teaching tool for currently-enrolled students (and had to evolve over the course of the semester according to changing student needs). And it served as a guide to the general public in the area

of the "Impact of Multimedia and Networks". The different functions often posed conflicts in deciding how to present the information. For example, the archival function (which seeks to preserve things the way they were) often conflicts with attempts to make information more up-to-date or easier to navigate for current students. Future versions of this course will probably lean away from the archival function and try to excerpt the most relevant and up-to-date (approximately 50%) of material from previous terms. This would involve an editorial function, and probably follow a traditional "publication" model, where items are reviewed for relevancy and currency.

But this raises a more serious issue whenever the Web is used as a primary publishing medium. Today historians can look back at print publications that reflect outmoded ideas or the changing views of an individual. But in the future that may be very difficult. Because the tendency is to update and replace outdated portions of Web documents, we may soon lose the historical records which will allow future scholars to view the evolution of ideas within a field. It may be possible to use recent developments in versioning (see for example Haake & Hicks, 1996) to help us view changing ideas within a particular field, but it would be advantageous for versioning systems to be able to generate a kind of "rollback" to an earlier time period, complete with links to the earlier versions of documents that existed at that time.

5. Privacy

In an attempt to provide an intimate picture of the class to interested parties (both currently and in the future), students were asked to post all coursework in public spots where others could read them. Most students appreciated the ability to review coursework from prior terms, and many said that this helped them gauge course requirements, find readings and citations relevant to the course, and inspire selection of project topics. At three points during the term students were required to post their personal impressions of the distant learning experience, and these essays were immediately moved into central storage so that they could be publicly accessed but couldn't be altered (as the students' impressions changed). Again, this provided a valuable resource in reviewing the changing impressions of the distant learning experience. But it is likely that students were less frank in their criticism of the instructor, Research Assistants, or fellow students than

they would have been if the essays had been less public. All these activities raise serious privacy questions. Is it an invasion of privacy to force a student to electronically publish their work? What about their personal impressions of a course? Future versions of this course will probably continue to require public postings, but experiment with masking identities.

6. Reliance on Technology

Surprisingly, the more common ("lower level") technological tools employed in this course posed far more problems than the "more advanced" tools. Classroom and student-to-student video connections were extremely reliable (the classroom video connection only went down twice). Clear audio was a little more problematic. But what posed the greatest technological challenge for this class was the maintenance of the WWW site. Network sluggishness and server downtime caused occasional problems.

File permission control problems plagued this course. Systems administrators could find no way to conveniently allow the instructor and 2 research assistants to all have write-access to the same set of central course files. As mentioned earlier, each time a person would edit a file, all the files in that directory would revert from group ownership to personal ownership by that individual (preventing the others from writing to that file in the future). We can't expect group work to become widespread until operating system level tools for collaboratory access are developed. Because virtually all course materials were available online (and most of these only available online) the course was dependent upon guaranteed online access. Though online systems are quite reliable, they have not yet achieved this degree of reliability. Today's systems are reliable enough for searching for a book or sending email (activities that can be shifted around in time), but they cannot guarantee a decent level of performance every time a student wants to verify an assignment or interact with a student 2,500 miles away. Until our systems can achieve the reliability level of fault-tolerant systems (such as those used by the automated teller machines at banks), placing all access into an online environment will only encourage resentment among the people who must use it.

7. Conclusion

Maintaining a WWW site for a distance learning class revealed a number of serious concerns that need to be dealt with in any robust WWW site. This course employed generic tools (such as the *Netscape* Web Browser) to support Web access, and it is clear that such tools are not yet capable of handling such problems as those outlined in this article. But as the features of specialized Hypermedia tools migrate into commercial Web browsers, we should see some improvement in this situation. In any case, the issues reviewed here should be useful for anyone planning to set up a WWW site.

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Bibliography

BEARMAN (David): 1995, ed. *Multimedia Computering and Museums (Selected Papers from the Third International Conference on Hypermedia and Interactivity in Museums)* (Pittsburgh: Archives and Museum Informatics).

BESSER (Howard): 1995. "Multimedia and Networks Teach about Museums", in BEARMAN (David), ed. pp. 124–140.

HAAKE (Anja) and HICKS (David): 1996, "VerSE: Towards Hypertext Versioning Styles" in *Hypertext '96. Proceedings of the Seventh ACM Conference on Hypertext, Washington DC, March 16–20 1996* (New York: Association for Computing Machinery) pp. 224–234.

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Portions of this article originally appeared in a paper entitled *Multimedia and Networks Teach about Museums* in BEARMAN: 1995, pp. 124–140.