

Class Web Page

Putting 21W.732 Students' Work Online

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21W.732
M.I.T.

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Executive Summary

Professor Andrea McKenzie is a new instructor at MIT, and she has requested a method for posting the best of her students' work on the Internet. She would like future students to have examples of good work to read, as well as providing current students a means of taking pride in their work. As her time is limited, she requires a fast, efficient, and easy method of posting the work that is compatible with all platforms. Team Indecision divided Professor McKenzie's request into four major problems: domain space, file format, page organization, and file transfer.

Research methods

- Domain space: Investigated possible domain spaces by contacting the MIT Writing Department webmaster and through web research.
- File formatting: Preferences were determined through a survey of 21W.732 students, and practicalities of formats were ascertained through web research.
- Page organization: Preferences were determined through the same survey of 21W.732 students.
- File transfer: Researched programs and issues on MIT's Information Systems website.

Recommendations

- Domain space: Store student work on the 21w.732 class locker (domain is: <http://web.mit.edu/21W.732/mckenzie/>).
- File format: Have students email documents to Professor McKenzie in a popular word processor format. Use Adobe Acrobat to convert the documents to PDF.
- Page organization: Model the page after existing pages on the <http://web.mit.edu/writing/> domain. Use sample page at <http://web.mit.edu/jpeters/www/21W.732/> for reference.
- File Transfer: Use the ssh function of the MIT-licensed SecureCRT program to connect to Athena and transfer files to the domain space.

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1.0 Introduction

Dr. Andrea McKenzie, a professor at the Massachusetts Institute of Technology, would like to put the course work of her students on the Internet. This would allow students and their friends and family to take pride in their work, as well as providing future students references that they could look to. As a new member of the MIT faculty, Professor McKenzie is inexperienced with Athena, the school's computer system. Team Indecision has researched and proposed a solution to Professor McKenzie's task of putting students' work on the Internet.

In order to put students work on the Internet, Professor McKenzie must first obtain domain space (a place on the Internet) to put the web page. The professor then needs a method for converting students' work into a web-compatible format. She must also design and create the web page HTML files to make the work available. The professor must then transfer the HTML pages and the students' work from her personal computer to the Internet domain space. Additionally, Professor McKenzie would like the solution to be as time-efficient as possible, and to be compatible with all computer operating systems.

1.1 Research Methods

Team Indecision has researched into each of these areas for the purpose of recommending to Professor McKenzie the best and most efficient way of putting her students work on-line. Team Indecision used resources on the Internet and on MIT's web page to determine possible Internet domain spaces. Team Indecision investigated resources on the Internet and various word processing and file-conversion programs to find methods of converting students' work to web-compatible formats. In order to recommend a style and layout for the page, Team Indecision looked into standard formats and templates in the web pages of MIT's Writing Department as well as similar pages on the Internet. Team Indecision used MIT's Computing Resources web pages to find ways of transferring the files from the professor's computers to the Internet domain space.

2.0 Analysis

2.1 Internet Domain Space

To put a web site on the Internet, Professor McKenzie must first obtain a place on the Internet in which to put it. This is called Internet domain space. Three obvious choices of Internet domain space which Professor McKenzie has available to her are MIT personal directory space, MIT Writing Department space, and free domain space available from various web companies.

2.1.1 MIT Personal Directory

Every member of the MIT community has a personal directory where he or she can place web pages. When an account is created for a new member of the MIT community, the account is created with a "www" directory. This "www" directory is visible from the Internet. Professor McKenzie need only copy the web page files into the "www" directory in her account, and then the web page would be on the Internet at <http://web.mit.edu/acmcken/www/>. This personal directory, however, will be removed soon after Professor McKenzie leaves MIT, and hence the web page would cease to exist [1].

2.1.2 MIT Writing Department

The MIT Writing Department has Internet domain space available for each class. 21W.732, the course that Professor McKenzie is currently teaching, has Internet space at <http://web.mit.edu/21w.732/>. As an instructor of this subject, Professor McKenzie has privileges to read and write files in this directory [2]. Therefore, she could create a sub-directory, for example <http://web.mit.edu/21w.732/andrea/>, in which the web page could be placed. This course locker is permanent, and hence the web page could exist there indefinitely.

2.1.3 Commercial

The Internet is filled with a variety of companies that provide free Internet domain space (Geocities, Tripod, and XOOM, for example). The web page could also exist on these domains indefinitely. However, the web page would then have no association with MIT.

2.2 File Format

An important feature to consider when putting students' work on the web is the file format to use. Using Professor McKenzie guidelines that the solution be easy to implement and reflect student preferences, Team Indecision first determined criteria for an ideal file format

solution. An ideal solution is one that can be converted from other document formats easily and quickly, and one that students and parents can easily access with commonly used software on many different operating systems. The solutions we explored for possible file formats include HyperText Markup Language (HTML), Adobe® Portable Document Format (PDF), and Adobe® PostScript® (PS). Each of these formats consists of a computer language which is used to “markup” text and images in a document to provide a specific layout of the document when a program which interprets the language opens it. The languages usually involve wrapping objects (such as text) in “tags,” which a program later uses to interpret attributes and placement of an object.

2.1.1 HTML

The first solution that Team Indecision considered is using HTML format to display documents online. This solution targets a very large audience as almost every existing operating system (and every mainstream operating system) provides free software for interpreting HTML documents. HTML documents also generally load very quickly and generally do not require special plug-ins (separate pieces of software) to view. In addition, HTML is a very widely known and used language and therefore would probably be easier to edit.

Unfortunately, HTML has a very significant drawback. While HTML conversion is incorporated into most modern word processors (in a “Save As HTML” feature), the conversion performed is usually not very accurate. When it was created, HTML focused very little on document formatting, so several other formatting solutions grew up around it. Consequently, HTML never acquired rich and easy-to-use formatting features. Most document-to-HTML converters therefore lose much of the original document’s formatting information during the translation. Indentation, spacing, and sizing, for example, are not easily implemented in HTML, so most converters simply ignore them, leaving the resulting HTML document drastically different from the original document.

The drawback of lost formatting inherent in HTML does not imply that it cannot or should not be used, however. In fact, regardless of which document format is ultimately chosen, some form of HTML document will be used on the page to navigate other documents—as an “index” page for example. Additionally, any document already written in HTML format (such as an online article) should probably be posted in HTML as none of the document’s original formatting would be lost. However, since HTML only rarely replicates document formatting

with any accuracy, it is not the ideal file formatting solution, and other options should be considered.

2.2.2 *PDF*

The second file formatting solution which Team Indecision researched is Adobe Systems Incorporated's® PDF format. According to Adobe, PDF "is the open de facto standard for electronic document distribution worldwide" [3]. The PDF language preserves all font and formatting attributes of a document, independently of application or operating system. In an effort to make PDF universally accessible, Adobe distributes a free PDF document interpreter (Adobe® Acrobat® Reader™) for all mainstream operating systems (with easy-to-use plug-ins available for popular applications like browsers) at <http://www.adobe.com/products/acrobat/readstep2.html>. Over 110 million copies of the Reader have been downloaded onto PC's [3], so PDF is widely accessible for a large audience.

So far, the "easily accessible" feature of our definition of an ideal file formatting solution is accomplished very well by PDF. A problem arises, however, with conversion to PDF. While software exists to convert any document to PDF (even scanned paper), this software comes at a price. Adobe® Acrobat® 4.0 (the standard software package for PDF conversion) retails for US\$249.00 [4]. The software's high price prohibits students from converting their own documents to PDF. The only viable solution that Team Indecision can devise using PDF as the default file format is, therefore, for students to send their documents in electronic format to the professor, allowing the professor to convert each document to PDF.

This solution also has drawbacks. Aside from the initial expense of software to create PDF files, a fixed amount of time at the professor's expense to convert each document to PDF will also be necessary. Since one of the professor's original specifications of the problem was to minimize time required for posting material, and PDF does not adequately fulfill this requirement, additional options should be explored.

2.2.3 *PostScript*

The third solution which Team Indecision researched was Adobe Systems Incorporated's® PostScript® 3™ (PS), "the worldwide printing and imaging standard" [5]. PS is a description language that provides instructions for a PS device (such as a compatible printer) on how to print each page. Since every mainstream operating system contains device drivers for some PS printer, any application with a "print" command can be converted to PS. Every

application which would be used to produce 21W.732 assignments will contain a “print” command (or else students would not be able to submit a hard copy), so any relevant document format can be easily converted to PS by students. Conversion is simply a matter of adding a printer to your operating system that uses PS, then printing the document to a file using that printer (“print to file” is another feature supported by most mainstream applications).

While documents can be universally converted to and printed from PS, viewing PS on a computer is not a widely accessible feature. A free program for handling PS files (Aladdin Ghostscript 6.01) is available at <http://www.cs.wisc.edu/~ghost/> for all mainstream platforms. Graphical Interface previewers for this program are also available at the same location for several operating systems. The combination of these two free programs contains the features desired in an “ideal solution” (viewing, printing, editing, and converting PS files), but the problem is that these programs are not widely used by the general public (by no means as widespread as Adobe® Acrobat® Reader™). They are accessible to all MIT students as standard software on every Athena computer, but only about half of the 21W.732 students surveyed said that their parents would be able to read PS files [see §2.2.4]. Thus, PS files are not easily accessible for the entire audience and do not constitute an ideal file formatting solution.

2.2.4 Student Preferences

Team Indecision conducted a survey asking nine 21W.732 students several questions about their preferences regarding file format. Please refer to Appendix A for a copy of the survey. Figure 1 indicates the results of the survey:

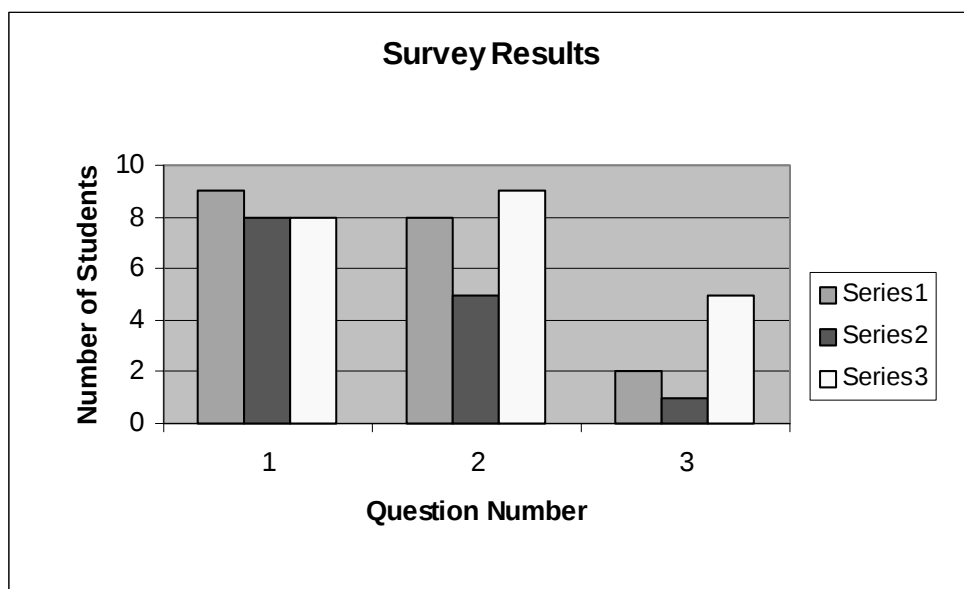


Figure 1: File Format Preferences Survey Results

Series 1 represents Portable Document Format (PDF) files, series 2 represents PostScript (PS) files, and series 3 represents HTML files. In question 1, the bar heights correspond to the number of students who have access to each of the specified file formats. In question 2, the bars correspond to the number of students who responded that their families and friends have access to each of these files. The values in question 3 represent the number of students who prefer their work to be displayed in any certain format. A total of nine 21W.732 students were surveyed. One student was undecided on question 3.

Most students and their families and friends are able to access PDF and HTML files. A large percentage (62.5%) of students also prefer that work be displayed in HTML format if possible. The overall preferences of the surveyed students indicate that HTML is the preferred file format, but PDF is an acceptable substitute.

2.2.5 Conclusions

None of the potential solutions that Team Indecision researched seemed to provide an “ideal” file format solution—one that both is easily converted to and easily accessible for students and parents on many platforms. Meeting the criteria of an ideal solution will likely involve a combination of the formats explored and require some time on both the students’ part and the professor’s part. Due to Professor McKenzie’s request for simplicity and preferences indicated

by 21W.732 students favoring other formats over PS, however, the most effective file formatting solution would be for Professor McKenzie to convert word processor files to PDF files.

2.3 File Transfer

After the appropriate domain space has been selected, the conversion completed, and organization determined, the document must be transferred onto the Athena system from Professor McKenzie's personal computer. There are several ways to accomplishing file transfer on Windows operating systems. The most common Windows file transfer methods are Secure CRT/SSH and WS_FTP [6]. One of the methods is a Secure Shell program, the other a File Transfer Protocol program.

2.3.1 SecureCRT (Secure Shell)

The Academic Computing Services at MIT encourages the use of Secure CRT, a Secure Shell client, mainly for its resistance against snoopers and other security risks. Under SecureCRT, passwords are encrypted as they travel through the network to prevent others from gaining unauthorized access to the user's files. If the program is insecure, others can tamper with the transferred files and cause serious damage to valued documents. Therefore in this respect, the security offered by SSH is a definite advantage in sending unaltered student work to the Athena system. In addition, SecureCRT effectively combines SSH security with "zmodem transfer capabilities" such as "fast data transfer and effective error detection...multiple file transfers" by adding the Student Information Processing Board (SIPB) locker on Athena [7], [8]. The SIPB locker containing functions necessary to use SecureCRT's zmodem function can be accessed using the command "add sipb" on Athena. SecureCRT is free of charge to the MIT community, and can be downloaded from The MIT Software Distribution web page, <http://web.mit.edu/software>. Installation instructions and additional information are available at http://web.mit.edu/acs/faq/remote_access/filetransfer.html#securecrtg.

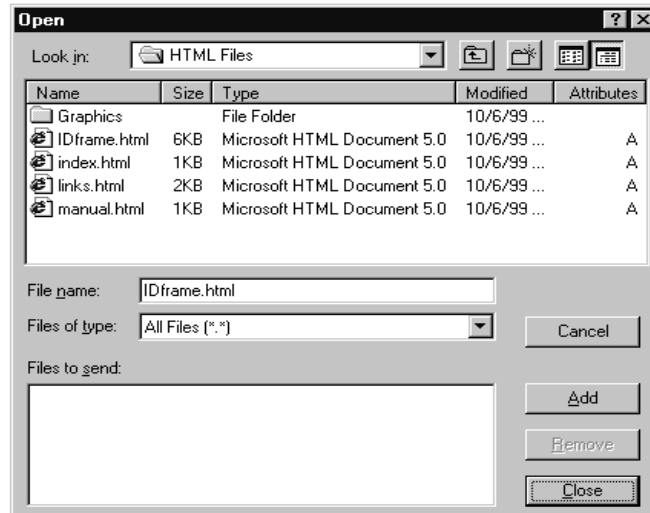


Figure 2: SecureCRT's "zmodem" function

SecureCRT allows a direct and secure file transfer from the user's personal folders to the desired domain space. However, this program operates on a command line interface, and requires some UNIX file handling knowledge on the part of the user. Although the transfer screen still involves manual, visual selection of the files, the user must enter SSH commands in order to login, establish a connection, etc. A complete list of commands is available under the tables of Standard and Protocol-Specific Command Lines in the Secure 3.0 Help Manual. However, this aspect of the program is counterbalanced by its ability to transfer files securely and efficiently. Under her requirements, Professor McKenzie specifically asked for a program that is fast, efficient, easy, and not too time consuming. Although SecureCRT requires that the user take time to familiarize him/herself with the command lines in this interface, it is one of the most secure programs available at MIT. Professor McKenzie has either the option of spending a few extra minutes transferring files through SecureCRT or using a simpler but much more insecure program.

2.3.2 WS_FTP (File Transfer Protocol)

The second method, WS_FTP, is a File Transfer Protocol program supported by the Computing Desk Help. It operates on a Graphical User Interface, and transferred files can be selected quickly and efficiently. This is generally faster than file transfer through SecureCRT. According to the MIT CWIS, "Ws_ftp is recommended by IS [MIT information systems] as an easy means of transferring files to Athena from a PC" [9]. This method of file transfer requires less technical knowledge from the user than SecureCRT. The graphical display allows the user

to visually highlight the selected files, which appear on the left screen. The right screen then confirms the transfer of all selected files [9]. This feature saves the user the effort of constructing and interpreting command lines. Information about downloading, installing, and using WS_FTP is available at <http://web.mit.edu/cwis/faq/wstftp.html>.

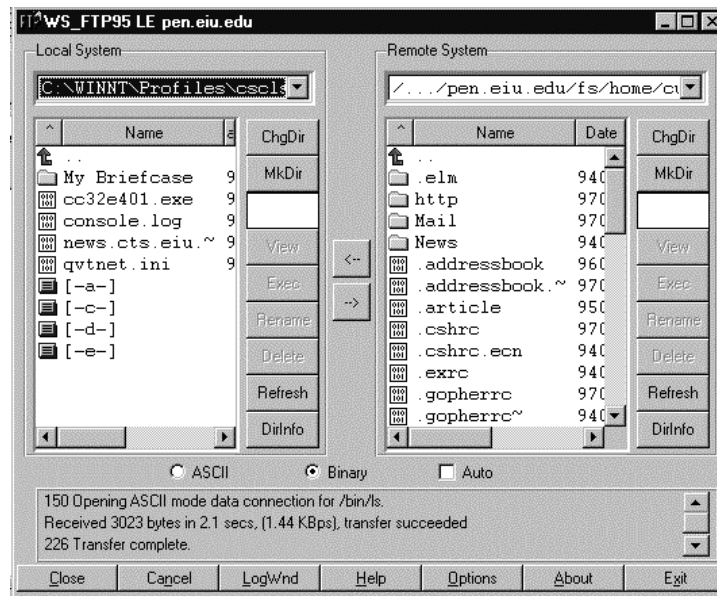


Figure 3: WS_FTP

However, there is one significant drawback to using this file transfer program. WS_FTP is extremely insecure; it is easy for others to capture the user's password during logon, when unencrypted information is sent through the network. As a result, others can easily gain unauthorized access to the user's account. Certainly, security precautions can be taken during each session. For example, the user could change his or her password for each transfer session. As an extra precaution, the user could also disable the "save my password" option [9]. Overall, however, FTP programs "send your password over the network in the clear, which poses a serious security risk" [9].

Between the transferring methods SecureCRT and WS_FTP, the former is more secure, while the latter is easier to use. It is important to recognize that both options require some compromise on the part of the user. In order to use SSH, the user would need to learn UNIX command lines and take time to utilize them during each file transfer session. The file transfer protocol program, on the other hand, is convenient but extremely insecure because it lacks encryption. Overall, the consequences of the second option outweigh the disadvantages of the

first – file interception and possibly destruction versus a few extra minutes for each transfer session.

2.4 Page Organization

In researching organizational features, Team Indecision looked at the structure of educational pages and the writing department pages at MIT. Team Indecision also conducted a survey about organizational style among students in 21W.732 to obtain input about their preferences and suggestions. We have divided our findings into general page layout, assignment organization, and other features.

2.4.1 General Page Layout

An essential feature of any web page is a course number or department header. In all web pages Team Indecision browsed and the examples provided in “Pedagogical Considerations” by the Academic Computing Support, a clear, dominant statement of the course or department is present. Specifically, all web pages related to the writing department display a heading in cursive letters “MIT Program in Writing and Humanistic Studies.”

Team Indecision also found the use of navigation bars prevalent in many web pages. According to the conducted survey, many students also requested this feature for efficiency in organization and ease of navigation. The Course 21W homepage contains a navigation bar that categorizes the topics into general information and several specific subdivisions such as Announcements, Faculty, Writing Center, etc. The topic immediately displayed when the user accesses the web page is the general information about the department. In our surveys, students also asked for a display of general course information and a syllabus before proceeding onto student work.

2.4.2 Assignment Organization

Many students requested that their work be organized by assignment, with an explanation of its nature and purpose so that “people could see what exactly we were supposed to do for each assignment.” They requested that “writing assignments [be organized] by category,” which many web pages accomplish by creating these categories under the navigation bar. This can be easily formatted to display “chronologically when the assignments were given and due.” Sample web pages provided through Academic Computing Support such as the “Introduction to Aerospace Engineering and Design” or “Experimental Physics I” are organized in categories,

with general information followed by specific assignments and supplemental information. One student also commented that the page should include “additional reading material that is helpful to the course.”

Students also suggested organizing assignments by assignment, date, author, and title, with four different sorting links on the navigation bar. This offers more versatility because while some students may only want to see examples of a specific assignment, others want their “friends and family to be able to get a page totally dedicated to [their] writing.” Expanding on this idea, many students suggested creating a “searchable index” that would allow users to look for specific assignments and authors.

Another option for assignment organization would be to list all the works and respective authors on the bottom of the general information page. This would be a simple and effective method of displaying all contents of the page. Student work could be listed by assignment description and by author, and a user could open a certain work by clicking on the corresponding link.

2.4.3 Other Features

An essential feature of an educational web page is contact information or a direct link to an email for the course instructor or administrator. Almost all course pages at MIT feature this option, so that students can communicate with professors online. Finally, as one student pointed out, the web page should be “updated frequently.”

Additional student comments include: creating these formatted files as links from a home page or a certain category, and making them as simple, efficient, and readable as possible. Although students prefer to have a “nice layout, instead of only having the files listed on a blank page,” they believe there should not be too much “clutter.” As one student stated, “I do not like to see cute things like pink bunnies associated with my document!”

Another important feature is consistency in file formatting and organization. The visual formatting of the documents themselves should be similar to each other.



Figure 4: Sample Web Page Design

A good web page design would include a general information page, along with works listed by assignment type and author name. Although many academic pages at MIT categorize information through a navigation bar, Professor McKenzie has requested that links to all student work be displayed on the bottom of the front page. This easy method of organization would effectively list all student work, and allow individual works to be retrieved from the links. Consistency of format and clean layout would also be maintained from one page to the next. The mold structure for the web page would be similar to the organizational setup of other writing department pages at MIT.

3.0 Conclusions

3.1 Domain Space

To begin the process, the necessary domain space may be obtained from personal MIT directory space, the MIT writing department, or commercial Internet sites. Creating a 21w.732 subdirectory under the writing department is the best option because the files will exist indefinitely, even after Professor McKenzie leaves the university. Professor McKenzie will also have full access to reading and writing within the directory through Athena. Another advantage of the MIT writing domain is that uploaded files will be associated with MIT rather than random commercial web sites.

3.2 File Format

The most convenient and efficient solution to this part of the problem would be to have students submit electronic copies of files in independent word processor formats. Professor McKenzie could then convert these files into PDF format using Adobe Acrobat. With only a small conversion time per document and very little technical knowledge required of the students, this solution seems best of those explored.

3.3 File Transfer

Among the researched choices, the best option for file transfer from Professor McKenzie's personal computer to Athena would be to use SecureCRT. This is the most secure way to access the Athena network, since it encrypts information such as passwords that are sent to the network. As a result, others will not be able to gain unauthorized access to the package and tamper with student files.

3.4 Page Organization

Team Indecision has created a model for the 21W.732 web site incorporating student preferences and features from other writing department pages. Student files can be uploaded into this framework, which includes features such as general information sections and a listing of individual works.

4.0 Recommendations

4.1 Domain Space

Team Indecision recommends that our client, Professor McKenzie, use the MIT Writing Department's Internet domain space. Professor McKenzie now has the privileges to read and write in the directory /afs/athena.mit.edu/course/21/21w.732 in MIT's Athena system. Within this 21w.732 directory, we recommend that she create a sub-directory called "andrea" in which Professor McKenzie may put the files of the web page. The web page will then appear on the Internet at <http://web.mit.edu/21w.732/andrea/>.

4.2 File Format

Team Indecision recommends that Professor McKenzie request that her students send her their work in a word processor format compatible with conversion software she uses. This solution allows students to use a range of system-independent formats, such as Rich Text Format (RTF) and Microsoft Word. Professor McKenzie can then use Adobe Acrobat to convert the word processor document into a PDF file.

4.3 File Transfer

In order to transfer the files of the web page from her personal computer to the /afs/athena.mit.edu/course/21/21w.732/andrea/ directory on Athena, Team Indecision recommends that Professor McKenzie use the Secure CRT file transfer program.

4.4 Page Organization

Team Indecision has created a web page that the team recommends Professor McKenzie use as a template for posting students' work. The sample web page is located at <http://web.mit.edu/jpeters/www/21W.732/index.html>. Team Indecision recommends that Professor McKenzie use the source files of this sample page as a model for her own page on which to post the work.

5.0 References

- [1] "Welcome to Athena (AC-01)." *Athena Account Policies*. Available:
<http://web.mit.edu/olh/Welcome/accounts.html#deactivation> Accessed: 1 Nov 2000
- [2] "Guide to Creating and Maintaining Course Web Pages."
<http://me.mit.edu/courses/course-info.html> Accessed: 1 Nov 2000
- [3] "Adobe PDF." *Adobe Products*. Available:
<http://www.adobe.com/products/acrobat/adobepdf.html> Accessed: 5 Nov 2000
- [4] "Adobe Acrobat: Buy This Product." *Adobe Products*. Available:
<http://www.adobe.com/store/products/acrobat.html> Accessed: 5 Nov 2000
- [5] "Adobe PostScript 3." *Adobe Products*. Available:
<http://www.adobe.com/products/postscript/main.html> Accessed: 5 Nov 2000
- [6] "Windows File Transfer Methods." *Transferring Files to a Web Site*. Available:
http://web.mit.edu/acs/WebGuide/file_transfer.html Accessed: 3 Nov 2000
- [7] "SecureCRT 3.0 Documentation." Vers. 3.0.2. Van Dyke Technologies, Inc. 1999.
- [8] "Using SecureCRT for Windows File Transfers." *Secure File Transfer*. Available:
http://web.mit.edu/acs/faq/remote_access/filetransfer.html#securecrtcg Accessed: 3 Nov 2000
- [9] "Using Ws_ftp to Transfer Files to Athena." Available:
<http://web.mit.edu/cwis/faq/wsftp.html> Accessed: 3 Nov 2000

6.0 Appendices

6.1 Appendix A Student Survey

As consultants to Professor McKenzie, Team Indecision proposes to devise an effective method of putting students' work on the web. This involves an investigation of the file formats available to students, their preferences, and organizational strategies. Since the primary purpose of developing this method is to provide a database of examples for future students and to allow current students, their families, and their friends to take pride in their work, we believe it is important that we obtain input from the students themselves. Please answer the following questions regarding file format and web page design. Our final product will directly reflect your student preferences below.

1. Are you able to look at the following file formats from your computer/any other accessible computer? Write "yes" or "no" for each option.

_____ Portable Document Format (PDF)
_____ Postscript
_____ HTML.

2. Do your friends and family have access to files in these formats?

_____ Portable Document Format (PDF)
_____ Postscript
_____ HTML

3. Which of these three formats would you prefer to see on the web page that will display 21W.732 students' work? Please place a check by your preference.

_____ Portable Document Format (PDF)
_____ Postscript
_____ HTML

4. Please write down any features or methods of organization that you would like to see on the web page. How would you like your work to be displayed?

Thank you for taking time to complete this survey.