

Computer Science Web Site: Usability Analysis and Development Guidelines

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Introduction

Description

This report summarizes the findings of a usability analysis for the creation of a new Computer Science web site at Brock University. The main objective is to produce a list of recommendations that a web developer can use in the development and implementation process.

This report is divided into two major sections. The first section, “Usability Analysis”, involves the research performed on members of the department, research conducted on web site usability and recommendations for the site based on the results. The second major section, entitled “Development Guidelines” takes the results from the recommendations report and provides guidelines for the developer on how implement the suggestions.

One major objective early on was to determine the needs of the people who will be using the future site. Since the site has important uses for a wide range of people, it was seen as important to involve the opinions of everyone willing to participate in a user survey rather than rely on the opinions of a small group of people. An online user survey, conducted in July of 2003 sought to determine which aspects of the current site work well and which aspects were missing. A series of nine questions examined the areas of navigation, user objectives, organization, and accuracy of the current pages as well as what the user desired to see in the next generation of the site. For a full list of survey questions, see Appendix B. Details on the results of the survey will be discussed further on in the report.

Prior to the implementation of the survey, research was conducted to investigate how to properly develop online surveys in hopes of increasing the likelihood of user response. The research focused on dynamics of survey design such as visual appearance, appropriate questions, how to present the questions and page layout and structure. The purpose of the research was to determine how to construct an online survey in an acceptable manner and if it is an acceptable form of conducting research on subjects within the Computer Science department.

Before any research on humans was conducted, the project needed to receive approval from the Research Ethics Board of Brock University. The methods of conducting research on participants followed those outlined in the ethics proposal. Development of the survey took place prior to the board’s approval in order to quickly administer the survey once such approval was granted. This was to allow for the survey to reach more students prior to the completion of the spring term. Unfortunately due to a slight delay in getting approval from the Research Ethics Board, the survey was not released to the public until mid July.

The online survey was hosted on the Sandcastle server at Brock and was posted for approximately three weeks for users to fill out. Faculty, staff and senior students were notified by e-mail to seek user participation. Prior to users filling out the survey, they were required to read and consent to the terms of the project in accordance with the rules specified by the Research Ethics Board¹. The terms outlined the purpose of the survey, those involved and how their responses would be used. It also outlined confidentiality concerns a participant might have in regards to their identity.

In addition to the user survey, one-on-one conversations with students and staff allowed for a better understanding of user needs. Personal experience in the area of web page development has helped determine elements of pages that have traditionally worked in a university setting and elements that have not. Finally, various web sites for Computer Science from other universities were examined to determine how other sites have tackled usability from a computer science academic perspective.

Web Accessibility

Aside from the functional requirements the site will serve, this report also sought to determine how to properly implement a site in accordance with the World Wide Web Consortium (W3C) on web accessibility.

Accessibility to web sites for users with disabilities is of increasing importance, especially due to recent legislation by the Ontario government. The most common disability that needs to be addressed on the web is, of course, visual impairment. A future implementation of the Computer Science site must adhere to the standards outlined for web accessibility.

Hearing disabilities is also a concern for users however since most sites do not rely on audio for the users to navigate and obtain information, this has not been a major issue in the past and is beyond the scope of this report. With more multimedia appearing on the web, it is possible that this will become a greater issue in the future. An outline of key issues to be concerned with in the development of a properly structured web page is included in the recommendations report.

¹ Research Services, Brock University. <http://www.brocku.ca/researchservices/>

Limitations and Constraints

The details in this report serve as a base mark for future development. Although general guidelines have been developed, the future developer(s) will have to research the current network setup within the department and what tools are at their disposal in order to make the site function. The developer is responsible for determining how well the sandcastle server can handle the functions he / she is planning to perform in the manner they are to be implemented and ensure that it will be able to handle large scale volume once the site is released.

This project's primary focus, as seen by the above statements, is to provide guidelines for usability and the development of a future Computer Science department web site. While these guidelines may be practical or useful for other sites, the research performed is solely focused on the Computer Science department at Brock University. It will not be a general, all-encumbering, guideline for web sites to follow.

Usability Analysis

Online Survey

During the month of July 2003, an online survey was conducted and presented to senior students in the Computer Science department, alumni, faculty and staff. The survey consisted of nine (9) questions, including sub sections to a few. Various issues were considered when developing the survey. They included:

- Which questions to ask the participants
- How the questions should be presented
- What types of responses to allow the participants to fill out (i.e. predetermined or open ended)
- Will the timing of the survey prevent a large, diverse result pool? If so, how can this be overcome?
- Visual design of the web pages
- Proper layout and structure of the survey

The questions were initially determined by Robert Graves and then reviewed by the project supervisor and other department faculty. Afterwards, the questions were revised according to feedback.

Implementation Guidelines

In order to develop a comprehensive, structured online survey that would increase the likelihood of people filling it out, research was conducted in the area of web surveys. The Online Survey Design Guide (OSDG)² was the primary source of information. While these guidelines were developed with a larger survey in mind, many of the principles are still applicable in the development of the online survey for this project.

Navigation

The OSDG categorized its guidelines into three sections. They are Navigation, Usability / Accessibility, and Web-based Questionnaires. The navigation section outlined the following points that were important in the development of this survey:

- Easy form of navigation
- Indexing survey into sections / pages³

² University of Maryland. Online Survey Design Guide. http://lap.umd.edu/survey_design/

³ University of Maryland. OSDG - Navigation. http://lap.umd.edu/survey_design/navigation.html

Due to the relative simplicity of the survey, there was little need to divide the survey into multiple sections. It was viewed that keeping all questions on the same page would be preferable. The survey consisted of a welcome page which outlined the purpose of the survey, approximate length and contact information. It concluded with the requirement for the participant to acknowledge that they read and understood the above statements. Answering so would direct them to the survey questions. After filling out the survey, a button labeled “Submit” indicated to the user the end of the survey and that clicking the button would submit the answers for review. The simple navigation and ordering of the questions was designed for easy flow and increased user response.

COSC 3P99 Project
Requirements Analysis for the Computer Science Web Site
Online Survey

The following online survey is being conducted for the purpose of researching requirements for the development of future implementations of the Computer Science web site found at <http://www.cosc.brocku.ca>. It has been reviewed and received ethics approval by the Brock University Research Ethics Board (REB).

This project is being supervised by Professor Ivo Düntsch, Chair of the Department of Computer Science, Brock University. For further information, you may contact Professor Düntsch at 905-688-5550 ext. 3513 or by e-mail at duentsch@cosc.brocku.ca. Research for this project is being conducted by Robert Graves, 5th year Computer Science Honours major. Questions concerning this project can be addressed to Robert at rg99ae@cosc.brocku.ca.

The survey should take between 10 – 20 minutes to complete. The results obtained will be studied and final conclusions will be made following the submission of all results. The researcher will identify common traits in the results and use the conclusions to develop a requirements analysis of future web site development for the Department of Computer Science. This project and the results obtained are for the use of the Department of Computer Science, Brock University.

Your participation will assist in discovering current strengths and weaknesses of the existing web site. It will also assist in determining what changes need to be implemented on the site in order to better serve the needs of its users.

This survey is purely voluntary and confidential. No information about yourself or the computer you are using will be tracked or stored which could possibly associate yourself with the answers you provided. No person will be awarded or penalized for participating or not participating in this study. All participants are free to answer as many or as few questions as they wish and may choose to quit the survey at any time.

Should you wish to obtain information on research participants' rights, you may reach the Research Ethics Officer, Office of Research Services at 905-688-5550 ext. 3035.

Continuing in this survey indicates that you have read the above consent form and agree to allow the information obtained from it to be used in further study for this project.

Usability / Accessibility

This section of the OSDG included the following points relative to this survey:

- Understanding that respondents come from various backgrounds and may interpret questions differently
- Form validation and error messages
- Consistency across survey
- Keep user response options consistent
- Simple colour scheme
- Easy readability⁴

The questions for the survey were carefully reviewed for sentence structure and wording to ensure that it was as clear as possible. The increased level of

⁴ University of Maryland. OSDG - Guidelines: Usability / Accessibility.
http://lap.umd.edu/survey_design/usabaccess.html

confusion with a question's meaning would cause a misinterpretation of the survey results. This could possibly lead to an implementation of a site that does not meet the proper user requirements.

Form validation is essential for many online forms. Since the user was not required to fill out all or certain questions, form validation based on user responses was seen as unnecessary. In hindsight, a little bit of form validation would have eliminated some data processing afterwards. There were a total of 37 responses to the survey, but eight of them contained no responses to any of the questions. As well, a few of the users indicated that they may be contacted if need be for further consultation, but did not provide any contact information. While the time spent to correct such responses was minimal, a bit of form validation to prevent them would have made the survey look more professional. The survey's layout was kept consistent through the use of Cascading Style Sheets (CSS). This allowed for all questions, text and form elements to be properly formatted in the same manner. The questions were provided in a similar fashion as well.

A simple colour scheme of beige, red and black was used. These colours correspond with the University's official colours as well as the colour of the main Brock homepage. The content is easy to read and the visual design was kept clean to give users a good first impression. As stated in the OSDG, a good first impression increases the number of respondents who complete the survey.⁵

COSC 3P99 Online Survey: Requirements Analysis for the Computer Science Web Site

Question 1
I am a:

Question 2
What are your primary objectives when coming to the Computer Science web site?

- Visit Course Web Sites
- Visit Professor Web Sites
- Print Assignment Cover Pages
- Find out more Information about a Course
- Find out more Information about a Stream
- Read the policies for the Computer Science department
- Use the Search Engine
- Other (explain)

Question 3
What features do you find essential that currently exist on the site?

⁵ University of Maryland. OSDG – Guidelines: Web-based Questionnaires.
http://lap.umd.edu/survey_design/questionnaires.html

Web-based Questionnaire Guidelines

This section of the OSDG included:

- Discussion of radio buttons vs. drop down boxes
- Allowing open-ended questions
- Restricting response choices
- Access Control⁶

It was outlined that radio buttons were more preferable to use instead of drop down boxes if there were not many options to choose from. Drop down boxes were only used for the first question. Radio buttons are seen as easier for the user to select and easier for the user to see all the options before making a decision.

In the beginning stages of the development of the online survey, all questions were originally open ended to allow more precise feedback. After consultation with other members of the department, it was determined that a few questions with predetermined answers would be more appropriate. As a result, a few questions were changed and added. For many of the questions where user response was restricted through the use of radio buttons, open ended sub questions were provided if the user selected a negative response. This allowed for better clarification. Such sub questions were used by a majority of participants and provided very useful information in the response analysis process.

Access control was initially considered when the survey was in its primitive stages. Such access control would limit those who could fill the survey out and restrict users from filling out the survey multiple times. While implementing such a system would not have been very time consuming, it was seen as unnecessary due to the small scale of the survey and unlikelihood of such a scenario. It may have also decreased the number of responses since users would be aware of the possibility of their responses being directly linked to them. The elimination of user identification may have also allowed for more honesty in some of the responses.

⁶ University of Maryland. OSDG – Guidelines: Web-based Questionnaires.
http://lap.umd.edu/survey_design/questionnaires.html

Survey Release

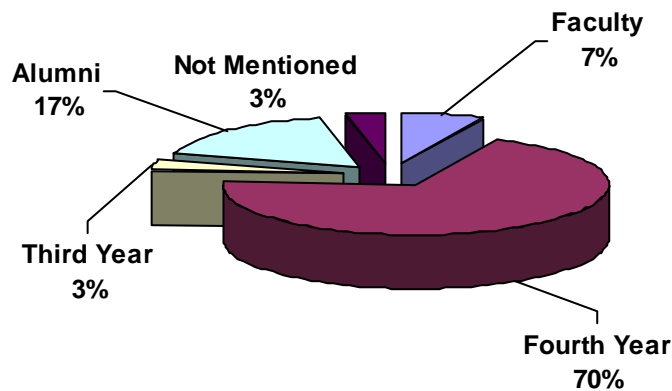
The survey release was delayed due to awaiting approval from the Research Ethics Board. This delay caused the survey to be released following the completion of spring exams. With a decreased number of students available on-campus, the possibility of low user response and a small diversity of participants was high. In order to combat this, participants were notified when the survey was initially released and then reminded nearly two weeks later by e-mail. This reminder did allow for approximately half a dozen more responses. The responses were largely from fourth year students or above. While the desire for more faculty / staff responses would have been preferable, a large number of senior student responses can be seen as an asset since those students have several years experience with the current implementation of the department web site. Many have already formed strong opinions about the site. With a total of 29 respondents, the turnout and diversity of the responses was viewed as acceptable.

Results Summary

The following is a summary of the results from the online user survey of faculty, staff and senior students of the Computer Science department conducted during July, 2003. For complete results, see Appendix A.

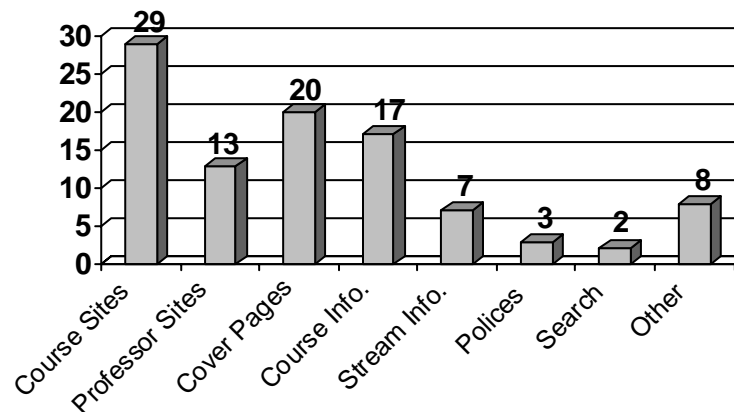
Question 1

Position



Question 2

What are your primary objectives when coming to the Computer Science web site?



Other Comments:

- research projects
- Prof Ross's website
- get phone numbers/email addresses for faculty
- Java Page and Mentor Page

- see what's available for new terms for further study, times, dates, course info (ex. a particular course offered once in awhile, perhaps).
- visit department tech reports site
- tech reports & seminars
- assignment and other stuff for the courses

Question 3

What features do you find essential that currently exist on the site?

The features deemed essential to any future COSC site were predictable. Course information was overwhelmingly viewed as the most important aspect of the COSC site for obvious reasons. Many students felt that there should be direct links to the various course sites from the main page. The sites should be just one click away instead of two or three as is sometimes the case. One student mentioned how they enjoyed the predictability of course website URLs (i.e. www.cosc.brocku.ca/Offerings/CourseCode). This is helpful for those who do not like to use mouse clicks and also handy if the user was unable to quickly find the site they were looking for. It allows a user to go directly to the course web site as well instead of first going to the Computer Science web site.

Faculty information was also viewed as an important feature. Participants wanted easy access to faculty information such as phone numbers and e-mail addresses.

Most participants agreed that the quick links drop down menu helped them to easily reach the pages they wanted. They felt that keeping a quick links menu was important which reduces frustration for users who cannot find the information they need. Such practices are also beneficial for those who have dial-up connections at home. The fewer pages that need to be viewed in order to get to the destination, the better.

As well, people believed that important news should remain as it is now on the front page. A couple of participants mentioned curriculum changes mentioned on the main page as something that was extremely important and useful. This is especially true as many students are finishing their program in the mist of major course restructuring within the Computer Science department.

Other miscellaneous things mentioned that were important to future development include common tasks such as printing cover pages, searching, Java help and references. Many participants have asked that research projects be featured more often. A few references were made to the quality of projects displayed on Professor Ross' web site. These can serve to strengthen an interest or knowledge in a topic.

Question 4

What features do you find essential that do not currently exist on the site?

The largest problem mentioned about the Computer Science web site has been its accuracy. Many participants said that the content was out of date, sometimes horrendously out of date. A number of people mentioned how the COSC 3P99 and COSC 4F90 research pages did not have any recent projects. Many people have made references to the lack of up to date research existing on the site (or at least the inability to easily find recent research papers / projects).

A poor or perhaps just old, visual design was a complaint which many people mentioned. Some said that the design is not adequate for new students and does not do its job to attract prospective students to Brock's Computer Science department. Of course, visual design of a site is highly subjective. Also, it is difficult at this point to tell if the participants do not like the current appearance of the site because they never really liked its design or simply because it is approximately three years old. Participants commented on the lack of consistency between various sub pages on the site. A more uniform look and feel was seen as necessary. Many students desired more links to other Brock University sites such as job postings with Experience Plus and the Student Self Service system.

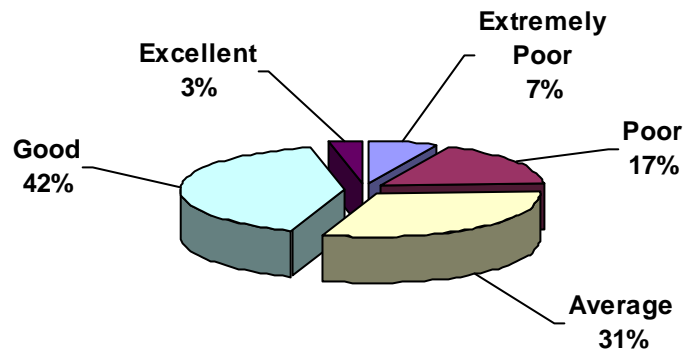
Many people felt that course and examination timetables should be posted directly on the department web site (or at least a visible link to an outside page) so that students can go directly to the Computer Science related material. Participants also believed that how-to information would be an asset – such as basic Java and UNIX resources. Information on lab schedules and software installations was also cited.

Feelings on the department news section on the main page were mixed. Most viewed that department news was important, but the way it was presented was critiqued. Old news items dating back nearly over a year ago and the overall look and function of the news box were among the complaints users had.

While all these points were mentioned, the majority of the concerns were the lack of up-to-date material on the site. A number of the contributors to the survey suggested that the out of date pages could play a factor in the lower enrollment numbers the department has experienced recently. It is clear the content weighs heaviest on the hearts of the survey partakers.

Question 5

How would you rate the navigation of the site?



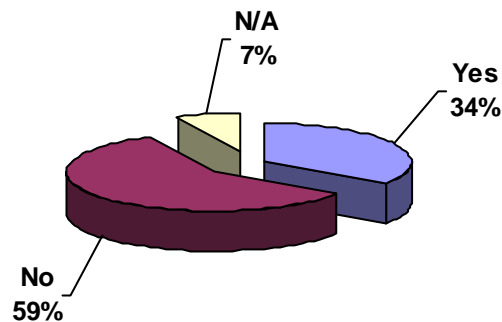
If you ranked the navigation as Extremely Poor, Poor, or Average, explain why:

The most common response to poor navigation was the inability to find course web pages quickly and easily. While some of the sites are listed on the Popular Pages drop down box, most of them were not listed there and had to be found within sub pages. As mentioned in previous questions, courses that haven't been offered in years are still listed on the site but give the impression that they are current listings.

Most complaints were centred around the main page and the overwhelming amount of content present on it. While some prefer to have more content on the main page to reduce the number of clicks it takes to get a page, many people did not like the overwhelming amount of space being used by unnecessary content. An example cited was the "Welcome to Computer Science!" message which takes up space but is almost always overlooked. Areas such as these could be used to provide shorter and more relevant links to information. The main page was seen as cluttered, with too many links on the left side bar causing the page to stretch and require excessive scrolling. A better organization of these links was seen as important to being able to find information if you are not certain where it is on the site.

Question 6

Do you find the content of the site to be reliable and up-to-date?

**Question 7**

What sections do you find to be inaccurate (if any)?

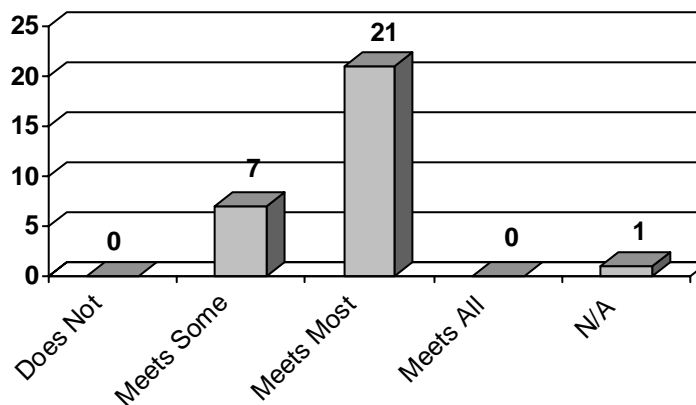
While a large number of participants did not comment on sections being inaccurate, those who did largely commented on the course web pages. As discussed in previous questions, the project courses COSC 4F90 and COSC 3P99 were criticized the most for having projects from years ago on the site but no recent work.

The news section again was highlighted as being old and rarely updated. While it is true that there is an overwhelming amount of news in the news box at times that date back to previous years, the news items have been updated more frequently in recent months. For some who filled out the survey, this fact was not realized. A few comments were also mentioned regarding faculty contact information. Some professors lacked email addresses while others did not.

Few commented specifically on the content being “inaccurate” – i.e. incorrect. The participants who made remarks on the site were all relating to the content being out of date.

Question 8

How does the Computer Science web site currently meet your needs?



If the site does not meet most or all of your needs, explain why:

A vast majority of respondents did not fill out this question. The ones who did often commented on issues covered in the previous questions. Poor quality of course web sites and missing contact information was mentioned a number of times.

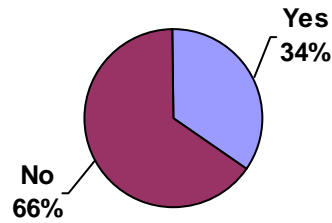
There was however a couple of interesting comments for this question that were not covered by other participants in previous questions. One person mentioned the possibility of an integrated online forum for students to discuss homework issues and other department related aspects. This of course raises many concerns that such a forum could produce. An abuse of the system for non-academic related conversations could pose a large problem.

Another participant raised the issue that the quality of the department web site and the projects displayed on it make large impressions to potential employers. A poor quality site can reflect badly on the department and the students.

Finally, a comment on having a dynamically generated degree status for students to view what courses they still need to complete for their program was an interesting thought. Of course the numerous changes to the department's courses / requirements in recent years could prove developing such a system difficult and quite possibly inaccurate for some students (causing them to make wrong course selections).

Question 9

May the researcher of this project contact you regarding any further questions and / or an interview in the future to discuss your answers?



Note: "Yes" only includes people who marked "Yes" on the survey and provided contact information. Those who marked "Yes" and did not provide any contact information are included in the "No" statistics.

Recommended Guidelines

Introduction

The following is a recommendations report for the future development of the Computer Science web page scheduled to commence in early 2004. The information provided in this document is the result of in depth research in the area of web design, the Computer Science Department and Brock University. Faculty, staff and students of the department were invited to take part in an online user survey in July of 2003. Details about the survey were discussed earlier in this report.

In addition to the user survey, Computer Science web sites from other universities were also examined in order to determine if a common trend exists between them. Personal experience in web page development also played a role in the creation of this document. The ideas and approaches to web design are taken from three years experience as a Senior Web Developer for the Information Technology Services department at Brock University. While not mentioned specifically, user reactions from such experiences also played a role in the creation of these recommendations.

In conjunction with the above research, informal conversations with users also contributed to the opinions formed about how a future development of the site should take place.

This recommendation report outlines suggestions for usability in the areas of navigation, site organization, accessibility, testing and compatibility.

Usability is an important aspect of any web site. In order to understand usability, we first must examine its definition. The term *usability* is the ability for a user to achieve his / her goals effectively and easily⁷. The ability to satisfy a user in their attempts to complete a task is complex. It involves proper navigation and organization of data. The navigation should be consistent throughout the site and the content should be organized under proper headings and categories. Implementation notes corresponding to the usability research will be discussed in the “Development Guidelines” section.

⁷ Mohindra, R. (2002). *Evaluation of Web Usability*. Computer Science Department, Brock University. pp. 6

Navigation

User-Focused Approach

One of the most important aspects of designing and developing a web site is the navigation component. With poor or uncommon navigation systems, users will become easily frustrated and often give up looking for the specific content they are searching for. It is easy to become lost in a web site since, unlike a book, the reader can come to a place from many different points. They are not necessarily going to come through the main page. If the site's navigation is poor, it is easier for a user not to recognize how to get back from where they came or even how to find such content again in the future.

An approach to navigation taken on by Brock University is a style known as "User-Focused". This approach attempts to group the users into specific categories and guide them to their desired page. For example, the main Brock homepage has a category called "Current Students". All links relating to current students are placed under this category.

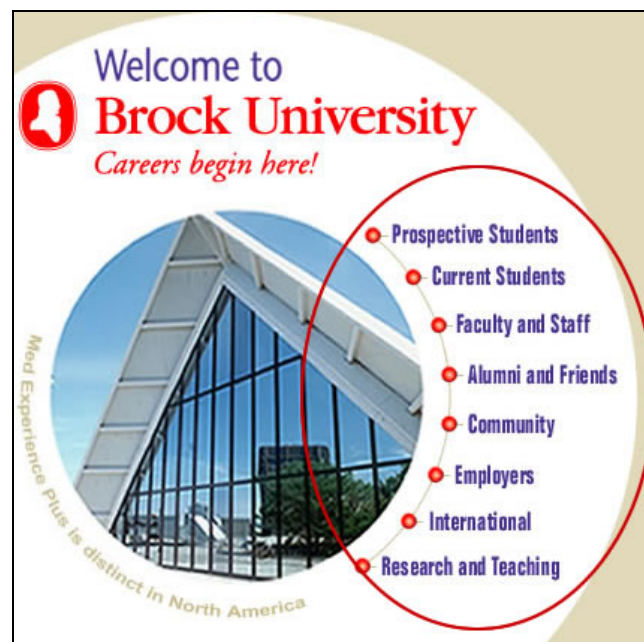


Figure: Brock University's Homepage. Demonstrates a "user-focused" approach to navigation.

From here, additional links provide either direct access to a specific page or further categories from which the user can choose. The user may have to dig through a number of categories in order to get to the page they are looking for.

Such a system has many theoretical advantages. It is organized in a very formal manner and if developed correctly, the user should have no problem determining which category they belong. As well, it is assumed that the user would also know which category and subcategory a page is located under.

In reality, this situation is often not so. Many types of pages may fall under multiple categories or it may be unclear as to which category a page would be located. For example, based on the Brock homepage example, where would one expect to find IT Services? The list of choices on the main page does not make this clear. Visitors do not like having to spend much time thinking about such easy choices. The more time visitors spend asking questions about the site, the harder it is to keep them⁸.

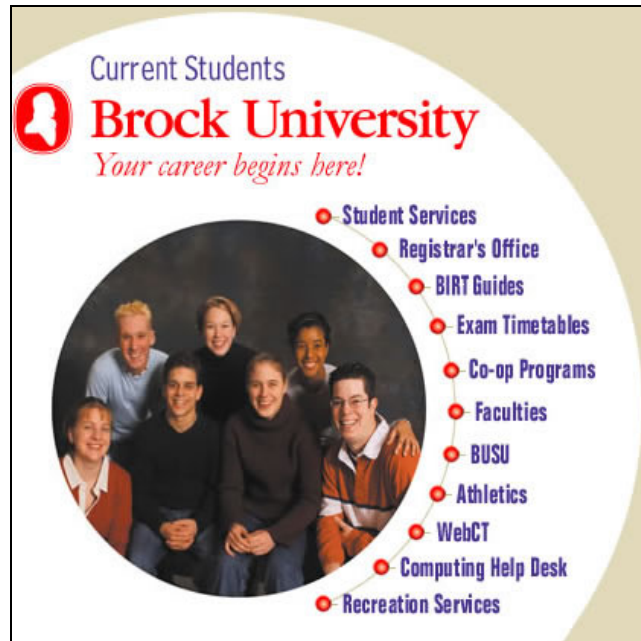


Figure: Brock University sub page.

The Brock University example has proven to be a frustration for many students, staff and faculty alike. Focus groups and informal interviews conducted by the Information Technology Services (ITS) department at Brock have found common sites such as the Registrar's Office are difficult to find and people do not always catch on to the user-focused approach the Brock homepage takes. As a result, ITS is currently working in cooperation with the Office of External Relations and focus groups to develop a site that maintains a user-focus approach but also seeks to deliver more frequently accessed content to the main page. The idea is that such an approach will maintain the advantages of a user-focused web site but also provide access to popular pages within two or three mouse clicks.

Computer Science Prospective

From the Computer Science prospective, its current site follows this model to an extent. While it does not tend to have as deep of a site structure to it as the Brock homepage, the department does break up the site into categories based

⁸ Krug, S. (2000). Don't Make Me Think: A Common Sense Approach to Web Usability. New Riders Publishing. pp. 15

on the type of user (i.e. Courses, Faculty, Co-op, etc.) This type of system is often proved to be quite helpful for people who are new to the site. It provides a clear way of guiding the user based on the category names. At the same time, such categorization may not be in the best interests of experienced users. Such people know exactly what they want to go for and do not wish to spend time clicking through several pages to find their content. This makes for the necessity to provide quicker options for experienced users.

Based on the feedback from the online survey conducted through this project, many participants expressed the difficulty in finding course web pages quickly. If the course web site is not listed on the popular pages drop down box, it takes three clicks just to access the main page listing the sites (let alone the mouse clicks required to find the information on the site itself). This may seem like a small issue but users with slow internet connections will find the need for 5 or so mouse clicks to be quite frustrating and time consuming. This is especially the case if the user does not know exactly what links to click to find the information. They may have to try a few alternatives on the course web site to find what they are looking for. Adding the additional clicks just to get to the page is an added frustration. It would be desirable to have direct access to course web sites from the main page. Since this could cause the main Computer Science page to be cluttered, a clear link indicating "Course Web Sites" would be a better alternative. Having this link on the main as part of the navigation (e.g. a toolbar) would be best. This would prevent it from getting lost in the midst of paragraphs of text as illustrated in the next figure.

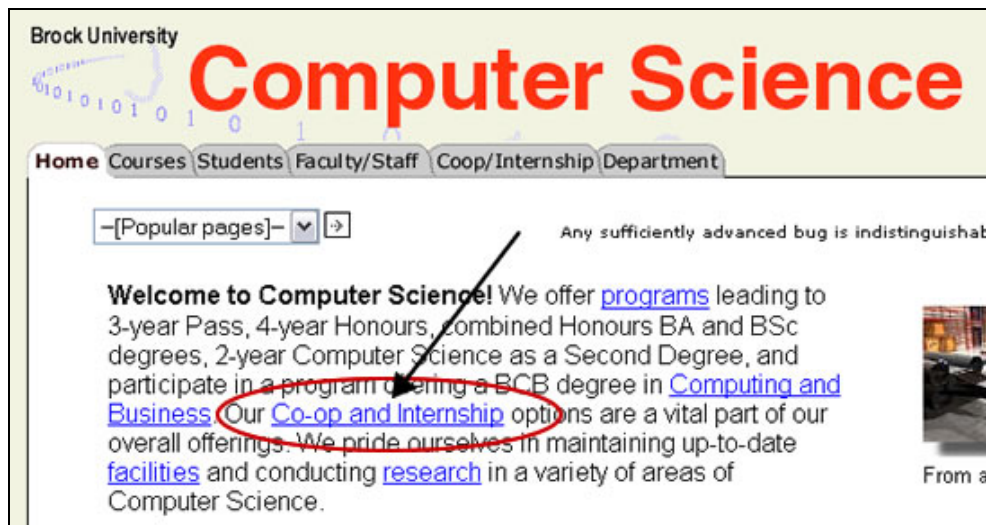


Figure: Illustrates how links can become hidden within paragraphs of text. Notice how the *Co-op / Internship* on the navigation bar is far more noticeable.

According to Steve Krug, author of the book "Don't Make Me Think", an unofficial two-click rule exists on the Internet. In many cases, developers have adopted a three-click rule instead. By the two-click rule he means that users

should only have to perform at most two mouse clicks to get to the section they need. Of course this *rule* is more of a *guideline*. Depending on the site, it may be impossible to do this without creating clutter. Note that the two-click rule does not mean the user should be able to get to the exact page they are looking for within two clicks, but rather, they should be able to reach the section containing the information they want within two clicks. For example, if one wanted to reach the COSC 3P94 Assignment 1 page, they should be able to get to the COSC 3P94 homepage within two mouse clicks. Once the user has reached the COSC 3P94 homepage, they know they are on the right track to finding the assignment information.

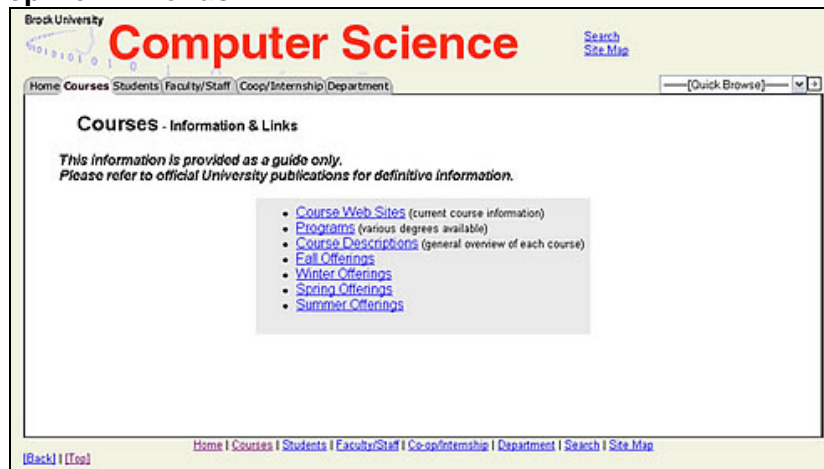
The logos or site titles in the template of the site should always link to the main page⁹. As well, when deciding names and directory locations for pages, the developer should always try to keep them short and easy to remember. If a page is buried in the navigation of the site, one might find it easier to memorize the location instead of clicking multiple links. This is evident in the naming structure of course web sites (www.cosc.brocku.ca/Offerings/coursecode). For people with slow Internet connections, going directly to a page may be much faster than following the navigation of the site itself.

⁹ Powel, T. A. (2002). *Web Design: The Complete Reference*, Second Edition. McGraw-Hill. pp. 192.

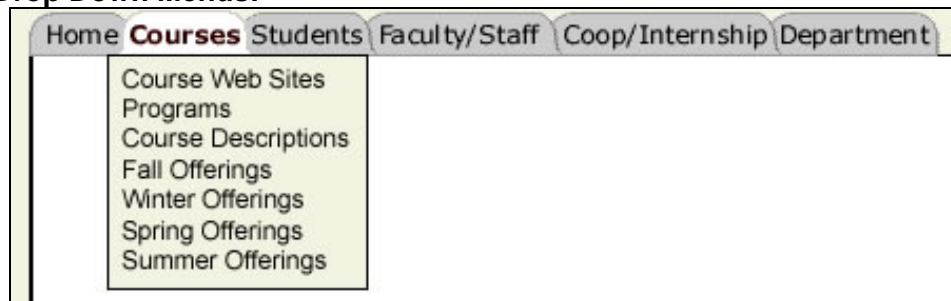
Drop Down Alternative

Drop down menus provide a handy and often stylish alternative to navigation. Converting plain tabs to menus that drop down when users hover over them allows for direct access to more pages from the homepage (and from many other pages if the navigation is consistent), while also eliminating clutter. The figures below illustrate how the *Courses* page on the department web site can be “eliminated” by using drop down menus.

Without Drop Down Menus:



With Drop Down Menus:



The drop down menus can be initiated by having them appear when the user hovers over the tab or when the user clicks on the tab (the prior being the most common approach). If the latter is used, this still technically requires two mouse clicks however only one page is loaded in the process – a fast improvement in speed.

An advantage to drop down menus is that they not only eliminate clutter on the page, but are also familiar to users. These menus mimic application toolbars. While critics of such elements may say that it hides portions of the navigation, these menus are only adding to the navigational components already in existence. In addition, since this form of navigation most often does not use

images, the element is a quick download for people accessing the pages through a slow Internet connection.

If drop down menus are implemented, they should be implemented into the layout early on and thoroughly tested in user-focus groups (discussed later) and through one-on-one usability testing to ensure the implementation is acceptable. Drop down menus become more of a drawback if they do not appear and disappear easily based on the user's mouse actions. If they appear too quickly, the menus could end up appearing on screen when the user is hovering their mouse past the menus towards another element. If they appear too slowly, then the user will become impatient and possibly resort to clicking the tab to go to the sub page (thus defeating the purpose of drop down menus altogether). The implementation of these menus can have several advantages from a navigation perspective; however their implementation should be achieved with caution. Based on user responses from the online user survey, most people liked the *Popular Pages* and *Quick Links* HTML-based drop down menus. This could suggest a willingness to adopt the JavaScript-based menus discussed here in the future.

Breadcrumbs

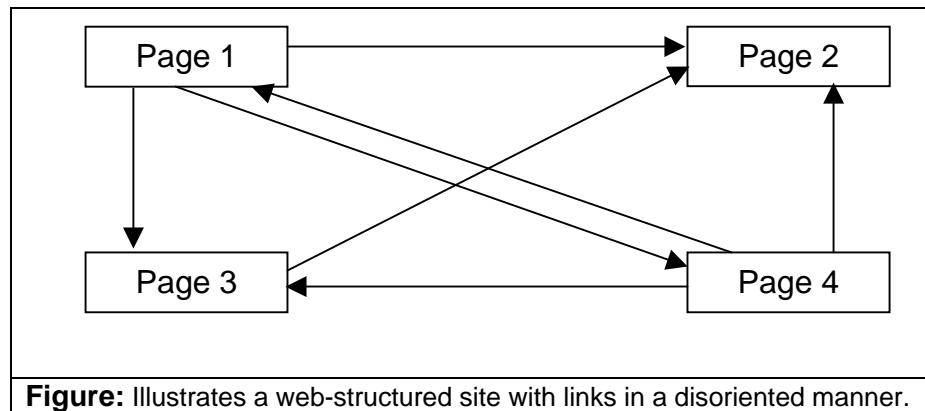
A key part of understanding usability for a web site is that users should not become confused by where they are in a site and how they got there. An easy way to overcome this problem is through the use of breadcrumbs.

Example: Clickable links using breadcrumbs

[Home](#) > [Courses](#) > [Course Descriptions](#) > [COSC 3P94](#)

This tracks the position of a page in the navigation structure and allows people to jump to a parent section quickly without relying on the back button. In the above example, it illustrates how the course page for COSC 3P94 is a sub page of *Course Descriptions*, which is a sub page of *Courses*, which can be reached from the main page. Each of these items is a link to its respective section. If the user reached the page by some other means (e.g. a bookmark or link from another site), breadcrumbs allow them to see how they would normally find their way back. It presents a way of identifying a page's location within the entire web site.

A caution when using breadcrumbs is not to make a web-structured site. Unlike deep and shallow structured hierarchies, web-structured sites are confusing and pages can be found from multiple locations.



While this type of site structure is not recommended anyway, when using breadcrumbs it adds confusion. Since someone can come to a page from multiple other pages, the breadcrumbs can change entirely from page to page eliminating the purpose of developing a backwards navigation for the user. Breadcrumbs were not specifically mentioned by user survey participants and are not necessary for a site's navigation to work successfully. They do however add to the understanding of how the site is organized.

Navigation Placement

There are generally only two locations where navigation should appear – the top and the left side. Placing navigation on the bottom is almost always discouraged because if the content is too long, the navigation will not appear on the screen when the page loads. As well, since people tend to scan pages from left to right, top to bottom, a bottom aligned navigation will be the last section they will likely scan. If the navigation appears on the right, can be difficult to determine exactly where the right side of the screen is since users' monitor resolutions differ¹⁰.

Top navigation only suites sites where there are limited number of choices available. If there are too many sections in a site, the headings will not appear on one row across the screen. A site should be designed to be able to appear properly on an 800x600 resolution screen. This significantly limits how many sections can appear without requiring a second row of navigation. Adding multiple rows in a top aligned navigation bar is like multi-layered tabs in Windows applications. It becomes confusing and cluttered.

The major advantage of top aligned navigation is that it is easy to notice. One suggestion might be to mirror the navigation on the bottom of pages. If the user scrolls through content to the bottom of the page, they would have to scroll all

¹⁰ Powel, T. A. (2002). Web Design: The Complete Reference, Second Edition. McGraw-Hill. pp. 206.

the way to the top (or click a *Back to Top* link) in order to view the navigation bar. Having links at the bottom removes this disadvantage¹¹.

The drop down menus discussed earlier work well with top aligned navigation sites. They provide a look and feel similar to what most applications have on their toolbars. As mentioned, they allow for the elimination of clutter on the screen while also giving quick access to different pages.

Left navigation is the other popular form of site navigation. It is traditional and easy for users to figure out how to use (in most cases). Since most pages scroll vertically anyway, it also allows for more sections to be displayed in the navigation bar without having to worry about screen resolutions. The major disadvantage to left aligned navigation is that too many sections on site's navigation can become cumbersome and confusing to the user. Another disadvantage is that it takes away from horizontal screen space. Most left navigation bars require approximately 20% of screen space. Content becomes more confined and hence more scrolling is necessary by the user¹². Another difficulty with top-aligned navigation is that it does not take much scrolling to force the navigation off the page. This issue has been combated by several different attempts to improve navigation. One form seen on a small number of sites is a relative navigation bar which floats down the screen as the user scrolls through the page. While this solution does solve the problem of navigation not appearing on screen, it is often a distraction from the actual content and can slow the page down slightly as the computer needs to process the transition of the navigation bar. A second, more widely accepted solution is duplicating the navigation bar on the bottom of the page. This has been illustrated by the current implementation of the Computer Science site.



Figure: Illustrates how the top-aligned navigation has been duplicated as textual links on the bottom of the page.

This provides a couple of advantages. Firstly, it is text which is quick to download and less of a distraction to the user. Secondly, it adheres to the W3C guidelines on web accessibility. For more information on this aspect, see the section of this report entitled *Web Accessibility*.

Due to the limited number of sections needed for the Computer Science department, top navigation placement should work well. It generally takes less space, allows for less scrolling by the user, and can implement a toolbar style

¹¹ Powel, T. A. (2002). *Web Design: The Complete Reference*, Second Edition. McGraw-Hill. pp. 201.

¹² Powel, T. A. (2002). *Web Design: The Complete Reference*, Second Edition. McGraw-Hill. pp. 202.

drop down menu more elegantly. As noted in the user survey, many users criticized the left bar navigation because it attributed to a cluttered first page and resulted in more scrolling. This adds to the need of placing more focus on toolbar style navigation rather than a lengthy sidebar format.

Navigation Sections

Through the research of student, staff and faculty suggestions, the following is a list of possible “sections” for the navigation (in alphabetical order). Please note that this is a recommendation only. Proper navigation terms and sections should be thoroughly discussed with those involved in the project development.

- Admissions or Prospective Students
- Courses
- Faculty / Staff
- Policies
- Programs
- Research
- Resources
- Students

Admissions or New Students would be functional to highlight aspects of the department that is already known to those currently enrolled. It would eliminate the need to take up space on the main page and would still make finding information for incoming or prospective students easy.

The *Co-op / Internship* tab currently on the site can be moved under *Programs* in order to reduce the number of sections in the navigation. The *Co-op / Internship* page only contains a link to the Brock University Co-op Office and office contact information anyways.

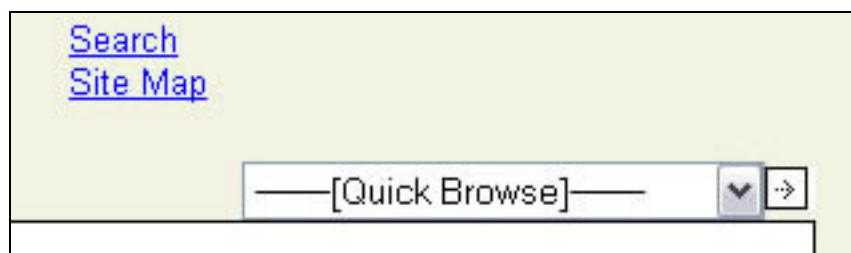
Resources is a section that could serve well if drop down menus were implemented. This section would allow quick and easy access to the pages that are popular among current students such as:

- Assignment Cover Pages
- Medical Certificates
- Swipe Card Access
- Java page (<http://www.cosc.brocku.ca/Java>)
- Tutorial Pages (e.g. UNIX, Linux)
- Floor Plans
- etc.

The *Research* section could contain links to faculty research pages and student research projects. *Policies* would be useful to highlight department policies from each page. The remaining sections should be evident and can be developed through links contained on the existing site and through consultation with faculty, staff and students.

Other Navigation Features

There are a few final points on navigation. These are search options, site maps and quick links – all of which are present on the current implementation of the Computer Science web site.



Search options (i.e. links to a search page or a search bar itself) and site maps are most commonly found in the upper right corner of the screen. This is particularly true for search options while site maps are also commonly found in the bottom right corner. The reason for having these features in the upper or lower right corner is because a person would scan the screen from left to right. After moving their eyes across the screen, the last options they would find would be either Search or Site Map (or both). Each of these features can be a last resort option that the user would utilize if none of the other links seem appropriate.

While the Computer Science site has a link to a search page powered by Google, an improved method would be implementing the search bar itself on each page.

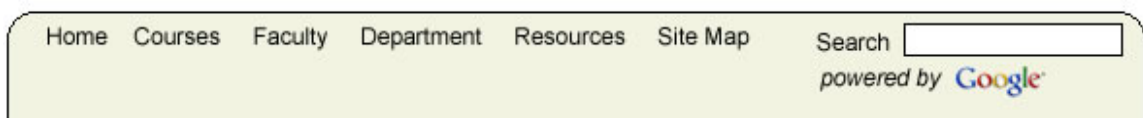


Figure: Sample of a navigation header with a search bar on each page instead of a search link.

This form of search engine implemented with the template of the site allows a user to have one click access to search results. They no longer have to click a link just to get to a page to enter search criteria. As mentioned in the drop down menus section, this provides faster navigation for people with slow Internet connections and for people who are just impatient.

For the site map, its concept of having links to virtually every page on the Computer Science site all one click away is fine; however the layout is quite poor. The advantage to the current page is that it is generated automatically, so it has no need for a developer's maintenance. This ensures its accuracy which is also an advantage. Alternative ways should be examined in order to better format the layout of the site map while maintaining its dynamic abilities. Another alternative is to provide expandable sections so that information can be hidden from view. For example, a link can be provided on the site map for course web pages. However, instead of displaying links for each course web page, these links can be hidden initially on the site map unless the user clicks on the icon to expand the list and view them all. In this case, it is important that a recognizable icon for such expandability be used so the user knows what clicking on the icon would do. A prime example of this would be the one used in Windows and other popular systems for expanding folder views.

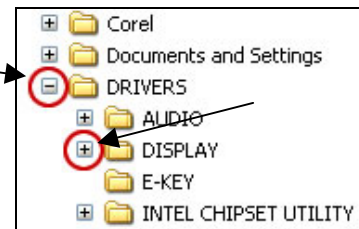


Figure: Expandable icons

Using this alternative, all the information would still be available while eliminating some of the clutter that currently exists.

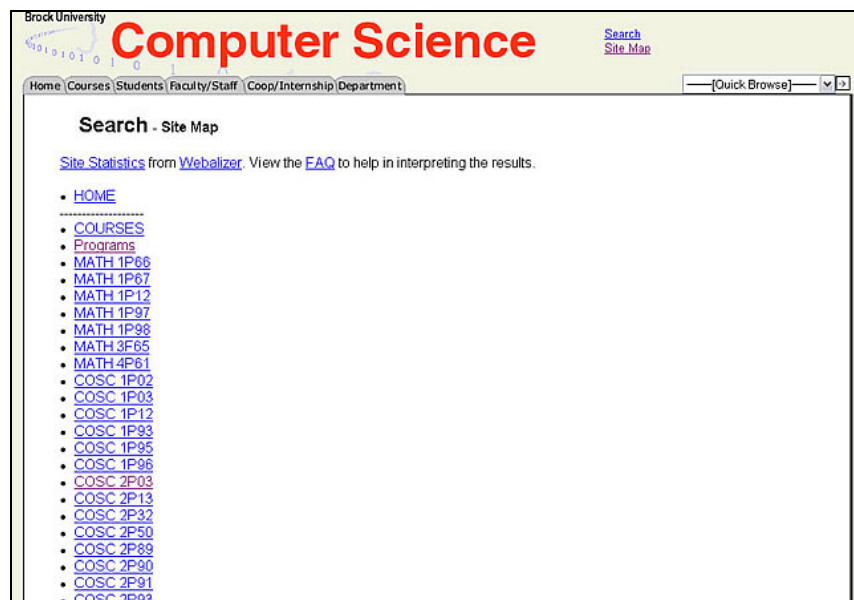


Figure: Large white space can be used to reduce amount of scrolling.

As you can see in the figure above, all links are listed in a sequential, vertical manner. It amounts to over three full screens of links to scroll through on a 1024x768 monitor resolution. A total of 80 – 90% of the screen is white space. By using tables to display the links in a more organized fashion, it can reduce the amount of scrolling a user needs to perform. Less scrolling and less clicking equals happier users.

The results of the user survey show that many users were quite satisfied with the Quick Links drop down box. It is located on every page in a consistent, visible location and is dynamic – it displays only the links related to the current page you are on. This form of navigation is repetitious. All the links are currently available in a more commonly used navigation style – plain links on the page. There is little use of having a secondary way of navigating the page. While much of this report deals with dynamic information, a static drop down box may serve a better purpose here. Providing important, commonly used features in a drop down box on every page would enhance the navigation of the site.

Organization

Main Page

One of the things frequently criticized in the user survey was the disorganization on the site – particularly the main page. The figure below illustrates the problems commonly cited with the homepage.

The screenshot shows the Brock University Computer Science website. Five red circles highlight specific areas:

- 1:** The navigation bar at the top, including links like Home, Courses, Students, Faculty/Staff, Coop/Internship, and Department.
- 2:** The main introductory paragraph starting with "Welcome to Computer Science! We offer programs leading to 3-year Pass, 4-year Honours, combined Honours BA and BSc degrees..."
- 3:** A project showcase area featuring two static photos of computer hardware and software.
- 4:** A large, vertically-oriented left-side navigation menu with categories like New Students, Co-op and Internship, Course Information, Program Information, People, Research, Administration, and Miscellaneous.
- 5:** A news section containing a dated announcement from September 2, 2003, about department information and faculty changes.

Figure: Illustrates some of the problems on the main page of the Computer Science web site.

1. Navigation bar: Nice approach; drop down menus can enhance it
2. Introduction paragraph: Long and verbose; not read often
3. Project Showcase: Highlighting projects is good; old, static photos used
4. Left Side Navigation: Nicely organized; important links; cluttered, forces more scrolling by the user
5. News Section: Poorly designed; out of date items still posted

For starters, the introduction portion under “Welcome to Computer Science!” is an element regularly found on the main pages of web sites. This section logically seems useful but in practice generally is not. Visitors to a site may read it (or glance through it) during their first visit, but it is just a place holder for any subsequent visits. If an introduction is to be left on the main page, it should be kept short and not hinder other important aspects of the main page (e.g. navigation or news).

Participants of the user survey often criticized the out of date or static content that is prominent throughout the site. The COSC 3P98 Graphics project highlight on the main page is one example of such stagnant content. The two project graphics there have been present for the past four years. Many students find Professor Ross' page interesting and the COSC 3P98 Graphics course is incredibly popular for an elective course. Highlighting such features such as those projects should remain, in fact increase, on any future site release. Several survey participants highlighted student projects and research as important to the department and should be easier to find. A useful feature to the main page would be a highlight of such recent projects. This portion does not need to take up a lot of space but should be a feature that is easy for the site administrator to update and update frequently. Including it in the Content Management System (discussed later) would be an advantage.

The left side bar is nicely broken down into categories. It is one of the most important elements of the main page. It gives students access to such things as assignment cover pages, program information, department policies, etc. The one problem with it is that it is long and located a third of the way down the page. Not likely a wise placement for such an important feature. This portion can be eliminated entirely if a drop down menu system was implemented in the top navigation bar. It would make the page cleaner, require less scrolling and make more room for additional features such as a "Project Highlight" section.

Finally, the News section is an element of the main page that has been subject to a great deal of abuse. It has been criticized for its size, how frequently it is updated and the out of date news contained in the news box. Since it is an embedded scrollable text box, the news section also causes frustration for users who have scroll wheels on their mice. If the user is using the wheel to scroll down the page, they must ensure that the mouse never goes over top of the news section. If it does, the main page will stop scrolling and the browser will begin scrolling through the news instead. Since the news portion takes up nearly half of the width of the screen, it is quite common for such an incident to occur. An alternative would be to reduce the size of the news box and text.

The news itself could be reduced through a number of options:

1. Reducing the size of the text (not recommended for people with poor vision).
2. Limit the number of news items displayed on the main page to the top three or four most recent.
3. Only display headlines for the news items and make the headlines clickable to display a full story.
4. A combination of 1, 2, or 3.

If limiting the number of news items displayed, a link should be provided to allow the user to view archived items in the database.

Secondary Pages

Secondary pages can take one of two forms. They can contain the same look and feel as the main page or contain a different layout but still maintain features which identify it as being part of the same site as the main page. These features include things like colour, logos, fonts, heading styles, etc. Which ever form is taken for secondary pages, it is vital that they all be as consistent as possible.

As sites transform themselves during redevelopment, less frequently visited pages are sometimes forgotten and old site structure and appearances remain. This produces inconsistency in the site and can lead a person to believe they have left the site they were visiting. An example of a page that has maintained its old appearance despite transformations in the rest of the department site is the Java Resource page (<http://www.cosc.brocku.ca/Java>).

Project Highlights

As discussed previously, research and student projects are among the most interesting aspects of the department site cited by users. Surprisingly, despite its popularity, the research and projects sections currently in place were among the most criticized for its out of date content. Many projects listed on the COSC 4F90 and COSC 3P99 site were as much as a decade old.

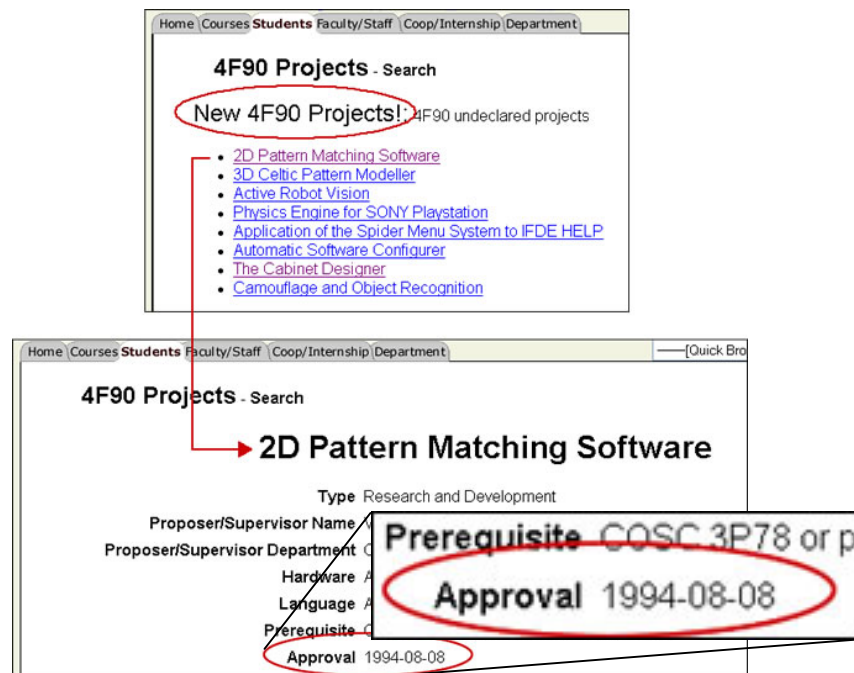


Figure: Example of an outdated COSC 4F90 project listed as new.

As well, at the time of the completion of this document, there were no projects listed as current and had not been for some time. It would be desirable to develop a section for research and projects that can be easily updated and useful for students to develop interests and increase their knowledge in a subject area. This section should contain primarily COSC 3P99 and COSC 4F90 projects but may also contain professor research. Developing an administrative area to easily update the content of this section is one thing – implementing a system in place to ensure that projects are brought to the attention of the webmaster and converted to something compatible for the web is another. At the very least, Microsoft Word or Adobe Acrobat files could be placed on the web with little effort which outline key points and highlights of the research projects. If time permits, the student and / or webmaster could post other content relating to the projects such as animations. As well as providing interesting content to people within the department maintaining an active list of projects also reflects highly on the department and university itself. This was cited by a participant in the user survey. It would add incentive to prospective students to take Computer Science at Brock University seriously.

Accessibility

What is Web Accessibility?

Web Accessibility refers to the ability for everyone, regardless of disability or system platform, to be able to access and interpret a web page as easy as possible. Most commonly, it pertains to those who have a visual impairment. Screen readers have been developed to allow such users to interpret the information contained on pages. Since such readers might have problems interpreting non-textual elements or interpret text out of context (e.g. not conveying to the user that a piece of text is a quote), standards have had to be developed to guide developers on how to properly create web sites.

Ontarians with Disabilities Act

Why should Computer Science care about people with disabilities? After all, there does not appear to be people in the department with such drastic visual impairments. There are a variety of reasons to be concerned with accessibility. For one, there may be prospective students to the department who are trying to find out more information about Computer Science at Brock who cannot easily read the information contained on the pages. Secondly, there may be people already in the department with slight visual impairments that are not evident to everyone. Another reason is that the Ontario government has legislated that businesses (including universities and colleges) identify and attempt to manage barriers that exist in their organization for people with disabilities. This has been legislated under the Ontarians with Disabilities Act (2001)¹³. Web pages are specifically mentioned in this act - being classified as part of the university's publications. It discusses several times that alternative formats should be provided for all publications¹⁴. From a web perspective, this can involve having text only versions of pages, allowing for pages to be translated with larger text, etc.

Recently Brock University, specifically Information Technology Services (ITS), has required that its future pages adhere to accessibility standards. Andy Morgan, Brock University's webmaster has done extensive research on how pages are interpreted by screen readers and how pages should be developed so that people with visual disabilities can interpret information from Brock's web pages. He sees web accessibility as essential to the development of the new Brock homepage this coming year and important to the success of the University itself. It is the responsibility of the developers to understand and adhere to the standards set forth by the World Wide Web Consortium (W3C), specifically the Web Accessibility Initiative (WAI).

¹³ Ontario Disabilities Act (2001). <http://www.gov.on.ca/citizenship/accessibility/english/act2001.htm>

¹⁴ Ontarians with Disabilities Act (2001) Guidelines for University Sector. (2001). http://www.cou.on.ca/publications/HTML_Accessibility_Document_Copies/DisabilitiesActGuidelines.htm

Developing Accessible Web Pages

The W3C established the WAI to develop a standard for creating accessible web pages. Complete details on the WAI guidelines can be found on the Web Content Accessibility Guidelines 1.0 web site¹⁵. The following is an outline of specific standards put forth by the WAI which pertain to the Computer Science web site. David Standish, from the Student Development Centre, is employed by Brock University in the field of assistive technologies. This includes how computers can be used to aid people with disabilities in academic studies. His advice on developing web pages that are able to be read by people with vision impairment have contributed to the development these accessibility guidelines.

The guidelines are based on a priority system with levels 1, 2 and 3. For a complete list of priorities set forth by the WAI, see Appendix C. Priority 1 contains specifications which *must* be implemented by developers in order for their pages to pass the accessibility guidelines. These specifications include:

- Providing alternative text for non-textual elements
- Ensuring that colour does not inhibit the user from interpreting information
- Ensuring documents are still readable even if they are not properly rendered by style sheets

An example of how (1) is implemented on the department web site is the use of textual navigation links at the bottom of the pages. This is recommended by the WAI since the navigation is largely dependant on images, not text. Another advantage to this form of navigation is that it helps avert a disadvantage of top-aligned navigation mentioned earlier. Placing these links at the bottom allow the users to access navigational components without scrolling to the top of the screen.



Figure: Illustrates how textual navigation can be implemented when images are the primary source of navigation on the page.

All images and non-textual elements should use alternative text which provides a textual explanation of the element when the mouse is rolled over it. In the case of images, the text should describe the image so that one who cannot see the image (due to either a disability or slow connection) can understand what

¹⁵ Chisholm, W., Vanderheiden, G., Jacobs, I. (1999). Web Accessibility Guidelines 1.0. <http://www.w3.org/TR/1999/WAI-WEBCONTENT-19990505>

the image contains. This is done for a variety of reasons. It allows people with slow Internet connections to see what the image will be before or without having to download it. From a disability standpoint, it allows screen readers to tell the user with a disability what the image is trying to convey. It should be noted that alternative text should *describe* the element in such a way that the user can identify as much as possible what it is trying to convey. For example, if an image has a person using a laptop along with some words, the alternative text should not simply repeat the words in the image but also illustrate what the image is about. The use of alternative text is especially useful for navigation images. If the “Home” button on the Computer Science site does not contain alternative text, a screen reader would tell the user that it is simply an image. If the button does contain alternative text for the image, it can tell the user that this is a “Home” button. In the case of drop down menus, screen readers are unable to read the links contained in the menu itself. This is where maintaining secondary pages become necessary for each menu. Without these sub pages, a person using a screen reader will be unable to navigate the site properly. The use of secondary pages will be discussed further in the Development Guidelines section.

It is also possible to provide alternative text for non-image objects, including textual links. This is especially useful since it can provide a detailed explanation of what the page the link corresponds to contains. The current department web site makes use of this on the left bar navigation on the main page (see Appendix D).

Priority 2 of the web accessibility guidelines lists specifications that *should* be followed by developers in order for pages to pass accessibility tests. It includes guidelines such as:

- Using style sheets to control layout and presentation (see *Style Sheets* in the Development Guidelines section)
- Having foreground and background colours properly contrast each other
- Using relative sizing of text rather than absolute sizing
- Dividing large blocks of information into more manageable blocks

Relative sizing of text is important because it allows text to be resized by the user's browser if they desire to have text displayed larger for visual purposes. This helps not only students with a visual impairment but also adults whose vision has deteriorated. Having absolute values for text sizes is good for presentation purposes because it guarantees that the text will display the same on different platforms. Unfortunately, users would be unable to resize the text if it is too small for their eyes.

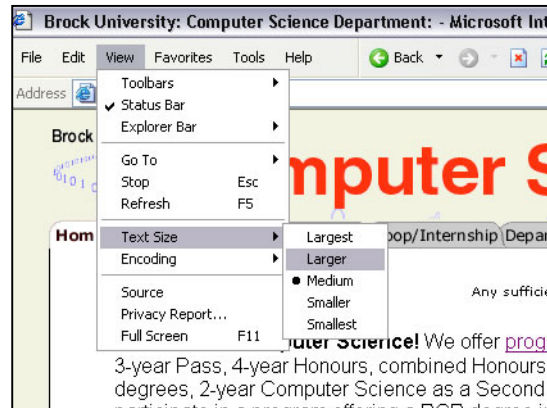


Figure: Changing text size using Internet Explorer 6.0.

Faculty and Staff

- [Jerzy Barchanski](#)
Associate Professor
- [Dave Bockus](#)
Instructor
- [Baoling Bork](#)
First Year Student Mentor

Figure: Text size set to "medium"

Faculty and Staff

- [Jerzy Barchanski](#)
Associate Professor
- [Dave Bockus](#)
Instructor
- [Baoling Bork](#)
First Year Student Mentor

Figure: Text size set to "larger"

Priority 3 discusses specifications that *may* be implemented by the developer. These specifications include things such as:

- Creating logical tab order for links and form elements on the page
- Creating shortcuts to page elements
- Grouping related links together and identifying the groups properly

It is important that form elements and links have a logical, linear order to them that is easy to understand if using the tab key instead of clicking the mouse. Many users use the tab key in order to quickly jump to the next element in a form. While web browsers tend to handle this automatically, if the page layout is complex, the elements may not tab in the proper order. Alternatively, the developer may wish the tab skip over some element and go back to it at a later time. Providing specific tab orders assist in this development.

The use of a content shortcut is a feature recommended by both David Standish and Professor Jon Radue. An example of this is the use of an *invisible* element

which is not displayed on the screen but is read by screen readers. This element, typically placed at the beginning of the document, allows for people reading the page through a screen reader to skip over the navigation and header components in order to get directly to the content of the page. Since screen readers start reading the pages from the beginning each time a page is loaded, implementing this type of shortcut allows people to skip passed the repetitive portions of the pages. Such shortcuts can be implemented to bypass other sections or skip directly to sections on a page.

User and Compatibility Testing

While this section is at the end of the recommendations report, user testing and compatibility testing should not be left till the end of the development process. It is a key part to understanding usability and reducing time spent in implementation.

User Testing

User testing is necessary to understanding how people will navigate the site and how it will serve its purpose of delivering desired content to the user. It can involve things such as one-on-one consultation with people within the department or focus groups that examine the strengths and weaknesses of the developing site. Individual consultation will allow the user to test the site for navigation and other aspects of usability. The developer can take notes about how easy / difficult it was for the user to find the information they wanted, if components such as drop down menus served its purpose or was more of a frustration, etc. Focus groups allow people within the department to meet and examine the structures of the new site and determine if they feel it will meet department expectations and user expectations¹⁶. Both of these forms of user testing allow the developer to identify weaknesses in the site early in the development process. A focus group should be set up with faculty, staff and a select group of students at various stages (particularly early on before a lot of work has been accomplished and before the site is due for release). Of course, personal consultations with the developer's supervisor and other users should continue throughout the development process. It should not be left till the end when changes to the implementation become costly and time consuming. A preview release can be setup and made public shortly before the official release date of the site. This allows for a broader range of opinions from the department. If a preview release is made, it would be necessary to include a temporary, prominent link that allows them to provide feedback of the site.

¹⁶ Krug, S. (2000). Don't Make Me Think: A Common Sense Approach to Web Usability. New Riders Publishing. pp. 141

Platform Testing

Like user testing, platform testing should be conducted during key stages in the development process – particularly when new elements have been added to the site. The pages should be tested on the major operating system platforms (Windows, Macintosh, Linux) and the major web browsers:

- Internet Explorer 5.0+
- Netscape 4.x, 6.x+
- Opera 6.0+
- Safari
- Any other browsers cited by users

While Netscape 4.x is slowly becoming non-existent, it is still the browser of choice for a select group of users. It is one of the most important browsers to test for since it does not support many new or dynamic features in web standards. Drop down menus, as mentioned earlier, is a particular concern when dealing with older browsers.

Producing browser compatibility does not mean that the site has to look the same on all browsers. This is especially difficult with Netscape 4.x. If an element cannot be supported in an older browser, it is necessary to add an alternative form to the user. For example, with drop down menus the headings of the menus should be clickable to a sub page in case the user's browser does not support them.

Some compatibility issues to look out for in web browsers and platforms are:

- Drop down menus not working properly
- Differences in widths and heights in tables
- Proper form submission (particularly in Netscape)
- Colour and resolution differences on monitors
- Any element requiring JavaScript or other client side scripting languages

Development Guidelines

About these Guidelines

This section outlines some points on the implementation of features introduced in the Usability Analysis portion of this report. These guidelines are not a necessity but are recommended through past experience in the production of large scale web sites / applications and compatibility testing.

Implementation Languages

Through consultation with faculty and staff in the department (specifically Professor Ivo Düntsch and Mr. Gord Dunkley), it is recommended that a PHP and PostgreSQL database be used in the development process. The database will allow for the implementation of a Content Management System (discussed later), data integrity and easier management from the administrative side. In addition to HTML 4.0 standards, Cascading Style Sheets (CSS) version 1 (CSS1) is recommended to provide layout and design to the pages as well as accessibility. CSS allows for more control on specifications from the developer's prospective instead of relying on client specific browsers to interpret the code and layout¹⁷.

Database Concerns

According to Systems Administrator Cale Fairchild, the use of database calls on the Computer Science web site, including high traffic pages such as the main page, would not be a concern for the developer. While queries made to a database must be tested and ensure they do not take up time and resources on the server while executing, Cale described the Sandcastle server as being able to support a large number of hits to pages that contain multiple calls to a PostgreSQL database. This question was proposed to Cale due to the concern of all the lab computers containing <http://www.cosc.brocku.ca> as their browser homepage. If the number of database calls on a high traffic page was a concern, placing numerous queries on the main page to make it dynamic would cause significant strain on the server. Fortunately this is not the case.

There have been numerous calls for the use of a MySQL database as a backend to the site's implementation. According to Cale, MySQL has awful support for IRIX machines. While he has tried to compile it on various occasions, his attempts have been unsuccessful. Since PostgreSQL provides support for transactions and is used by many courses in the department (unlike

¹⁷ Chisholm, W., Vanderheiden, G., Jacobs, I. (1999). Web Content Accessibility Guidelines 1.0. <http://www.w3.org/TR/1999/WAI-WEBCONTENT-19990505>.

MySQL), it has become the database of choice for web site development on Sandcastle.

Web Site Administration

An interview with Gord Dunkley

The following is a summary of an interview conducted on August 19, 2003 between Robert Graves and Gord Dunkley. Gord currently maintains the majority of the Computer Science web site. The purpose of this interview was to develop an understanding of how the current maintenance of the site works including its strengths, its weaknesses and how future implementations could be developed to properly manage the site.

The current Computer Science site is maintained primarily by Gord Dunkley. He makes changes on a working copy of the site. When the changes are complete, Systems Administrator Cale Fairchild uploads the files to the live site. This is a common practice on many large scale web sites and also within the University. It prevents a novice user from having direct access to the live data and hence lessens the potential of data corruption. Course and professor web sites are maintained by the respective professor. Other sites such as the Computer Science Club (CSC) are maintained by their respective groups.

When asked what features would be required from a webmaster prospective for the site, Gord expressed interested in a Content Management System (CMS). Such a system would allow for easy online manipulation of content without needing special software or knowledge of a programming language. A web based system would also allow for content managers to do updates from off campus if need be. Content Management Systems are discussed in more detail in the next section.

Accessibility was another area of concern. There is an increasing amount of pressure on businesses to make their services accessible to people with disabilities. Web sites are often overlooked. A poorly developed site can make it hard for a person with a visual impairment to navigate. It has been expressed by members of the Computer Science department that developing an accessible web site is not only an asset but a necessity. For more information on accessibility, see the *Web Accessibility* section under Usability Analysis.

Many of the issues addressed by participants of the online survey were also addressed during the interview. Gord discussed the portions of the site which were updated frequently and those which were rarely updated. When it comes to computer expertise, Gord described himself as an intermediate level user. However when dealing with the web, more specifically web programming, Gord described himself as more of a novice programmer. After the duration of the

interview, the current system of maintaining the site seemed adequate given Gord's experience and abilities. The concern would be if the site maintenance was later passed on to someone with less programming experience – such as an administrative assistant. If a content management system is developed, it is necessary that there be a low learning curve for a user which may not have an intermediate level of computer expertise. The maintenance of content on the site should not require the user to have knowledge of a web programming language, nor computer software and techniques such as telnet or FTP. The higher the learning curve, the more frustrated a user will become and the greater potential for error.

Throughout the interview, Gord seemed to feel that the system was adequate for the tasks he needed to perform, however it took some time to get a handle on everything. He knew HTML however some experience with the programming language PHP would have been an asset. The lack of a good text editor also made for the task of updating the site more difficult. Gord handles a majority of the site through a text editor called PHPed. Such a form of content maintenance could prove to be a problem if the site was passed on to a non-programmer or more specifically, a non-PHP programmer. Any future implementations of the site should take careful consideration about how to develop a system in which portions can be maintained online through a CMS and other (usually more static) portions by a visual (WYSIWYG) web page editor such as Dreamweaver. Such editors have the potential to ruin pages by providing its own code. An ideal situation would be to research the various programs available for site maintenance including their strengths and drawbacks. Having a site that can be maintained by a visual editor without corrupting the code would be ideal if a non-programmer were ever to take over the Computer Science web site. Through personal experience, Macromedia's Dreamweaver appears to be one of the best in this field.

Content Management System

Basics

Several participants of the Online Survey noted that much of the content of the site was out of date. News information was posted from a year ago, professor information was missing and research papers / projects were outdated. A solution to combat the outdated material is to make updating the Computer Science web site easier. This is where a Content Management System (CMS) comes into play.

The basic concept behind a CMS is that dynamic information (particularly information that needs to be updated frequently) is stored in a database. A popular database currently installed on the Sandcastle server is PostgreSQL. It is free and provides the advantages of content reliability provided by other

popular databases. It also integrates easily with PHP for programming web pages. From there a web interface is created to handle the updates of the content. This type of system has several major advantages. Firstly, it allows the webmaster to maintain the site from any computer with an Internet connection. No extra software is needed and hence the person maintaining the site would not need to wait until he / she was at his / her office computer before the update could be made. Secondly, if properly developed, it will ensure data integrity in the database hence preventing errors from a user not inserting or updating the data format and code correctly. Finally, online CMSs allow for an easier learning curve. Those maintaining the site do not need to learn new software or programming languages. If the person is not proficient with certain development software (e.g. an administrative assistant), using online forms provides a recognized method of the Internet to which the user is already familiar.

A CMS can be implemented for the following sections on the Computer Science site:

- News and Events
- Course Listings (e.g. listing of currently offered courses, times and locations, instructors, and their web sites)
- Professor Information (e.g. phone extension, e-mail, office, office hours, etc.)
- Research Papers / Projects
- Other sections which are in need of frequent updates

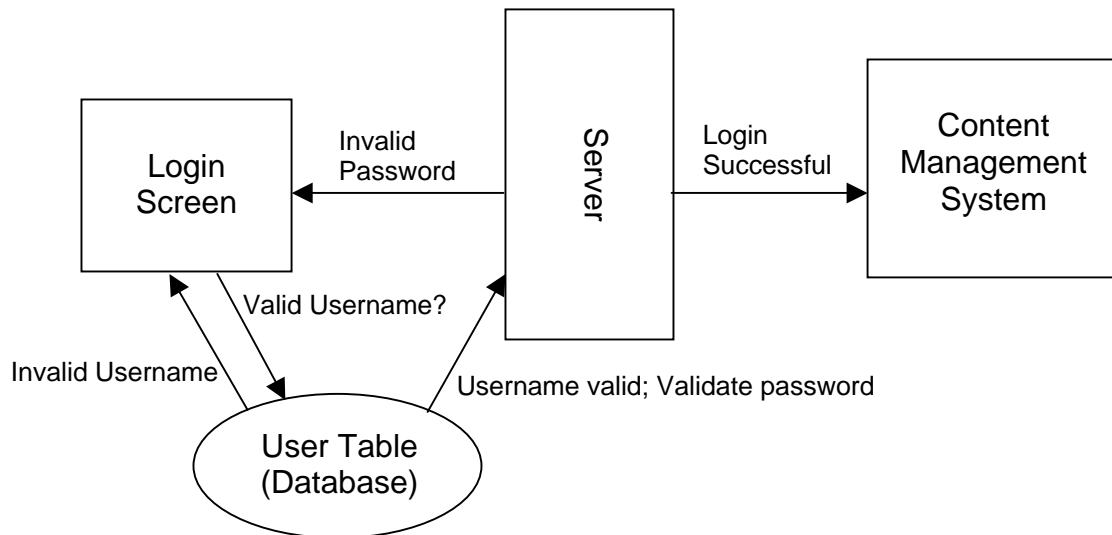
Security

A web interface would need to be developed for each of these sections to allow the user to add, update and delete items from the system. Such a system would have to be password protected through a high level encryption system to prevent hackers from breaking into the pages that manage the data.

Since the likelihood is that the person updating the site would have a sandcastle account with the department, it is possible to use IMAP authentication with the sandcastle server. This would allow the person to use their sandcastle username and password which would be authenticated against the server. A major advantage to this is that you are using the UNIX encryption scheme already in place (so you don't need to be concerned about a poor encryption scheme you developed). As well the user(s) will not need to memorize another username / password combination. In order to limit the number of sandcastle users who can access the CMS, a table will need to be created in a PostgreSQL database to store the list of valid users. Before authenticating against the sandcastle server, the login script would first have to ensure that the username exists in the *users* table. Such a table could look as follows:

ID	Name	Username	Server
1	Gord Dunkley	gdunkley	sandcastle
2	Cale Fairchild	root	sandcastle

Notice there is no need for a *password* field since the username and password is validated on the server itself. The process for logging a user into the CMS would look as follows:



Details on how to authenticate against a server using PHP can be found on PHP.net under the *imap_open* command.

Each administrative page in the CMS would have to be protected. Hence such an authentication method would have to be called at the beginning of each of the pages. To prevent the user from having to re-enter their username and password when they go from page to page, the user's information would need to be stored in a variable which can be passed between pages. PHP allows this through the use of SESSION variables. More information about how to properly handle session variables can be found at PHP.net. A simpler method of authentication would be protecting an entire administrative directory using .htaccess.

Implementation

The following will illustrate an example of implementing a CMS for the news section of the web site. This example is done using a PostgreSQL database.

First, create a table in the database which will contain all the news stories. An example of such a table is shown below:

Table: news	
Field Name	Type
id	serial
heading	varchar(50)
date	date
story	text

Date would store the date the item was inserted into the table. *Id* stores the key uniquely identifying the record in the table. Making *id* of type *serial* forces the key to automatically increment for each record added. After creating a table, there will be the need for a page to insert new stories and a page to edit existing stories. Such a page would look something like this:

News Information	
Heading:	<input type="text" value="New Web Site for COSC"/>
Story:	<input type="text" value="The department is pleased to announce the creation of a new web site for COSC. We eagerly await to hear your comments."/>

This is the basic concept of the CMS. A place listing the existing news stories on the administrative side would be needed to select items to edit or delete. The system itself can become quite simple and once created for one section (i.e. news), the code can be easily applied to future sections (e.g. courses, professor information, etc.) simply by changing the field names.

Drop Down Menus

While drop down menus have many advantages, as discussed in the Usability Analysis section, this type of navigational feature does have a few drawbacks. They all revolve around the issue of compatibility between browsers and platforms. Most of the common drop down menus are primarily designed for Internet Explorer 5.0 or greater. When developing the menus it is important to ensure that the code will work in the majority of browsers used on the market. Specifically, the ones tested should be:

- Internet Explorer 5.x, and greater
- Netscape 4.x, 6.x and greater
- Opera 6.x and greater
- Safari (MAC only)
- Any other browser recommended by faculty, staff or students as being used in the department

Also, the browsers should be tested on both PCs and Macintosh systems. Slight differences in the programs for the different operating systems may cause problems.

Few implementations of drop down menus work properly on the most popular platforms – even less work properly with different resolutions. The majority of drop down menus use *absolute positioning*. This means that the (x, y) coordinates that specify where the menu will appear must be specified with absolute screen coordinates. This works fine no matter what resolution the user is viewing the page on - as long as the page is left justified. If the tables on the page are centred, then different resolutions will often display the menus in different locations. The way around this is to apply *relative positioning* to the script. The script will need to determine the (x, y) coordinates of where the parent tab is located on the screen and then position the drop down menu relative to that location. Good open source examples which meet all of the above criteria can be found on BrockPeople (<http://www.brockpeople.ca>) and the future implementation of the Brock University homepage (due for release in January, 2004).

Finally, in order to combat the risks of compatibility issues, it is still necessary to keep the secondary page. Since these types of menus use JavaScript, keeping a secondary page with the same links as the menus allows for users who have JavaScript disabled to still be able to use the site. The buttons which activate the drop down menus when the mouse hovers over them would also serve as links to these secondary pages. Since screen readers are currently not capable of reading the contents of drop down menus, having a secondary page such as this also allows for better web accessibility.

Producing Breadcrumbs

Breadcrumbs can be produced through several means. The easiest way is to parse the URL and display it as links.

Example: Parsing a URL into Breadcrumbs

URL: http://www.cosc.brocku.ca/courses/course_descriptions.html#COSC_3P94

Breadcrumbs: Home > Courses > Course Descriptions > COSC 3P94

As you can see, the directory names and file names are translated into the breadcrumb links easily. The disadvantage to this is that the directory and file names must be in a readable form. For example, a directory called *newstudents* would translate into Newstudents in the breadcrumb since the parser would have no way of knowing where the space should go between the words.

Another alternative would be storing directory and file names in a file with a translation between the URL name and the readable version that displays on screen. This presents a major issue since the conversion list must be kept up-to-date. The best choice between these two methods would be a combination of the two. By modifying the original parsing script to first search through a file for a directory name, the developer can maintain a list of “user-friendly” text corresponding to its directory. If the directory name is found in the file, it would display the user-friendly text. If it cannot be found in the file, it would parse the URL as illustrated in the first example. This would eliminate the potential of a script causing errors if the file was not maintained properly. Other examples for developing breadcrumbs can be found on the web. Most publicly available scripts follow the first method mentioned since it is easy to develop and requires no maintenance.

Style Sheets

Style sheets have introduced a vast improvement in the way that the web is presented. Regular HTML was not meant for publication purposes¹⁸. Style sheets allow for the separation of structure and presentation in a web document. It creates a level of abstraction between the way the document is constructed and the way it is interpreted and displayed. Cascading Style Sheets, conforming to the CSS1 standard should definitely be implemented in a future development of the department web site. It will allow for easy updating of the appearance of the site without having to alter the code on each page. It also allows the developer to have more control in how the information is displayed on various platforms. Style sheets allow for more presentation control than regular HTML tags.

One of the major advantages to style sheets is how it allows for multiple style sheets to be used depending on the situation. A developer can specify one set of styles for displaying on a computer screen, a different set of styles for when pages are printed, and another for when pages are displayed on a screen through a projector. An example of how this is implemented can be found on the web site for the Business Career Development Office (BCDO) at Brock¹⁹. In the BCDO web site, a print style sheet prevents things such as the navigation bars from being printed when the page is sent to the printer. Since the navigation bars are useless in print form, it saves ink and allows for more information to be printed on a page. Below is an example of how two style sheets can be implemented within the head of an HTML document:

Example: Implementing screen and print style sheets on a page

```
<link href="coscstyles.css" rel="stylesheet" type="text/css" media="screen">  
<link href="printstyles.css" rel="stylesheet" type="text/css" media="print">
```

The use of separate screen and print style sheets can make pages look highly professional if implemented properly and should be considered for future development. It is especially useful in making printer friendly versions. The BCDO web site has no need for a "Printer Friendly Version" button on its site since all pages are printer friendly through the use of the print style sheet.

It is important to remember that highly structured documents adhering to the WAI standards convey more information to screen readers (since the best readers are based on such standards) and also to search engines²⁰. Proper use of meta data should be used to ensure that search engines are successful

¹⁸ Jacobs, I., Brewer, J. (1998). WAI Resource: HTML 4.0 Accessibility Improvements. <http://www.w3.org/WAI/References/HTML4-access>. See Style Sheets

¹⁹ Business Career Development Office, Brock University. (2003). <http://www.bus.brocku.ca/bcdo/>

²⁰ Jacobs, I., Brewer, J. (1998). WAI Resource: HTML 4.0 Accessibility Improvements. <http://www.w3.org/WAI/References/HTML4-access>. See Improved Structure

in indexing (or in some cases, not indexing) pages on the site. Meta data can be used to describe the page, give the page an official title, author and copyright date, and most importantly, provide keywords for search engines to index.

Finally, various validation tools can be used to ensure that the web page conforms to the WAI standards for web accessibility. A popular online tool is Bobby (<http://www.cast.org/bobby>) which takes a URL and parses through the page to determine if the page adheres to such guidelines. It categorizes the “errors” based on the WAI priority lists. While such tools cannot perfectly identify how well a document adheres to the guidelines, it can give important suggestions. Hence it should be important to note that not passing the “Bobby Test” does not mean a site does not properly follow web accessibility suggestions. There are some results listed by Bobby that are only proposals since it cannot be certain if the developer followed the given guideline or not. Other validation tools can be found on the WAI web site²¹.

²¹ World Wide Web Consortium: The QA Toolbox. (2002). <http://www.w3.org/QA/Tools/#validators>

Conclusions

The implementation of a new web site for the Department of Computer Science involves usability analysis of both users and maintainers. Navigation is one of the most significant aspects in development that needs to be examined. Navigation involves grouping links to pages in appropriate categories and in appropriate order, analyzing where users expect to find a given page, and using appropriate methods of common navigation to incorporate these aspects.

Organization is another significant problem which needs to be addressed. It is difficult to determine how to organize the site so that links are not buried under multiple parent links and at the same time are not all on one page making it cluttered and daunting. Both deep and shallow structured sites are criticized by users for such faults. A form of navigation and organization implemented should seek to compromise these two methods. Drop down menus allow for more direct links to pages to be placed on the main page without making the page appear cluttered as it does currently, however they do have many compatibility problems associated with them. These compatibilities can easily be overcome. Most scripts available on the Internet do not attempt to overcome these problems however.

A content management system (CMS) will seek to employ usability from an administrative perspective. Even though the department is full of programmers, it does not necessarily mean that an expert programmer will always be maintaining the site. Administrative assistants are often required to maintain department web sites. Alternatively, an administrative assistant may be needed to update a portion of the site when the site's administrator is away. As such, a CMS should be developed to allow for easy maintenance of the pages (especially portions that are updated often such as news, research papers, courses, professor information, etc). Content Management Systems also make it easier for programmers to update the site since it does not require additional software or knowledge of how to use such software. A site that is easier to update can help ensure content is updated more frequently – a concern addressed time and again in the online user survey.

Accessibility to web sites for people with disabilities is a growing concern among businesses and universities. Accessibility addresses the needs of those with visual impairments and also browser compatibility issues. The World Wide Web Consortium (W3C) has established a body to present recommendations of how web accessibility can be incorporated into a site. It outlines three levels of priorities for accessibility issues to be implemented. As well, the W3C lists a variety of code validation tools that assist web developers in assuring that their sites conform to the W3C guidelines.

Finally, as with any programming project, thorough testing is needed on the site from both a user and system perspective. Users should not be left in the dark about how the site is emerging. Since faculty, staff and students will be using the site each day their opinions are important and should be seriously considered through one-on-one discussion and focus groups. Browser and platform compatibility should be tested at various stages in development to ensure that newly added elements to the site work properly and to reduce the amount of time needed in debugging.

This report outlines specific recommendations based on user opinions and personal experience in large scale web site creation. Following the guidelines outlined here will help ensure a smoother, successful development of the Computer Science web site.

Appendices

Appendix A **User Survey Responses**

Response 1 (ID: 16) - Monday, July 28, 2003

I am a: Fourth Year/Above

What are your primary objectives when coming to the Computer Science web site?
Visit Course Web Sites, Visit Professor Web Sites, Find out more Information about a Course, Other

Other Objectives: research projects

What features do you find essential that currently exist on the site?

- department news
- quick access to nearly all information about department

What features do you find essential that do not currently exist on the site?

- department research is not highlighted enough
- the site is not very inviting to a new user (ie. new users like flashy pictures and such... maybe see www.cs.cmu.edu, which is a bit too flashy but you get the idea)
- show student work, stuff going on, talks etc...

How would you rate the navigation of the site? Good

If you ranked the navigation as Extremely Poor, Poor, or Average, explain why.

Do you find the content of the site to be reliable and up-to-date? Yes

What sections do you find to be inaccurate (if any)?

4F90/3P99 are years out of date!!!! and are not updated regularly...

How does the Computer Science web site currently meet your needs? Meets most of my needs

If the site does not meet most or all of your needs, explain why.

Response 2 (ID: 17) - Monday, July 28, 2003

I am a: Fourth Year/Above

What are your primary objectives when coming to the Computer Science web site?
Visit Course Web Sites, Print Assignment Cover Pages

Other Objectives:

What features do you find essential that currently exist on the site?
links to course home pages

What features do you find essential that do not currently exist on the site?
timetable/course locations
professor office hours

How would you rate the navigation of the site? Good

If you ranked the navigation as Extremely Poor, Poor, or Average, explain why.

Do you find the content of the site to be reliable and up-to-date? Yes

What sections do you find to be inaccurate (if any)?

How does the Computer Science web site currently meet your needs? Meets most of my needs

If the site does not meet most or all of your needs, explain why.

Response 3 (ID: 18) - Monday, July 28, 2003

I am a: Fourth Year/Above

What are your primary objectives when coming to the Computer Science web site?
Visit Course Web Sites, Print Assignment Cover Pages, Find out more Information about a Course

Other Objectives:

What features do you find essential that currently exist on the site?
courses

What features do you find essential that do not currently exist on the site?

How would you rate the navigation of the site? Average

If you ranked the navigation as Extremely Poor, Poor, or Average, explain why.

Do you find the content of the site to be reliable and up-to-date? No

What sections do you find to be inaccurate (if any)?

How does the Computer Science web site currently meet your needs? Meets some of my needs

If the site does not meet most or all of your needs, explain why.

Response 4 (ID: 19) - Monday, July 28, 2003

I am a: Alumni

What are your primary objectives when coming to the Computer Science web site?

Visit Course Web Sites,Find out more Information about a Course,Other

Other Objectives: Prof Ross's website

What features do you find essential that currently exist on the site?

quick links to popular course websites

What features do you find essential that do not currently exist on the site?

How would you rate the navigation of the site? Average

If you ranked the navigation as Extremely Poor, Poor, or Average, explain why.

depends on what you're looking for, sometimes you need to go thru too many pages to get to a course's website

Do you find the content of the site to be reliable and up-to-date? No

What sections do you find to be inaccurate (if any)?

some courses are not up to date

How does the Computer Science web site currently meet your needs? Meets most of my needs

If the site does not meet most or all of your needs, explain why.

Response 5 (ID: 20) - Monday, July 28, 2003

I am a: Fourth Year/Above

What are your primary objectives when coming to the Computer Science web site?

Visit Course Web Sites,Print Assignment Cover Pages,Find out more Information about a Course,Other

Other Objectives: get phone numbers/email addresses for faculty

What features do you find essential that currently exist on the site?

faculty page

What features do you find essential that do not currently exist on the site?

How would you rate the navigation of the site? Good

If you ranked the navigation as Extremely Poor, Poor, or Average, explain why.

the popular pages pull down is biased!

Do you find the content of the site to be reliable and up-to-date? Yes

What sections do you find to be inaccurate (if any)?

How does the Computer Science web site currently meet your needs? Meets most of my needs

If the site does not meet most or all of your needs, explain why.

occasionally, phone numbers/email addresses are missing from faculty pages

Response 6 (ID: 21) - Monday, July 28, 2003

I am a: Fourth Year/Above

What are your primary objectives when coming to the Computer Science web site?

Visit Course Web Sites,Print Assignment Cover Pages,Find out more Information about a Course

Other Objectives:

What features do you find essential that currently exist on the site?

That the course web sites are in a predictable location i.e. /Offerings/CourseName

That there are easy links from the homepage to the print cover page page, and help desk page, mainly for the java library link to the sun site

What features do you find essential that do not currently exist on the site?

A modern look and feel. Course web pages that actually get updated, anyone look at 4F90/3P99 lately? those projects are still the same old ones.

How would you rate the navigation of the site? Good

If you ranked the navigation as Extremely Poor, Poor, or Average, explain why.

Do you find the content of the site to be reliable and up-to-date? No

What sections do you find to be inaccurate (if any)?

Any of the course pages seem to always be out of date. As well the news never seems to change.

How does the Computer Science web site currently meet your needs? Meets most of my needs

If the site does not meet most or all of your needs, explain why.

Response 7 (ID: 22) - Monday, July 28, 2003

I am a: Fourth Year/Above

What are your primary objectives when coming to the Computer Science web site?

Visit Course Web Sites, Visit Professor Web Sites, Print Assignment Cover Pages, Find out more Information about a Course, Find out more Information about a Stream, Other

Other Objectives: Java Page and Mentor Page

What features do you find essential that currently exist on the site?

The quick links drop down.

What features do you find essential that do not currently exist on the site?

Simplified interface.

A text box that uses autocomplete that allows you to navigate to any page based on title.

How would you rate the navigation of the site? Poor

If you ranked the navigation as Extremely Poor, Poor, or Average, explain why.

Should separate the functionality for future students and current students using tabs or something. I think the tabs could be used more effectively to separate content. The entire "Welcome to Computer Science! We offer programs leading to 3-year Pass, 4-year Honours, combined Honours BA and BSc degrees, 2-year Computer Science as a Second Degree, and participate in a program offering a BCB degree in Computing and Business. Our Co-op and Internship options are a vital part of our overall offerings. We pride ourselves in maintaining up-to-date facilities and conducting research in a variety of areas of Computer Science." section is completely useless. I have never used it ever.

the logo wastes valuable space with crap.

the popular pages thing is interesting but stupid.. why use it unless you wanna see what is popular.. not good for main page.

The news could a be in the form of a small amount of text with links to content. cause it wastes space most of the time as the news is rarely updated.

Do you find the content of the site to be reliable and up-to-date? Yes

What sections do you find to be inaccurate (if any)?

How does the Computer Science web site currently meet your needs? Meets most of my needs

If the site does not meet most or all of your needs, explain why.

COurse instructors sites often suck. Prof Hughes has most organized site so far. They should implement a general template for proffesor site and then let them have a section where they can add their own stuff.

Vlad once had a site where I didn't know the assns were posted on it cause he used some small imagess.

Professor don't alwas post the required information to tell us what assigments a course will require and when the test dates are.

Response 8 (ID: 23) - Monday, July 28, 2003

I am a: Alumni

What are your primary objectives when coming to the Computer Science web site?

Visit Course Web Sites

Other Objectives:

What features do you find essential that currently exist on the site?

links to other course sites
contact information about professors, faculty
contacts to jobs, alumni

What features do you find essential that do not currently exist on the site?

alumni stuff? (ie. contact fellow cosc alumni)
new layout, new look
change 3p98 thumbnail pictures

How would you rate the navigation of the site? Average

If you ranked the navigation as Extremely Poor, Poor, or Average, explain why.

It is too busy. You can see old cosc courses not being taught that semester

Do you find the content of the site to be reliable and up-to-date? No

What sections do you find to be inaccurate (if any)?

contact information (ie. new members not on and/or no picture with them)

How does the Computer Science web site currently meet your needs? Meets some of my needs

If the site does not meet most or all of your needs, explain why.

It's too busy, layout is not good

Since I am an alumni, I have no use for the site anymore

Response 9 (ID: 25) - Monday, July 28, 2003

I am a: Fourth Year/Above

What are your primary objectives when coming to the Computer Science web site?

Visit Course Web Sites, Visit Professor Web Sites, Find out more Information about a Course, Use the Search Engine

Other Objectives:

What features do you find essential that currently exist on the site?

search and projects for courses. Professor Ross has the best examples of projects displayed. The COSC 3P99 and 4F90 projects should be displayed or featured as well.

What features do you find essential that do not currently exist on the site?

The site has everything. Just needs better organisation. FEATURE PROJECTS FROM COURSES!!! Needs consistent SECOND pages!!!

How would you rate the navigation of the site? Average

If you ranked the navigation as Extremely Poor, Poor, or Average, explain why.

Too much stuff on first page. It's hard to find certain pages. Front page links should correspond to the tabs.

Do you find the content of the site to be reliable and up-to-date? No

What sections do you find to be inaccurate (if any)?

How does the Computer Science web site currently meet your needs? Meets some of my needs

If the site does not meet most or all of your needs, explain why.

Response 10 (ID: 26) - Monday, July 28, 2003

I am a: Fourth Year/Above

What are your primary objectives when coming to the Computer Science web site?

Visit Course Web Sites, Visit Professor Web Sites, Print Assignment Cover Pages, Read the policies for the Computer Science Department, Use the Search Engine

Other Objectives:

What features do you find essential that currently exist on the site?

Course information and curriculum changes.

What features do you find essential that do not currently exist on the site?

up to date information about getting into acm and being eligible for the programming competitions.

How would you rate the navigation of the site? Good

If you ranked the navigation as Extremely Poor, Poor, or Average, explain why.

Do you find the content of the site to be reliable and up-to-date? No

What sections do you find to be inaccurate (if any)?

Eligibility information about competitions.

How does the Computer Science web site currently meet your needs? Meets most of my needs

If the site does not meet most or all of your needs, explain why.

Response 11 (ID: 30) - Monday, July 28, 2003

I am a: Fourth Year/Above

What are your primary objectives when coming to the Computer Science web site?

Visit Course Web Sites, Visit Professor Web Sites, Print Assignment Cover Pages, Find out more Information about a Course, Find out more Information about a Stream

Other Objectives:

What features do you find essential that currently exist on the site?

- cover page

- course info
- java help (not so much anymore, but when i was starting out...)

What features do you find essential that do not currently exist on the site?

- my photo notes!!

How would you rate the navigation of the site? Average

If you ranked the navigation as Extremely Poor, Poor, or Average, explain why.

It goes down too far on the left-hand side, and the popular pages drop-down seems fairly arbitrary, although it did help me find Prof. Ross' page. ;-)

Do you find the content of the site to be reliable and up-to-date? No

What sections do you find to be inaccurate (if any)?

The individual course webpages sometimes are updated before a semester starts, sometimes after, and sometimes not at all. Past course webpages should be archived where possible, so students can get a better idea of what they'd be getting into.

How does the Computer Science web site currently meet your needs? Meets most of my needs

If the site does not meet most or all of your needs, explain why.

Response 12 (ID: 31) - Monday, July 28, 2003

I am a: Fourth Year/Above

What are your primary objectives when coming to the Computer Science web site?

Visit Course Web Sites, Visit Professor Web Sites, Print Assignment Cover Pages

Other Objectives:

What features do you find essential that currently exist on the site?

3 clicks away from any other page

What features do you find essential that do not currently exist on the site?

a link to brock self serve

a uniform pages for all courses would make finding assignment / lecture information much easier

How would you rate the navigation of the site? Good

If you ranked the navigation as Extremely Poor, Poor, or Average, explain why.

Do you find the content of the site to be reliable and up-to-date? No

What sections do you find to be inaccurate (if any)?

on the main page the text area is never updated, course web sites are not updated when a course ends

How does the Computer Science web site currently meet your needs? Meets most of my needs

If the site does not meet most or all of your needs, explain why.

Response 13 (ID: 32) - Monday, July 28, 2003

I am a: Third Year

What are your primary objectives when coming to the Computer Science web site?

Visit Course Web Sites, Print Assignment Cover Pages

Other Objectives:

What features do you find essential that currently exist on the site?

Course Webpage links.
Assignment cover page.
programs, professors etc..

What features do you find essential that do not currently exist on the site?

custom login and personalization.

How would you rate the navigation of the site? Poor

If you ranked the navigation as Extremely Poor, Poor, or Average, explain why.

Awkward and doesn't give what I need right in front of me.

Old design and cluttered.

Do you find the content of the site to be reliable and up-to-date? No

What sections do you find to be inaccurate (if any)?

Java IDE's and Links. etc..

How does the Computer Science web site currently meet your needs? Meets most of my needs

If the site does not meet most or all of your needs, explain why.

Response 14 (ID: 33) - Monday, July 28, 2003

I am a: Alumni

What are your primary objectives when coming to the Computer Science web site?

Visit Course Web Sites

Other Objectives:

What features do you find essential that currently exist on the site?

QUICK links to courses (I believe should be on the default page as this is most likely the majority reason students have for visiting the site.

What features do you find essential that do not currently exist on the site?

- better search engine
- QUICK, VISIBLE links to other key Brock pages
(CSC pages should be subset of Brock - design cues, etc.... the school should be a unified collection of pages, not some hodge-podge assembly of various styles and subjects.....

...lack of uniform design leads to changing interfaces which leads to confused visitors which leads to frustration which means a bad design.

How would you rate the navigation of the site? Average

If you ranked the navigation as Extremely Poor, Poor, or Average, explain why.

some priority assessment should be given to all links to determine their importance, and hence location within the site

Do you find the content of the site to be reliable and up-to-date? No

What sections do you find to be inaccurate (if any)?

content is reliable, but not maintained enough....CONTENT should be updated frequently.

How does the Computer Science web site currently meet your needs? Meets some of my needs

If the site does not meet most or all of your needs, explain why.

Response 15 (ID: 34) - Tuesday, July 29, 2003

I am a: Fourth Year/Above

What are your primary objectives when coming to the Computer Science web site?

Visit Course Web Sites, Print Assignment Cover Pages

Other Objectives:

What features do you find essential that currently exist on the site?

Course Web Sites

Instructor's pages are sometimes interesting.

What features do you find essential that do not currently exist on the site?

I realize that content is key, but the layout and visual impression is very lacking - especially considering it's the Computer Science Department. I'm sure this does not look good to potential Brock Cosc Students.

There needs to be a "Wow" effect, while maintaining easy accessibility and great, up-to-date content.

How would you rate the navigation of the site? Good

If you ranked the navigation as Extremely Poor, Poor, or Average, explain why.

Do you find the content of the site to be reliable and up-to-date? Yes

What sections do you find to be inaccurate (if any)?

I would say that I generally find the sections I visit to be accurate.

I don't usually delve too far into the COSC site, probably because there isn't really anything too interesting presented there...

How does the Computer Science web site currently meet your needs? Meets some of my needs

If the site does not meet most or all of your needs, explain why.

I really only use the site for Course Web Sites and bit of info here & there.

It would be nice to have more information about Course Registration, course requirements, applying to the 4th year, etc... to clear some things up.

What about having an integrated forum in the site? Not one that the site links over to, but one that can interface in with the site - encourage more class discussion about homework and assignments.

Response 16 (ID: 35) - Tuesday, July 29, 2003

I am a: Select One

What are your primary objectives when coming to the Computer Science web site?

Visit Course Web Sites, Print Assignment Cover Pages, Find out more Information about a Course

Other Objectives:

What features do you find essential that currently exist on the site?

What features do you find essential that do not currently exist on the site?

How would you rate the navigation of the site? Average

If you ranked the navigation as Extremely Poor, Poor, or Average, explain why.

Do you find the content of the site to be reliable and up-to-date? No

What sections do you find to be inaccurate (if any)?

How does the Computer Science web site currently meet your needs?

If the site does not meet most or all of your needs, explain why.

Response 17 (ID: 36) - Tuesday, July 29, 2003

I am a: Fourth Year/Above

What are your primary objectives when coming to the Computer Science web site?

Visit Course Web Sites, Visit Professor Web Sites, Print Assignment Cover Pages, Find out more Information about a Course, Find out more Information about a Stream

Other Objectives:

What features do you find essential that currently exist on the site?

course infos

What features do you find essential that do not currently exist on the site?

department related stuffs...like whats going on...whats new...etc. etc.

How would you rate the navigation of the site? Poor

If you ranked the navigation as Extremely Poor, Poor, or Average, explain why.

some times links don't work...there is no consistency in page design...everybody has its own style...most of them are not updated frequently...

Do you find the content of the site to be reliable and up-to-date? No

What sections do you find to be inaccurate (if any)?

How does the Computer Science web site currently meet your needs? Meets most of my needs

If the site does not meet most or all of your needs, explain why.

Response 18 (ID: 39) - Wednesday, July 30, 2003

I am a: Fourth Year/Above

What are your primary objectives when coming to the Computer Science web site?

Visit Course Web Sites, Visit Professor Web Sites, Print Assignment Cover Pages, Find out more Information about a Course

Other Objectives:

What features do you find essential that currently exist on the site?

What features do you find essential that do not currently exist on the site?

How would you rate the navigation of the site? Poor

If you ranked the navigation as Extremely Poor, Poor, or Average, explain why.

Links appear too low down the page. Should be either aligned on top or left or right justified.

Do you find the content of the site to be reliable and up-to-date? Yes

What sections do you find to be inaccurate (if any)?

How does the Computer Science web site currently meet your needs? Meets most of my needs

If the site does not meet most or all of your needs, explain why.

Response 19 (ID: 40) - Wednesday, July 30, 2003

I am a: Alumni

What are your primary objectives when coming to the Computer Science web site?

Visit Course Web Sites, Print Assignment Cover Pages, Find out more Information about a Course, Find out more Information about a Stream, Other

Other Objectives: See what's available for new terms for further study, times, dates, course info (ex. a particular course offered once in awhile, perhaps).

What features do you find essential that currently exist on the site?

What features do you find essential that do not currently exist on the site?

A link for Gord Dunkley and a page with a mailto. He currently sends us job listings, etc. by email, attends workshops and gives resume and cover letter help. A connection between Gord and the Career Services job pages would be useful, thanks.

How would you rate the navigation of the site? Good

If you ranked the navigation as Extremely Poor, Poor, or Average, explain why.
I can find what I am looking for, perhaps because I am familiar with the site.

Do you find the content of the site to be reliable and up-to-date?

What sections do you find to be inaccurate (if any)?
spell check before publishing online would be good

How does the Computer Science web site currently meet your needs? Meets most of my needs

If the site does not meet most or all of your needs, explain why.
Make it a site employers and coop employers would look at as it may reflect the type of work the Brock students would produce or are capable of.

Response 20 (ID: 41) - Thursday, July 31, 2003

I am a: Fourth Year/Above

What are your primary objectives when coming to the Computer Science web site?
Visit Course Web Sites,Print Assignment Cover Pages

Other Objectives:

What features do you find essential that currently exist on the site?
course websites

What features do you find essential that do not currently exist on the site?

How would you rate the navigation of the site? Average

If you ranked the navigation as Extremely Poor, Poor, or Average, explain why.
because it takes time to go to the course websites

Do you find the content of the site to be reliable and up-to-date? Yes

What sections do you find to be inaccurate (if any)?

How does the Computer Science web site currently meet your needs? Meets most of my needs

If the site does not meet most or all of your needs, explain why.

Response 21 (ID: 42) - Friday, August 1, 2003

I am a: Fourth Year/Above

What are your primary objectives when coming to the Computer Science web site?

Visit Course Web Sites, Visit Professor Web Sites, Print Assignment Cover Pages, Find out more Information about a Course, Read the policies for the Computer Science Department

Other Objectives:

What features do you find essential that currently exist on the site?

All of the ones in Question 2

What features do you find essential that do not currently exist on the site?

Web-based email might be nice for sandcastle accounts, though not essential. I don't see it lacking in any way, since I have managed to use it for any purpose for which I visited the COSC site. Perhaps a searchable listing of COSC student web-sites would also be nice.

How would you rate the navigation of the site? Excellent

If you ranked the navigation as Extremely Poor, Poor, or Average, explain why.

It is well laid out. One might argue that the front may be a bit cluttered but I think it's fine and like it.

Do you find the content of the site to be reliable and up-to-date? Yes

What sections do you find to be inaccurate (if any)?

Professor emails are missing (though there is the "email:" field). The news seems to be outdated sometimes.

How does the Computer Science web site currently meet your needs? Meets most of my needs

If the site does not meet most or all of your needs, explain why.

It would be nice to find out, through the site, what my graduation requirements are (dynamic retrieval of progress processed through the calendar year one belongs to).

Response 22 (ID: 43) - Wednesday, August 6, 2003

I am a: Faculty

What are your primary objectives when coming to the Computer Science web site?

Visit Course Web Sites, Visit Professor Web Sites, Find out more Information about a Course, Find out more Information about a Stream, Read the policies for the Computer Science Department, Other

Other Objectives: visit department tech reports site

What features do you find essential that currently exist on the site?

faculty links; course links; tech report pages

What features do you find essential that do not currently exist on the site?

How would you rate the navigation of the site? Good

If you ranked the navigation as Extremely Poor, Poor, or Average, explain why.

Do you find the content of the site to be reliable and up-to-date?

What sections do you find to be inaccurate (if any)?

cosc 4F90 web site (project proposals) is years out of date.

How does the Computer Science web site currently meet your needs? Meets most of my needs

If the site does not meet most or all of your needs, explain why.

Response 23 (ID: 44) - Wednesday, August 6, 2003

I am a: Faculty

What are your primary objectives when coming to the Computer Science web site?

Visit Course Web Sites, Find out more Information about a Course, Other

Other Objectives: tech reports & seminars

What features do you find essential that currently exist on the site?

Course info and research info.

What features do you find essential that do not currently exist on the site?

Up to date pages - most are horrendously out of date.

How would you rate the navigation of the site? Extremely Poor

If you ranked the navigation as Extremely Poor, Poor, or Average, explain why.

It is impossible to find anything without already knowing where it is. There are too many ways to do essentially the same thing. The front page has far too many links on it - they could be categorized on different pages. New links are added without thinking about whether old ones could be removed, or whether a better organization is possible. The "news" takes up too much room, and goes back to March 2002 (i.e. is not very new).

Do you find the content of the site to be reliable and up-to-date? No

What sections do you find to be inaccurate (if any)?

Courses "information and links" is several years out of date. Typical assignments and outlines from 1997 are not appropriate.

Students information: link to ZDnet? Student FAQ - comments, for example, on the shortage of IT professionals "by the year 2000". Description of computing resources on new students page - macs??? (Perhaps this explains why our first year enrollment is going down?)

And many, many more.

How does the Computer Science web site currently meet your needs? Meets some of my needs

If the site does not meet most or all of your needs, explain why.

It needs to be simplified - less confusing first page with less "stuff". The research page needs something e.g. a description of research areas of each faculty member.

Response 24 (ID: 45) - Thursday, August 7, 2003

I am a: Fourth Year/Above

What are your primary objectives when coming to the Computer Science web site?

Visit Course Web Sites

Other Objectives:

What features do you find essential that currently exist on the site?

Cover pages, door access etc
Course links
Requirement changes/course content changes
Prof. contact numbers & info
Department news updates
Computer Science club link

What features do you find essential that do not currently exist on the site?

Link directly to cosc course timetables

Link directly to exam times

Who is the advisor for part-time students in their senior years (or whatever)??? Currently you have to wade through each faculty page to figure this out.

What programs are loaded in each lab? Ex, where is Microsoft Office, or JADE located?

The name of scheduled lab TAs would be nice, Ex: Jane Doe, Cosc 1P01, Lab 2 & 3, John Doe, Lab 1 & 4 ... etc

Lab "politeness" rules would be nice.

A link to basic lab instructions - eg, how to run Java in Unix or at home when you've only run it in Code Warrior ... or how to telnet to sandcastle from home ...

It would be nice to see all those employment postings (that get emailed to senior students) posted in one place.

How would you rate the navigation of the site? Poor

If you ranked the navigation as Extremely Poor, Poor, or Average, explain why.

I prefer a great search engine to slogging through heading after heading looking for my topic.

Do you find the content of the site to be reliable and up-to-date? Yes

What sections do you find to be inaccurate (if any)?

Course pages are often slow to be updated (the previous year's input sits there for a long time).

How does the Computer Science web site currently meet your needs? Meets most of my needs

If the site does not meet most or all of your needs, explain why.

I've learned how to slog through the site, so I can find most of what I need

Response 25 (ID: 46) - Friday, August 8, 2003

I am a: Fourth Year/Above

What are your primary objectives when coming to the Computer Science web site?

Visit Course Web Sites, Visit Professor Web Sites, Find out more Information about a Course, Find out more Information about a Stream

Other Objectives:

What features do you find essential that currently exist on the site?

courses and staff tabs

What features do you find essential that do not currently exist on the site?

which courses will be offered for the upcoming year. A lot of courses are listed and have not been offered for the last 2 years

How would you rate the navigation of the site? Good

If you ranked the navigation as Extremely Poor, Poor, or Average, explain why.

Do you find the content of the site to be reliable and up-to-date? No

What sections do you find to be inaccurate (if any)?

courses

How does the Computer Science web site currently meet your needs? Meets some of my needs

If the site does not meet most or all of your needs, explain why.

Response 26 (ID: 47) - Monday, August 11, 2003

I am a: Alumni

What are your primary objectives when coming to the Computer Science web site?

Visit Course Web Sites,Print Assignment Cover Pages

Other Objectives:

What features do you find essential that currently exist on the site?

What features do you find essential that do not currently exist on the site?

How would you rate the navigation of the site? Good

If you ranked the navigation as Extremely Poor, Poor, or Average, explain why.

Do you find the content of the site to be reliable and up-to-date? No

What sections do you find to be inaccurate (if any)?

How does the Computer Science web site currently meet your needs? Meets most of my needs

If the site does not meet most or all of your needs, explain why.

Response 27 (ID: 48) - Monday, August 11, 2003

I am a: Fourth Year/Above

What are your primary objectives when coming to the Computer Science web site?

Visit Course Web Sites,Print Assignment Cover Pages

Other Objectives:

What features do you find essential that currently exist on the site?

OK

What features do you find essential that do not currently exist on the site?

Time Table for COSC courses.

How would you rate the navigation of the site? Good

If you ranked the navigation as Extremely Poor, Poor, or Average, explain why.

Do you find the content of the site to be reliable and up-to-date? Yes

What sections do you find to be inaccurate (if any)?

How does the Computer Science web site currently meet your needs? Meets most of my needs

If the site does not meet most or all of your needs, explain why.

Response 28 (ID: 49) - Monday, August 11, 2003

I am a: Fourth Year/Above

What are your primary objectives when coming to the Computer Science web site?

Visit Course Web Sites, Print Assignment Cover Pages

Other Objectives:

What features do you find essential that currently exist on the site?

pretty much just the course web site links

What features do you find essential that do not currently exist on the site?

almost everything else

How would you rate the navigation of the site? Extremely Poor

If you ranked the navigation as Extremely Poor, Poor, or Average, explain why.

it sucks, thats pretty much all.

Do you find the content of the site to be reliable and up-to-date? No

What sections do you find to be inaccurate (if any)?

Looks like the webpage was one of the first created on the web. Why it still looks like this, god knows why.

How does the Computer Science web site currently meet your needs? Meets most of my needs

If the site does not meet most or all of your needs, explain why.

provides links to course webpages!

Response 29 (ID: 50) - Tuesday, August 12, 2003

I am a: Fourth Year/Above

What are your primary objectives when coming to the Computer Science web site?

Visit Course Web Sites, Visit Professor Web Sites, Print Assignment Cover Pages, Find out more Information about a Course, Find out more Information about a Stream, Other

Other Objectives: Assignment and other shit for the courses

What features do you find essential that currently exist on the site?

the quick link is amazing !!!

What features do you find essential that do not currently exist on the site?

the news box bothers me, make it a different page for god sakes everytime u scroll it gets caught in it and scrolls it, besides, the colors are too ugly.

How would you rate the navigation of the site? Average

If you ranked the navigation as Extremely Poor, Poor, or Average, explain why.

too many links that are not visible at first sight

Do you find the content of the site to be reliable and up-to-date? No

What sections do you find to be inaccurate (if any)?

courses, streams, EVERYTHING is outdated. and why the hell is it so plane.....integrate some fancy flash or images in it.

How does the Computer Science web site currently meet your needs? Meets most of my needs

If the site does not meet most or all of your needs, explain why.

Appendix B

Survey Questions

1. I am a:
 - Faculty Member
 - Staff Member
 - First Year (Entering) Student
 - Second Year Student
 - Third Year Student
 - Fourth Year (or above) Student
2. What are your primary objectives when coming to the Computer Science web site?
 - Visit Course Web Sites
 - Visit Professor Web Sites
 - Print Assignment Cover Pages
 - Find out more Information about a Course
 - Find out more Information about a Stream
 - Read the policies for the Computer Science department
 - Use the Search Engine
 - Other (explain)
3. What features do you find essential that currently exist on the site?
4. What features do you find essential that do not currently exist on the site?
5. a) How would you rate the navigation of the site?
 - Extremely Poor, Poor, Average, Good, Excellentb) If you ranked the navigation as Extremely Poor, Poor, or Average, explain why.
6. Do you find the content of the site to be reliable and up-to-date? Yes / No
7. What sections do you find to be inaccurate (if any)?
8. a) How does the Computer Science web site currently meet your needs?
 - Doesn't meet my needs
 - Meets some of my needs
 - Meets most of my needs
 - Meets all of my needsb) If the site does not meet most or all of your needs, explain why.
9. Do you wish to be contacted for further questions and / or an interview in the future to discuss your answers? Yes / No
10. Contact Information (all optional)
 - Name, Phone Number, E-mail

Appendix C

WAI Priority Checkpoints

The following content has been taken from the W3C web site entitled "Checklist of Checkpoints for Web Content Accessibility Guidelines 1.0" available at <http://www.w3.org/TR/1999/WAI-WEBCONTENT-19990505/full-checklist>.

Priority 1 checkpoints

In General (Priority 1)

- [1.1](#) Provide a text equivalent for every non-text element (e.g., via "alt", "longdesc", or in element content). *This includes:* images, graphical representations of text (including symbols), image map regions, animations (e.g., animated GIFs), applets and programmatic objects, ascii art, frames, scripts, images used as list bullets, spacers, graphical buttons, sounds (played with or without user interaction), stand-alone audio files, audio tracks of video, and video.
- [2.1](#) Ensure that all information conveyed with color is also available without color, for example from context or markup.
- [4.1](#) Clearly identify changes in the natural language of a document's text and any text equivalents (e.g., captions).
- [6.1](#) Organize documents so they may be read without style sheets. For example, when an HTML document is rendered without associated style sheets, it must still be possible to read the document.
- [6.2](#) Ensure that equivalents for dynamic content are updated when the dynamic content changes.
- [7.1](#) Until user agents allow users to control flickering, avoid causing the screen to flicker.
- [14.1](#) Use the clearest and simplest language appropriate for a site's content.

And if you use images and image maps (Priority 1)

- [1.2](#) Provide redundant text links for each active region of a server-side image map.
- [9.1](#) Provide client-side image maps instead of server-side image maps except where the regions cannot be defined with an available geometric shape.

And if you use tables (Priority 1)

- [5.1](#) For data tables, identify row and column headers.
- [5.2](#) For data tables that have two or more logical levels of row or column headers, use markup to associate data cells and header cells.

And if you use frames (Priority 1)

- [12.1](#) Title each frame to facilitate frame identification and navigation.

And if you use applets and scripts (Priority 1)

[6.3](#) Ensure that pages are usable when scripts, applets, or other programmatic objects are turned off or not supported. If this is not possible, provide equivalent information on an alternative accessible page.

And if you use multimedia (Priority 1)

[1.3](#) Until user agents can automatically read aloud the text equivalent of a visual track, provide an auditory description of the important information of the visual track of a multimedia presentation.

[1.4](#) For any time-based multimedia presentation (e.g., a movie or animation), synchronize equivalent alternatives (e.g., captions or auditory descriptions of the visual track) with the presentation.

And if all else fails (Priority 1)

[11.4](#) If, after best efforts, you cannot create an accessible page, provide a link to an alternative page that uses W3C technologies, is accessible, has equivalent information (or functionality), and is updated as often as the inaccessible (original) page.

Priority 2 checkpoints

In General (Priority 2)

[2.2](#) Ensure that foreground and background color combinations provide sufficient contrast when viewed by someone having color deficits or when viewed on a black and white screen. [Priority 2 for images, Priority 3 for text].

[3.1](#) When an appropriate markup language exists, use markup rather than images to convey information.

[3.2](#) Create documents that validate to published formal grammars.

[3.3](#) Use style sheets to control layout and presentation.

[3.4](#) Use relative rather than absolute units in markup language attribute values and style sheet property values.

[3.5](#) Use header elements to convey document structure and use them according to specification.

[3.6](#) Mark up lists and list items properly.

[3.7](#) Mark up quotations. Do not use quotation markup for formatting effects such as indentation.

[6.5](#) Ensure that dynamic content is accessible or provide an alternative presentation or page.

[7.2](#) Until user agents allow users to control blinking, avoid causing content to blink (i.e., change presentation at a regular rate, such as turning on and off).

[7.4](#) Until user agents provide the ability to stop the refresh, do not create periodically auto-refreshing pages.

[7.5](#) Until user agents provide the ability to stop auto-redirect, do not use markup to redirect pages automatically. Instead, configure the server to perform

redirects.

[10.1](#) Until user agents allow users to turn off spawned windows, do not cause pop-ups or other windows to appear and do not change the current window without informing the user.

[11.1](#) Use W3C technologies when they are available and appropriate for a task and use the latest versions when supported.

[11.2](#) Avoid deprecated features of W3C technologies.

[12.3](#) Divide large blocks of information into more manageable groups where natural and appropriate.

[13.1](#) Clearly identify the target of each link.

[13.2](#) Provide metadata to add semantic information to pages and sites.

[13.3](#) Provide information about the general layout of a site (e.g., a site map or table of contents).

[13.4](#) Use navigation mechanisms in a consistent manner.

And if you use tables (Priority 2)

[5.3](#) Do not use tables for layout unless the table makes sense when linearized. Otherwise, if the table does not make sense, provide an alternative equivalent (which may be a linearized version).

[5.4](#) If a table is used for layout do not use any structural markup for the purpose of visual formatting.

And if you use frames (Priority 2)

[12.2](#) Describe the purpose of frames and how frames relate to each other if it is not obvious by frame titles alone.

And if you use forms (Priority 2)

[10.2](#) Until user agents support explicit associations between labels and form controls, for all form controls with implicitly associated labels, ensure that the label is properly positioned.

[12.4](#) Associate labels explicitly with their controls.

And if you use applets and scripts (Priority 2)

[6.4](#) For scripts and applets, ensure that event handlers are input device-independent.

[7.3](#) Until user agents allow users to freeze moving content, avoid movement in pages.

[8.1](#) Make programmatic elements such as scripts and applets directly accessible or compatible with assistive technologies [Priority 1 if functionality is important and not presented elsewhere, otherwise Priority 2.]

[9.2](#) Ensure that any element that has its own interface can be operated in a device-independent manner.

[9.3](#) For scripts, specify logical event handlers rather than device-dependent

event handlers.

Priority 3 checkpoints

In General (Priority 3)

[4.2](#) Specify the expansion of each abbreviation or acronym in a document where it first occurs.

[4.3](#) Identify the primary natural language of a document.

[9.4](#) Create a logical tab order through links, form controls, and objects.

[9.5](#) Provide keyboard shortcuts to important links (including those in client-side image maps), form controls, and groups of form controls.

[10.5](#) Until user agents (including assistive technologies) render adjacent links distinctly, include non-link, printable characters (surrounded by spaces) between adjacent links.

[11.3](#) Provide information so that users may receive documents according to their preferences (e.g., language, content type, etc.)

[13.5](#) Provide navigation bars to highlight and give access to the navigation mechanism.

[13.6](#) Group related links, identify the group (for user agents), and, until user agents do so, provide a way to bypass the group.

[13.7](#) If search functions are provided, enable different types of searches for different skill levels and preferences.

[13.8](#) Place distinguishing information at the beginning of headings, paragraphs, lists, etc.

[13.9](#) Provide information about document collections (i.e., documents comprising multiple pages.).

[13.10](#) Provide a means to skip over multi-line ASCII art.

[14.2](#) Supplement text with graphic or auditory presentations where they will facilitate comprehension of the page.

[14.3](#) Create a style of presentation that is consistent across pages.

And if you use images and image maps (Priority 3)

[1.5](#) Until user agents render text equivalents for client-side image map links, provide redundant text links for each active region of a client-side image map.

And if you use tables (Priority 3)

[5.5](#) Provide summaries for tables.

[5.6](#) Provide abbreviations for header labels.

[10.3](#) Until user agents (including assistive technologies) render side-by-side text correctly, provide a linear text alternative (on the current page or some other) for *all* tables that lay out text in parallel, word-wrapped columns.

And if you use forms (Priority 3)

[10.4](#) Until user agents handle empty controls correctly, include default, placeholder characters in edit boxes and text areas.

Appendix D

Alternative Text for Non-Image Objects

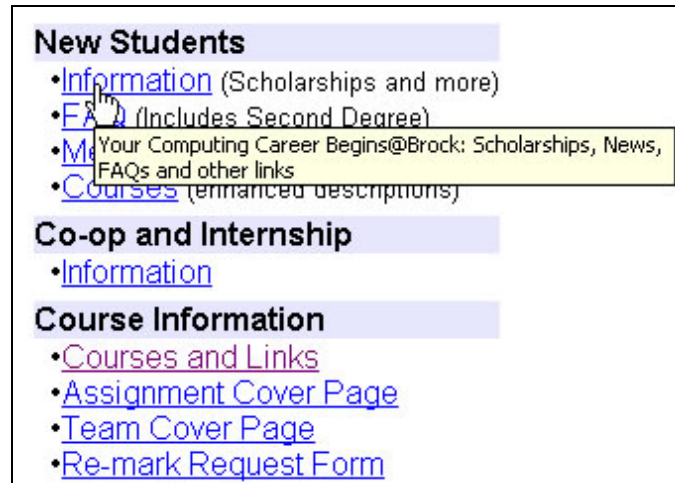


Figure: Having the title attribute over top of the links clarifies what is to be expected if the user clicks on the link.

Example: Title Attribute

```
<a href="information.html" title="Your Computing Career Begins @ Brock: Scholarships, Views, FAQs and other links">Information</a>
```

Appendix E

Relative vs. Absolute Text Sizing

Example: Relative Sizing without Style Sheets

```
<font size="3">Text goes here</font>
<font size="+2">Text goes here</font>
```

Example: Relative Sizing using Style Sheets

```
<style type="text/css">
<!--
.bodytext {
    font-family: Arial, Helvetica, sans-serif;
    font-size: medium;
}
-->
</style>
:
:
<span class="bodytext">Text goes here</span>
```

Example: Absolute Sizing using Style Sheets

```
<style type="text/css">
<!--
.bodytext {
    font-family: Arial, Helvetica, sans-serif;
    font-size: 14px;
}
-->
</style>
:
:
<span class="bodytext">Text goes here</span>
```

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