

**Educational Uses of the Web:
Extending a Teacher's Communication and Mediation Capabilities
through the Internet**

by

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Submitted to the Department of Civil and Environmental Engineering
in Partial Fulfillment of the Requirements for the Degree of
Master of Science

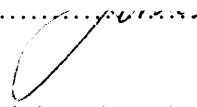
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ABSTRACT

Among the most important issues facing educators today are the instructional integration of technology and user support. These, coupled with the trend toward using web sites as a point of comparison for courses as well as schools, provide strong motivations for investigating how the web can be used to support and augment classroom instruction. A framework to address these issues was developed and tested using three prototype web applications deployed in the schools of Engineering, Business, and Architecture. These involved faculty, teaching staff, and students, as well as professionals in industry. The prototypes sought to identify: (a) educational opportunities afforded by the web based on various teaching styles; (b) tasks that lent themselves well to its asynchronous, albeit ubiquitous, nature; (c) issues involved in web site preparation and management, including web authorship and student use. Emphasis was placed on developing interactive features and designing general templates or containers that could accommodate various subjects and empower both professors and students to create and maintain web content without having to rely on an intermediary. This paper will discuss the requirements, design, development and implementation of the web sites, an evaluation of the features, and plans for dissemination and institutionalization.

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1.0 Introduction

The major issues and trends in the educational market today serve as strong motivators for investigating how the Internet, particularly the World Wide Web, can be used to enhance the teaching process and learning experience. With this backdrop in mind, the goals of the thesis will be described and the research methodology articulated.

1.1 Trends in Education

“Instructional integration of technology and user support are the two most important information technology issues confronting American colleges and universities over the next two-three years.” This was the conclusion reached by the 1996 Campus Computing Survey, a national study on the use of information technology in higher education [3]. Just over one-fourth (27.3 percent) of the 660 institutional respondents to the survey mentioned "assisting faculty integrate technology into instruction" as the "single most important" information technology issue at their institution, while another fourth (24.1 percent) considered "providing adequate user support" as the top technology challenge confronting their campus.

In addition to facing these issues, colleges are beginning to be compared with respect to their use of technology and the extent to which they've made this available to members of the academic community. A survey was conducted recently by Yahoo! Internet Life to identify and rank America's 100 most wired colleges [15]. This seminal effort rated schools according to 35 factors organized under four main categories: academics, hardware and wiring, social use of the Net, and student services. Under academics, which accounted for 45% of the total score, was the percentage of classes that had web pages. Table 1.1 shows the Yahoo rankings of the top five Engineering and Business Schools, as identified by US News [13, 14]. (Appendix A.1 and A.2 contain the list of colleges that were cited by Yahoo, and the MIT profile, respectively). It is interesting to note that while MIT fared well in all three surveys, some of its historical rivals, notably Stanford, Harvard, Georgia Tech and University of Illinois, lagged far behind or even failed to make the 'Most Wired' list. Special mention was made of the fact that the rate of Net use for academics catapulted Emerson, a small liberal arts school, to third place while bringing down Stanford, an otherwise solidly wired institution, to 84th. The point to make is that attention is now being paid to the use of the web for education, thereby making this virtual teaching medium a potential source of competitive advantage for Universities.

School	'97 US News Eng	Bus	America's Most Wired	% Academic Use of Web
MIT	1	4	1	40
Stanford	2	1	84	5
UC-Berkeley	3	10	17	40
U of Illinois	4	48	44	50
Georgia Tech	5	36	Not ranked	
Harvard	25	2	64	N/A
UPenn	33	3	27	10
U of Chicago	-	5	Not ranked	
Northwestern	13	6	2	60

Table 1.1: 1997 College Rankings [13, 14, 15]

1.2 Goals

The goals of this thesis are to:

1. **Identify and evaluate educational uses of the web in context of a 'conventional' classroom setting.**

By 'conventional' is meant an environment where students meet their teacher face-to-face on a regular basis, as opposed to a virtual setting, or distance-learning context. While the imperatives to leverage the Internet may be less for conventional classes, the potential value added of a complementary virtual medium should not be overlooked. However, the web page is meant to support and augment, rather than replace, classroom instruction.

2. **Develop 'generic' web-based models/templates that can be easily customized and extended to meet the needs of various classes.**

Based on the best practices identified in #1, design general templates and continuously refine these to create a base set of containers that are scalable and customizable.

3. Facilitate dissemination and institutionalization of web-based teaching tools and ensure quality control in course module development.

Use the standard set of templates to initiate a 'mass customization' effort targeted at enabling teachers to set up home pages quickly and effectively and institutionalizing this practice.

4. Empower users to create their own content.

Users in this respect refer to professors as well as their teaching assistants, and students. One goal is to develop a model that doesn't rely on the webmaster to post materials because: (a) many professors can't rely on technical support at the institutional or even departmental level; and/or (b) they simply want control over what's published and how it appears over the web because they feel that they're the domain experts and know best how to present the material. In addition, empowering the students to contribute directly to the class web site lessens the overhead involved in administering the class and gives them more room for creativity.

1.3 Research Methodology

The approach taken in conducting this research was exploratory in terms of identifying features and processes that lent themselves well to the web interface. In order to get a representative cross-section of the academic community, prototype applications were created for courses in the schools of Architecture, Business, and Engineering to serve as proof-of-concept. In exchange for feedback from the professor, teaching staff, and students, an offer was made to develop and maintain web applications for the following classes:

- Computer-Aided Engineering II (Prof. John Williams, School of Engineering)
- 1.208/15.770 Transportation and Logistics Analysis (Prof. Yossi Sheffi, School of Business and Engineering)
- 4.184 Workplace of the Future (Prof. William Porter, School of Architecture)

Prior to the start of the 1997 Spring term, a course prototype was presented to the professors to demonstrate the interactive capabilities of the web. This was followed by meetings with the teaching staff to determine the nature, teaching style, and objectives of the class and to identify processes which can be facilitated or enabled by the web. During the course of the semester, feedback from the teaching staff and students was used to refine the system, and set priorities. Feedback came in the form of email messages, face-to-face meetings, informal conversations, and a formal survey questionnaire at the end of the term. This study sought to benefit from both the depth of insight resulting from actually implementing the

proposed model and doing interview-based research, and from the broad coverage and generalizability of results afforded by larger sample, questionnaire-based surveys. The use of different feedback mechanisms and selection of prototypes representing various schools and teaching styles also provided some triangulation of results, confirming conclusions from several different perspectives.

Input for the discussion on institutionalization was culled from the professors involved in this study, as well as from meetings with key administrators from Athena, the Academic Computing Services (ACS), Center for Advanced Educational Services (CAES), Center for Educational Computing Initiatives (CECI), and the Hypermedia Teaching Facility (HTF).

2.0 Academic Use of the Web

This section describes some of the more sophisticated course web site management systems and development environments available today, both within and outside of MIT, along with web statistics for MIT courses. Following a discussion of the major approaches to web site management is a description of the model adopted by this thesis.

2.1 Current Landscape

Outside MIT

While majority of the class web sites contain static web pages showing course content, more sophisticated packages and development environments are emerging that seek to provide a total learning environment. Examples of this include:

- Harvard's Course Platform (URL: www.atg.com/dynamo/press/profiles/hbs.dyn) [2]
- Lotus Learning Space (URL: 198.114.68.60) [5]
- University of British Columbia's WebCT (URL: homebrew.cs.ubc.ca/webct) [11]

Harvard's Course Platform

Built by Art Technology Group based on their proprietary server-side, Java-based Dynamo Developer's Kit, the intranet-based Course Platform implemented at Harvard's Business School provides tools for content creation and editing for both faculty and students. Based on standard templates that ensure a consistent look and feel across all screens, the system dynamically generates a custom view for each user, automatically updating and displaying time-sensitive information such as syllabi, assignments, personal calendars and course schedules. Each person's view includes a custom homepage, personal navigation scheme, and editing capabilities appropriate to the courses being taken or taught, and based on whether the user is a student or faculty member.

While the system has sophisticated editing and personalization features, its orientation toward implementing a consistent look and feel across screens comes at the expense of personal customization; no facility is provided to deviate from the standard format. Having been built on top of proprietary software, modifications or extensions to the system would need to be made using the Dynamo Developer's Kit, which is an object-oriented application framework provided with class libraries.

Lotus Learning Space

At the core of LearningSpace are five integrated databases that provide the tools and framework for developing an on-line curriculum class, or for actively participating in an on-line class:

- **Schedule** contains information from the instructor about each class: course syllabus, course description, objectives, requirements and due dates, assignments and quizzes. Allows participation in class surveys.
- **MediaCenter** has multi-media course references.
- **CourseRoom** enables one to interact with the instructor and other students, share information, participate in debates and discussions, work in teams, ask questions, and get answers.
- The **Profiles** database allows one to locate classmates and find out about the instructors. Each class member profile is a unique "home page" covering that student's background and interests.
- The **Assessment Manager** is for instructors to create and store tests, assessments, grades and class surveys, and to provide private evaluations and feedback to students or teams.

Originally built to run on Lotus Notes 4.1 or later, the package is being adapted for use over the web. While this allows for more customization than is offered by the Harvard Course Platform, significant Notes expertise and administration is required to set up the system. This was originally marketed by Lotus not as an out-of-the-box solution, but was meant to be packaged with Lotus services and requires consultation with a LearningSpace specialist.

University of British Columbia's (UBC) WebCT

Developed in the Department of Computer Science at the University of British Columbia, Web Course Tools, or WebCT for short, provides:

- A presentation tool that allows the course designer (a member of the teaching staff) to determine the layout, colors, text, counters, etc for the course pages.
- A set of student tools that can be integrated into any course. These include communication facilities (conferencing system, chat and e-mail), student evaluation and self-evaluation tools (on-line, automatically marked quizzes, and content-related multiple choice questions), a searchable image archive, a course calendar tool, a linkable glossary database, student collaboration and presentation areas, student content annotation, student homepage generation, course navigation, indexing and searching tools, account administration tools and more.
- A set of administrative tools that aid in the delivery of a course. These include student progress tracking, course access tracking, a categorized question database and on-line quiz creation tool (with historical statistics on performance and automatic marking), a questionnaire delivery and report tool, student access control, grade maintenance and reporting tool, and more.

A fairly flexible and easily-customizable PERL-based system that can be administered through the browser, the WebCT server is currently available in beta version only on the Unix platform, although plans are underway to release the NT version in the second quarter of 1997 and to convert most of the code to C. The software is provided free until August 1997, which marks the end of the beta period. The plans are to charge modest licensing fees mainly to ensure its continued maintenance and support. Unlike the two previous products discussed, UBC claims that it does not intend to exploit the commercial value of this software. To date roughly 500 installations of WebCT have occurred for testing and use at institutions around the world. The UBC WebCT server houses approximately 140 courses [11].

Within MIT

Hypermedia Teaching Facility (HTF)

Originally established as a central resource for the Mechanical Engineering department, the Hypermedia Teaching Facility was created to study the use of the Internet in education and to help the transition to on-line courses. Plans are currently underway to move HTF to the Center for Advanced Educational Systems and open its facilities to other departments in MIT. According to Dr. Nishikant Sonwalkar, director of HTF, what distinguishes the center from other web-oriented facilities is its strong pedagogical model; i.e. its promotion of the concept of the Curricular Hyperweb. Under this paradigm, a student enters the hyperweb through a port to a domain, and explores the domain through a disciplinary spine, or trunk path. Ports and trunk paths play the same role in hypermedia curricular as gates and roads play in national parks - points of departure for systematic further study. Links exist both between objects within a domain and between objects in different domains. The system allows students to access course materials, problem sets and on-line textbooks, and facilitates communication with professors and teaching assistants. All students are given passwords and their activity on the web is monitored to understand usage pattern of students coming from different course requirements. The application records the path that students take through the course in order to help the professor find the weak points in the text - where more explanation is needed or where a different approach should be tried.

Unlike the systems discussed earlier, the HTF model requires the professor and/or teaching assistant to send the material to be posted to the HTF for publication. The center sponsors training sessions and assists in the development of multi-media content based on input from the professor. Their development environment, called the Hypermedia-Based Instruction and Teaching Environment (HITE), consists of multimedia document conversion, security, course administration, interdocument link formation, pedagogical guidance, and mechanisms for compensation and authentication. The material developed each semester is archived and made available to professors who may be teaching the course in the future. Thus far, HTF has built and supported three courses and one virtual laboratory.

Web Courses at MIT

Table 2.1 shows the *approximate* number and percentage of courses within MIT that have web pages. The total number of courses was deduced from the 1996-1997 MIT Course Bulletin. Given that the goal of this effort is to calculate the percentage of MIT classes that have web pages, certain subjects that didn't follow the 'conventional classroom model' were excluded from the course totals as the concept of the 'class' was not well-defined. These include courses that were meant to cater to teaching assistantships, individual research, projects or investigations, such as those pertaining to thesis writing, internships, special problems, and special studies where students didn't all belong to the same class and interact with the same teacher(s). Subjects with multiple course numbers, such as 1.208/15.770 Transportation and Logistics Analysis, were counted under both departments, but considered only a single entry when calculating the university-wide totals. If a given course meets with, or has an alias in the same department, both subjects were counted as one for department totals. Courses not offered in the 1996-1997 school year and non-credit classes offered during IAP were excluded from the course totals. These rules likewise applied when counting web sites.

The number of web sites was approximated mainly from information provided by the Academic Computing Services (ACS) as well as departmental web sites. The ACS source consisted of: (a) a central web page containing links to web courses in various departments (<http://web.mit.edu/acs/www/acaduses2.html>) and (b) a list of Athena course lockers containing www sub-directories with a 'last modified' date stamp for each entry. All entries that were not modified after 1995 were excluded from the total count. The courses varied widely in terms of content and sophistication. In tallying the number of web sites, a class had to have a separate URL containing mainly material for the given course in order to qualify as a home page. If the course description was part of a master list containing other courses, then this was not included in the web totals. Thus, courses that only appeared in the MIT registrar list (<http://registrar.mit.edu/>) were not added to the web count, while those that had separate html pages that simply listed course descriptions, overviews, or syllabus added to the web totals. Given the data sources used to deduce the web count, the figures below may not necessarily represent a comprehensive list. Courses that did not use the Athena locker or did not have links from the central MIT list or from departmental web sites may not have been included in the site totals.

Department	# Courses Offered	# Web Sites	% with Web Sites
Course 1 - Civil and Environmental Engineering	141	11	7.8
Course 2 - Mechanical Engineering	103	29	28.2
Course 3 - Materials Science and Engineering	82	14	17.1
Course 4 - Architecture	105	9	8.6
Course 5 - Chemistry	46	8	17.4
Course 6 - Electrical Eng'g and Computer Science	182	37	20.3
Course 7 - Biology	64	7	10.9
Course 8 - Physics	68	16	23.5
Course 9 - Brain and Cognitive Sciences	52	8	15.4
Course 10 - Chemical Engineering	89	10	11.2
Course 11 - Urban Studies and Planning	109	7	6.4
Course 12 - Earth, Atmospheric, & Planetary Science	136	2	1.5
Course 13 - Ocean Engineering	77	5	6.5
Course 14 - Economics	79	15	19.0
Course 15 - Management	214	42	19.6
Course 16 - Aeronautics and Astronautics	86	7	8.1
Course 17 - Political Science	78	13	16.7
Course 18 - Mathematics	110	13	11.8
Course 20 - Applied Biological Sciences	1	-	-
Course 21 - Humanities	300	24	8.0
Course 22 - Nuclear Engineering	61	1	1.6
Course 24 - Linguistics and Philosophy	61	2	3.3
HST - Health Sciences and Technology	83	5	6.0
MAS - Media Arts and Sciences	46	8	17.4
SP - Special Programs	39	3	7.7
STS - Science, Technology, and Society	53	8	15.1
TOX - Toxicology	10	-	-
TPP - Technology and Policy	29	1	3.4
Total (excludes duplicate entries across departments)	2218	285	12.8

Table 2.1: MIT Courses with Web Sites

(Please refer to preceding section for an explanation of how the numbers were derived.)

2.2 Approaches to Course Web Site Management

There are two main approaches to web site management:

1. Centralized Model

- Hardware, software and human (application development and technical support) resources maintained at a central site. Content provider needs to go through this intermediary for application design changes and possibly publication of content.
- Advantages: Economies of scale resulting from sharing of resources, control of standards, availability of critical mass of skills.
- Disadvantages: Author does not have full control over application design and publication of content, larger start-up costs (for central site), slower response/turnaround time for user requests.
- Ex. Hypermedia Teaching Facility

2. Decentralized Model

- Content provider has full control over the design and content of the web site. In a fully decentralized model, the 'course developers' (i.e. professor, teaching staff) maintain the hardware and server software needed to keep the web site up and running. A deviation of this model has the hardware and server software maintained by a central resource, such as Athena, but leaves development of the web application and html pages to the course developers. The latter model may constrain the application design capabilities. For instance, relying on the Athena web server prevents course developers from using cgi-scripts in their web sites.
- Advantages: Author has full control over publication and can see results immediately, no need to rely on an intermediary
- Disadvantages: Lack of hardware/software support and technical expertise, larger over-all costs to the university, reinvention of wheels, variable standards, no synergy and integration.
- Ex. Several courses maintained by the teaching staff.

2.3 Proposed Model

The applications developed for this thesis were predicated upon creation of generic course templates designed to:

- Support a common set of course delivery and management tasks;
- Be easily customized and extended to meet to the unique needs of the various classes;
- Empower both the teaching staff and students to publish and edit content without the intervention of a webmaster;
- Run on a development and production environment that supports multiple platforms, is scaleable, provides industrial-strength security and database management support.

This paradigm lends itself well to prototyping, rapid application development and mass customization, and can be adapted to both the centralized and decentralized models. The use of generic templates that can be easily replicated and customized enables, but does not require, development of standards, promotion of best practices, flexibility in both application design and publication of content. Support of multiple platforms and scalability allows for development of course web sites that can be maintained on most PC's connected to the MIT network, or on more powerful UNIX servers. This openness also allows for easy migration of course databases from a decentralized PC environment to a centralized UNIX platform. Given the short lead times and limited technical resources available to most professors in developing web content, the generic toolkit described above enables them to get a jumpstart on their web site and focus on development of course material.

3.0 Web-based Course Applications

Details of the web-based course applications are presented in this section, including development methodology and environment, user requirements, application design and physical implementation. Snapshots of various templates are provided and organized according to the functions they support.

3.1 Development Methodology and Environment

Hardware and Software

The web sites referenced in this thesis were developed and maintained using:

- **Rapid application development (RAD) approach** - Designs were prototyped based on user requirements and quickly deployed. Feedback was continuously solicited during the term and used to refine the interface.
- **Lotus Notes/Domino 4.5** - Provided the application development environment, database management and web support.
- **Domino.Action** - Web application generator provided by Lotus. Used in creating the 4.184 web site.
- 166 MHz Pentium PC running Windows NT 4.0 server.

Human Resource Support

- One Notes administrator and applications developer - Development of major portion of templates took about 3 weeks. Refinements and additions were added throughout the Spring semester.
- One system administrator.

3.2 Class Profiles: Models of Teaching/Class Interaction

The proof-of-concept for this thesis was developed by prototyping applications for three classes that were designed for students in the schools of Architecture, Business and Engineering. To establish context for the web sites and provide a foundation for the user requirements analysis, the professors were asked about their objectives in establishing home pages.

1.125 Computer-Aided Engineering II (URL: web.mit.edu/1.125/www)

Prof. John Williams' hoped to accomplish the following through the class web site:

- Help the students organize and manage their own groups.
- Share information among class members. Because of the nature of the class and the topics covered, which represented evolving, 'bleeding edge' technology, there was a strong need to locate, gather, and share information quickly. Since the class used beta version software, there were a lot of things that didn't work in the beginning and that the class didn't know about. Packages were being updated over the course of the semester so things that didn't work in the beginning may have been fixed later on. Given the limited time to design and develop the course projects (using Java and VRML), it was in the best interest of the students, at least in the beginning, to share updates/developments as soon as possible.

1.208/15.770 Transportation and Logistics Analysis (URL: monett.mit.edu/1-208db.nsf)

Prof. Yossi Sheffi is constantly in search of new ways of teaching his class. Thus, he willingly responded to an offer from the author to develop and maintain a course home page in order to uncover ways to improve the quality of teaching and learning. It may be interesting to note that although the same offer was extended to all Course 1 faculty members, Prof. Sheffi was the only one who stepped forward to 'volunteer' his class. Through the class web site, he hoped to find new methods for getting material more efficiently to the class, the challenge being how to integrate the variety of mediums and materials in a way that enriches the learning experience for the students. He hoped to find ways of bringing 'outside resources' into the class. For instance, he would like to be able to tap on experts in his field to lecture to the class from a distance and enable the lecturer to follow-up on the initial contact by continuing discussions outside of class or giving and evaluating assignments related to the lecture. There are currently a number of classes in MIT that have conducted video-conferences with remote speakers, but oftentimes, there is no follow-up interactions with the guest resource. Prof. Sheffi wanted to find ways to make this resource a more integral part of the class. According to him, with the enabling power of new technology, the role of contact time with the teacher in a 'conventional classroom' setting, or the so-called 'talk and chalk model' is no longer clear. His willingness to experiment with the web medium reflects his constant search for answers to the fundamental question: "How is learning best done?"

4.184 Workplace of the Future (URL: monett.mit.edu/4184/homepage.nsf)

Prof. William Porter articulated the following objectives in deploying the web application in his 4.184 class on the Workplace of the Future:

- “To generate a good deal of dialogue outside the classroom, creating a ‘work place’ analogous to those we were looking at, i.e., consisting of our face-to-face meetings and a virtual place that could continue the conversation.
- To build a class ‘memory’ of documents and ideas that had resulted from our collective efforts.
- To create a space for invention of ideas, at least in combination with our face to face meetings, which would permit the development of innovative ways of using the web in connection with teaching and building a center of ideas.
- To be able to link a wider community, consisting of professionals and others not present in Cambridge, with the class work. “

The following table summarizes the various classes studied in this thesis. These classes, conducted in different schools within MIT, subscribed to different teaching models, thereby providing a representative cross-section of the academic population from which to base the functional requirements and system design. The data below, along with the professors’ objectives articulated earlier, formed the basis of the functional requirements used to design the web applications.

School	Business/Engineering	Architecture & Planning	Engineering
Course Title	1.208 Transportation Logistics	4.184 Workplace of the Future	1.125 Computer-aided Engineering II
Course Description	Introduction to inventory theory. Analysis of tradeoffs between transportation and inventory cost. Routing and scheduling with inventory considerations. Distribution network design and carrier network design. Optimization of carrier networks with emphasis on truck and rail networks. Integration of carrier and shipper perspective in system models. International logistics issues.	Focus of the class is on the architecture of the workplace of the 21st Century. This requires rethinking the nature of the workplace, and, within that frame of reference, rethinking the role of technology, space and organization. The class will draw from the expertise of successful professionals to collectively craft the tools and techniques of inquiry required in the art of rendering pre-design services.	Goal of course is to develop expertise in modern software development. Team-based project is designed to encourage the student to explore ways of conveying new ideas to others by means of interactive graphical environments. The course will combine VRML 2.0, Java and other tools to construct this environment. Weekly student presentations will be web-based.
Home Page URL	monett.mit.edu/1-208db.nsf	monett.mit.edu/4184/homepage.nsf	web.mit.edu/1.125/www
Model of Teaching	Instructionist	Constructivist [9]	Instructionist-Division of Labor + Constructivist
Primary Role of Teacher	Provider of Information	Guide; Facilitator	Supervisor; Project Leader
Teaching Staff	MIT Professor Teaching Assistant	Professors from various departments at MIT; Visiting professors; Industry professionals; Student assistants	MIT Professor
Class Participants	MIT students	Students from schools both here & abroad; Professionals	MIT students
Student Profile	Web-literate; Little exposure to HTML; Work individually on assignments	Mix: range from web-literate to web-savvy; Heavy work with images; Work individually and in groups	Web-savvy; Proficient in HTML; All have home pages; Programming background; Work in groups
Primary Role of Class Web Page	Knowledge base populated mainly by professor Container for problem set submission and evaluation	Knowledge base populated by all class participants Shared space Synchronous & asynchronous communication tool	Central place to hold pointers to other sites; team home pages Persistent discussion forum

Table 3.1: Comparative Analysis of Class Profiles

The diagram below graphically summarizes the salient attributes of each class.

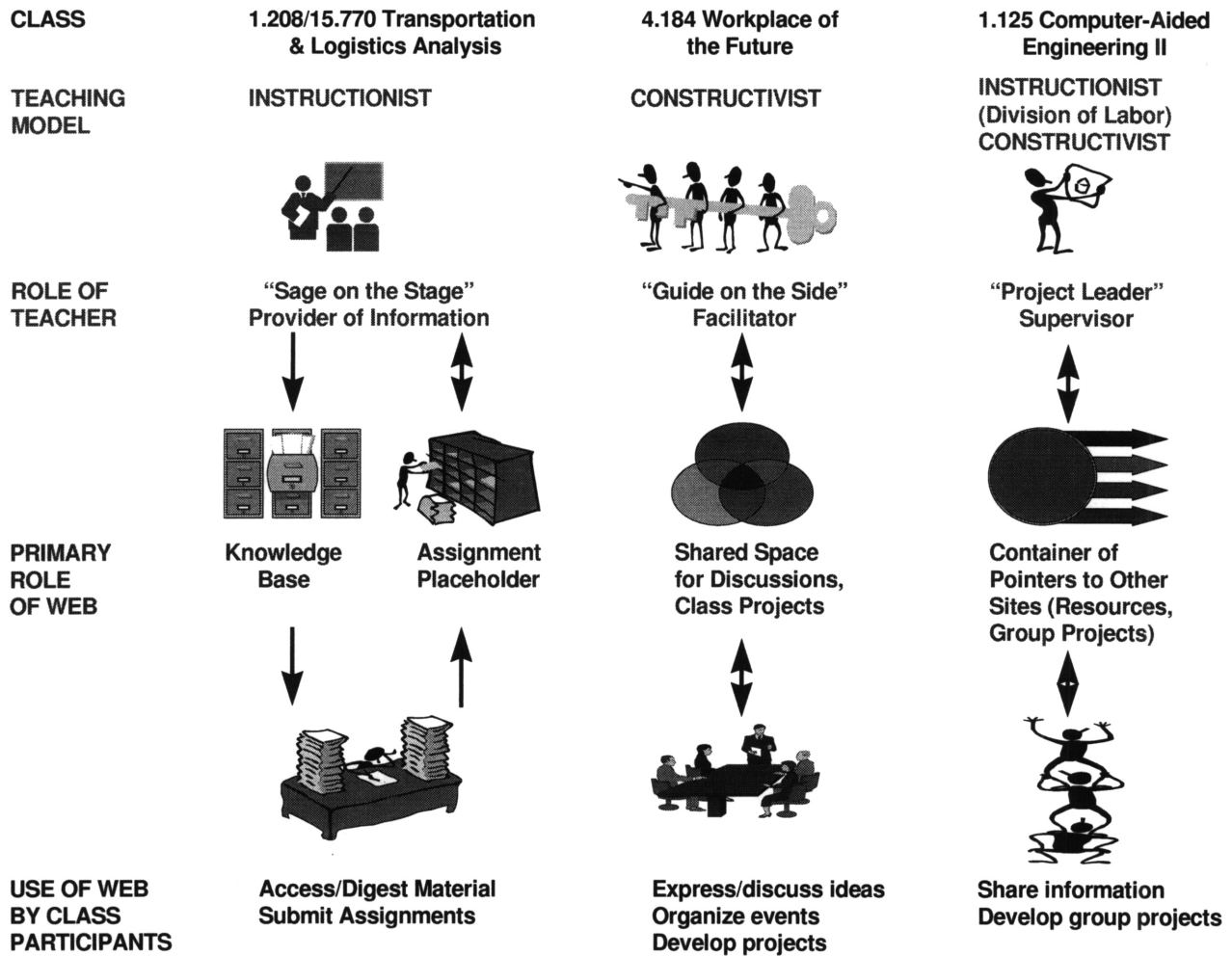


Figure 3.1: Models of Teaching/Class Interaction

3.3 Application Design

3.3.1 Functional Requirements

Based on the class profiles identified earlier, common elements were abstracted and a general design developed to cater to the needs of various classes, regardless of domain or teaching style. Following is a framework that proposes four main functions of a class web site, to correspond with the major components of the instructional process [12]. Typical examples of each component are listed in under each of the main functions.

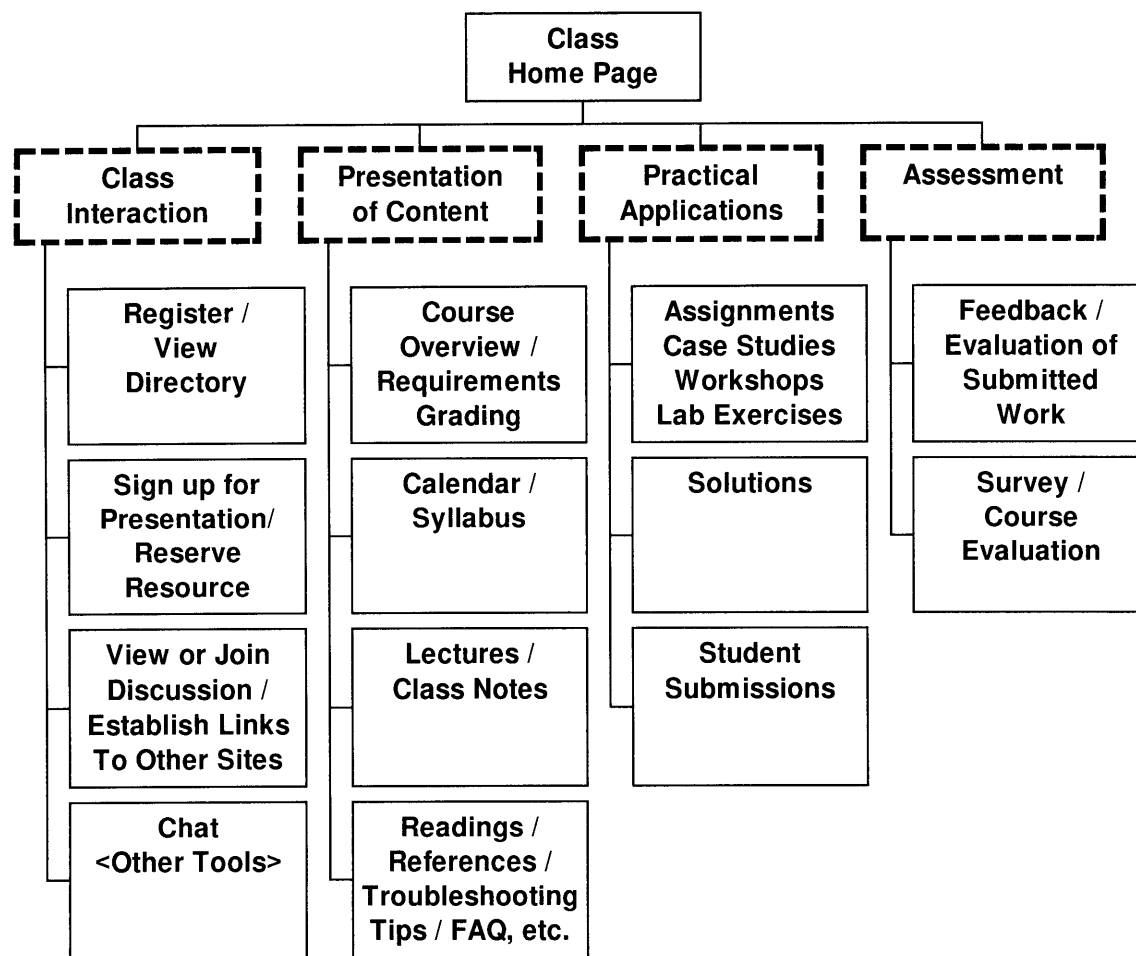


Figure 3.2: Functional Requirements for a Class Web Site

3.3.2 Logical Design

The diagram below attempts to put more flesh into the functional specifications by mapping the various functions into templates or forms that correspond to actual web pages. The dashed lines represent logical groupings rather than physical web pages. Examples of these forms will be provided in the next chapter. Not all of the elements listed need to be part of the class web site; the nature of the class will determine which components make it to the final cut.

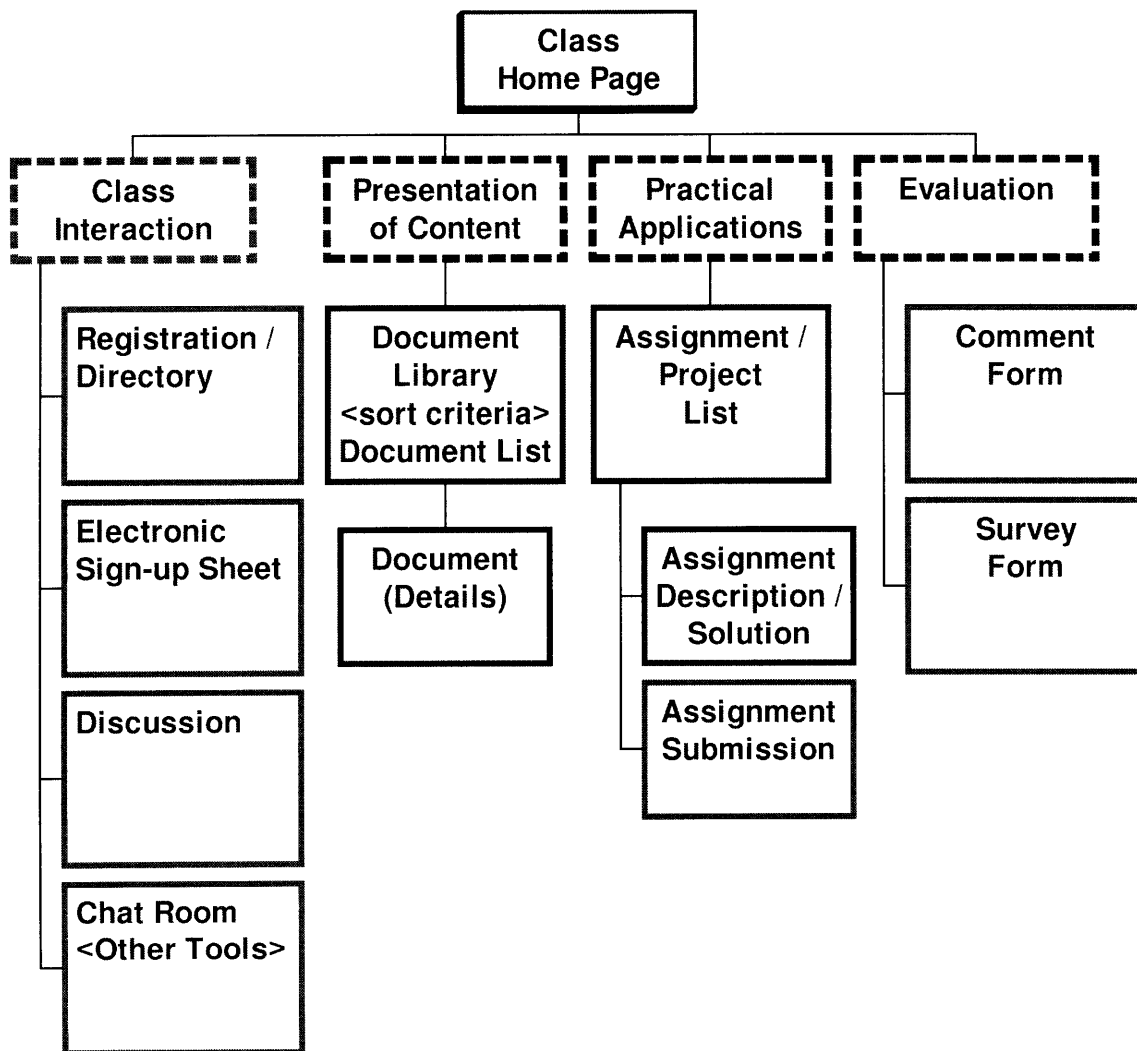


Figure 3.3: Logical Design of the Web Application

3.3.3 Workflow

The following diagrams depict the workflow involved in performing the most common tasks, along with the templates used to create documents and the databases where these documents are stored.

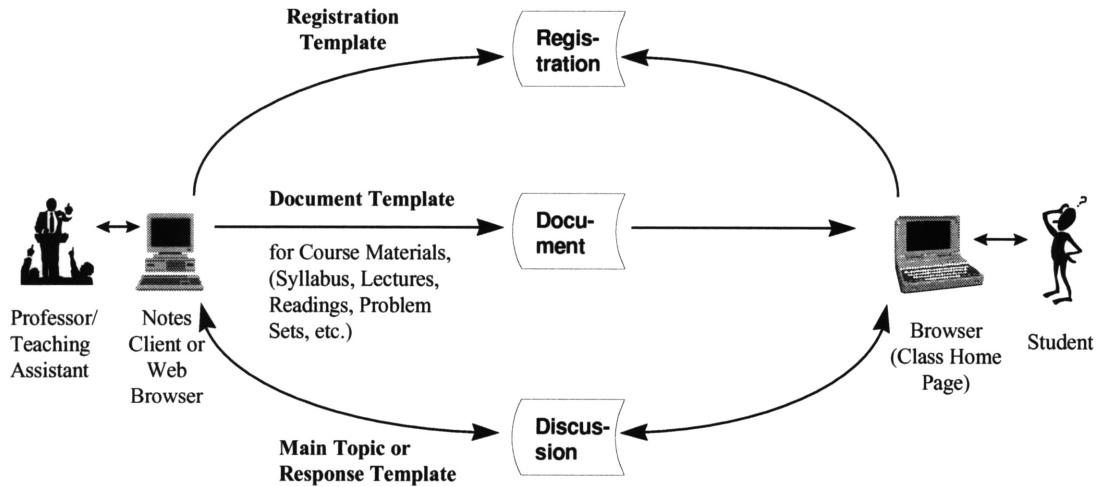


Figure 3.4: Workflow Showing Databases, Templates, and Documents that Support Registration, Course Material Management, and Asynchronous Discussion

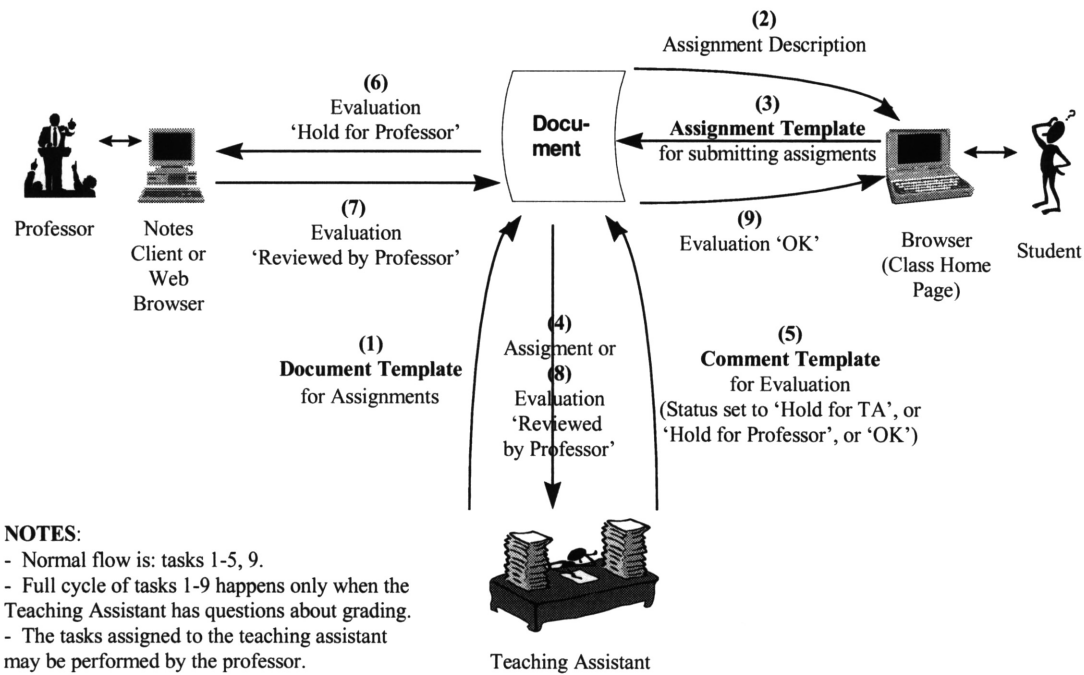


Figure 3.5: Workflow Showing Databases, Templates, and Documents for Managing Assignments

3.4 Physical Implementation

3.4.1 List of Screens by Function

Examples of the various templates listed below can be found in the next section. Unless otherwise stated, the snapshots were taken from a web browser. The screens include:

- **Class home page** - Entry point of the class web site. Conveys the main features of the site.

Class Interaction

- **On-line registration form** - This is not meant to replace the official registration procedure, but provides a way to build a virtual community and enable the students in class to get to know one another by way of their homepages and background information. This form may be customized to capture information that's important to the professor, such as expectations of the class and previous exposure to the subject matter. Registration is also useful for assigning user-id's and passwords which are required to access secure web sites.
- **Class directory** - Maintained dynamically based on the registration form, the directory lists all class participants, along with a means of contacting and learning more about them. This lays the groundwork for asynchronous class communication.
- **Electronic sign-up sheet** (Read and Edit modes) - Provides a convenient means of empowering students to sign up for groups and establish links to their group home pages without having to go through the professor or teaching assistant. The ability to edit the sign-up sheet through the browser greatly reduces the administrative overhead of the professor. Similar forms may be designed to reserve resources, schedule presentations, or request consultation time with professors.
- **Discussion forum** - Provides all class participants with a shared space that can be used to: share information, offer suggestions, discuss ideas, ask questions, assist in organizing groups, express opinions.
- **Persistent chat room** - Allows both synchronous and asynchronous communication among class participants and other external resources. Records all conversations and allows people to leave messages for others. Contains a 'Memories' folder that enables one to review everything that transpired in the room.

Presentation of Course Material

- **Document list and detail** - The list offers a bird's eye view of the documents authored by the professor. To assist the student in finding information, dynamic sort and search facilities are provided. A keyword index is also provided. Selecting any entry from this list displays the document detail. The detail form is a standard container that prompts the author to specify the title, category, sequence number and body of the document.

Practical Applications/Assignment Submission

- **Assignment list** - List of assignments with corresponding solutions. Includes due date and number of days left until the assignment is due.
- **Submission form** - Enables students to submit their assignments by entering text or uploading a file from their local machine.
- **Submitted list** - Shows all the assignments that a given student submitted, with a date and time stamp. The teacher's evaluation is threaded to each assignment.

Assessment

- **Comment form** - Means by which a professor or teaching assistant can provide feedback on a submitted assignment. This is threaded to the original submission.
- **Evaluator's checklist** - Lists all the assignments that currently being checked by the professor and/or teaching assistant. Flags those which need the professor's attention. Only the teaching staff and webmaster are authorized to view this list.
- **Survey form** - Online questionnaire that can be filled out anonymously to gather feedback on the course, the web site, a particular lecture or guest speaker. Results are summarized by the system and can be processed further to generate useful statistics.

3.4.2 Screen Snapshots

Following are snapshots depicting actual implementations of the logical design discussed in the previous section. The images are grouped according to the major functional divisions outlined earlier.

3.4.2.1 Class Home Pages

Home pages of the three course prototypes are shown in Figures 3.6 – 3.8. While on the outset they may look different, a closer investigation of each web site's features reveals a common functional structure similar to that outlined in the logical design. This highlights a key feature of the model proposed by this thesis: the ability to customize basic templates in order to enable professors to express their individuality if they so desire. Salient points of the home page include:

- A message area to post current news. This is a convenient alternative to sending out e-mail messages to the entire class (pull vs. push technology)
- User-id/password authentication may be implemented if the need warrants it
- Layout of home page presents road map of entire site. All major features accessible from this page.

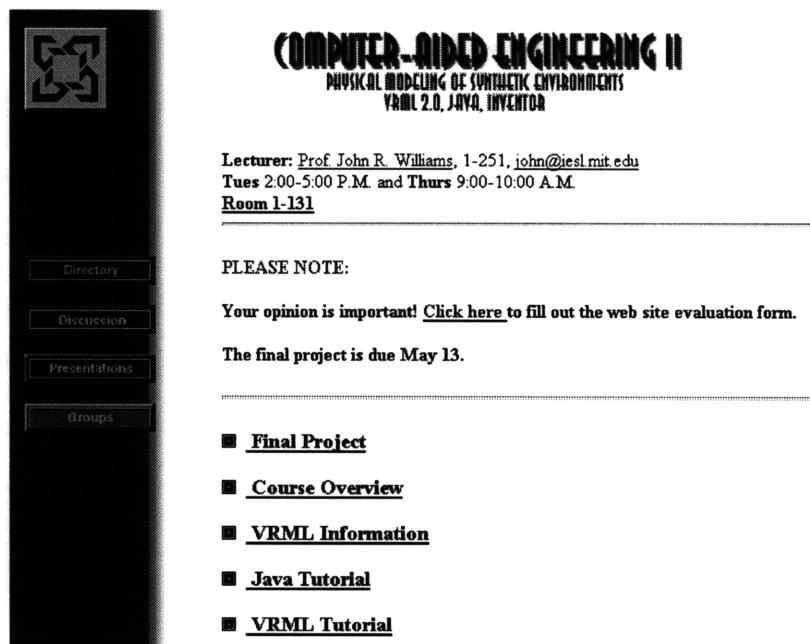


Figure 3.6: 1.125 Computer-Aided Engineering II Home Page
(<http://web.mit.edu/1.125/www>)



1.208J / 15.770J

TRANSPORTATION & LOGISTICS ANALYSIS

Instructor: Prof. Yossi Sheffi

Teaching Assistant: Katey Cunningham

Webmaster: Clarissa Hidalgo

Spring 1997
10:00 - 11:30 M, W
Room 1-150

Today is 05/08/97 04:15:02 AM

- Please review the comments that were made by other students on your Memo to Management and prepare a "Author's Closure".
- [Click here](#) to retrieve the Excel spread sheet containing the freight rate information for Problem Set 6

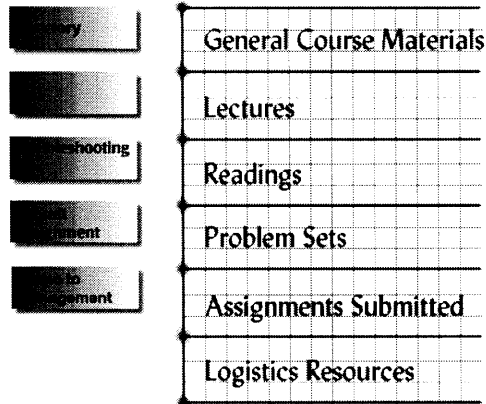


Figure 3.7: 1.208/15.770 Transportation and Logistics Analysis Home Page (<http://monett.mit.edu/1-208db.nsf>)

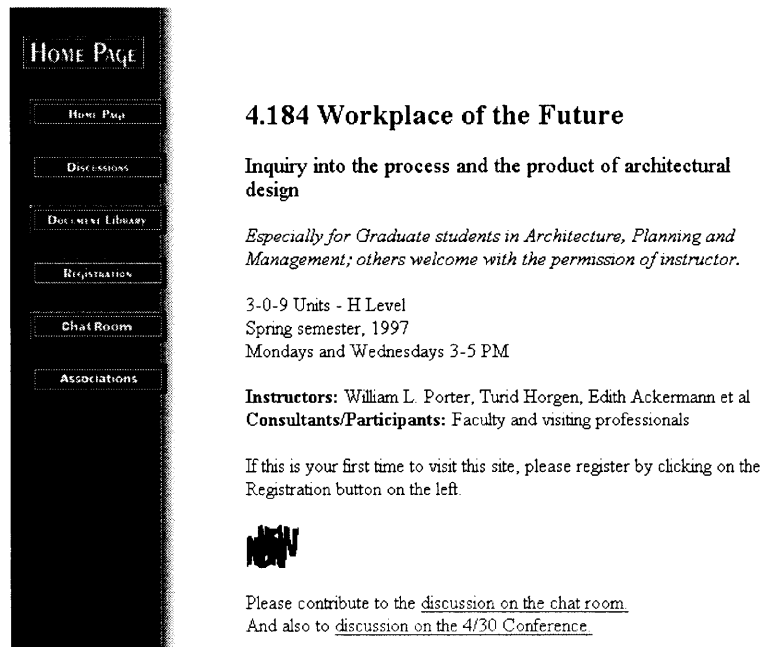


Figure 3.8: 4.184 Workplace of the Future Home Page (<http://monett.mit.edu/4184/homepage.nsf>)

3.4.2.2 Class Interaction

The next set of images represent templates that are designed to promote interaction among participants in the class.

3.4.2.2.1 Managing the Class Directory

A very common administrative task at the start of each term involves gathering students email ids and preparing a class list. Though simple, this can become tedious for classes with large numbers of students. By providing an online **Registration Form** (Figure 3.9) to fill out at the student's leisure, the system can maintain an up-to-date **Class Directory** (Figure 3.10) which is available to all members of the class. This directory automatically establishes hyperlinks to the students' home pages and email ids, and allows entries to be sorted in various ways, such as by department affiliation or by status (professor, teaching assistant, student, listener, guest lecturer, etc). In addition to providing contact information, the registration process manages assignment of user-id's and passwords for secured web sites.

1.125 Student Registration Form

All Fields marked with * are required

First Name:

Middle Initial:

Last Name:

School:

Course:

Level:

Status:

Phone Number:

E-mail:

Home Page URL:
(w/o http:// prefix)

Reasons/objectives in taking this course:

Figure 3.9: Registration Form

1.125 Directory
People-By Course

Previous Next Expand Collapse

Search

Views:
By Course
By Name
By Status

Course	Last Name	First Name	Email	Home Page
▼ Course 01 - Civil and Environmental Engineering				
	Bhagavatula	Krishna	kishore@mit.edu	web.mit.edu/kishore/www/home.html
	Brown	David	debrown@mit.edu	web.mit.edu/debrown/www/home.html
	Dirisala	Siva	discu@mit.edu	web.mit.edu/discu/www/
	Ganguly	Auroop	auroop@mit.edu	web.mit.edu/auroop/www/home.html
	Guzman	Joel	dguzman@mit.edu	web.mit.edu/dguzman/www/
	Kuo	Kal	katsumi@mit.edu	web.mit.edu/katsumi/www/
	Morton	Carrie	clover@mit.edu	web.mit.edu/clover/www/home.html
	Raheja	Sameer	sraheja@mit.edu	web.mit.edu/sraheja/www/
	Sharifi	Husham	husham@mit.edu	web.mit.edu/husham/www/
	Sthanu	Subramaniam	subbu@mit.edu	web.mit.edu/subbu/www/home.html
	Wei	Coach	kwei@mit.edu	web.mit.edu/kwei/www/home.html
	Williams	John	john@esl.mit.edu	www.esl.mit.edu/john/
▼ Course 03 - Materials Science and Engineering				
	Sprague	Jason	jason@mit.edu	www.mit.edu/people/jason/home.html
▼ Course 04 - Architecture				
	Gallemore	Twig	twigs@mit.edu	web.mit.edu/twigs/www/courses.htm

Figure 3.10: Dynamically-built Directory

3.4.2.2.2 Electronic Sign-up

Another set of activities that's common among classes include: forming groups to work on projects, signing up for presentations, reserving shared resources such as equipment, rooms, or consultation time with the teaching staff, or submitting URL's to link to (from the class home page). These tasks can be facilitated through the use of online forms that can be edited directly from the browser. The following screens show examples of how these forms were used effectively for various purposes.


By building in edit features and designing a form with clear instructions and a simple interface to allow user entry of key fields, the administrative overhead involved in forming groups and establishing links from the course web site to student home pages can be largely left to the students. The basic template can be easily modified to accommodate various tasks that require coordination or allocation of limited resources.



Computer Aided Engineering - Course 1.125

Group Home Pages

Instructions



- Click the Edit button above to add an entry or change an existing one
- Add the name of your group or the title of a topic in an empty slot. **Do not** modify anyone else's entry
- Enter the corresponding URL, *without the http:// prefix*. A hyperlink will automatically be created to this URL
- Enter the group members
- Click *Submit* when you're done
- If you encounter problems with this form, or have any comments/suggestions, send mail to chidalgo@mit.edu or [enter your feedback online](#)

#	GROUP NAME/TOPIC TITLE	MEMBERS
1	<u>10th Planet</u>	Sameer Raheja, Husham Sharifi, Joel Guzman and Kai Kuo
2	<u>Reality Bytes</u>	Subramaniam R. Sthanu, Twig Gallemore, Auroop Ratan Ganguly David Brown and Charles Dalsass


Figure 3.11: Group Sign-up Sheet in Read Mode



Computer Aided Engineering - Course 1.125

Group Home Pages

Instructions



- Add the name of your group or the title of a topic in an empty slot. **Do not** modify anyone else's entry
- Enter the corresponding URL, *without the http:// prefix*. A hyperlink will automatically be created to this URL
- Enter the group members
- Click *Submit* when you're done
- If you encounter problems with this form, or have any comments/suggestions, send mail to chidalgo@mit.edu or [enter your feedback online](#)

#	GROUP NAME/TOPIC TITLE	URL (w/o http:// prefix)	MEMBERS
1	10th Planet	web.mit.edu/1.125/www/10t	Sameer Raheja,
2	Reality Bytes	web.mit.edu/1.125/www/VR	Subramaniam R. Sthanu,
3	Vermel Wizards	web.mit.edu/1.125/www/Ver	Gang Chen,
4	Imagineers	web.mit.edu/1.125/www/Ima	Krishna Bhagavatula,
5	John R. Williams	web.mit.edu/1.125/www/	John R. Williams

Submit Request

Figure 3.12: Group Sign-up Sheet in Edit Mode



Student Presentation Schedule and Sign-up

Instructions



- Add your name in the appropriate slot. **Do not** erase any names previously entered. Remember only 3 to a group.
- Note that the topics already have links to pre-defined directories in /mit/1.124/www/Pres96/Presx, where x is the topic number. You should (a) create the appropriate Presx directory for your group, (b) place your html files in this directory, with the lead page stored in a file called index.html.
- Please review the [presentation guidelines](#).
- Click *Submit* when you're done.
- If you encounter problems with this form, or have any comments/suggestions, send mail to chidalgo@mit.edu or [enter your feedback online](#).

#	TOPIC	DATE (MM/DD)	PRESENTERS (Enter your name separated by commas. Maximum of 3 per group.)
1	Documents on the Web	11/28	Simonetta Rodriguez
2	Makefiles	09/10	Sameer Raheja, Anna Lukasiak, Carrie Morton
3	Debugging	09/12	Andrew Walsh

Figure 3.13: Presentation Sign-up Sheet (Edit Mode)

ABOUT POLICIES HARDWARE SOFTWARE RESERVATION HOME

May

COURSES FACULTY STUDENT PROJECTS RES. DIRECTORY

To reserve room 1-131, click the Reserve icon above then enter the time, short activity description and your email id on the appropriate date(s). Example: 1-4 Group Mtg (bbrown@mit.edu)

Press the Submit button below when you're done.

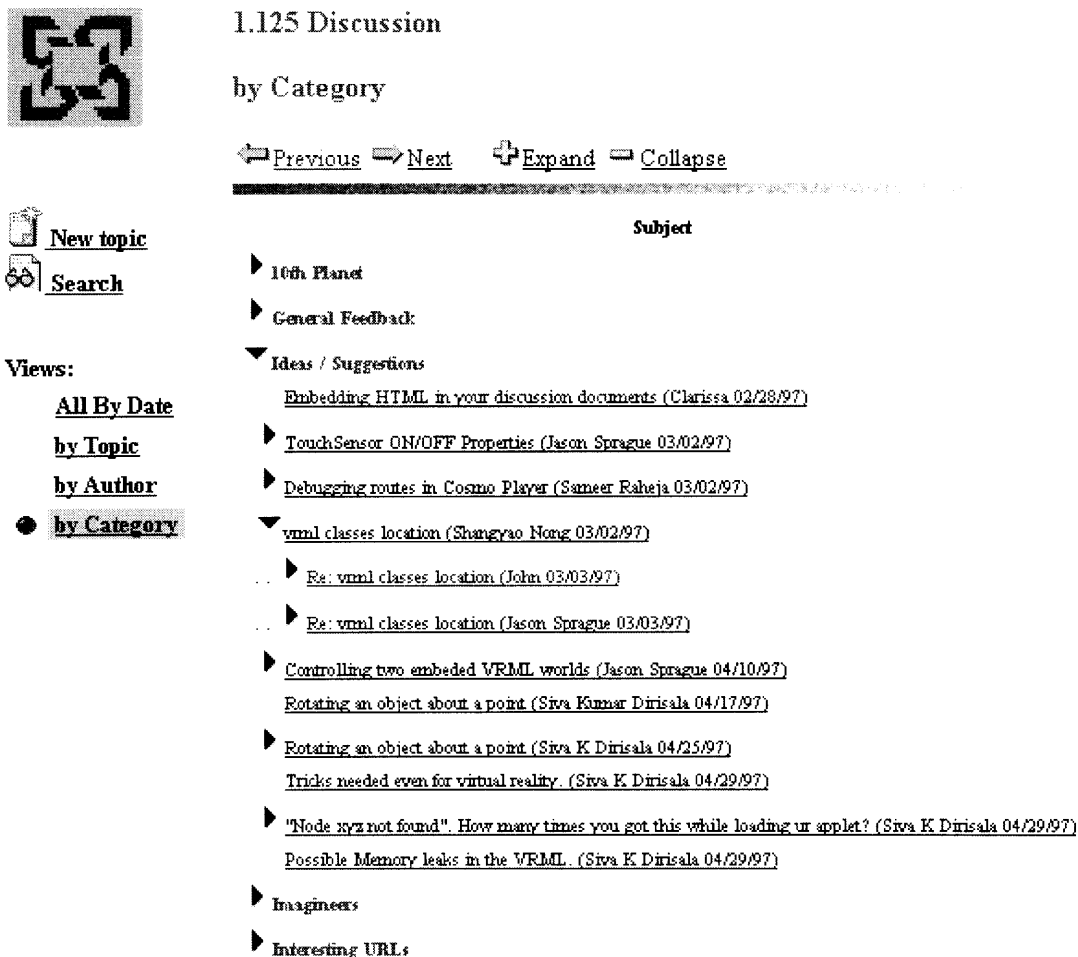
Monday	Tuesday	Wednesday	Thursday	Friday
			9-11am 1.125 john@iesl	3-5p.m. Feniosk Research Group
11-12:30 1.147 jjconnor@mit	10.00-11.00am 1.04 Prof Gibson	11-12:30 1.147 jjconnor@mit	9-11am 1.125 john@iesl	

Figure 3.14: Room Reservation

3.4.2.2.3 Discussion

However rich the face-to-face medium of class interaction may be, it is subject to physical and temporal constraints. Barring the availability of special audio or videoconference facilities, one needs to be present in class at a specific place and time in order to participate in a discussion. In addition, normal class dialog is non-persistent, unless taped or written as lecture notes by the student. The web can be used to address these issues by hosting discussion forums and chat rooms. The following images show how these facilities were provided in the class prototypes.

Figures 3.15 – 3.16 were taken from a discussion forum in one of the courses. These show how topics are organized and presented over the web and how one can contribute to the discussion. Figure 3.17 shows a variation of the Discussion Topic form with a facility for uploading any local file.



The screenshot displays a web-based discussion forum interface. On the left side, there is a sidebar with a 'New topic' button (represented by a document icon) and a 'Search' button (represented by a magnifying glass icon). Below these, a 'Views:' section offers sorting options: 'All By Date', 'by Topic', 'by Author', and 'by Category' (which is currently selected and highlighted with a radio button). The main content area is titled '1.125 Discussion by Category' and includes navigation links for 'Previous', 'Next', 'Expand', and 'Collapse'. A horizontal line separates the navigation from the list of discussion topics. The list is organized into categories, each indicated by a right-pointing triangle icon. The categories and their respective topics are: '10th Planet', 'General Feedback', 'Ideas / Suggestions' (containing several sub-topics with dates and authors), 'vml classes location' (with sub-topics), 'Imagineers', and 'Interesting URLs'.

1.125 Discussion
by Category

← Previous Next → + Expand - Collapse

Subject

- ▶ 10th Planet
- ▶ General Feedback
- ▶ Ideas / Suggestions
 - [Embedding HTML in your discussion documents \(Clarissa 02/28/97\)](#)
 - ▶ [TouchSensor ON/OFF Properties \(Jason Sprague 03/02/97\)](#)
 - ▶ [Debugging routes in Cosmo Player \(Sameer Raheja 03/02/97\)](#)
 - ▶ [vml classes location \(Shangyao Nong 03/02/97\)](#)
 - ▶ [Re: vml classes location \(John 03/03/97\)](#)
 - ▶ [Re: vml classes location \(Jason Sprague 03/03/97\)](#)
 - ▶ [Controlling two embeded VRML worlds \(Jason Sprague 04/10/97\)](#)
 - ▶ [Rotating an object about a point \(Siva Kumar Dirisala 04/17/97\)](#)
 - ▶ [Rotating an object about a point \(Siva K Dirisala 04/25/97\)](#)
 - ▶ [Tricks needed even for virtual reality. \(Siva K Dirisala 04/29/97\)](#)
 - ▶ ["Node xyz not found". How many times you got this while loading ur applet? \(Siva K Dirisala 04/29/97\)](#)
 - ▶ [Possible Memory leaks in the VRML. \(Siva K Dirisala 04/29/97\)](#)
- ▶ Imagineers
- ▶ Interesting URLs

Figure 3.15: Discussion List With Search and Sort Facilities

Previous	Next	Prev Main	Next Main	Edit	Compose New Topic	Respond
--------------------------	----------------------	---------------------------	---------------------------	----------------------	-----------------------------------	-------------------------



Author: john williams
Date: Monday, 3/03/97 5 27 PM EST
Subject: Re: java classes in vrml

It looks like we will have to go with Javascript or VRMLscript.
 I can't figure out how to get Java to work with VRML either. Lets
 discuss this in class.

This page has been accessed 11 times since 03/11/97

- [Previous Main Topic](#)
[vrml classes location](#) (Shangvao Nong)
 . [Re: vrml classes location](#) (john)
 [Re: vrml classes location](#) (Shangvao Nong)
 . . [Re: vrml classes location](#) (Jason Sprague)
 . . [Re: vrml classes location](#) (Shangvao Nong)
 [Re: Enuf is Enuf :-\)](#) (Subramanian R. Srinu)
 [Re: java classes in vrml](#) (Subramanian R. Srinu)
 [Re: java classes in vrml](#) (john williams) * You are here *
[Next Main Topic](#)

[by Topic](#) ([Expanded](#)), ([Collapsed](#)) | [by Category](#) | [by Author](#) | [by Date](#) | [1.125 Home Page](#)

Figure 3.16: Discussion Topic Detail Showing Threaded Responses

Note availability of navigation buttons, and facilities to edit or respond to this topic,
 or to create a new one

Discussions
MAIN TOPIC

Author: Clanssa L Hidalgo

Date: Friday, 5/09/97 2:10 AM EDT

Subject: * Why am I doing this thesis?

Category: * Question

Select a value from the drop down list or enter a new value to the right.

New Category:

Web page content: To use HTML formats and attributes in your text, enclose the HTML code in square brackets. You may also attach a file by clicking on the 'Browse' button below.

You can embed HTML here so you can create hyperlinks or display images using the tag.

You can also upload files from your local machine by simply clicking the browse button below and selecting any file.

File to attach:

Figure 3.17: Creation of a Discussion Topic (With Ability to Upload a File)

3.4.2.2.4 Chat Room

Another tool that can be used to continue discussions outside of class is the chat room. The chat tool used in one of the courses supported not only synchronous communication among geographically dispersed parties, but also allowed for asynchronous discussions by capturing conversations in a persistent medium. A 'memories' feature enables one to review all that transpired in a given room before he or she entered it. In addition, this tool integrated a discussion database similar to that shown earlier, and allowed for web tours to take place by pushing the web pages visited by the tour leader to the browsers of all participants in the chat room.

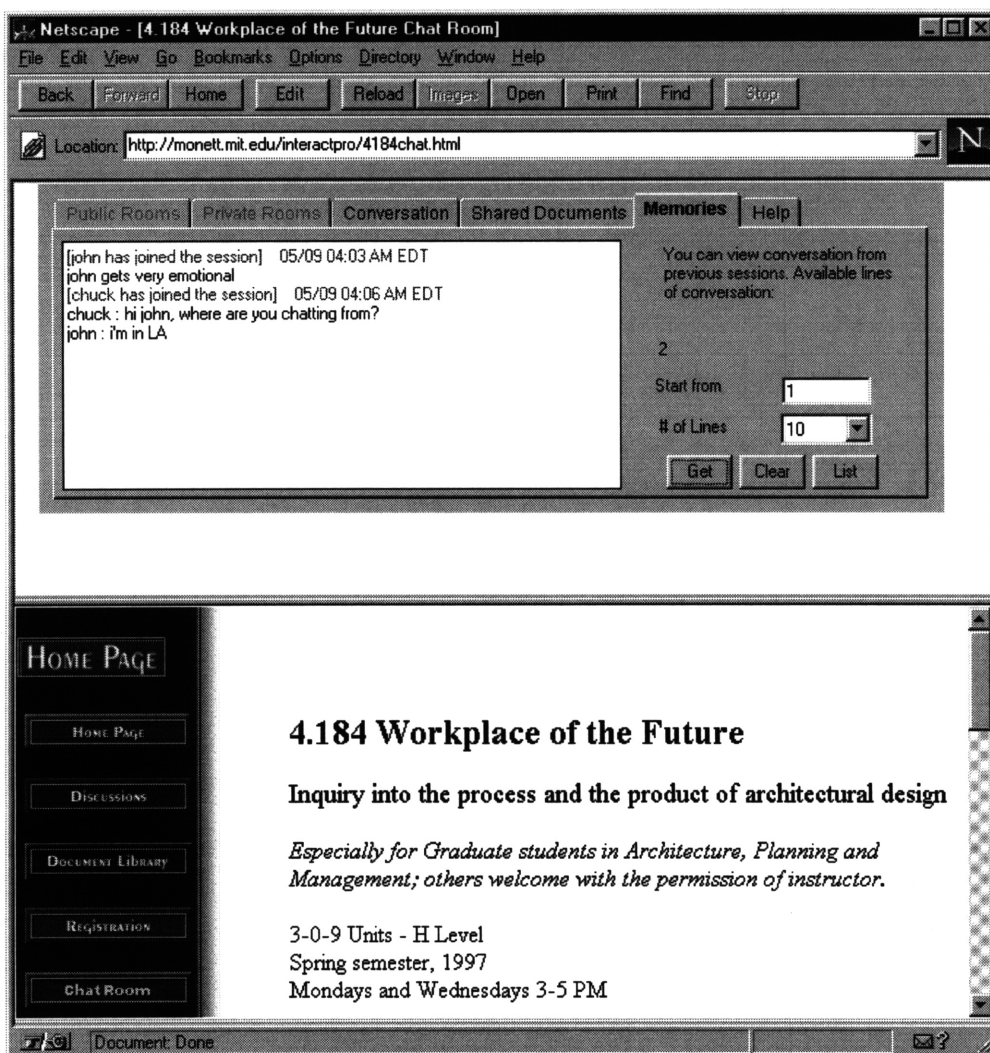


Figure 3.18: Persistent Chat Room Showing Previous Conversations that Took Place

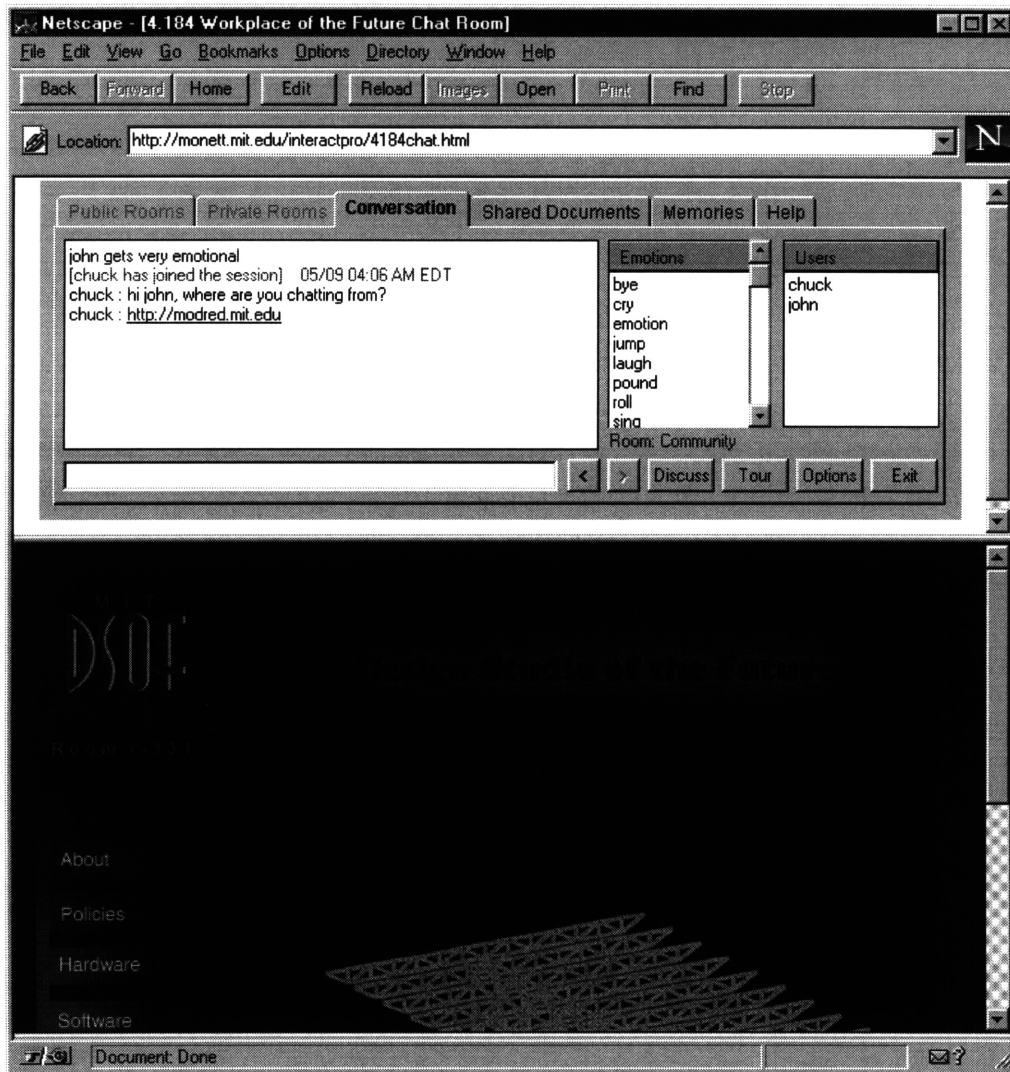


Figure 3.19: Persistent Chat Room Showing Current Conversations Taking Place

Lower panel allows for display of URL's referenced in the conversation
or pushed by the leader of a web tour

3.4.2.3 Presentation of Course Materials

Using the Lotus Notes client to create content provides the user with the following features:

- WYSIWYG (what-you-see-is-what-you-get) interface. Knowledge of HTML is not required, but author may embed HTML tags to enhance appearance of content on the web.
- Interface can be enhanced so as to be accessible from a web browser. Cutting and pasting images/text will not be available using the browser, although upload of local files is still possible.
- Document management functions handled by the system, i.e. user need not worry about storage, retrieval, sorting and searching.

The screen below shows the Lotus Notes client interface. The document author need only fill out the following fields: title, category (lecture, syllabus, readings, assignment, etc.), body. To assist the student in finding information on the web site, the author may also provide a short description and keywords to associate with the document. The main content will be displayed in the body field, which can be populated using a word-processor type interface. In addition, files may be attached in this area. This same template can be used to post different types of materials, distinguished by the category field. The system then organizes documents according to the category specified.

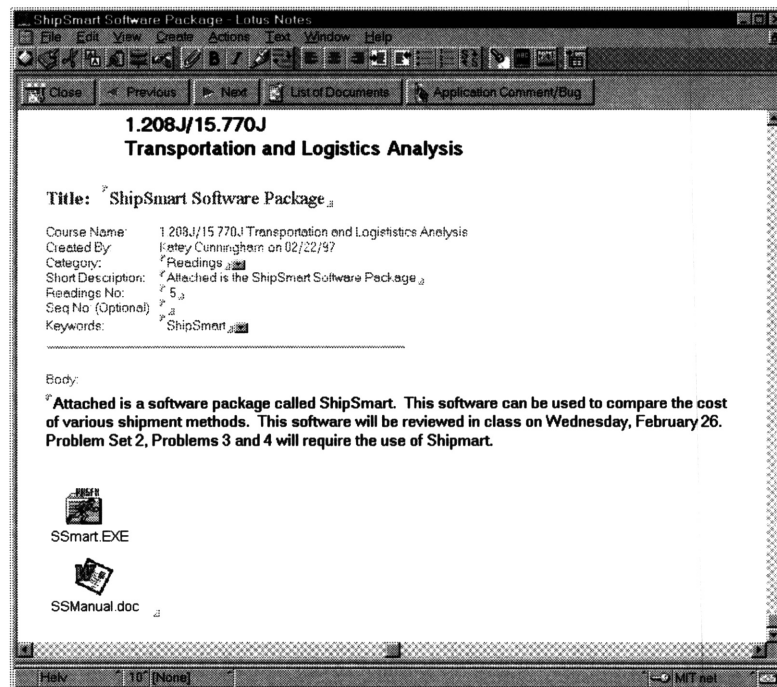


Figure 3.20: User Interface for Document Author (Using Lotus Notes Client)

After the author saves the document using the interface shown earlier, it is immediately available over the web. The following snapshot shows how the reading assignment created looks in a browser after it is saved.

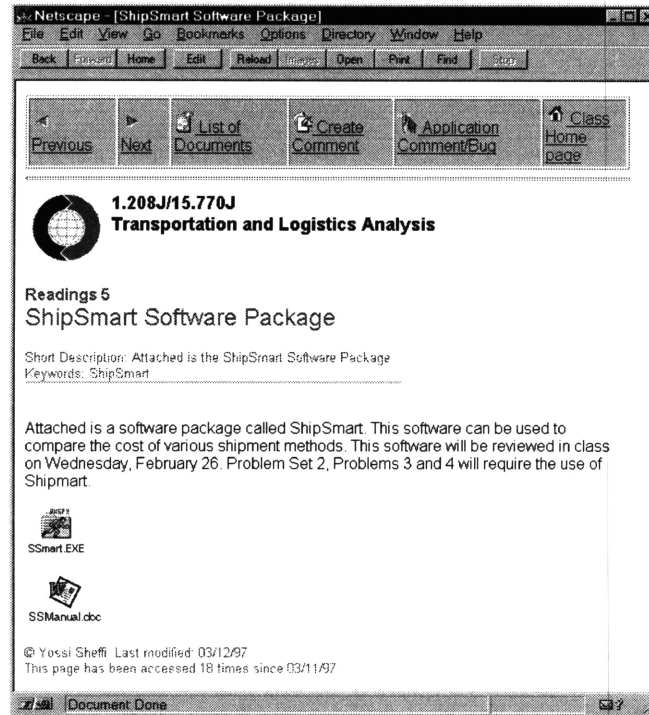


Figure 3.21: Document Detail (As It Appears on the Web)

Powered by an underlying database management system, the application automatically updates the document list, as shown by the next two diagrams. Figure 3.22 shows documents sorted by category, while Figure 3.23 displays information according to keywords.



All By Category

[Previous](#) [Next](#) [Expand](#) [Collapse](#)



Search

Views:

[General Course](#)

[Materials](#)

[Lectures](#)

[Readings](#)

[Problem Sets](#)

[Logistics Resources](#)

[FAQ](#)

● [All By Category](#)

[Keyword Index](#)

Category	No	Title
▶		General Course Material
▶		Lecture
▼		Readings
	1	Business Logistics
	2	Inventory Considerations
	4	Inventory and Transportation Trade-offs
	5	ShipSmart Software Package
	6	Safety Stock
	8-9	Forecasting
	10-11	Inventory Replenishment
	13	Chapter 7: Multi-stage Inventory
	15	Chapter 8: Transportation Systems
	16	Chapter 9: Consolidated Operations
	17	Chapter 10: Direct Transportation
	23	Performance Measures
▶		Problem Set
▶		Logistics Resources
▶		FAQ

[Previous](#) [Next](#) [Expand](#) [Collapse](#)

Figure 3.22: Document List Maintained by the System



Keyword Index

[Previous](#) [Next](#) [Expand](#) [Collapse](#)



Search

Views:

[General Course](#)

[Materials](#)

[Lectures](#)

[Readings](#)

[Problem Sets](#)

[Logistics Resources](#)

[FAQ](#)

[All By Category](#)

● [Keyword Index](#)

	Subject
▼	Service
	Brazil Case Study
	Introduction to Logistics and Transportation Management
▼	Service constraints
	Inventory Control Meeting Service Constrains
▼	Ship Smart
	ShipSmart Software Package
▼	Statistics
	Characterizing Demand: Review of Statistics
▼	Supply chain management
	Introduction to Logistics and Transportation Management
▼	Syllabus
	Syllabus

Figure 3.23: Document List Sorted by Keyword

3.4.2.4 Practical Application of Material Learned: Assignment Submission Process

The following diagrams show how assignments are managed through the web site. Templates were built to allow students to scan the list of problem sets due (Figure 3.24), submit assignments over the web (Figure 3.25), and view everything they've submitted (Figure 3.26). Upload of local files is supported through the familiar 'Browse' button. Security was built into the system to ensure that the student sees only assignments and grades that belong to him or her.

1.208J/15.770J Class Documents

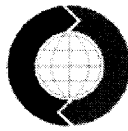
Problem Sets

[← Previous](#)
[Next →](#)
[+ Expand](#)
[- Collapse](#)

No	Problem Set	Date Due	Days Until Due
▼ 1	Problem Set 1 Problem Set 1 Solution	02/19/97	OVERDUE
▼ 2	Problem Set 2 Problem Set 2 Solution	03/05/97	OVERDUE
▼ 3	Problem Set 3 Problem Set 3 Solution	03/12/97	OVERDUE
▼ 4	Problem Set 4 Problem Set 4 Solution	03/19/97	OVERDUE
▼ 5	Problem Set 5 ... ▼ Problem Set 5 Solution Lecture 2 PPT file	04/16/97	OVERDUE
6	Problem Set 6	05/12/97	DUE TODAY

[← Previous](#)
[Next →](#)
[+ Expand](#)
[- Collapse](#)

Figure 3.24: List of Problem Sets with Due Dates



1.208J/15.770J
Transportation and Logistics Analysis

Assignment:

Problem Set 5

Created By:

idreth xaiser on 05/09/97

For Problem Set Suggestions:

No. of problems in this batch:

To submit your assignment, you may:

1. Enter or cut and paste **text** in the area below; or
2. Attach a file from your PC. To use this option, you **must use a Netscape browser**.

Press the **Submit** button when you're done.

Option 1. Enter text here, then press the Submit button.

Option 2. This works on **Netscape browsers only**. Attach a file from your PC by entering the fully-qualified name (ex. c:/1208/ps3kc.doc) or clicking the **Browse** button and making your selection. Be sure to follow file-naming convention

File to submit

Browse...

Figure 3.25: Assignment Submission Form



1.208J/15.770J Assignments Submitted

Assignments Submitted-By Name

◀ Previous Next ▶ + Expand - Collapse

Search

Views:
By Assignment
By Name

Student	Assignment	Date Submitted
	▶ Roberto J Murchison	
	▶ Rodrigo Armijo	
	▶ Rodrigo Tuset	
	▶ Scott D. Howarth	
	▶ TooPing Tan	
	▶ Victor Reinoso	
	▶ william g. cook	
	▼ xtest xuser	
	▼ <u>Problem Set 1</u>	02/18/97 04:02:00 PM
 <u>Re: Problem Set 1</u>	
	▼ <u>Problem Set 2</u>	03/04/97 03:25:00 PM
 <u>Re: Problem Set 2</u>	
	<u>Problem Set 3</u>	03/10/97 09:48:00 AM
	<u>Problem Set 4</u>	03/18/97 11:33:00 PM

◀ Previous Next ▶ + Expand - Collapse

Figure 3.26: List of Assignments Submitted


3.4.2.5 Assignment and Course Evaluation

The system assists in the evaluation process by:

- Enabling the teaching staff to retrieve everything submitted over the web and thread a comment / evaluation to each one. A list is maintained by the system to assist the professor and teaching staff in tracking the status of each assignment (Figure 3.28).
- Allowing submission of anonymous survey questionnaires over the web (Figure 3.29).

Workflow for grading papers is supported by associating a status with each **Comment Form** (Figure 3.27) which enables flagging of items not ready for release to students. Status may be set to:

- Hold for Teaching Assistant (TA) - TA has not yet completed checking
- Hold for Professor - TA wants to solicit professor's opinion
- Reviewed by Professor - Professor reviewed document and made comments for TA
- OK – Ready for release to student


Subject:

From: Clarissa L Hidalgo

Status:

95/100. Good job! Please see my comments in the attached file.

Problem set with comments

Figure 3.27: Comment Form



1.200J/15.770J Assignments Submitted

OnHold

[Previous](#)
[Next](#)
[Expand](#)
[Collapse](#)

 [Search](#)

Views:

- [By Assignment](#)
- [By Name](#)
- [On-Hold](#)

Assignment	Student	Date Submitted
▼ Problem Set 3		
▼ Clarissa L Hidalgo	...	03/11/97 06:30:00 PM
Re: Problem Set 3 (** Hold for Professor**)		
▼ xtest xuser	...	03/10/97 09:48:00 AM
Re: Problem Set 3 (** Reviewed by Professor**)		
▼ Problem Set 4		
▼ Clarissa L Hidalgo	...	03/17/97 04:03:00 PM
Re: Problem Set 4 (** Hold for Professor**)		
▼ xtest xuser	...	03/18/97 11:33:00 PM
Re: Problem Set 4 (** Hold for TA**)		
▼ Problem Set 5		
▼ xtest xuser	...	03/27/97 10:50:45 PM
Re: Problem Set 5 (** Hold for TA**)		

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[Next Section](#)

Figure 3.28: Evaluator's Checklist

Helps the teaching staff manage grading of assignments

1.125 Web Evaluation: Student Questionnaire (Spring '97)

Please Note: The purpose of this questionnaire is to evaluate the usefulness of the class web site in administering the course and contributing to the student's over-all learning experience. Your input will be used to improve the web application and refine its user interface. It is envisioned that this prototype will be used as a basis for other course web sites in MIT. Note that this is NOT meant to replace the course evaluation which will be handed out at the end of the term. Your candor and thoughtful responses will be greatly appreciated.

USER PROFILE/ENVIRONMENT

Department affiliation/course no. (ex. Course I):

For the following questions, please check all that apply:

Operating system:	<input type="checkbox"/> Windows 3.1 <input type="checkbox"/> Windows NT 3.51/4.0 <input type="checkbox"/> Unix (Athena) <input type="checkbox"/> Windows 95 <input type="checkbox"/> Macintosh <input type="checkbox"/> Other
Browser:	<input type="checkbox"/> Netscape <input type="checkbox"/> Internet Explorer <input type="checkbox"/> Other
Service provider used to access the web:	<input type="checkbox"/> MIT network (including Athena; Sloan PC lab; tether accounts) <input type="checkbox"/> AOL <input type="checkbox"/> Other
Familiarity with the web:	<input type="checkbox"/> No experience prior to this subject <input type="checkbox"/> Familiar with the interface (know how to browse, surf, submit forms) <input type="checkbox"/> Know HTML <input type="checkbox"/> Created web pages (ex. Personal home page; student presentations) <input type="checkbox"/> Maintained web site/server (other than personal web pages. Ex. Course/club web site; professional site)

How frequently did you access the class web site?

No. of times/week:

Average length of each session (including access time): hours minutes

WEB SITE FEATURES

Please rate each of the following features in terms of usefulness. Did these contribute to your learning experience?

Feature	5 = Very useful, 1 = Useless
Message area (on the home page)	<input type="radio"/> 5 <input type="radio"/> 4 <input type="radio"/> 3 <input type="radio"/> 2 <input type="radio"/> 1
Registration/class directory	<input type="radio"/> 5 <input type="radio"/> 4 <input type="radio"/> 3 <input type="radio"/> 2 <input type="radio"/> 1
Discussion forum	<input type="radio"/> 5 <input type="radio"/> 4 <input type="radio"/> 3 <input type="radio"/> 2 <input type="radio"/> 1
Group sign-up form (where you specified the group name, members, and URL)	<input type="radio"/> 5 <input type="radio"/> 4 <input type="radio"/> 3 <input type="radio"/> 2 <input type="radio"/> 1

What feature(s) did you find most useful? Least useful? What, if any, new features would you have liked the site to have (i.e. what would you like to be able to do over the web)?

CONTENT AND INTERFACE

How would you compare this with other course web sites you've used or seen?

Figure 3.29: Survey Form for Evaluation of Web Application (Partial)

4.0 Application Evaluation

This section begins with a qualitative discussion of the advantages, disadvantages, and issues associated with the various features included in the web sites. Quantitative results from the survey are then summarized and interpreted for each course, followed by a comparative analysis of the three classes. The section concludes with a list of lessons learned, suggested enhancements, and a summary of situations in which the web can be useful in administering a class.

4.1 Feature Evaluation

FEATURE	ADVANTAGES	DISADVANTAGES	COMMENTS/ISSUES
Home Page	<ul style="list-style-type: none"> • Leverages the ubiquity, platform independence, and multi-media nature of browsers. A convenient way to tie various learning tools and external resources together. • Provides the students with another data point with which to compare courses. A way to broadcast the nature and contents of a class. 	<ul style="list-style-type: none"> • Requires time, effort and money to develop and support. If students don't perceive added value in visiting the home page or don't have incentives to do so, the resources expended may not be justified. If done poorly, students may develop a negative connotation for the class. • Lack of institutional support and incentives for professors to create web sites. According to the 1996 Campus Computing Survey, just an eighth of colleges surveyed have a formal program to recognize and reward technical efforts as a routine component of the review and promotion process [3]. • Need access to computer with Internet connection and browser software. 	<ul style="list-style-type: none"> • 1996 Campus Computing Survey [3] listed instructional integration of technology and user support as the most important Information Technology issues facing colleges.

Table 4.1: Advantages and Disadvantages of Web Site Features

Message area (home page)	<ul style="list-style-type: none"> • Ability to announce news without having to wait for the next class meeting or sending email. Can establish hyperlinks to related documents. 	<ul style="list-style-type: none"> • If news is posted rather than sent via email, some students may not receive it, particularly if they're not in the habit of visiting the home page. 	<ul style="list-style-type: none"> • Pull technology (web posting) may be preferable to the push alternative (email) if students are in the habit of checking the class web site regularly. • Need to keep messages current, otherwise, people may begin ignoring or overlooking this area.
Class Interaction			
Online registration	<ul style="list-style-type: none"> • Simple user interface. No additional administrative overhead for professor in building class directory. • Single entry can be used to: <ul style="list-style-type: none"> (a) Dynamically build class directory with hyperlinks to email ids and home pages (b) Provide userid and passwords to class members in order to: <ul style="list-style-type: none"> ➤ Gain access to materials on the site ➤ Establish an identity when creating documents (discussion, submission). Author names are stamped on all documents created, thereby lessening the probability of inappropriate content. May allow anonymous creation of documents if the need calls for it. 	<ul style="list-style-type: none"> • People sometimes forget their password and register multiple times. • Allowing online registration and immediate access opens web site to the possibility that a non-authorized user will gain access to the site. This may be addressed by deferring activation of account pending approval by an authorized party, but this involves human intervention. How strictly one wants to control access should dictate the manner of implementation. 	<ul style="list-style-type: none"> • Can customize entry form to include relevant background information to ask students, such as related courses taken, expectations of the class, etc. • Need to establish a procedure for people who forget their passwords and be able to respond to this quickly.

<p>Class directory</p>	<ul style="list-style-type: none"> • Facilitates process of preparing class email list. • Helps establish a virtual community. Gives class members a means of finding out more about their classmates and teaching staff, and ways to contact them. May be useful for group formation. • Gives professor a bird's eye-view of the composition of the class. 		<ul style="list-style-type: none"> • Privacy issue: If site is not secured (i.e. requires userid/password authentication), some students may have reservations or objections to making the directory publicly available. This issue can be addressed by discussing any concerns with the class and adjusting the directory's access levels accordingly.
<p>Electronic sign-up</p>	<ul style="list-style-type: none"> • Empowers students to schedule presentations and consultation hours, reserve resources, and establish links to their web sites without burdening the teaching staff with the administrative overhead. • Can promote standardization across student presentations by referencing templates in the instructions. • Provides a mechanism for students to self-organize. 	<ul style="list-style-type: none"> • Less control over sign-up 'sheet' 	

<p>Discussion forum</p>	<ul style="list-style-type: none"> • Enables all class participants to create, edit, and possibly delete discussion topics, or respond to material posted by others. Accepts embedded HTML and uploading of files. • Provides a shared space that enables class members to: share information, offer suggestions, discuss ideas, ask questions, organize groups, express opinions. • Complements classroom discussions and addresses the following limitations of face-to-face sessions: <ul style="list-style-type: none"> ➤ <i>Temporal nature:</i> Electronic discussions are persistent ➤ <i>Physical and temporal constraints:</i> One need not be in a specific place at a given time to participate in the discussions. This opens the forum to remote participants and enables members to read or contribute 'at a time of convenience and at the time of thought. Asynchronous participation allows students time to reflect and carefully construct their points-of-view' [1]. Also, reticent members will not be precluded from participation by their outspoken counterparts and may be less intimidated by the virtual medium. 	<ul style="list-style-type: none"> • Managing information as the discussion forum grows can become unwieldy. Issues to address: <ul style="list-style-type: none"> ➤ Information overload. How to archive/remove those items that are no longer relevant. How to sift through the data to hit the most relevant ones first ➤ Monitoring/assessing quality of content. Distinguishing between fact and opinion. Should the professor reserve the right of censorship? • What's written may be construed as a reflection of the teacher/class. If anonymous authorship is allowed, may be even harder to control what people publish on the site. 	<ul style="list-style-type: none"> • Availability of forum does not ensure effective use. This feature will be used by class members if they perceive it to be a valuable information resource and effective communications tool [1]. • Although provided in all three class home pages, the 'free-flowing' discussion forum was not used as originally intended in the instructionist model. Its format did, however, lend itself well to an assignment that required students to post a proposal and have other members of the class evaluate it. The free-flowing nature of the forum thus evolved to a more focused use for a particular topic.
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	<ul style="list-style-type: none">• Presence of user-selected categories, sort and search facilities help the user navigate through the discussions.• Enables professor to get an idea of what people are doing or thinking, their level of understanding and concerns.		
--	--	--	--

Presentation of Content			
Document detail (for course materials)	<p>For content provider:</p> <ul style="list-style-type: none"> • User-friendly, WYSIWYG interface. Author does not need to know HTML. • Same interface can be used to create various types of materials (syllabus, lecture notes, assignments, etc.) • Can post files for downloading. This is especially useful for distributing software. • Can incorporate external resources easily. Very useful for 'bleeding edge' technology (such as VRML, e-commerce) since printed material gets outdated quickly. • Convenient way to build and maintain a library of materials for future use. • Can rework materials easily and have these immediately available to students. May post a message on the home page alerting students to these changes. • Gives professor an incentive to organize materials better, potentially leading to higher-quality courses. • Can lessen amount of hand-outs. 	<ul style="list-style-type: none"> • If attaching downloadable files, need to support and test on different environments. PC-based files (ex. Microsoft products) not available on UNIX, and sometimes not compatible with Macs. • HTML converters and import facilities don't always produce expected results. Currently no good HTML converters for math. Good scanning facilities unavailable to general academic community. • Students encumbered by download and printing time. Download problem may be alleviated by compressing files but printing large files remains an issue for those without access to high-speed printers. • Special software requirements (plugins, browser versions) may be required. Not all students are web-savvy enough to configure the browser by themselves. 	<ul style="list-style-type: none"> • Edutainment issue: Given that multi-media tools can help students visualize difficult concepts, will easing the cognitive burden result in a more passive approach to learning, less reflective thinking and a more superficial understanding of the subject matter? The challenge is to strike a healthy balance between the benefits afforded by the rigor of reflective thinking and the experiential impact of a multi-media environment. • Intellectual property issue: How does the author (i.e. teacher and student) protect his or her intellectual property? Given the ease of accessing external resources over the web, how does the content provider avoid liability for 'borrowing' from other sources? The policies governing copyright infringement over the web are not always clear. • Security issue

	<ul style="list-style-type: none"> • Enables people outside of the class (ex. industry professionals or colleagues) to view the materials and provide feedback. • Convenient means of tying together different tools independently developed by different people/vendors. <p>For students:</p> <ul style="list-style-type: none"> • Multi-media delivery of content. Can be used to help students visualize difficult concepts at his or her own pace. • If lecture notes are posted, student able to retrieve these even if he/she misses class. <p>For both:</p> <ul style="list-style-type: none"> • Ability to access live / realistic data (ex. Direct link to equipment specs from vendors, transportation statistics for simulation, etc.) • For reference materials (online books, manuals), ease of access, archiving and updating; easy browsing. 		
--	---	--	--

Document list	<ul style="list-style-type: none"> Automatically maintained by system. Allows dynamic sorting and searching, making it easier for students to find specific information. 		
Practical Applications			
Assignment list	<ul style="list-style-type: none"> Places all assignments and corresponding solutions in a central location, along with reminders of due dates and days until due. 		
Assignment posting, submission, and distribution	<ul style="list-style-type: none"> For the person submitting the assignment: Ability to upload any type of file. Possible to download a partially-filled spreadsheet, run simulations, and submit a completed form. Ability to embed html allows for inclusion of multi-media objects and hyperlinks to external resources. Allows more room for creativity. A convenient medium for assignments that are meant to be read and evaluated by other class members. Posting on the web site allows other members to thread comments to the submitted work. This cannot be replicated in a paper medium. Can show web-based projects to prospective employers. 	<ul style="list-style-type: none"> Formulas/equations are difficult to type. Students used to submitting hardcopies. Some students uncomfortable with the medium. Initially submitted email and/or hardcopies in addition to posting on the web. Some failed to verify that attachments were successfully uploaded. Need to address possibility of a virus-infected or overly huge file being submitted Upload feature not available on all browsers. This caused some confusion for the students. They should be made aware of these limitations upfront. Original formatting and special characters not properly preserved when cut-and-paste onto text field. 	<ul style="list-style-type: none"> Social issue: student's level of comfort with the technology should be considered. Feedback mechanism can be designed to help students develop confidence in the system. Ex. display specific messages; provide warning when no attachment was received; allow student to view submissions easily. May need to be flexible and allow students to submit hardcopies initially. Find out what problems they encountered and help them solve this as early as possible.

	<ul style="list-style-type: none"> • Need not be in class to submit the assignment or pick it up once corrected. Students can get back assignments at their own convenience, from any browser. Eliminates the problem of tracking missing hardcopies. <p>For the teaching staff:</p> <ul style="list-style-type: none"> • Flexibility in assigning due dates. Need not make assignment due when the class meets. • 'Returning' corrected papers is no longer a problem. Eliminates the administrative overhead of distributing marked assignments, which may be cumbersome and time-consuming for large classes. 	<ul style="list-style-type: none"> • When uploading files like Word documents with images and formulas, HTML conversion not always correct. Documents needed further manual manipulation to display properly on the web. 	
--	---	---	--

Submitted list	<ul style="list-style-type: none"> Provides a visual verification of the document submitted and uploaded to the server, along with a date and time stamp. Teacher's evaluation is threaded to original submission. 		<ul style="list-style-type: none"> Access levels were defined to allow the teaching staff to view all students' assignments, but restrict a student to viewing only his or her submissions.
Assessment			
Evaluator's checklist Comment form	<ul style="list-style-type: none"> All assignments / projects are centrally maintained with submission date stamps. In cases where 2 or more people are evaluating submissions, hardcopies need not be distributed or passed around among the teaching staff. All comments can be entered directly on the web. Workflow can be established to support the submission process. (Ex. student submits -> TA reviews -> TA forwards to Professor in case of questions -> Professor reviews -> TA releases evaluation) Remarks for common mistakes can be easily replicated (cut and pasted) for several students. If spreadsheets are submitted, the evaluator can look at the formulas used and spot where the student's logic failed. Documents are more readable. 	<ul style="list-style-type: none"> Evaluator has less flexibility in checking because of the need to use the computer. People are more accustomed to checking and marking hardcopies, which constitute a very portable medium. 	

Survey form	<ul style="list-style-type: none"> • Can be submitted anytime • Evaluator will have more time to reflect on the question • System can collate and summarize answers • Saves class time 	<ul style="list-style-type: none"> • Less control over collection of surveys, compared to situation where hardcopies are given and filled out in class. In the latter situation, students can be asked to submit their questionnaires before leaving. 	
General	<ul style="list-style-type: none"> • Ubiquity of browser, familiarity of students with the interface make the web site a potentially powerful resource. 	<ul style="list-style-type: none"> • Server down time, difficulty of getting an Internet connection, web page response times may encumber students trying to access the class web site. 	

4.2 Rating of Features

Results of the survey that students were asked to complete are summarized in Figures 4.2 – 4.5. Samples of the questionnaires can be found in Appendix B and C. Details of the responses were collated in Appendix D – F.

As Figure 4.2 illustrates, the Discussion forum was considered to be the most useful feature by students in 1.125 Computer-Aided Engineering II. This result was corroborated by the students' qualitative comments on the survey forms. Following closely behind, from the standpoint of utility, was the posting of course materials on the web site. Aside from the course overview and assignment/project descriptions, most of the materials for this class consisted of pointers to other resources on the web. This was primarily due to the subject matter of the course: VRML and Java, which may be considered 'bleeding edge' technology. As this case study illustrates, the web is a particularly useful resource for topics pertaining to emerging technologies, due to the speed with which changes take place and the efficacy of distributing and downloading software through this medium. Textbooks may not be suitable reference materials in these situations since there is a good chance that portions of it will be outdated even before the term ends. It is also possible that good books may not yet be available in print.

The Discussion forum was very effective as a means of sharing information among all members of the class, including the professor. Students had strong incentives to both read and post questions, problems and answers because this was the primary source of new information; unlike in other classes that rely on the more traditional sources such as lectures and text books. Due to the use of beta-version software and the lack of Athena support for their platform, the students had to rely on each other to be able to move forward as a group, thus fostering a spirit of sharing, at least in the beginning. The Discussion feature facilitated this process. As the groups made headway in their projects, the competitive spirit emerged somewhat, and they began to share less information, but not significantly so.

1.125 Feature Ratings

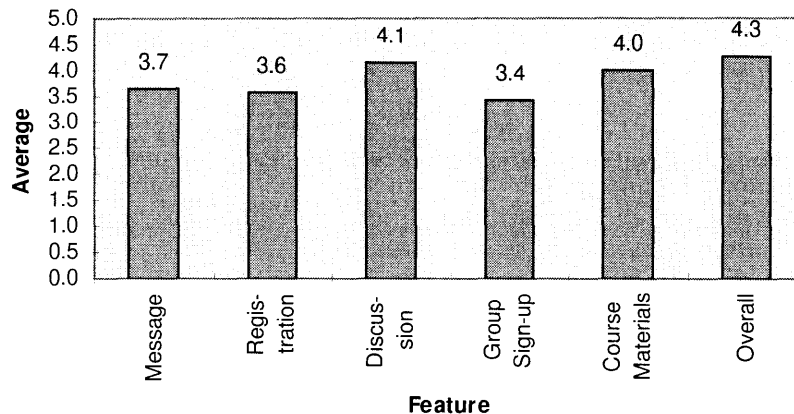


Figure 4.2: Ratings of 1.125 Web Site Features

Like the previous class, 4.184 Workplace of the Future students found the Discussion database to be the most useful feature of the web site. As Figure 4.3 illustrates, the sort facility was likewise deemed useful because it enabled them to find specific topics more quickly. Because of the growing number of documents posted in this database and the numerous categories defined, people needed different means of filtering the data in order to find information more quickly. Unlike the 1.125 class, where contributions to the Discussion were purely voluntary, the 4.184 professor specifically asked students to post their comments and reactions to this database.

The Chat Room, on the other hand, fared poorly mainly because an early version of this software was used for a class exercise. A complimentary copy of this package was provided by a Lotus Business Partner in exchange for feedback from the class. The user interface of the version used in class had much room for improvement and the class exercise in fact yielded a number of suggestions that the vendor incorporated into their next release. Aside from the user interface, other factors that may have contributed to the poor rating of this feature were the users' unfamiliarity with the technology, uncertainty about how and in what context it is best used, and the lack of a clear and compelling goal for the class exercise. The experience was not a total loss, however, given that part of the objective of the class was to familiarize the students with emerging technology, assess how these can affect how people interact with one another, and extrapolate the implications on the design of future workplaces.

4.184 Feature Ratings

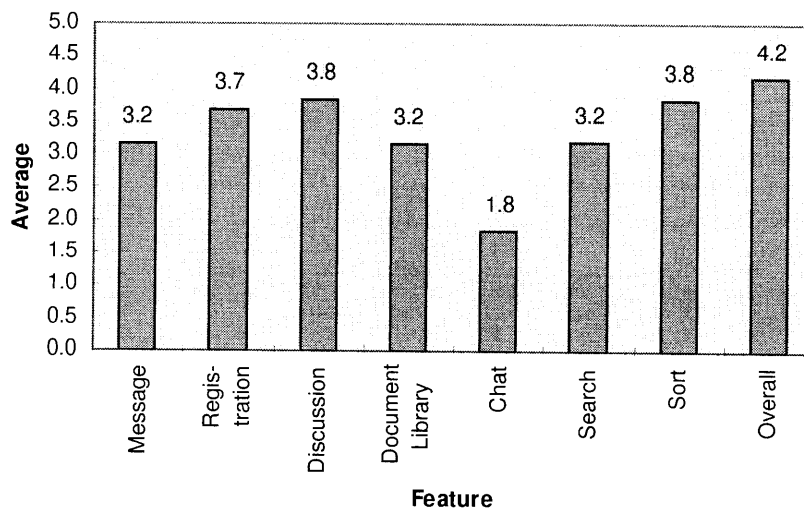


Figure 4.3: Ratings of 4.184 Web Site Features

There was an overwhelming consensus among both students and teaching staff that the message area on the 1/208/15.770 Transportation and Logistics Analysis home page was very useful (Figure 4.4). This pull technique worked well in disseminating information quickly since people had incentives to visit the site regularly, given that this was the only way to retrieve their readings and assignment descriptions, and was the preferred method of submitting problem sets and accessing the teaching assistant's comments. The frequency and regularity with which the messages were updated also enhanced the value of the web as a 'bulletin board' of latest information.

Despite the initial problems with online assignment submission, many in the class came to appreciate the ability to submit their problem sets and retrieve their grades anytime from any browser. A number of factors dampened the enthusiasm for this medium, however. Having to type formulas instead of handwriting these was one of the first major complaints with the online mode. The fact that a number of Sloan students had to use AOL to connect to the class server resulted in delays and frustrations in getting an Internet connection. Unfamiliarity with the web interface and discomfort with the technology prompted some students to prefer giving hardcopies. A few who submitted problem sets over the web also sent email copies and/or hardcopies to the teaching assistant because they wanted reassurance that their work was received.

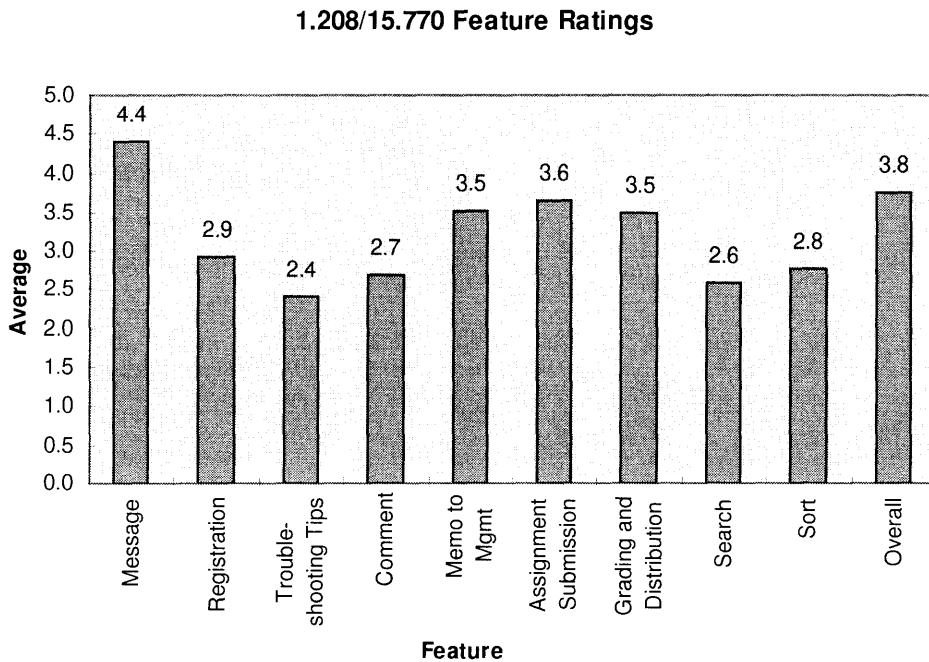


Figure 4.4: Ratings of 1.208/15.770 Web Site Features

The Memo to Management was actually very similar to the 1.125 Discussion feature in terms of format and capabilities, except that the use of the forum by the 1.208/15.770 students was a lot more

structured. Each one was asked to assume the role of logistics manager of a company and submit a memo addressed to the procurement or marketing manager recommending an idea/procedure/project that some company has implemented and explaining its viability for their own company. The class was then asked to critique two of their colleagues' memos, and finally, post an author's closure to respond to comments received. Many, including the professor, felt that the web was the ideal medium for such an exercise, noting that this could not have been possible with hardcopy memos. The main complaint about this feature was the loss of formatting and inability to paste pictures in the text area of the submission form. The file upload feature was disabled due to the application's limitations in automatically converting Word files to HTML. A few students got around this by submitting their file to the teaching assistant and having her post this through the Lotus Notes client, which allows cutting and pasting of images.

An analysis of Figure 4.5 reveals that overall, the class favored posting of course materials over the web. The syllabus, with hyperlinks to lectures and readings, as well as the pointers to logistics resources, were deemed to offer most value. Publishing the problem sets with a count down until the due date enabled people to retrieve copies of these even without attending the class and served to remind them when things were due. The web notes explaining highlights of the user interface was likewise appreciated.

To stem the growing tide of dissatisfaction with the time and trouble it took to print huge PowerPoint files, hardcopies of the lectures were provided beginning with the third week of class. Despite this, a good number of students said that it would still be useful to post these in the course web site for future reference, or in case they miss class. In general, printing problems, Internet service provider access, and the lack of Athena support for Microsoft software diminished the utility of posted course materials.

1.208/15.770 Utility of Posting Materials

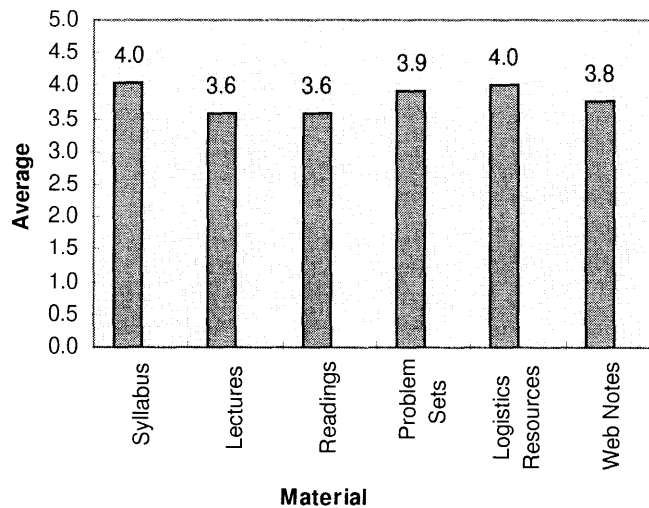


Figure 4.5: Ratings of 1.208/15.770 Posted Materials

To ensure that there were no glaring deficiencies in the user interface that may have adversely affected perception of the application features, the students were asked to rate various aspects of the web environment. As Figure 4.6 shows, there appears to have been no major issues with response time, user interface, site navigability and quality of course materials. The 4.184 home page registered the lowest ratings since it was created using a web site generator which made application development easier, but at the expense of greater system overhead and less flexibility in customizing the design. The fact that the most web-savvy students were in 1.125 possibly accounted for the higher ratings garnered by this site.

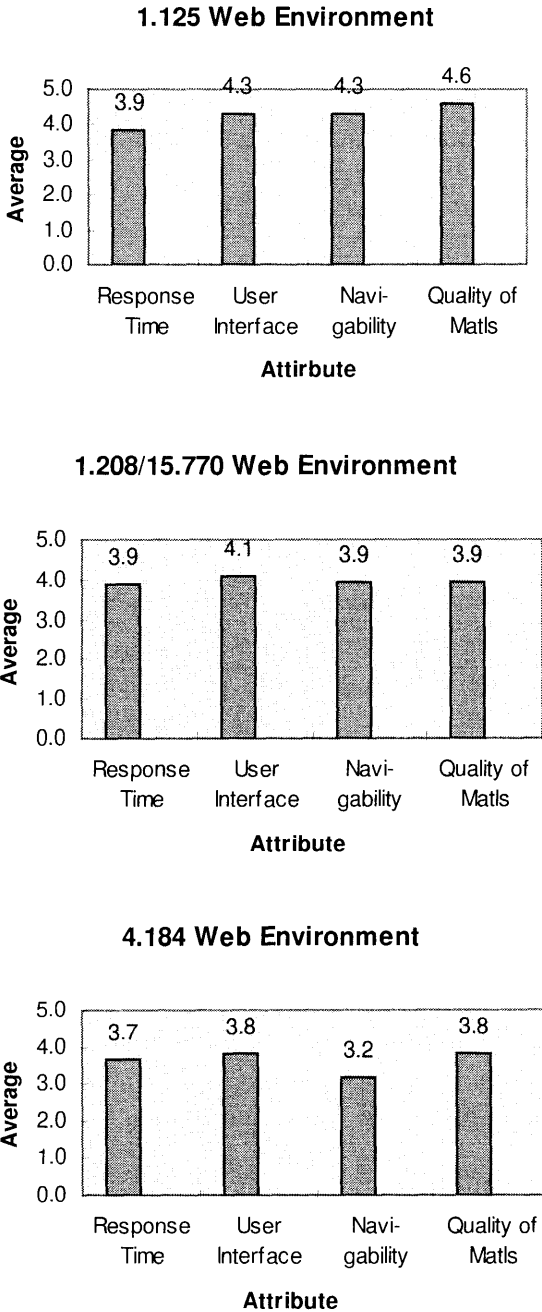


Figure 4.6: Ratings of Various Attributes Pertaining to the Web Environment

Overall, the home pages got favorable responses and most students expressed an interest in seeing similar web sites available for other classes. Appendices D-F summarize the students' comments. It's interesting to note that in all three classes, the web site as a whole got higher ratings than most, if not all, of the features taken individually. This connotes the existence of synergies among the various features, the perception that the whole is greater than the sum of its parts. The concept of a 'one-stop-shop', where all course resources are available at a central location that's available anytime, anywhere, appears to have strong appeal among the students. The presence of tools to enable people of similar interests to interact with one another further enhances the value of the web site.

4.3 Comparative Analysis of Web Use

Juxtaposing the three classes prototyped yields interesting similarities and differences which will be articulated in this section.

Web Site Objectives / Primary Use

The primary objectives of the 1.125 web site were to share information and to help the students manage their own groups. The Discussion forum provided a *shared space* for information exchange and the web site was used effectively as a *container of pointers to Java and VRML resources*, as well as the students' home pages. The group home pages helped the students organize and manage their groups, with communication facilitated by the Discussion database.

The 1.208/15.770 home page was used mainly as a central repository for course materials and a mechanism for management of assignments. Like 1.125, the web site had a fair amount of course content, but unlike the former, 1.208 course materials were mostly authored by the professor of the class. As mentioned earlier, 1.125 relied heavily on information contained at other sites. Prof. Sheffi's objective in deploying the 1.208 web site was to explore new ways of teaching the class and bringing in outside resources to enrich the learning experience. He was very much enthused by the Memo to Management exercise and felt that this was a very good use of the web; something which could not be replicated in a pure analog world. His experience administering assignments via the web opened possibilities for tapping on external resource persons in remote locations to give lectures and enabling them to have follow-up contact with the students, either through online discussions, or through assignments administered by them.

Prof. Porter outlined four objectives for the 4.184 web site. His goal of generating dialogue outside of class was addressed by the Discussion and Chat forums, although awkwardness in the interface of these features curtailed their utility somewhat. The second objective of building a class memory of documents and ideas was not met. In his words: "The documents page helped, but to be an authoritative memory of the work of a group, there really had to have been someone in charge of managing it. And there would have to have been greater commitment to it, as well as [an] understanding [of] what was important to

retain.” The plan to create a shared space for invention of ideas “worked a little. The idea of the ‘container’ grew from our face to face class session into a little essay on the web, and then has taken off a bit more since, in both the face to face and virtual worlds.” The intent to link a wider community outside of MIT did not take fruition since the others did not use the class web site, and it was not developed far enough to justify their use. As regards course materials, there was much less of this type of document in the 4.184 home page as compared to the other two. This could largely have been a function of the Constructivist nature of the class teaching style, which relied much less heavily on the professor as a source of information as compared to the Instructionist style of 1.208.

Student Profile

Students in 1.125 were mostly web-savvy Engineering students, all of whom had personal home pages and were fairly familiar with HTML. A few even had experience administering web servers. Their counterparts in 4.184 were Architecture students who were web-literate but less knowledgeable about HTML. Like 1.125, 4.184 was open to exploring the web medium and pushing it to its limits, but whereas the former left it to the students to develop applications to uncover the web’s potential, the latter often articulated their needs to the webmaster and left it to her to create the necessary infrastructure. The 1.208/15.770 audience, two-thirds of which came from the Business school and the rest from Engineering, were the least sophisticated users as far as web technology was concerned, although most of them were familiar with the browser interface. This group was the least tolerant of application glitches and generally did not share the exploratory nature of the students in the other two classes as far as web use was concerned.

Discussion Forum

This feature may be considered the ‘killer app’ of the web sites, or the interactive tool that added the most value to the class, although this was used in different ways. 1.125 used this to share *‘factual’ information* with one another, whereas 4.184 published mainly *ideas and personal comments*. The former worked well as a pull medium; the 1.125 professor did not have to compel the students to visit the site. In fact, unlike the other two classes, the request to include a Discussion forum on the 1.125 home page *came from the students*. Most people took it upon themselves to check out the latest postings for fear that they might miss something important that will prevent them from moving ahead with their project. To lighten the load on individual members, some groups appointed a person to monitor the Discussion postings and inform the others about important items. This contrasts somewhat with the 4.184 forum, which one student described as “at times, trying to push a pull medium.” This referred to those occasions where the professor asked the students to visit the web site to retrieve certain types of information, or to post their comments on certain topics. There were also times when a member of the class would email the others to let them know that a specific document was posted. This need to push information partially

resulted from the lack of strong incentives that compelled students to visit the site regularly. As one student put it, there wasn't a strong feeling of loss if he didn't visit the site often.

What presented difficulties for both 1.125 and 4.184 students was navigating through the Discussion database toward the middle and end of the term when it got quite large, and people were overwhelmed with information. Managing the data and finding relevant information became an issue, which the interface did not fully address. The sort by date feature came in handy, but did not suffice.

As regards 1.208/15.770, the Discussion database evolved from a fairly unstructured model similar to 1.125 and 4.184, to the more focused Memo to Management (MTM) forum. Originally deployed as a template very similar to 1.125 that had no particular focus, the feature was reworked to contain the memos since it remained unused (as a general container) for most of the semester. Once recast as the medium to host the MTM exercise, it worked very well. "This was what the web was made for," enthused Prof. Sheffi after reviewing the posted memos and noting the quality of ideas and asynchronous discussions that took place.

To recap, while students in all three classes appreciated the value of the Discussion forum, they had different incentives in visiting their course web sites. Fear of missing something important motivated the 1.125 student. In 4.184, the professor's endorsement and push to use the site served as the primary motivator, while 1.208/15.770 students felt compelled to access the site since this was the only way they could get most of the materials and their assignments.

Message Area

A unanimous verdict was reached as to the usefulness of a message area in the home page. This feature was used most effectively in 1.208/15.770, which deployed it from the start and updated it frequently. The other two classes followed suit later in the semester, with 1.125 moving messages up from a separate README file which some students stopped checking after a while since it was not updated regularly.

Registration / Directory

The teaching staff in all three classes found this feature useful as a way of contacting students and creating a class list. Where students were concerned, the directory was deemed more valuable by 1.125 and 4.184 since there was a greater sense of community in these classes as well as more interaction among the members of the class.

4.4 Lessons Learned and Implementation Tips

- 1. Students look for value in a web site. Before the start of the course, plan how the web can be used effectively.**

Good web sites don't just happen incidentally. Thinking through the nature of the class, as well as the work and interaction expected of the students, and understanding the capabilities of the web, help produce more effective home pages. Students need incentives to visit the class site, especially for courses that meet regularly face-to-face. Recognize that introducing the virtual medium as a supplementary tool may require changes in the way the course is taught, and be prepared to make adjustments.

- 2. The needs and dynamics of the class should drive technology, not vice-versa.**

Although it may be acceptable to experiment with the virtual medium in the absence of precedents, feedback from the class, both formal and informal, should be solicited and responded to throughout the course, rather than at the end. Treat students as customers to listen to, rather than a captive audience to dictate upon. For instance, one class began with the objective of fostering a paperless environment where all lecture notes, readings, and assignment submissions were posted on the web. The first few weeks revealed a desire to have printed copies during the lectures and a growing dissatisfaction with the amount of time it took to print. Rather than persist with the original plan, the professor decided to provide hand-outs, thereby averting a potential technology backlash.

- 3. Students want good reasons to change 'rituals'.**

If the virtual medium is to be used in lieu of an established practice (such as posting reading material on the web instead of providing hardcopies, or requiring online submission of assignments instead of accepting hardcopies), students want to understand the value of the new process. This is not always obvious, and is particularly important in situations that involve a change in the process or 'rituals' that students are accustomed to. Many students are 'creatures of habit' and being in a technically-oriented school like MIT does not necessarily spare one from those who are skeptical of using technology for technology's sake.

- 4. Not all surfers are created equal.**

For interactive web sites, it is not enough to give students the class URL and expect them to navigate through it effortlessly. Attention should be paid to the level of sophistication of the users, and adjustments made accordingly. Some ways to ease the transition to the new medium include: (a) walking

them through the process either during class or at a mutually-agreed upon time outside of normal class hours; (b) handing out short instructions to familiarize them with the site, and/or posting web-specific instructions (such as configuring browsers or installing helpers); (c) preparing a non-graded exercise that enables them to go through the process without penalty and identifies potential problems early on (ex. require students to submit a test assignment before any problem set is due).

5. Before deployment, test the interactive web features on various platforms.

Remember that your audience can be working on different environments (UNIX, Mac, Windows 3.1, Windows 95, etc.) and use different browsers. Inform the students of any known limitations. Where possible, provide 'easy-to-detect' warnings. For example, if the file upload feature is only available on Netscape browsers, display this beside the submit button. Gather feedback on problems encountered along the way and address these as soon as possible. Problems and workarounds can be published in a 'Troubleshooting Tips' section.

6. Users CAN be empowered to create compelling web sites without knowing HTML.

A web application can be designed to allow both professors and students to create and edit content on the home page without having to rely on a webmaster or knowing HTML. This decentralized control helps make the web site more engaging, less encumbering and more up-to-date.

4.5 Suggested Enhancements

The following features and suggestions arose from feedback gathered from users of the web applications as well as a survey of current course web sites.

1. Use of chat software

A persistent Chat Room was deployed in one of the prototypes only, mainly because it was an early version of the software provided by a Lotus Notes Business Partner midway through the semester. A subsequent version has since been provided that has a much-improved interface, and supports more features such as an integrated Discussion database as well as the ability to conduct web tours that push URLs visited by a tour leader to the browsers of remote participants. This tool can be used to supplement the asynchronous communication afforded by the Discussion database, which all classes found useful. For instance, as an extension of the Memo to Management exercise, Prof. Sheffi envisioned forming smaller groups of students to discuss topics selected by the group members themselves. This avoids the problem of having to read a lot of memos to decide which to comment on, and makes for more focused discussions.

The chat facility also shows promise for linking with people in remote locations, and may be well-suited to a class like 4.184 that conducts teleconferences and invites a number of guest lecturers. Further testing of the software and practice with the technology is suggested to be able to assess the best ways that this can be used.

2. Personalization and customization of web sites

The Harvard Course Platform (URL: www.atg.com/dynamo/press/profiles/hbs.dyn) and University of British Columbia's WebCT (URL: homebrew.cs.ubc.ca/webct) provide sophisticated examples of how web sites can be configured to present personalized information for both professors and students, and how the look and feel of the application itself can be customized by the course developer using the browser interface. Further enhancements of the templates built in this thesis can benefit from ideas developed in the aforementioned web sites.

3. Better filters for Discussion forums

A common problem identified by users of Discussion forums is that of data management: how to filter out 'obsolete' data, navigate through the database easily, find pertinent information, or present the topics in a way that has meaning for a given user. This thesis presented a standard template with threading, sort and search capabilities. This could benefit from more finely-tuned filtering mechanisms. One fairly advanced suggestion offered by a student was to provide "the ability to highlight content at an editorial level so that one could visit and go directly to what someone they trust thought was important."

4. Collaborative projects

In a software development context, one might introduce the concept of collaborative coding. In this exercise, a simple code fragment can be posted on the web with a stated goal in mind. Members of the class can be encouraged to contribute to this, and rewarded for keeping their code well-documented, easily maintainable and extensible.

A similar project was started in the 4.184 class where one member posted an intentionally unfinished document divided into sections, and invited others to contribute to it. The effort was mildly successful, as it suffered from the lack of good annotation tools over the web. For instance, it could have benefited from 'Post It-type' sticky notes or redlining facilities to enable contributors to write minor comments on particular sections of the document. Because the students were limited to the Main Topic/Response format of discussion, they were sometimes discouraged from threading a minor comment to a long document because of the effort involved. Dividing the document into smaller chunks is an option,

albeit a not so palatable one. Also, long documents may sometimes tend to be perceived as ‘finished’ by a casual reader, who will in turn hesitate to add to it.

5. Engaging the students (Suggestions for more web-savvy audiences, such as 1.125 class)

Web-based projects can be designed that appeal to the ‘hacker mentality’ of some students and their spirit of competition. For instance, a problem set can be assigned that requires the students to design a class logo using a technology that’s relevant to the class, such as VRML or Java for 1.125. After everyone submits their entry, an online poll can take place that solicits the student’s opinion as to the best entry. The winner’s work can then be posted on the class home page. An alternative to this is to let the system automatically replace the home page logo regularly using the various student entries. The point is that the course home page can be made more engaging by challenging the students to create content that is worthy of being displayed in a prominent place on the web site. The more students contribute, and the greater the power they have over influencing the look and feel of the course home page, the greater the likelihood that they’ll feel a sense of ownership and visit the site more often.

Another suggestion that’s pertinent to technology-focused classes is to attempt to showcase the technology by leveraging the multi-media nature of the web. For instance, in 1.125, embed VRML, Java or JavaScript code on the home page to flaunt the power of these tools and entice the students to exercise their creativity. As one person commented: “When hackers see something cool, they try to figure out how it’s done and do something better.”

4.6 Conclusions

The web is a powerful tool, but it is not a panacea for everything. Teachers must spend time to understand not just the capabilities of the web, but also the context in which certain features work, as well as the pitfalls in introducing new technology in a class. They must be willing to adapt a new paradigm to use this medium effectively. It would likewise be in their best interest to be conscious about the possibility of overwhelming students with technology or with tons of data and information, made possible by the electronic medium. The web is particularly useful in promoting interaction outside of class and making external resources available to the class, either by creating hyperlinks to these sites, or using discussion and chat facilities to communicate with others. The web also lends itself well to personalization and mass customization, although developing applications to leverage these features is not a trivial task.

A course web page will be useful if the class can benefit from the following features afforded by this medium:

- Cross-platform, multi-media, ubiquitous nature
- Ability to reference external resources, especially where 'bleeding edge' technology is involved
- Inexpensive way of publishing ideas/soliciting feedback
- Shared space
- Addresses limitations of face-to-face classes: temporal nature, physical constraints
- Efficient way of distributing files/software.

5.0 Dissemination and Institutionalization

This section offers suggestions for facilitating dissemination of the templates developed in this thesis, socializes the issues inherent in providing institutional web support, and concludes with the migration plans for the three class prototypes.

5.1 Facilitating Dissemination

- Develop prototypes as proof-of-concept. For these prototypes, select courses that:
 - ◊ Represent various teaching styles and student backgrounds. This can provide a more representative cross-section of the academic population and help build more general containers.
 - ◊ Are taught by professors who really believe in the potential of the web, are willing to experiment with the medium, and can serve as 'champions' for your cause.
 - ◊ Enable development of web sites that can serve as 'showcases' of the potential of the web.
- Make a deliberate effort to develop models/templates that are scalable, easily customizable, replicable, and non-domain-specific. Solicit feedback from early adopters and use this to refine the models.
- Seek out partners from the business sector who may be willing to provide software or technical assistance in exchange for feedback on their product or publicity for their company.
- Publicize success stories to lobby for departmental and institutional support. This could consist of articles in school publications, professors sharing their experiences with department heads or colleagues, giving demonstrations of the applications built, meeting with groups dedicated to distance learning initiatives.

5.2 Institutionalization: Issues and Suggestions

Following are some issues that need to be addressed when planning for institutional support of course web sites.

- **Amount of control exercised by the central site**

The benefits of centralization vs. decentralization discussed in Section 2.2 should be carefully weighed against the needs and psyche of the academic population. While the faculty can appreciate a resource that they can turn to for help in developing home pages, the question arises as to the framework

that will work best for MIT. A total learning environment similar to that provided by Harvard Business School's Course Platform personalizes web pages for faculty and students and empowers the author to create content through the web interface, but limits users to a standard look and feel. Thus, content creation is decentralized, but application design is centralized. Whether or not MIT professors will be willing to adhere to a 'forced' standard is a big question. As a former Athena administrator put it: "There's nothing that poisons the well faster than making MIT faculty feel that there's a structure they need to adhere to."

- **Target audience**

Another important issue to address is that of the target customer for the course web sites. If done for internal MIT purposes, i.e. to support classes taught on campus, then standardization may not be an issue and institutional support may take a laissez-faire attitude toward teachers' initiatives to customize their web sites. However, if the URL's are meant to be accessed by 'outsiders', then MIT may be more conscious about the image they project to the public and opt for more standardized templates that meet certain quality requirements.

- **Implementation strategy; Determination of user requirements**

Because of the wide variety of teaching styles, personalities, and domains within MIT, a viable strategy for developing an institution-wide framework would be to determine what's common across these classes and to provide generalized templates for these common features. As a first step, the various groups currently involved in providing web support for a set of users can try to pool resources to avoid duplication of effort. These groups include: Athena, Academic Computing Services, Hypermedia Teaching Facility, Center for Educational Computing Initiatives, Center for Advances Educational Services, and the Intelligent Engineering Systems Laboratory. A good place to solicit opinion from is the Cross Talk forum as this involves a cross section of the academic population. One can also benefit from analyzing the more sophisticated platforms that are available to the public, such as those mentioned in Section 2.1, to gain significant headway in assessing the state of the art in web courseware and adopting best practices.

What are the attributes and/or practices that would encourage widespread adoption of course templates? Among those identified by key MIT administrators are: (a) the need for selling the concept to get faculty buy-in, education of users, and outreach; (b) a system that makes efficient use of people's time; (c) ability to leverage teaching assistants; (d) ease of administration and customization.

Once a base application is developed, it can then be prototyped on a core set of subjects to give the initiative critical mass, serve as showcases, and set the standards for others to emulate. The effort should be aimed at promoting best practices within the University.

- **Institutional budget and support**

In order to be successful, a campus-wide effort must have significant funding and commitment from MIT administration to continue support of this initiative, similar to Athena, but not requiring as big a budget. At the operational level, another model suggested is to have the department provide professors with funds for webmasters just as they do for teaching assistants (TA). This does not necessarily mean additional funds; a plan may be considered to split the current TA allocation equitably between the TA and the webmaster.

- **Problem of motivating and teaching the teacher**

Finding the right incentive to motivate a wide variety of teachers to spend the time to develop a course home page is not a trivial task. Currently, there are no direct or tangible incentives for doing so; web sites are generally not considered when evaluating a teacher's performance. In addition, as a seasoned MIT administrator noted, there appears to be "an inverse correlation between the number of students in a course and the incentive of the professor to package the course more nicely." Even after the incentive issue is addressed, training the teachers to use the system can prove to be another major hurdle, as they are usually strapped for time and may not be inclined to go to a center for training. On the other hand, doing personal training may not be viable. One way to address this is to leverage teaching assistants since they are generally easier to get access to and more willing to learn and adopt new technology.

- **Establishing metrics for assessing effectiveness of changes**

Given the projected expense in providing support at the institutional level, it will be important to be able to measure the effectiveness of the web sites deployed. Establishing meaningful metrics is another non-trivial endeavor that may be necessary to justify the expense involved and encourage the administration to continue funding the project.

- **Intellectual property**

The ease of publishing material on the web and of copying or referring to resources make issues of intellectual property all the more difficult to address. Because of the large gray area surrounding policies pertaining to this issue, it may be difficult, if not impossible, to publish and police a formal set of guidelines for enforcing intellectual property rights on the web.

5.3 Migration Plan for Prototypes

1.208/15.770 Transportation and Logistics Analysis: Transferring technology to a central, school-wide administration group

Since the teaching staff of this course does not have its own server and system administration resources, and prefers to 'outsource' web site management, plans are being made to transfer all databases and templates developed to a central administration group that can service all departments within MIT. Candidates for this include: (a) the group that manages Athena, the MIT computing backbone, and (b) the Hypermedia Teaching Facility (HTF), a central resource that will be available to all professors in MIT come Fall of 1997. Originally serving primarily the Mechanical Engineering department, HTF is dedicated to the use of hypermedia in education and has a full-time development and administration staff, as well as hardware resources. The applications developed in this project will serve to expand the toolkit and knowledge base of whichever group takes over. The potential of this initiative to have an institution-wide impact is thus greatly enhanced, given the generic nature of the models/templates created, and the campus-wide administration resources offered by the central groups.

1.125 Computer-Aided Engineering II: Expanding the capabilities of an existing site

This project served to introduce new capabilities that were easily combined with the existing web site. The class home page will continue to be hosted in its current site, with the new features incorporated for use in the future.

4.184 Workplace of the Future: Empowering a group to manage it's own site

Having gained experience developing content, and having had exposure to web site management, the teaching staff from the Architecture department intends to migrate the class databases to their own server and host the site from there. The group has also been able to build upon the base templates and merge a new web-based tool developed from a different research effort. The transition will take place 1 month prior to the end of the term, to allow for technology transfer and system administration training.

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Appendix A.1: List of America's Most Wired Colleges

1-25	26-50	51 - 75	76 - 100
1. MIT	26. UC-Davis	51. Wellesley	76. James Madison U.
2. Northwestern	27. U. of Pennsylvania	52. Connecticut College	77. Hartwick
3. Emerson	28. WPI	53. Swarthmore	78. UCLA
4. Rensselaer	29. Rice	54. Tufts	79. Brigham Young
5. Dartmouth	30. Tulane	55. U. of Michigan, Ann Arbor	80. Amherst
6. of Oregon	31. Johns Hopkins	56. UC-Santa Cruz	81. Williams
7. NJIT	32. Vanderbilt	57. New York U.	82. Kent State
8. IU Bloomington	33. Wake Forest	58. U. of Alaska, Fairbanks	83. Washington State
9. Middlebury	34. Rutgers	59. Temple	84. Stanford
10. Carnegie Mellon	35. Drexel U.	60. Yale	85. Kansas State
11. Colby	36. F&M College	61. Washington U.	86. Whitman
12. Princeton	37. Washington and Lee	62. U. of Houston	87. U. of Missouri, Rolla
13. Case Western Reserve	38. U. of Tulsa	63. Claremont-McKenna	88. SUNY-Potsdam
14. U. of Arizona	39. U of Wisconsin, Madison	64. Harvard	89. RI School of Design
15. Pomona	40. Vassar	65. Villanova	90. Hendrix
16. UC-Berkeley	41. Oberlin	66. U. of South Dakota	91. Clarkson
17. U. of Connecticut	42. Duquesne U.	67. Oklahoma State	92. Ohio State
18. Skidmore	43. Brown	68. George Mason U.	93. East Carolina U.
19. Iowa State U.	44. U. of Illinois, Urbana-Champaign	69. U. of Virginia	94. Marquette
20. Reed	45. Michigan State	70. Texas A&M	95. of Wyoming
21. U-Texas, Austin	46. U. of Miami	71. LeMoyne	96. Wesleyan
22. Holy Cross	47. American U.	72. U. of Chicago	97. Occidental
23. Auburn	48. Haverford	73. Scripps	98. Drake
24. U. of Rochester	49. Union	74. Smith	99. of Mississippi
25. CalTech	50. Cornell	75. UC-San Diego	100. Milsaps

Source: <http://www.zdnet.com/yil/content/college/100colleges.html>

Appendix A.2: America's Most Wired Colleges: MIT Profile

Note: Following is the MIT profile as it appeared in the survey on America's Most Wired Colleges. See <http://www.zdnet.com/yil/content/college/mit.html>.

MIT

Cambridge, Massachusetts

Students "must have e-mail to be able to function." At any time, there are about 500 users on MIT's instant-messaging network.

FAMOUS GEEK ALUM: Nicholas Negroponte, founder of MIT Media Lab.

STUFF TO CHECK FOR

(Confused? Go the bottom of this page; we'll explain everything.)

HARDWARE AND WIRING

Student-owned computers (%): 80

Port-to-pillow ratio: 1:1

Default e-mail account? Yes

Web page? Yes

Unlimited Web access? Yes

Online library catalog access? Yes

Plug and play? Yes

ACADEMICS

Mandatory Internet training? No

Classes with Web pages (%): 40

Classes with online homework (%): 90

Classes with online study aids (%): 60

STUDENT AFFAIRS

Online registration? Yes

Online add/drop? Yes

Online transcripts? No

Online syllabi? Yes

SOCIAL SERVICES

Student Web pages (%): 50

Club / organization Web pages (%): 100

Online gaming / chat / dating? Yes

Events listings / rideboards? Yes

Popular online hangout? No

Newsgroup hierarchy? Yes

EXPLANATIONS

HARDWARE AND WIRING

Some campus computers are **student-owned**, while some belong to the school.

Port-to-pillow ratio is the number of computer ports available per student; best is 1:1.

Default e-mail means that students automatically get an e-mail account.

Likewise, some colleges automatically give students room for their own Web page.

In some schools students don't have **unlimited Web access**; if they stay online too long they'll pay.

With **online library catalog access**, students can find out which books are available at the campus library.

If you've got your own computer and want to connect on campus, be sure the school lets you plug and play.

ACADEMICS

Some school require new students to have **mandatory Internet training** as part of their syllabus.

A certain percentage of **academic courses** are likely to have a Web page at any given time.

Some courses allow you to **submit homework online**, too.

Some courses even have **study questions or notes** online. Hey, who needs to attend class?

STUDENT AFFAIRS

At some schools, students can **register for classes** online.

Likewise, some institutions move the tedious **add/drop** process onto the Net.

Some places even allow students to get their **official grade reports** online.

Many places permit students and other interested parties to see **course syllabi and listings** via the Net.

SOCIAL SERVICES

A certain percentage of **students** have Web pages on the school's system.

Likewise, some **clubs and organizations** do Web pages too.

The school may or may not sponsor an **online gaming, chat, or dating service**.

Similarly, the school may keep an online list of **events on campus, or rides** to destinations elsewhere.

Some schools have **popular hangouts** on their little corner of the Web.

Many schools have their own **newsgroup hierarchy**, as in this school.fan.internet.

Appendix B: Sample Questionnaire - Professor/Teaching Staff

NOTE: Following is the questionnaire presented to the teaching staff of 1.208. The forms presented to the professors in 1.125 and 4.184 were similar, except for the specific features listed.

1.208/15.770 WEB EVALUATION: PROFESSOR/TEACHING ASSISTANT QUESTIONNAIRE

What were your goals/objectives in deploying a class web site? Were these objectives met? Please explain.

How frequently did you access the class web site?

No. of times/week: _____

Average length of each session (including access time): ____ hours, ____ minutes

Web Site Features. From your perspective, please rate each of the following features in terms of usefulness.

	Very useful	4	3	OK	2	1	Useless
Message area (on the home page)	5	4	3	2	1		
Registration/class directory	5	4	3	2	1		
Troubleshooting tips	5	4	3	2	1		
Memo to management ..	5	4	3	2	1		
Grading and distribution of assignments	5	4	3	2	1		
Search capability	5	4	3	2	1		
Sort capability (ex. view material by keyword, by category, etc.)	5	4	3	2	1		
Posting materials	5	4	3	2	1		
Web site overall	5	4	3	2	1		

Web site response time	Very good	5	4	3	2	1	Poor
User interface	Intuitive and easy to use	5	4	3	2	1	Confusing
Navigability	Easy to browse through the site and find the information that I needed	5	4	3	2	1	Not well-organized
Quality of materials	Excellent	5	4	3	2	1	Poor

What feature(s) did you find most useful? Least useful? What, if any, new features would you have liked the site to have?

How do you think the class regarded the web site? Did they find it useful? What, if any, feedback did you get from the students (via email, conversations, word of mouth)?

How would you compare this with other course web sites you've used or seen?

What difficulties did you encounter in using this site? How do you think these could have been averted?

As regards content, can you suggest ways that the web medium can be used more effectively to present the course materials (ex. Lectures, readings, syllabus, etc.)?

Please comment on the type and level of support you received for the class web site. Did you feel empowered to create content on your own or were you encumbered by the system? Did you have to rely on the webmaster to publish your documents? Can you offer any suggestions to improve this process of creating and publishing web content?

What would you like to happen to the site after this term? Would you like to take over maintenance and control over the databases, or leave this to someone else? How would you like course web sites administered: using a centralized (i.e. someone else manages the server but you need to go through an intermediary to publish content) or decentralized model (you have complete control over publication and can see the results instantly but you need to manage the server or find resources to do so)?

What do you think is the best way to disseminate and institutionalize the web course prototype/templates?

Please list any general comments or suggestions for improvement.

Appendix C: Sample Questionnaire - 1.125, 1.208, 4.184 Student

1.125 WEB EVALUATION: STUDENT QUESTIONNAIRE (Spring '97)

Please Note: The purpose of this questionnaire is to evaluate the usefulness of the class web site in administering the course and contributing to the student's over-all learning experience. Your input will be used to improve the web application and refine its user interface. It is envisioned that this prototype will be used as a basis for other course web sites in MIT. Note that this is NOT meant to replace the course evaluation which will be handed out at the end of the term. Your candor and thoughtful responses will be greatly appreciated.

USER PROFILE/ENVIRONMENT

Department affiliation/course no. (ex. Course 1): _____

For the following questions, please check all that apply:

Operating system: ___ Windows 3.1 ___ Windows 95 ___ Windows NT 3.51/4.0
 ___ Macintosh ___ UNIX(Athena) ___ Other _____

Browser: ___ Netscape ___ Internet Explorer ___ Other _____

Service provider used to access the web:
 ___ MIT network (including Athena, Sloan PC lab, tether accounts)
 ___ AOL ___ Other _____

Familiarity with the web:
 ___ No experience prior to 1.125
 ___ Familiar with the interface (know how to browse, surf, submit forms)
 ___ Know HTML
 ___ Created web pages (ex. Personal home page, student presentations)
 ___ Maintained web site/server (other than personal web pages. Ex. Course/club web site, professional site)

How frequently did you access the class web site?
 No. of times/week: _____
 Average length of each session (including access time): _____ hours _____ minutes

WEB SITE FEATURES

Please rate each of the following features in terms of usefulness. Did these contribute to your learning experience?

	Very useful	OK	Useless	
Message area (on the home page)	5	4	3	2 1
Registration/class directory	5	4	3	2 1
Discussion forum	5	4	3	2 1
Presentation sign-up form	5	4	3	2 1
Course materials	5	4	3	2 1
Web site overall	5	4	3	2 1

Web site response time	Very good	5	4	3	2	1	Poor
User interface	Intuitive and easy to use	5	4	3	2	1	Confusing
Navigability	Easy to browse through the site and find the information that I needed	5	4	3	2	1	Not well- organized
Quality of materials	Excellent	5	4	3	2	1	Poor

What feature(s) did you find most useful? Least useful? What, if any, new features would you have liked the site to have (i.e. what would you like to be able to do over the web)?

CONTENT AND INTERFACE

How would you compare this with other course web sites you've used or seen?

Would you like to see more web sites like this available for other classes? Did it contribute to your over-all learning experience? Please explain.

What difficulties did you encounter in using this site? How do you think these could have been averted?

Can you suggest ways that the web medium can be used more effectively to present the course materials?

Please list any general comments or suggestions for improvement. What would make it worth your while to visit a class web page?

1.208/15.770 WEB EVALUATION: STUDENT QUESTIONNAIRE (Spring '97)

Please Note: The purpose of this questionnaire is to evaluate the usefulness of the class web site in administering the course and contributing to the student's over-all learning experience. Your input will be used to improve the web application and refine its user interface. It is envisioned that this prototype will be used as a basis for other course web sites in MIT. Note that this is NOT meant to replace the course evaluation which will be handed out at the end of the term. Your candor and thoughtful responses will be greatly appreciated.

USER PROFILE/ENVIRONMENT

Department affiliation/course no. (ex. Course 15): _____

For the following questions, please check all that apply:

Operating system: Windows 3.1 Windows 95 Windows NT 3.51/4.0
 Macintosh Unix(Athena) Other _____

Browser: Netscape Internet Explorer Other _____

Service provider used to access the web:
 MIT network (including Athena, Sloan PC lab, tether accounts)
 AOL Other _____

Familiarity with the web:
 No experience prior to 1.208/15.770
 Familiar with the interface (know how to browse, surf, submit forms)
 Know HTML
 Created web pages (ex. Personal home page, student presentations)
 Maintained web site/server (other than personal web pages. Ex. Course/club web site, professional site)

How frequently did you access the class web site?
 No. of times/week: _____
 Average length of each session (including access time): _____ hours _____ minutes

WEB SITE FEATURES

Please rate each of the following features in terms of usefulness. Did these contribute to your learning experience?

	Very useful		OK		Useless
Message area (on the home page)	5	4	3	2	1
Registration/class directory	5	4	3	2	1
Troubleshooting tips	5	4	3	2	1
Ability to create a comment on any course material	5	4	3	2	1
Memo to management ..	5	4	3	2	1
Assignment submission	5	4	3	2	1
Grading and retrieval of assignments	5	4	3	2	1
Search capability	5	4	3	2	1
Sort capability (ex. view material by keyword, by category, etc.)	5	4	3	2	1
Web site overall	5	4	3	2	1

Posted materials	Useful to post on the web		Any medium will do		Prefer hardcopy
Syllabus (including links to lectures and readings)	5	4	3	2	1
Lectures	5	4	3	2	1
Readings	5	4	3	2	1
Problem Sets	5	4	3	2	1
Logistics Resources (interesting links, seminars)	5	4	3	2	1
Web Notes	5	4	3	2	1

Web site response time	Very good	5	4	3	2	1	Poor
User interface	Intuitive and easy to use	5	4	3	2	1	Confusing
Navigability	Easy to browse through the site and find the information that I needed	5	4	3	2	1	Not well- organized
Quality of materials	Excellent	5	4	3	2	1	Poor

What feature(s) did you find most useful? Least useful? What, if any, new features would you have liked the site to have (i.e. what would you like to be able to do over the web)?

Did you continue to download the PowerPoint lectures even after hardcopies were distributed? Do you think it would be useful to post materials for which hardcopies are provided in class?

CONTENT AND INTERFACE

How would you compare this with other course web sites you've used or seen?

Would you like to see more web sites like this available for other classes? Did it contribute to your over-all learning experience? Please explain.

What difficulties did you encounter in using this site? How do you think these could have been averted? (For Mac and Athena users, please describe the problems you encountered.)

As regards content, can you suggest ways that the web medium can be used more effectively to present the course materials (ex. Lectures, readings, syllabus, etc.)?

Please list any general comments or suggestions for improvement. What would make it worth your while to visit a class web page?

4.184 WEB EVALUATION: STUDENT QUESTIONNAIRE (Spring '97)

Please Note: The purpose of this questionnaire is to evaluate the usefulness of the class web site in administering the course and contributing to the student's over-all learning experience. Your input will be used to improve the web application and refine its user interface. It is envisioned that this prototype will be used as a basis for other course web sites in MIT. Note that this is NOT meant to replace the course evaluation which will be handed out at the end of the term. Your candor and thoughtful responses will be greatly appreciated.

USER PROFILE/ENVIRONMENT

Group affiliation/course no. (ex. Architecture, Professional, etc.): _____

For the following questions, please check all that apply:

Operating system: Windows 3.1 Windows 95 Windows NT 3.51/4.0
 Macintosh UNIX(Athena) Other _____

Browser: Netscape Internet Explorer Other _____

Service provider used to access the web:
 MIT network (including Athena, Sloan PC lab, tether accounts)
 AOL Other _____

Familiarity with the web:
 No experience prior to 4.184
 Familiar with the interface (know how to browse, surf, submit forms)
 Know HTML
 Created web pages (ex. Personal home page, student presentations)
 Maintained web site/server (other than personal web pages. Ex. Course/club web site, professional site)

How frequently did you access the class web site?
 No. of times/week: _____
 Average length of each session (including access time): _____ hours _____ minutes

WEB SITE FEATURES

Please rate each of the following features in terms of usefulness. Did these contribute to your learning experience?

	Very useful	OK	Useless
Message area (on the home page)	5	4	3 2 1
Registration/class directory	5	4	3 2 1
Discussion forum	5	4	3 2 1
Chat room	5	4	3 2 1
Document library	5	4	3 2 1
Search capability	5	4	3 2 1
Sort capability (ex. View documents by author, by category, etc.)	5	4	3 2 1
Web site overall	5	4	3 2 1

Web site response time	Very good	5	4	3	2	1	Poor
User interface	Intuitive and easy to use	5	4	3	2	1	Confusing
Navigability	Easy to browse through the site and find the information that I needed	5	4	3	2	1	Not well-organized
Quality of materials	Excellent	5	4	3	2	1	Poor

What feature(s) did you find most useful? Least useful? What, if any, new features would you have liked the site to have (i.e. what would you like to be able to do over the web)?

CONTENT AND INTERFACE

How would you compare this with other course web sites you've used or seen?

Would you like to see more web sites like this available for other classes? Did it contribute to your over-all learning experience? Please explain.

What difficulties did you encounter in using this site? How do you think these could have been averted?

As regards content in the document library, can you suggest ways that the web medium can be used more effectively to present the course materials?

Please list any general comments or suggestions for improvement. What would make it worth your while to visit a class web page?

Appendix D: 1.125 Summary of Responses to Survey Questions

Total no. of students in class: 16
Total no. of responses submitted: 7
Percentage of responses: 43.8

No.	Message	Regis- tration	Discus- sion	Group Sign-up	Course Matls	Overall	Respns Time	User Interface	Navi- gability	Quality of Matls
1	4	3	2	2	4	3	4	4	4	5
2	3	3	3	3	4	4	3	4	4	4
3	5	4	5	5	5	5	5	5	5	5
4	3	4	5	2	4	4	3	4	5	5
5		4	5	4	3	4	4	4	4	4
6	2	2	4	3	3	5	3	4	3	4
7	5	5	5	5	5	5	5	5	5	5
Average	3.7	3.6	4.1	3.4	4.0	4.3	3.9	4.3	4.3	4.6

WHAT FEATURE(S) DID YOU FIND MOST USEFUL? LEAST USEFUL? WHAT, IF ANY, NEW FEATURES WOULD YOU HAVE LIKED THE SITE TO HAVE (I.E. WHAT WOULD YOU LIKE TO BE ABLE TO DO OVER THE WEB)?

Discussion forum was most useful. It would be great if we put actual demos.

put the readme on the main page rather than having a link to it

I found the discussion forum the most useful. Although, the messages did get a bit overwhelming after a certain time...the "View by date" choice became the most useful. Least useful was the group and project sign up forms as we did not use them at all. A new feature I would like would be a real time web chat interface...but that might only be useful in a bigger class.

Just having the discussion group is great.

I think in some ways this worked better in this context and the reason why is several

1. Personalization of individual group pages linked from it lets it work better as a central crossing ground from which individual(groups) pass and "see" each other's stuff. This also worked well with (design inquiry 4.273 with porter) I mentioned it in my review for (4.184) were all groups/assignments were linked from one page. which was the crossing ground
2. Online Tutorials and sharing of information much of it is already on the web so it coming to the course page for relevant links works great
3. most participants are well versed in using the web as a source of info
4. It worked as a pull medium, I knew if i wanted to keep up with whats up in the class I had to check it (assignmentns, meetings, new stuff, cool stuff etc.)

Discussion Forum is the most useful feature. Also, Prof William's information about the next class (if it is there, at what time etc) are useful.

HOW WOULD YOU COMPARE THIS WITH OTHER COURSE WEB SITES YOU'VE USED OR SEEN?

Great.

better

Very, very good compared to other classes.

The discussion group is the distinguishing factor I think

I didn't use it all that much but a few times it was helpful to at least see that other people were having the same problems that I was

This was great it was quite fitting for the class a few more bells and whistles would have been cool like hackers like to show off, (maybe a place on the home page where people could put images and compete to keep their image there may be cool)

Compared to 4.184 the links on the homepage were most useful, the information you wanted was much more accessible and right there first thing.

This is the best so far.

WOULD YOU LIKE TO SEE MORE WEB SITES LIKE THIS AVAILABLE FOR OTHER CLASSES? DID IT CONTRIBUTE TO YOUR OVER-ALL LEARNING EXPERIENCE? PLEASE EXPLAIN.

Yes, yes, yes! I could access materials, references and information from anywhere, anytime.

it's convenient, and in a computer based class yes, it contributed to learning, but sometimes it's a pain to have to be near a computer to be able to get work done

Yes. I think every class should have it. The discussion forum is invaluable, as well as the useful links.

definitely, as i mentioned in the 4.184 comments

This is good.

WHAT DIFFICULTIES DID YOU ENCOUNTER IN USING THIS SITE? HOW DO YOU THINK THESE COULD HAVE BEEN AVERTED?

None that really bothered me.

Sometimes the discussion section took awhile to load (independent of connection speed).

It was down or nonexistent a few times

Not too many difficulties,

No real difficulties. The only problem I had was not able to compose a new topic as a separate topic. It always used to come under some other existing topic. I did not bother much to explore, but I may be wrong.

CAN YOU SUGGEST WAYS THAT THE WEB MEDIUM CAN BE USED MORE EFFECTIVELY TO PRESENT THE COURSE MATERIALS?

This was wonderful!

It's pretty good as is. Unless you can arrange a video link so that the professor can teach virtually and I can have class at home. :)

Use VRML and JAVA and JAVA SCRIPT on the page that's what the course was teaching, so show us some examples flaunt it! All hackers see something cool they try to figure how it is done and do something better,

I think collaborative coding mechanism, (like our attempts a collaborative papers in 4184) may be a good idea. put some simple dumb code up there and have a goal in mind have individuals contribute to it with the objective/rewards for keeping it short minimal lines and cool adding functionality. Ill bet no one would screw it up no one wants to be the lame duck.

PLEASE LIST ANY GENERAL COMMENTS OR SUGGESTIONS FOR IMPROVEMENT. WHAT WOULD MAKE IT WORTH YOUR WHILE TO VISIT A CLASS WEB PAGE?

More easy to learn tutorials.

a "tip of the day/week" ?

Overall very good. I liked it.

I mentioned above collaborative coding, and cool stuff, bells whistles, set standards of quality for the students to strive to, give handy tips on making better web pages, vrmf worlds, or provide cool java code for downloading and incorporating into students work. I think it works better in the context of this class than others... I am not entirely sure why. ill have to give it some more thought

From the nature of this course, both these last questions are difficult to answer. Availability of problem sets and links to useful material is what makes it interesting but, that is provided by almost all class home pages.

Appendix E: 1.208/15.770 Summary of Responses to Survey Questions

Total no. of students in class: 32
Total no. of responses submitted: 29
Percentage of responses: 90.6

No.	Msg	Reg	Tip	Com	Memo	Sub	Grad	Srch	Sort	Overall
1	5	3	1	2	3	4	5	3	2	4
2	5	2	1	1	4	3	3	2	1	3
3	3	2	1	2	4	2	3	2	2	3
4	5	3	2	3	5	5	2	2	3	4
5	4	2	3	3	3	3	3	1	2	3
6	5	4	2	2	5	5	5	2	3	4
7	4	2	2	3	1	4	4	2	4	5
8	4	4	2	1	5	5	3	3	2	4
9	1	1	1	1	2	1	1	1	1	1
10	5	4	3	3	3	1	2	3	3	4
11	5	3	3	3	4	5	5	3	3	4
12	3	3								4
13	5	2	2	2	5	4	4	1	2	4
14	5	1	3	3	4	2	3	4	2	3
15	5	5	3	3	3	1	1	5	5	5
16	3	2	3	2	5	4	3	2	2	4
17	5	3	3	3	1	5	5	3	3	3
18	4	2	1	5	3	4	5			4
19	4	2	4	3	3	5	3	4	5	3
20	5	5			3	4	4	4	3	5
21	4	3	2	2	3	3	4	2	2	4
22	5	2	1	3	1	2	1	2	3	3
23	5	5	3	5	2	4	4	4	2	3
24	5	4	5	4	4	5	4	3	4	5
25	5	4	3	3	5	5	5	2	2	4
26	5	1	2	2	4	2	2	3	3	3
27	5	3	3	5	5	5	5	2	3	4
28	4	3	4	3	5	5	5	4	4	5
29	5	5	2	1	4	4	4	1	4	4
Average	4.4	2.9	2.4	2.7	3.5	3.6	3.5	2.6	2.8	3.8

No.	Syl	Lec	Read	PS	Log	Web	Resp	Inter	Nav	Qual
1	4	5	5	5	4	4	3	4	4	3
2	4	1	1	5	3	5	3	4	5	4
3	3	1	2	2	5	3	4	4	4	3
4	5	2	5	5	4	4	5	4	4	4
5	3	2	2	4		5	4	4	3	4
6	4	5	5	5	4	3	5	5	5	5
7	5	5	5	5	4	4	5	5	5	4
8	3	5	1	1	5	5	5	4	4	4
9	1	1	1	1	3	1	1	4	4	1
10	5	5	5	5	5	5	2	3	3	3
11	3	3	3	4	4	3	4	5	5	5
12	2	2	2	2	3	3	5	5	4	4
13	5	1	4	4	3	3	4	5	4	4
14	5	5	5	5	5	4	2	4	3	3
15	5	5	5	1	5	5	5	5	4	5
16	4	5	5	5	3	3	3	4	4	5
17	5	5	5	5	1	2	5	2	2	5
18	5	5	5	5	4	4	4	3	5	4
19	5	5	5	5	3	4	3	3	4	4
20	3	4	5	5	3	3	5	5	5	5
21	1	1	1	1	5	3	2	3	3	4
22	5	5	5	5	4	3	4	4	4	3
23	5	5	5	5	5	5	3	4	2	3
24	5	3	5	4	3	4	5	5	4	4
25	3	5	5	5	5	4	5	4	4	4
26	4	1	2	4	5	3	4	5	3	3
27	5	3	3	3	5	5	4	2	5	4
28	5	5	1	3	5	5	5	5	4	5
29	5	4	1	5	4	4	4	5	4	5
Average	4.0	3.6	3.6	3.9	4.0	3.8	3.9	4.1	3.9	3.9

WHAT FEATURE(S) DID YOU FIND MOST USEFUL? LEAST USEFUL? WHAT, IF ANY, NEW FEATURES WOULD YOU HAVE LIKED THE SITE TO HAVE (I.E. WHAT WOULD YOU LIKE TO BE ABLE TO DO OVER THE WEB)?

Downloading readings, hwk sets, and notes was very useful. Although I would prefer having a text book. Uploading homework was easy. However, preparing homework for submission was VERY time consuming. I'd rather write out equations and hand them in.

1. Improve syllabus to be updated and have links to each class lecture and handouts.
2. Improve interface for assignments and memo to mgmt to allow faster search and access.
3. Include more links to other logistics sites.

Lecture notes were most useful.

Downloading the class readings was not useful, I still read my stuff on paper so I have to print it anyway. For problem sets then it is more efficient because they are short. The web site should not be an excuse to deliver material late to the students, a couple of times I wanted to read the lectures and they were not posted on time.

Text box (kind of like this) for assignment submission was useless. I was using equations and spreadsheets in Word for my problem set. How is this supposed to go in a text box?

I had some difficulties in finding out how to find out the grading of the problem sets. but that was at the beginning.

Posted Materials are most useful.

ability to print lecture notes and reading notes on athena. printing on athena is free, you can print double sided, and is not a hassle for most MIT students. Sure for Sloan students, MS based documents are easy, but having the documents available for the rest of MIT is also important.

Basically, I used the website as my repository for course material. I used it primarily to download readings and problem sets, and then sometimes to reference course administrative details. I didn't use it to network with other students taking the course but I think that's mostly because I'm not a Sloan student. In general, I was very pleased with how the website was implemented as a tool for the course, even though I didn't take advantage of all of its features.

web notice

Easy to retrieve and submit assignments. It would be nice to have a message at the home screen when certain assignments have been graded and results posted. A summary grade page (with all assignments and scores) would be nice to have as well. I really liked this different format for classes ... the web site was very easy to use.

Listing class members alphabetically would be useful.

The web concept worked very well, especially if you were an off campus student, who was using the "distance learning" concept. For on - campus people, however, I mostly downloaded and printed out everything that I needed on the web. For me, I found that the web just placed the cost of printing upon me rather than that of the class. Actually, doing the homeworks and uploading on the web was not that bad. I thought it to work well and it turned out to be relatively simple. The problem was that I could not upload anything from home properly. I always had to try to upload it twice and then email it anyway, because I never knew if it had worked. I also thought that the memo to management and the responses worked perfectly and something like that could not have been done without some sort of medium like the internet.

It was very time consuming to have to type Problem Sets.

Most useful: message area. Everything else: so-so.

Because it is easier to read hard copies, most material needed to be printed. Since printers only print single-sided, this wastes paper.

Most - download of readings (I use TCPIP!), submission of assignments, retrieval of grades
Least - syllabus, FAQ

I liked two things most. The readings/notes being online saved me money, paper and it made updates and corrections possible. A true "living" work. I also liked the memo area where at a glance you knew what was coming up. Least - turning in HW had to be done at school for me and that was inconvenient.

I think that the website is completely useless.

Most - having lectures on web will make it possible to use parts later for presentations - that is excellent.

On memo to management - it would have been nice to import file, not just cut and paste.

Some headings were confusing. Did not actually correspond to where you went on the page. Also some features worked weird: i.e. assignments by name or by assignment.

News was good. Access to soft copy of HW sets. I would have liked class notes/readings to contain the Excel versions of spreadsheets available in Excel.

Homework return was useful. It was also convenient to submit h/w on the web. (Although I know some of the students who wrote out the h/w on paper found it inconvenient).

Assignment were most useful. The site should be accesible from the Sloan web pages (so it can be accessed from anywhere without having to recall the exstrange address).

DID YOU CONTINUE TO DOWNLOAD THE POWERPOINT LECTURES EVEN AFTER HARD COPIES WERE DISTRIBUTED? DO YOU THINK IT WOULD BE USEFUL TO POST MATERIALS FOR WHICH HARD COPIES ARE PROVIDED IN CLASS?

I didn't download, but it was good to have them available in case I missed class.

I continued to download them. It is useful.

No I did not. Not really.

No.

Yes I continue to download them! It is useful to have a n electronic format of each file: this is for following use of this material.

I did not download the lecture once hardcopies were distributed. It is probably useful for cases when one has missed the class, then you have the oportunity to download the material given in class, but it is a marginal contribution, not that important (we are meant to go to class after all, right?).

No. Yes.

Yes. Yes.

No.

No

NO. YES.

I did not but I'm not sure if I would have if they weren't distributed in hardcopy in class. Strangely enough, I learn best from careful reading of a textbook. I only rely on class to reinforce issues I've had time to think over on my own and to have interaction. I would suggest that if hardcopies are handed out in class, they're printed two-sides so as not to waste so much paper!

No. Yes, so that students who wish to make note and changes can do it on the electronic copies and re-print

I got in the habit of only getting the lecture notes, since the material in the power point presentations closely followed the lectures

no I did not continuue to downlad lectures. Actually I discontinued downloading them even before hard copies were distributed. I think it is useful to post them on the web because sometimes one might need them.

No ... took too much time to download. Much easier to get copies as I walked in classroom than to download AND printout

Yes. However I think it would be more convenient if the items could be read directly using the browser without having to download the file. This is particularly useful given the enormous size of some of the files that were posted. This can be done effectively using a plug-in such as QuickView Plus by Inso. QVP allows you to read Excel, Word, and PowerPoint documents (along with documents created by an additional 100+ applications) within the browser environment.

No. After the hardcopies were provided, I ceased downloading the lecture materials. Actually, I just downloaded the readings most of the time anyway.

Yes, still post items even if they're distributed in class. They provide a great future reference. Once Prof. Sheffi finishes editing them, they'll be even more valuable!

No. No.

No. Yes, some people may want hardcopies.

Wrong question! Since PP lectures closely followed the chapters, I found it most useful to download and print chapters and take notes on the wide margins. Didn't use PP in hardcopy or download. Instructors should exploit this! I liked this best.

No. Yes.

No. No.

Yes. Yes.

I don't think so. Hardcopies should be enough.

No. Kinda useful, for when I miss class or lose one.

No. Yes, sometimes you lose your hardcopy. It is useful but not critical.

NOTE: for the first 4 posted materials above which I marked '1': Actually, it is useful to have a hard copy and have it on the web.

I like to have a file version of class materials, except for the text.

HOW WOULD YOU COMPARE THIS WITH OTHER COURSE WEB SITES YOU'VE USED OR SEEN?

Best I've used at MIT (by far)

NA

This is the best example I have ever seen among many.

Ok, but not very easy to browse.

This was good, but I had more trouble initially here while I had no trouble at all with the other course.

It is the first course web site I use

Nicely organized. Good to be able to download stuff and not to have to pay for it. We paid in convenience, however.

Best one I have seen so far. All reading materials and lectures are provided. Awesome!

I think the web page is good and well done. Easy to use and helpful. May be sometimes is difficult to download stuff and print it out because many people have old printers and PCs.

N/A

Very good

There was a web page used in my 15.081 course last semester and it was horrible. I could only access the page from an Athena workstation. The content was poorly organized. Although I also used it as a point from which to download course lectures, it did not have the wide array of resources that the 1.208 page did.

o.k.

Definitely the best. A very good use of the web for teaching.

This is the best web site compared to the ones in other courses.

Haven't seen any other.

My biggest gripe regarding content is not web-related: it is not particularly helpful for us as students to be given access to book chapters that have not been proofread. This is irresponsible in any educational environment. Unfortunately, it has not been uncommon in this course. While the web does allow for easy distribution of corrected versions, the time spent managing the information (updating downloads, etc.) is excessive and not productive.

Awesome. I have a nother class (15.057) where the web is used in the same, extensive manner. I think I like the setup of this one better.

Excellent.

Most extensive

N/A

Much more advanced and useful. Excellent distribution medium (don't listen to those who grumble about printing out chapters, they don't realize they are saving the cost of a hardback book). Successful, although simple, interaction through memo exercise. Good security and response time. Make sure to post files zipped for faster downloading.

More in depth, complete. Used more thoroughly.

Bad. Files are too large to download. It doesn't bring anything new and valuable to the class. It's basically just to have technology.

This is the best I've seen.

The most complete and complex. Not the easiest to use though.

By far the best - most thorough, most up-to-date.

More an integral part of the class, mainly due to h/w return/submission.

This is the best of all I've seen.

**WOULD YOU LIKE TO SEE MORE WEB SITES LIKE THIS AVAILABLE FOR OTHER CLASSES?
DID IT CONTRIBUTE TO YOUR OVER-ALL LEARNING EXPERIENCE? PLEASE EXPLAIN.**

Yes. I can't say that it improved my learning, but it did help getting course info, etc.

I think it is useful for delivery of information. i.e. lectures, handouts, news, etc.

Yes. It is good to have the material on the web if it is available on time and you have the appropriate hardware to download and print it.

This was good, but I had more trouble initially here while I had no trouble at all with the other course.

It was kind of new to download info from the net. But it did not contribute to any additional learning experience as far as I see it.

Yes I would like to have EACH CLASS with its own web site where students can have access to any kind of information and be able to get informed about any change or updated.

Not really. I felt I got my material too late to study it before class, I had problems submitting material from home (via AOL). It made me waste more time than anything else. I guess it contributed in me learning what bugs the internet still has, and how home pages can be used creatively, however that is not what I took the logistics course for.

It was nice to have the memo to management piece as a way to get feedback from classmates.

Yes, more please. Web site was always up to date and well maintained. Many other courses have old stuff or even things from previous semesters. This course never suffered from that. Helps to have someone dedicated to do this, not just the TA.

I think it was helpful and contributed to the learning experience.

Yes

Yes. Yes. It was easily accessible from any web surfer. By checking it regularly, any announcements could be seen. I could check old material from weeks back without any hassle. The memo to management tool was very effective, and not easily possible otherwise.

I don't know if it contributed to my learning the course material per se, but it facilitated learning in that I could always reference it if I had a question about the course and find the answer I wanted.

Yes. web site like this can aid access to learning material, or at least serve as a backup mood to obtain lecture notes/PS in case when student can't come to class

Yes- I would especially like to be able to access this web site once I've graduated.

Yes. It was very convenient way to download readings, to post homework sets, etc.

Would like to see more of this. Liked that it was generally fast, and I could usually find what I needed very quickly. I'm not sure how much it added to the overall learning experience, but made my life easier (could always get handouts, lectures, readings from home).

I find it to be a convenient complement to the experience, but as I experienced it in this course, I am not convinced it is better in any meaningful way. If anything, it has frustrated my learning experience to have to go to a website everytime I wanted to read a chapter of the text. The bound book is still superior in convenience.

I think the web site is a great place to go for vital information (e.g. when things are due, dates to remember, people's email addresses, a class list, etc). The web site address is a bit confusing though.

Yes, but if I had to log-on through AOL, I'd probably hate it. Having an Ethernet hook-up makes life very easy.

Not really needed, not really; kind of neat, but other than the memo to management exercise feedback mostly just duplicates standard class features; only really useful if there are no lectures.

Yes but only if readings, PS, etc. are also distributed as hardcopies.

YES but instructors must get a new paradigm as well as students. Instructors can overwhelm students with tons of data and information. Also, our class had problems with the timeliness of posting so that they were available before class. I realize the huge amount of work that went into this site but the next stage, student manipulation and access to data will be even better.

Yes. No. It was convenient, but I can't say it added to learning. Still had to read, do p-sets and attend lecture. Though I will add that since Prof. Sheffi basically regurgitated the lecture notes and reading provided, I skipped class more often (without missing much). Wouldn't have been possible with case-discussion based classes.

No. It didn't contribute at all with my learning experience. It just caused trouble and waste of time.

Yes. However, assignment submission was a pain - and made value of assignments go down.

Yes, this is a great and very useful resource. You can keep in touch with everything that's going on in class, even if you miss a couple. Overall makes life easier for students and also for TA's.

Yes - it was very helpful, although sometimes it was unpleasant to be FORCED to deal through the site. I always knew I could keep up with what was going on and due.

Don't really feel strongly one way or another. Sometimes it was convenient, sometimes inconvenient, esp. when server was down, I couldn't access tether, etc.

Yes to both questions. It helps, in general, to keep you more "connected" to the course (in case you missed something because arriving late or being absent).

WHAT DIFFICULTIES DID YOU ENCOUNTER IN USING THIS SITE? HOW DO YOU THINK THESE COULD HAVE BEEN AVERTED? (FOR MAC AND ATHENA USERS, PLEASE DESCRIBE THE PROBLEMS YOU ENCOUNTERED.)

Uploading the Memo to Mgmt. I couldn't submit a document with any formatting. I could have provided an HTML file, but that didn't appear to be an option. I had trouble uploading my last suggested problem. It was a zip file. Maybe that was part of the problem. I never got it to upload.

I had MANY problems when converting the word files and powerpoint files to MAC format. They were illegible and distorted. Therefore, I downloaded them in a PC and then print them in hard copy. I had MANY problems when converting the word files and powerpoint files to MAC format. They were illegible and distorted. Therefore, I downloaded them in a PC and then print them in hard copy.

My hardware was not appropriate for the kind of graphics presented in the material.

Materials were not downloadable from athena. I know other courses in Sloan where I can print materials from both unix and windows platforms.

None. Just a complain regarding the response time: I believe it should be improved.

Sloan gives me an AOL account I can use from home. I could not submit my problem sets through AOL (either the browse or submit button did not appear). I guess it could be solved by making sure the university distributes systems that are compatible with each other.

No real issues.

As I said before, some difficulties in printing the material. That'all.

Not much.

Printing files. Uploading assignments.

The site was worthless for posting problem set solutions. In all of my write-ups, I had graphics, charts, tables, etc. that would not transfer easily. After being disappointed with trying to post PS1, I gave up on it after that and turned in hard-copies. Besides, it also felt more reassuring to put the document in the hands of the TA than to rely on an electronic submission that may or may not have been successful. I use both a Mac and a PC on a regular basis and did not have any difficulties with compatability except for with compressed/zipped files, which I could only unzip on my PC.

The reading material, PS sets are microsoft office based => have to hunt for PC to read them. Having a txt based version may help

The problem was with corrected problem sets. Maybe it would be better to receive hard and soft copies of the corrected sets.

Occasionally it seemed hard to hit the MIT server. Also, there was sometimes an extended waiting period when submitting assignments (understandably).

I could not upload. That was the worst.

None.

None

I use PC with TCPIP through MITnet. I had zero problems. My one disappointment was that formatting on our memos was lost in posting.

Submission. Compatibility. I'm not sure why I couldn't "click and attach" files to website on AOL as I do with email attachments when submitting HW. You could do this with Netscape. It may be AOL, which Sloan will NOT be using next year.

Difficult to access. Difficult to download. Difficult to print. Therefore I did not do it.

Sometimes the info wasn't available on web before day of class-(class notes at the first). This was a problem.

Hated not being able to post my memo to management as a Word file. It lost all formatting.

I was never able to upload an assignment from home - Win 3.1; MITnet-PPP, Netscape, Word file. I didn't like the way we were forced to enter the management memo as text, not Word doc.

It was very slow to access from home, esp. powerpoint. If everyone had ethernet @ home it would be better.

It took good time to download the text and print it. I could never submit assignment on the web, because I only have AOL browser, which does not have capability for that operation.

AS REGARDS CONTENT, CAN YOU SUGGEST WAYS THAT THE WEB MEDIUM CAN BE USED MORE EFFECTIVELY TO PRESENT THE COURSE MATERIALS (EX. LECTURES, READINGS, SYLLABUS, ETC.)?

Can't think of any improvement over what is being done.

Some materials should be put in HTML format as web pages, without the need to download and then look at it off-line. Use of pictures and graphics.

Anything that is informational or short, I believe is useful to be put on the site. For studying I think most people prefer paper and there are still economies of scale (in cost and Time) of printing material centrally rather than having each student do it at home.

Mac problems weren't related to the size of the files. I suspect that PCs had the same problems unless they were killer machines with lots of RAM and a relatively new printer.

Nope.

It is fine as it is.

No

Frankly, no. I thought it was a great resource. The only other thing I could think of is maybe putting some more meat on the logistics resources section like, say links to third party logistics companies websites or something. (Just brainstorming here)

I cannot think of other material that could be presented on the web.

The Lecture and Reading Numbering should coincide with the actual class sessions.

Wrong question! You should think about how the website can be integrated into the whole teaching experience. This actually happened somewhat with the similarities between the advanced PP class presentation and the text we downloaded. When readings, lectures, and presentations move in parallel then there is a lot of reinforcement and faster learning. For example, the PP "show" can make realtime demonstrations of data tabulated and discussed in the chapter. Same color pictures, format, etc. Watch how it is used.

Maybe if there were a "discussion" section, in which participation could go toward class participation (for grading). This would have been great since there wasn't a lot of chance to really participate in class other than asking questions.

Take the website out of the class.

What about documenting Q&A from the lectures? A full-course syllabus, with dates of all assignments, would be nice.

Not given the current infrastructure.

PLEASE LIST ANY GENERAL COMMENTS OR SUGGESTIONS FOR IMPROVEMENT. WHAT WOULD MAKE IT WORTH YOUR WHILE TO VISIT A CLASS WEB PAGE?

The idea is good but there were many problems with the material or assignments not received on time to be prepared for the class.

This is just a comment. The cost of use of paper for printing is kind of transferred with web sites. If I am using my own printer I'll be more careful w.r.t wasting paper.

I think it is more a case that it is still inconvenient to access Internet from home (how many times do you want to logon to download a lecture and your service provider is down?), so I would rather have my material printed on paper where I know I will have there when I want to read it or study.

Good for late breaking news.

Necessity. If the web page is merely ornamental and not essential to the class, I probably wouldn't use it.

Like the web-page used this semester, a good web-page for a course should be a one-stop shopping location for all your questions regarding the course and should also serve as a repository of course material. This eliminates paper waste. I can appreciate the work that goes into supporting this interface! Although there were some problems with course administration due to website problems, I think it was well worth the effort.

Getting vital information is the key. The entire memo to management concept worked extremely well. Getting the uploading to work better would be better.

The ability to skip lectures, otherwise it's mostly redundant.

WRT the "posted material" question on the other side. I think the more of those items are on the web, the more useful it is to have the last item on the web too. The choices are not independent of each other. Glad I was part of the experiment!

Better summary/index to lectures, and to readings on the menu or index page. I wasn't sure what ch 11 material was before taking the time to download and open.

Take the website out of the class.

Was the security necessary? Is there a way to set up such that any PC that's been authorized before is always authorized.

Consider radically changing class format. Class is really web-based, lectures are only once a week or 2 weeks, or for a special guest, and the class really takes place on the web. Now it's kind of a double class: all the elements of a traditional class, plus most of the elements of web-based learning.

The first page, the assignment, the lecture notes and memo to management are the important parts. Do not create funny but not useful features.

Appendix F: 4.184 Summary of Responses to Survey Questions

Total no. of students in class: 8
Total no. of responses submitted: 6
Percentage of responses: 75

No.	Msg	Reg	Doc	Chat	Srch	Sort	Overall	Resp	Inter	Nav	Qual
1	3	4	2	1	3	2	4	3	3	2	3
2	4	4	5	2	2	5	5	4	5	4	5
3	3	4	3	2		3	3	4	3	2	3
4	4	5	3	3	4	5	4	4	5	4	4
5	3	3	2	1	4	5	4	4	4	5	4
6	2	2	4	2	3	3	5	3	3	2	4
Average	3.2	3.7	3.2	1.8	3.2	3.8	4.2	3.7	3.8	3.2	3.8

WHAT FEATURE(S) DID YOU FIND MOST USEFUL? LEAST USEFUL? WHAT, IF ANY, NEW FEATURES WOULD YOU HAVE LIKED THE SITE TO HAVE (I.E. WHAT WOULD YOU LIKE TO BE ABLE TO DO OVER THE WEB)?

I guess the project page might be most useful, because it may enable us to collaborate to work on the project even from a remote area. We'll see later how it actually works out. I found the Document Library least useful. It's not because of its feature, but because of that the context of Document Library is unclear. But some documents which should seemingly belong to Docmunet Library are listed in Discussion.

The best feature is the registry (For contacting people) and the discussion forum. In general I would prefer a more communal website and let domino do what it does well and it would be a tool for discussion threads, not a the main structure/face, I suggest a web site that is more customizeable by the participants, with links to tools such as a domino site for discussions. See below for comments on the discussion threads. The ability to embed html in the comments was very cool but if domino is supposed requires you not know any html, then its a paradox. Not many people used this ability and I think that value was under realized.

One small point is that the text is a little small - Arial or Universal font might work better and could perhaps be read over pictel.

The most useful is probably the library and the discussion area

the discussion (and its categorizing) was good if there was more participant use

HOW WOULD YOU COMPARE THIS WITH OTHER COURSE WEB SITES YOU'VE USED OR SEEN?

It seems a little bit disorganized, compared with the 15.563 course web site. A little change such as giving a date and author's name immediately after the title makes it look a lot different. Some contents posted look irrelevant to the page in terms of context. For example, I think syllabus and participants should go to the Home page, instead of listed under the Document Library. This makes the context of the Document Library unclear, and makes the Homepage look like having less useful information.

Pretty good, but having had it in two courses this term I must say, it is much too much the same between classes that have extremely different content and needs. and I think the value of domino must be weighed against the effort, and monotony it struggles with to do thing that could be much easier and better accomplished with simple html and cgi. 4273, Design Inquiry (porter) used simple cgi scripts to thread comments wonderfully on one page, fast easy convenient. Secondly in other courses 1.125 and 4.273 groups or individuals made personal web sites/pages and linked into them, (this provides the personalization that is so important)

Seemed pretty much up to par graphically. The ambitions for the use of the site were very high and I think the site responded well for a while.

better than average

much more features to promote interaction rather than just a presentation of topics. that was great!

useful: threaded discussions

not useful: having to leaf through many pages

**WOULD YOU LIKE TO SEE MORE WEB SITES LIKE THIS AVAILABLE FOR OTHER CLASSES?
DID IT CONTRIBUTE TO YOUR OVER-ALL LEARNING EXPERIENCE? PLEASE EXPLAIN.**

Yes, I'd like to see more web sites for other classes. Our web sites are useful, convenient to communicate with other people in class, or easy to post your opinion, suggestion, questions, etc. But I don't think that the web sites actually stimulated my mind in terms of using the web. The information posted there could be communicated orally, or in the face-to-face conversation. I think it would be a good idea to post our reflection or reaction from each session on the sites, so we could later know what other people thought about the class.

I would like to see it available for all classes, Mas.837 Collaboration between Humans Computers and Things could have greatly benefited from this. It took them all semester to get a cgi script working to submit a url. and then there was no active comment mechanism. but lots of need for comment and solicitation within the course. It contributed greatly to my learning experience because I am very interested in web as a medium and the critical look at it as a medium became clear, especially domino. Which I'm not knocking, but it is definitely good for some things but not for others

I think chat rooms would be very useful for instruction as a learning supplement and a place for students to review and ask questions.

Yes I think it has been a very useful device and it gave me access to the system even from very far locations

yes, but there must be a real commitment to using it.

yes.it served as a reference point.

**WHAT DIFFICULTIES DID YOU ENCOUNTER IN USING THIS SITE? HOW DO YOU THINK THESE
COULD HAVE BEEN AVERTED?**

I sometimes got confused the Discussion page with the Document Library page. Both pages have too many categories. It would be a good idea to categorize the Discussion, for example, as reaction from the previous session and response to reflection posted, questions, other comments, etc. It would also be good to have date and author's name immediately after the title, or category name, so you can see what is new.

time delays, in locating and the domino engine was kind of slow and became moreso as the content base grew. the next and previous and collapse all were painfully slow (i would probably prefer the discussions to generate a frames page with the topics on a side menu and the discussions threaded on the main window so I could see all topics. The overall extend of the content became difficult to follow, How much is there, how do I know I am seeing it all? there were. Big problem with frivolous links like took a page to explain that a ">" was supposed to be an appostrophy or "I agree" as compared to pages that were 4-5 pages of printed content, I think the easy solution is a single page of threaded comments, where you can see in a glance an I agree or an explanation instead waiting for the domino engine to do its magic and be dissappointed to see

Discussion profiles became so dense and unspecific in their catagorization that it became necessary to simply print the whole site and review it as such.

Editing a document to be posted in the discussion area

sometimes hard to find things, eg card wall demo

AS REGARDS CONTENT, CAN YOU SUGGEST WAYS THAT THE WEB MEDIUM CAN BE USED MORE EFFECTIVELY TO PRESENT THE COURSE MATERIALS (EX. LECTURES, READINGS, SYLLABUS, ETC.)?

Contents themself are great. But I think the way theyare posted could be improved. For example, Communication-First Thughts. Because I was in class when Prof. Porter explained this, I know what the document is about. But if I hadn't been in class that day, I'd probably not have understood the context of the document. I'd suggest that:

- the Homepage contains the course schedule as well as brief description of each class session;
- list related or required reading documents for each session, if any;
- post the document in the Document Library; and
- cross-link the list of readings in the course schedule and the document itself in the Document Library.

For presenting course materials, I think that we must use the medium for what is best at (if the course is about the web as a medium its wonderful source for learning) Its a great medium for comments and asynchronous threaded discussions (whcih would not occur nearly to that extent ohterwise) It is pull medium so that must be considered whenever you are "presenting" material. Whos going to look?, why? anyone can say well my browser does not work. I think it is not a good way to present material, because of this it is a way to pull material and it must provide an incentive/content to work as such.

Think about what people look for when they approach a site such as this. General facts for brousing are good only to the individual getting up to speed with the material. For somebody who is trying to analyze the utility of the this information with respect to a specific goal, it becomes difficult and slow to navigate. I am not exactly sure what to suggest in terms of a remedy, however, attention should be given to how the website can do more than a document library by using the intelligence of the computer effectively. Ie. Supplemental catagorization by project (goal, problems, etc)

The most recent achievements and material should be posted in the home page with more evidence

PLEASE LIST ANY GENERAL COMMENTS OR SUGGESTIONS FOR IMPROVEMENT. WHAT WOULD MAKE IT WORTH YOUR WHILE TO VISIT A CLASS WEB PAGE?

It would have been very helpful, if the detailed course schedule was updated on the site periodically. The Document Library could be categorized by date, and reading materials could be put under the corresponding class date. I'd like to know other people's reaction to classes through a class web page, rather than obtaining documents and information for the course.

I think a common pitfall of most software (especially collaborative software) is that it tries to standardize/ generalize many activities that seem common to a purpose (to reach a wider market) rather than customize to the specific needs of the learning environment and subject content. The tools and division of content are very useful but need to be customizeablbe and built from within and by the participants they are the ones who know the needs. It is much like architectural programming (our client is our best source to understand the problem) I feel that the domino web face is good to a limited extent but becomes limiting. I hope I dont sound too harsh, I think your work has been quite commendable. I am very interested in seeing your thesis, and I have much more I would like to say but the medium is getting too me right now. So if you have the time to hear more and share some more thoughts, I would love to meet for coffee or lunch.

To highlight the most relevant or recent topics in order to have a more immediate access to the focus of the most recent discussions

if there was crucial things there that could not be found elsewhere (ie in class)

a role for maintenance of the site to highlight content at an editorial level so that one could visit and go right away to what someone they trust thought was important.