

Matthew E. Carroll. Usability Analysis in Practice: Assessment for Redesign of the School of Information & Library Science Web Site. A Master's Paper for the M.S. in I.S. Degree. April, 2004. 51 pages. Advisor: Gary Marchionini

The University of North Carolina at Chapel Hill's School of Information and Library Science (SILS) web site has existed in its current form for almost three years while web design has evolved from more simple design practices of the late 1990's, leaving the current web site dated in terms of usability and visual design. The current SILS web site draws verbal complaints from many users although little qualitative data and no concrete quantitative data has been collected regarding problems with the current site, or any previous iteration of the SILS web site.

This usability study was designed to analyze the current site and identify major issues so that a more user-centric site may be developed to replace the current one. As well, it will for the first time record quantitative data on the SILS web site and establish benchmark measures that future iterative designs can be compared against. This study was designed along the guidelines of two major usability experts - Jeffrey Rubin and Jakob Nielsen - to be a quick, inexpensive and effective method of evaluating a web site design.

Headings

World Wide Web, Web Sites – Evaluation, User-Interfaces - Testing

Usability, Human Computer Interaction

USABILITY ANALYSIS IN PRACTICE: ASSESSMENT FOR REDESIGN OF THE
SCHOOL OF INFORMATION & LIBRARY SCIENCE WEB SITE

by
Matthew E. Carroll

A Master's paper submitted to the faculty
of the School of Information and Library Science
of the University of North Carolina at Chapel Hill
in partial fulfillment of the requirements
for the degree of Master of Science in
Information Science.

Chapel Hill, North Carolina

April, 2004

Approved by:

Gary Marchionini

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LITERATURE REVIEW

Throughout my master's program education, the classes I have taken that relate to usability and systems design unanimously stress the importance of following accepted design practices and of thinking of the end user and his or her needs concerning the system they will use. They also discuss the common pitfalls of design that hamper usability. Despite the body of knowledge that exists in its faculty and students, the School of Information and Library Science's (SILS's) own official web site suffers from many known usability issues, and there has never been any usability study to examine the web site. This work was thus undertaken to critically look at the SILS web site and to analyze user interactions and attitudes toward the site for the purpose of gathering data that can be used to eventually craft a better web site.

This study addresses several issues. First, it identifies and quantifies what problems exist with the current web site. Second, it produced useful data for new versions of the site and a model for gathering quantitative data on their usability levels. This data can now be compared against successors and used for full-scale implementation or for continuing work on an improved site design. With a better web site and a proven data set for improved usability and user attitudes, SILS can be confident that it has a web site that better serves those who use it.

It is now an accepted belief that usability is a good thing that every designer should incorporate it into his or her designs, although usability itself is not a new concept. Definitions of the term usability date back many years, and vary greatly in complexity and focus. More recent definitions by Dumas and Redish (1993) simply claim that “everyone benefits from usability”. Jakob Nielsen (2000), one of today’s prominent usability experts, has simply stated that “... usability rules the Web.” Mayhew (1999) discusses in more detail how usability increases productivity and user intuitiveness among business-centered designs, thus decreasing expenses and error rates related to the system. Perspectives and definitions don’t stop here, however.

THEORY & RESEARCH

Today, a simple online search using the term “usability” will fetch a seemingly limitless number of links to sites and documents dedicated to designing with usability in mind, and definitions of what usability actually is. When I was looking for conceptual definitions of the term ‘usability’, I was a little disheartened to read Parush’s observation that if you ask ten usability professionals what usability means “you’ll probably get at least eleven answers.”¹ Parush’s reasoning for this is simply that usability means many things to many people, and that its definition changes according to a particular designer’s needs and the design in question.

As I continued tracking the various meanings for usability that many authors seemed to take for granted, I realized that usability is indeed different things to different people

¹ Parush, A. (2001) Usability Design and Testing. *Interactions*, 8(5), 13-17.

according to their different perspectives. I found a comprehensive paper - authored by Jonas Löwgren - that nicely sums these perspectives up. Below are some definitions that demonstrate the variety of ways usability is conceptualized, followed by summary concepts of usability in various design approaches.

Bruce Allen, an electronics technologist who studies usability, frames usability in terms of making the product appropriate to the context at hand.² He plainly states that usability is about being able to complete tasks. Deborah Hix, a user-interface design and development specialist, believes that usability is an appropriate level of usefulness to the end-user, and is established through quantitative goals that, when met, mean that usability is good enough.³

Also worth mentioning is Jeffery Rubin, who's definition of usability states that usability is "...a process that employs participants who are representative of the target population to evaluate the degree to which a product meets specific usability criteria". As well, Rubin defined six basic elements of usability testing to aid designers in creating their own usability tests. These elements are:

- (1) The development of a clear problem statement or test objective.
- (2) Use of a representative sample of end-users that may or may not be chosen at random.
- (3) A representation of the actual work environment.
- (4) Observation of end-users who either use or review a representation of the product.
- (5) Collection of qualitative and quantitative performance and preference measures
- (6) Recommendation of improvements to the design of the product.

² Allen, B. & Buie, E. (2002). What's in a Word? The Semantics of Usability. *Interactions*, 9(2), 17-21.

³ Hix, D., & Hartson, H. R. (1993). *Developing User Interfaces: Ensuring Usability Through Product & Process*, (p221). New York: Wiley.

Looking on the Internet, I found some additional definitions of usability. From the web site for the National Cancer Institute's Usability.gov pages I found these definitions:

Usability is the measure of the quality of a user's experience when interacting with a product or system — whether a web site, a software application, mobile technology, or any user-operated device.

Usability is a combination of factors that affect the user's experience with the product or system. (<http://usability.gov/basics/index.html>, Mar. 26, 2004)

From the National Library of Canada I found this definition that concentrates more on

Web usability:

The key to web site usability is ensuring that the site is both useful and usable for the intended audience. The discussion as to what constitutes a "usable" web interface is ongoing. To a certain degree usability depends upon the purpose and target audience of a particular site. However, there is general agreement that a usable web interface is one that is accessible, appealing, consistent, clear, simple, navigable and forgiving of user blunders. (<http://www.nlc-bnc.ca/9/1/p1-260-e.html>, Mar. 26, 2004)

Finally, the International Standards Organization defines usability as “ ... the effectiveness, efficiency, and satisfaction with which specified users can achieve specified goals in particular environments” (ISO DIS 9241-11).

Needless to say, there exists a plethora of definitions for a designer to choose when selecting standards for usability goals and guidelines, and they all state the same general ideas concerning usability. Yet, I discovered that underlying these varying definitions for usability, there are some broader areas of focus and methodologies that dictate the views towards usability and help a designer better choose appropriate models and methodologies for their project.

The summative work by Jonas Löwgren actually describes these perspectives on usability in a 1995 paper, appropriately titled “Perspectives on Usability”.⁴ This paper clearly lays out the five major viewpoints of usability and their histories in usability work. Thanks to the work of Mr. Löwgren I found in one location a comprehensive look at usability, what its various definitions are, and how they have been applied.

Löwgren notes that usability is “one of the central concepts in human-computer interaction” and from there presents five perspectives on usability, starting with the oldest, general theory. He lists the other four perspectives as usability engineering, subjectivity, flexibility, and sociality. Each perspective looks at usability in a different light, and each tests and evaluates usability in a different way.

General theory is seen as the traditional scientific approach to usability.⁵ The aim of this approach is to “accumulate pieces of knowledge about human interaction with computers.” Löwgren writes however that the general theory perspective proved to be of limited value to human-computer interaction (HCI) practitioners, including those interested in web usability.

⁴ Löwgren, J. (1995). IDA Technical Report.

⁵ Löwgren, 2.

General theory has been widely applied as cognitive engineering, the application of cognitive psychology to interface design.⁶ It basically draws from knowledge and techniques from cognitive psychology to provide the basis for principle-driven design.⁷ In practice, general theory experiments tend to be short and tend to take place in laboratory settings, and the independent variables are of three kinds: user, task, and system.⁸ The dependent variable is always the user's reaction, although it can be measured in a number of ways, including time to completion, error rate, and satisfaction.

Löwgren states that usability engineering emerged when general theory failed to have an impact on development processes and places emphasis on practical applicability rather than generalizability, which makes usability a measurable element of a design process.

Good, et al⁹, state that usability engineering is a process that is grounded in classical engineering, which quantitatively states what characteristics and what amounts a final product should have and then goes about building the product.

Usability engineering usually consists of three main steps: user and task analysis, where the context is studied; usability specification, where goals are drawn; and prototyping,

⁶ Lansdale, M., & Ormerod, T. (1994). *Understanding Interfaces, A Handbook of Human-Computer Dialogue*. London, Academic Press.

⁷ Woods, D., & Roth, E. (1988). Cognitive Engineering: Human Problem Solving with Tools. *Human Factors*, 30(4), 415-430.

⁸ Löwgren, 5.

⁹ Good, M., Spine, T., Whiteside, J., & George, P. (1986). User-derived Impact Analysis as a Tool for Usability Engineering. *Human Factors in Computing Systems (CHI'86 Proceedings)*, 241. New York, ACM Press.

which continues until goals are successfully met. Here usability is a quantifiable property of a system and can be tested without regard to a system's utility.

Löwgren states that the subjectivity perspective is a reaction to usability engineering's tendency to view usability as a property of a system and claims that usability can only be viewed in the context in which a user actually uses the system. Here, usability becomes a subjective property of the system and cannot be divorced from utility, and contextual design has emerged as the way to develop usable systems from the subjectivity perspective.

“Contextual design is described as a cyclic process of requirements generation, design, implementation and evaluation, similar to Boehm's 1986 spiral model.”¹⁰ To gather data for usability with this perspective, ethnographic field-research techniques are used to capture users actively interacting with the system.

Löwgren states that flexibility is a narrow perspective that focuses on the time frame in which usability engineering takes place: during the “period of time ranging from project inception to system delivery,”¹¹ and emerged as a way to deal with systems that may change during development. Flexibility concerns itself not so much with measuring usability, but with ensuring that systems remain flexible to changes and can adapt to remain usable.

¹⁰ Löwgren, 8.

¹¹ Löwgren, 3.

Löwgren finally mentions the sociality perspective as one that is “gradually emerging as computer-supported cooperative work” grows as a scientific field regarding computer use and focuses on systems in the social context, as opposed to general theory and usability engineering, which tend to view the user-system interaction as occurring in a void. Usability here is found in the social-use situations.

In light of all these perspectives, I decided to design a study that draws from usability engineering and general theory, through applying what has been discovered through other perspectives like subjectivity. Thus, this study involved looking at a current web site and located its flaws and areas for improvement. The work was driven by several questions: Where are the problems on the SILS web site? What do end-users want from the site? How can redesigning the front-page navigation (and site-wide navigation) on the SILS web site improve usability and user attitudes?

According to Nielsen¹², effective usability studies of this nature can be successfully completed using as few as five participants at one time, and then testing several iterations of a design as it develops. In this study, a sample of five SILS students was used to gather initial data on the current SILS web site for later comparisons after the SILS web site is redesigned. To complement Nielsen’s methodology, Rubin’s six basic elements of usability testing were used to further structure the study.

¹² Nielsen, Jakob. (March 19, 2000). Why You Only Need to Test With 5 Users. Retrieved September 3, 2003 from the World Wide Web: <http://www.useit.com/alertbox/20000319.html>

METHODS & ANALYTICAL APPROACH

The research approach I utilized for this project was to analyze the current SILS web site to gather user attitude data that can be used in future benchmarks. This was done by monitoring end-users in task-analysis tests. The SILS web site was chosen for redesign for several factors, including my familiarity with the site, its current need for a redesign, and ease of access to end-users.

To perform this study, end-users performed a set of tasks in my presence and talked aloud about how they went about accomplishing each task. Participants were all SILS students selected by myself for their varied experience with the current SILS web site.

Testing was done in a laboratory environment in the Interaction Design Lab in Manning Hall, and took about 40 minutes for each user. Using the lab's two video cameras, screen monitor and audio equipment, I recorded the user's vocal and physical actions for later interpretation, and I further documented vocal and physical actions during the testing. As the testing administer, I aided users by answering their questions regarding task clarification, but I did not initiate any conversation or aid in users' search for specific information.

Tasks will consisted of seven basic information-seeking activities. Users were asked to complete each of the following tasks beginning from the homepage of the SILS site:

1. Locate the email address of professor Joe Hewitt.
2. Locate the four suggested areas for MSIS areas of study for master's students under the suggested courses listing.
3. Locate and write down all the student chapters of organizations at SILS as they are named on the web site.
4. Record the institution and date that Dean Joanne Marshall obtained her doctorate degree.
5. Locate and record the (non-email) mailing address of SILS.
6. Locate who is leading the Metadata Generation Research Project.
7. Locate the resource reservation schedule and record how many video capture PCs are available for scheduling.

After they completed the tasks, participants filled out a short questionnaire that collected data on their attitudes toward the site and their experiences with it. This data was kept confidential and in a secured location, and will only used to compare data between versions of the SILS web site. The extent of personal information collected comprised only the user's length of time at SILS and their academic role at the school.

STUDY INTRODUCTION

The current web site for the School of Information and Library Science (SILS) at the University of North Carolina at Chapel Hill (UNCCH) is a staple of information and resources for students, faculty and staff alike, yet it bears blatant usability, information architecture and site-design errors, and is underdeveloped by current school standards and needs. Considering that one of the overarching principles of SILS is organization, many individuals routinely remark that the SILS web site should be a standard for good design and usability, and complain that the current web site is neither visually attractive nor does it allow for good usability. The SILS web site was designed during an earlier era of the Internet (late 1990's) and now shows its age as design and usability standards have evolved. Screen captures of iterations of the original SILS web pages are available for view in Appendix G.

Previous SILS web sites were all built by individuals without the aid of any data to support design decisions. The latest iteration of the SILS web site was constructed almost three years ago and was largely focused on expanding content within the design constraints of the site. The most formal design the SILS site has historically had was a committee that decided on the site's required content almost two years ago.

Despite the grumblings of those who interacted with the SILS web site, no action was taken to remedy the SILS web site until late 2003 when a site redesign was considered and begun with a visual design contest, with a new site scheduled to replace the old site by mid-2004. While a redesign was considered necessary, no actual data had been collected to identify current usability issues with the SILS web site for future designs to improve upon. This is the main purpose of this study: to identify major usability breakdowns with the current SILS web site in order to benchmark new designs in future iterative design processes. This study endeavors to create a baseline from which future designs can be compared. After the new web site replaces the current site, future testing can be done to gauge improvements and discover new weaknesses to the site design.

DESIGN OF THE USABILITY TEST

To construct the test for this study, material from two prominent usability researchers was used. This test combines the theories of Jeffery Rubin's six elements of usability testing and Jakob Nielsen's five-tester usability model. Nielsen states that you can test a design with as few as five individuals and identify 90% of usability issues in any given design, and that in conjunction with iterative designs, three tests with as few as five individuals each will provide the designer with a better data set and final design than a single usability test that uses 15 or more participants. This study endeavors to capture the initial 90% of the site problems so they can be tracked in future SILS web site designs through future studies like this one.

Jeffery Rubin's definition of usability testing is "a process that employs participants who are representative of the target population to evaluate the degree to which a product meets specific usability criteria."¹³ Rubin's six elements of usability testing are:

1. Development of problem statements or test objectives.
2. Use of a representative sample of end users that may or may not be randomly chosen.
3. Representation of the actual work environment.
4. Observation of end users who either use or review a representation of the product and controlled and sometimes extensive interrogation and probing of the participants by the test monitor.
5. Collection of quantitative and qualitative performance and preference measures.
6. Recommendation of improvements to the design of the product.

Jakob Nielsen states "the best [usability test] results come from testing no more than five users and running as many small tests as you can afford."¹⁴ He goes on to state that "after the fifth user, you are wasting your time by recording the same findings repeatedly but not learning much new." For these reasons, this study's sample was drawn from SILS students and the number of users tested was limited to five people.

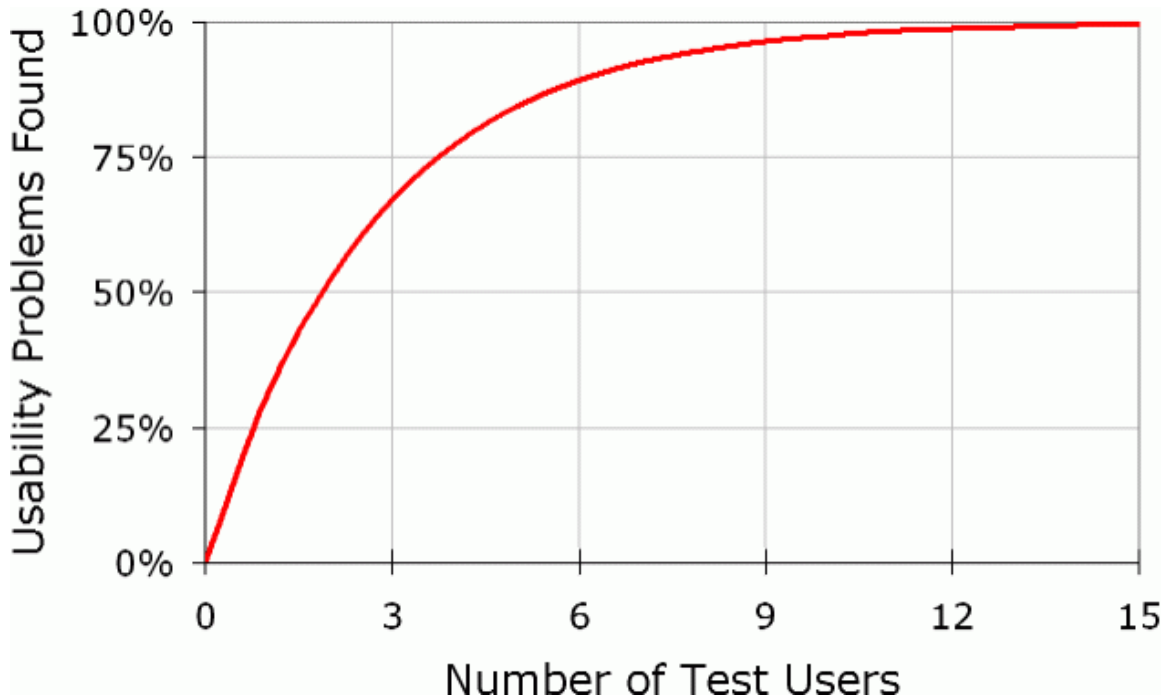
In earlier usability tests, Nielsen and Tom Landauer showed that the number of usability problems found in a usability test with n users is: $N(1-(1-L)^n)$, where N is the total number of usability problems in the design and L is the proportion of usability problems discovered while testing a single user.¹⁵ The typical value of L is 31%, averaged across a

¹³ Rubin, Jeffery(1994). *The Handbook of Usability Testing*. New York: John Wiley & Sons, Inc.

¹⁴ Nielsen, Jakob (2000). *Why You Only Need to Test with Five Users*. Retrieved March, 2004 from the World Wide Web: <http://www.useit.com/alertbox/20000319.html> .

¹⁵ Nielsen, Jakob, & Landauer, Thomas. *A Mathematical Model of the Finding of Usability Problems*. *ACM InterCHI April 1993 Proceedings*, 206-213.

large number of projects they studied. Plotting the curve for $L=31\%$ gives the following result:



This study was designed to test a small number of similar users of the SILS web site with the objective of identifying major web site design flaws with the current SILS web site and to establish an initial benchmark for future designs. Test participants were specifically chosen to be all SILS students with varying degrees of experience with the SILS web site. The current, live SILS web site was used in testing in a lab environment. A testing administrator collected qualitative and quantitative data in this environment. Participants completed a task list that required that they interact with the SILS web site. The data collected was then analyzed and recommendations made based on this initial data collection.

PROBLEM STATEMENT

Below are the purposes and objectives used to guide this study.

Purpose

The purpose of this usability test is to identify major problems in the current SILS web site design so that a future site redesign can address these issues in the most effective manner. The data collected in this study will be used to establish guidelines for a new site content management.

Problem Statement and Objective

1. Identify any potential navigation and content obstacles or break-downs in the site.
2. Identify any common site usage break-downs among users during task completion.
3. Track user behavior as they use the site and look for common practices and needs.
3. Identify any common work-arounds to shortcomings in the current web site composition.

REPRESENTATIVE SAMPLE OF USERS

While knowing who the population is that uses the SILS web site is important, general web usability standards hold true in almost all contexts among almost all Internet users. Regardless of this potential freedom, it is still considered necessary to study the relevant target audience that will most likely interact with the SILS web site. Also, research by Jakob Nielsen et al. shows that small populations of 5-7 users generate enough data to

effectively analyze trends. Since the purpose of this study is to identify common trends in the SILS site usage, a small sample was used.

The target users for this study were SILS students who interact with the site and who may have differing levels of experience using the site. Users were selected mainly according to the following criteria:

1. Users were SILS students in either the information-science or library-science tracks.
2. Users had varying levels of experience with the current SILS web site.

TEST ENVIRONMENT

The School of Information and Library Science is lucky enough to have its own usability lab, the Interaction Design Lab (IDL)¹⁶, that was easily accessible and appropriate for this study. This lab enabled the capture of three video streams and an audio stream of test participants during the study that allowed for detailed analysis of not only a user's navigation through the SILS web site but also of their physical behavior and audible comments.

All testing was done in the interaction lab under identical conditions. Video cameras recorded the participants' keyboard actions, eye travel, and mouse travel on the computer monitor. An audio track recorded user comments while performing tasks in the study.

¹⁶ The School of Information and Library Science Interaction Design Laboratory:
<http://squash.ils.unc.edu/newidl/>

Recordings were used to compare data from test administrator notes and to flush out specific trends in user behavior.

The testing environment was set up with one computer for the participant to use during the study, with one video camera on top of the monitor and another in the ceiling overhead of the participant. Additionally, a microphone was located on the monitor to capture participants' voices. The test administrator sat to the participants' left at another desk to further observe, guide and interview the participants.

ELEMENTS OF THE TEST

Role of the Test Administrator

A single administrator who conducted the tests and observed participants did all testing. The administrator used a prepared script to ensure identical directions and procedure among all the tests conducted, and prepared the testing environment before any participant arrived by turning on all equipment and properly setting up the computer.

During the test, the administrator ensured that the participants did not stray from the SILS web site and recorded their behavior and comments for later review. The administrator was also available to answer any questions the participants may have asked and to offer encouragement when participants became discouraged. If a participant became

completely stuck and unable to proceed, the administrator could prompt the participant to try a certain action or to proceed to the next task.

The Tests

The usability test comprised of two questionnaires and a task-completion test. To begin the study, the administrator began reading from the script to explain the study to the participant and then presented a consent form for the participant to sign and a pre-test questionnaire to capture demographic and SILS-web site experience data. Participants were next given a list of seven tasks that entailed finding specific information on the SILS web site. After the participant completed the tasks, a post-test questionnaire was given to the participant to fill out. After the participant finished this second questionnaire, the administrator reviewed the responses of the post-test questionnaire with the participant in order to gather more specific qualitative data.

The Pre-Test

The pre-test consisted of six quantitative questions:

- Gender
- Academic Status at SILS
- Program Track
- Internet experience
- Computer experience
- Frequency of SILS web site use

The pre-test questionnaire can be viewed in Appendix D.

The Test

The test consisted of seven tasks:

- Locate the email address of SILS Professor Joe Hewitt
- Locate the four suggested areas for MSIS areas of study for master's students under the suggested courses listing.
- Locate and write down all the student chapters of organizations at SILS as they are named on the web site.
- Record the institution and date that Dean Joanne Marshall obtained her doctorate degree.
- Locate and record the (non-email) mailing address of SILS.
- Locate who is leading the Metadata Generation Research Project.
- Locate the resource reservation schedule and record how many video capture PCs are available for scheduling.

The task list can be viewed in Appendix E.

The Post-Test

The post-test consisted of 11 quantitative questions on a five-point scale and an open comment area for qualitative data collection:

- What is your overall impression of this web site? Is it easy to use?
- Overall, is the web site organized in such a way that information is easy to find?
- Do you feel comfortable with font, size and color of the page text?
- Is page layout helpful for you to search for information?
- Is the navigation layout (links) helpful for you to search for information?
- Can you predict where a link will lead you?
- In general, was it easy to find what you were looking for?
- How do you like the images displayed on the pages?
- Overall, how do you like the web site?
- Overall, finding specific information was:
- Overall, while using the site, did you feel?
- In your opinion, what is the best feature or worst problem of the web site?

The post-test questionnaire can be viewed in Appendix F.

After the participant finished the post-test questionnaire, the administrator asked the participant to explain in more detail each of his or her responses to in order to gather more complete qualitative data. The administrator recorded the participants' answers at the time of the interview.

DATA COLLECTION AND ANALYSIS

After all participants had taken the study, their questionnaires and video were further analyzed to identify trends in usability failures in the SILS web site. The information provided from the analysis highlighted a few trends in user behavior and pointed out some areas where the current SILS site and any future revisions can be improved.

For this study, errors were defined as instances where a participant had to halt his or her forward navigation and return to the main SILS page to start a task anew. Errors represent a complete breakdown of a participant's ability to navigate the site in search of particular information. Since the current web site offers no navigational path among areas of the site, returning to the main SILS web page is the only method of navigating between pages.

Among all the users tested, not a single participant completed the task list without an error, and the overwhelming number of errors occurred with the main SILS page and participants choosing the wrong initial section link to jump to. Beyond the main page, overly large content pages (pages with much vertical scrolling) also caused a large

number of task-completion errors, as the amount of information on these pages was overwhelming to participants and they failed to find the relevant information they sought.

Different participants had significant trouble with different tasks, but no single participant had significant trouble completing tasks overall. Some behavior unique to particular users included using the bottom-navigation bar at the bottom of the main page (participant 1), using the built-in search feature in the SILS web site (participant 2), and using the web browser's built in text search to locate particular text strings in a page (participant 4). Participant five was never fully sure that the information found was the information needed, and on two tasks the participant continued to look in other places after finding the information sought in order to be sure that he/she had found the correct information. This translated into the participant's much higher total error rate compared to the other participants, as the participant would continue searching other pages until returning and settling on a previously found page for a task response.

Among all the tasks the participants had to complete, there were no errors completing task one. For task two, there were ten total errors, with three participants having one error each, one participant having seven errors and eventually abandoning the task. In each error instance, the participant went to the wrong page initially.

Three of five participants had problems completing task three with a total number of eight errors divided among them. One participant had six errors and abandoned the task, while two others each had one error each.

For task four, only one participant had more than one error, with nine total errors in trying to complete the task. Every user found the answer to task four by navigating through the faculty web page from the main SILS web page, and then to the dean's web pages.

For task five, two participants had errors, although all participants eventually completed the task. For task six, two participants had zero errors, while the other three had one, two and three respectively. For task seven, one user had errors but found the information to complete the task. The data collected by the test participants regarding task errors per task can be seen in Table 1 below.

	Participant 1	Participant 2	Participant 3	Participant 4	Participant 5	Total Errors
Task 1	0	0	0	0	0	0
Task 2	1	0	1	1	7*	10
Task 3	6*	1	1	0	0	8
Task 4	0	0	1	0	9	10
Task 5	1	0	0	4	0	5
Task 6	1	0	3	2	0	6
Task 7	0	0	0	0	3	3
Total Errors	9	1	6	7	19	42

* - Participant gave up on task.

Navigation

The number one issue with the site was the lack of consistent navigation across content pages and the poor layout of the main page. When participants began a task, they always started from the main SILS page, which in its current form uses an all-image navigation menu that does not resize and that makes poor use of white space to separate navigation

choices. The result is a link menu that is tiny, cramped, and hard to work with, and if the image map that holds the site navigation fails to load, users have no navigation or page context, and no way to use the site.

Navigation in the main-page menu is broken into sections and sub-sections that attempt to organize the site content. While all participants appreciated the break up of site content into categories, they did not always have a clear understanding of the organization schema and the difference between some organizational categories, as no additional contextual information is provided beyond the basic category and link name. Additionally, the structure of the links in the main-page menu is such that participants had a difficult time quickly finding any particular link without carefully reading through a horizontal list of choices. Several participants remarked that the links were ambiguous and stated that more context would have aided their searches and link choices.

The error rate among participants was highest for the main page, although this was their starting point for each task. All participants had particular trouble discerning how to proceed with task six: “Locate who is leading the Metadata Generation Research Project.” No participant noticed the link “Metadata Generation Project” on the main page under the “Labs & Learning” section. During the study, every participant chose the “Faculty Research” link under the “Research” section on the main SILS page when attempting to complete task six.

When questioned about this, participants responded that they did not see the “Metadata Generation Project” link. As well, they stated that they were unsure where the line was drawn between the “Research” and the “Labs and Learning” headings on the main page, as research and learning were being conducted from the links in both of these sections. Participants also remarked that they did not see a difference between the “Labs and Learning” and the “Facilities” headings as both sections had links to SILS related facilities. This information indicated that more thorough headings should be used in future designs to help end-users better discern the content of each section and how it is different from other sections.

Sub-page navigation (navigation on content pages) for the current site for all practical purposes does not exist. Once participants completed a task, the only method they had to return to the main page (or to other pages in the site) was to select the “home” or “back” buttons in the web browser. To keep things simple they were instructed to use only the “home” button in the web browser, which took them back to the SILS main page and its large link set. These instructions were necessary for the study because there simply does not exist any in-site return navigation from content pages in the current site design.

As participants entered one area of a site, and then wanted to navigate to another section of the site, they all had to return to the main SILS web page to do so. Most participants noted this fact and stated that it did not make sense that navigation was so limited. Additionally, the above-mentioned issue of no return-to-home-page navigation served to exacerbate the navigation problem and to further irritate test participants. Results from

this study indicate that a more consistent and informed navigation schema is needed. Basic heuristics on site design also demand a more robust sub-page navigation.

Site Content

Behind navigation issues came content organization of SILS pages. Participants noted that while they could find the information they sought, it was often buried in a long page (vertical scrolling) and that they had to scan these large pages to find the material pertinent to their task, as there existed no intra-page navigation like anchor tags. The task that most directly has test participants deal with this issue were tasks two (locate the four suggested areas for MSIS areas of study for master's students under the suggested courses listing) and three (locate and write down all the student chapters of organizations at SILS as they are named on the web site).

Each of the pages where the information for these tasks is found are quite long and require much vertical scrolling, as the information is not broken up into separate smaller pages, and there exists no page-navigation methods (such as anchor tags) to help an end user. Participants were forced to scroll up and down and to "hunt and peck" for the small amount of information that they sought, and every participant complained about this. During their task completion part of the study, two of the five participants navigated to this page and then away again after failing to initially find the information they sought. Even while completing other tasks, when participants arrived at a similarly long page,

their search was slowed by their having to scan a large amount of material before being able to make a judgment call on that particular page's relevancy to their search.

Results from this study indicate that page content needs an improved organization schema – either breaking the content pages up into smaller more manageable pages, using anchor tags within large pages, or using of both the former methods in conjunction with a more clearly defined information hierarchy on the page or page set.

Visual Design

Data collected from the participants also showed ambivalence towards the site's visual design, and participants had no strong positive or negative opinions of the sites visual presentation beyond the main page and its image-driven navigation menus. Participants mostly stated that the content they sought was present once they could get to it and felt that the current visual design did not help nor hinder their searches, although they did note the lack of consistency among SILS pages. While most pages in the current web site have a consistent look, the current site has one page that uses frames with different background images and colors, and several others that use plain white backgrounds and different page headers and content organization. Additionally, some areas of the site have completely different design schemas.

One user did notice that on the main page, there existed two links titled "Contact Us" that took end users to two separate places. One is a link to a web page where various contact

information for the School is listed, and the other is a “mailto” link that simply allows the end user to send an email to the School. When asked, all users agreed that the navigation at the bottom of the page was largely ignored or unnoticed in their interaction with the SILS web site.

Results from this study indicate that a consistent look and feel should be considered in future redesigns and that navigation elements should not be located at the bottom of a web page without also appearing at the top of the page. As well, care needs to be taken that there are not identically named links on a page, and that all links of a particular name are consistent in their action.

CONCLUSIONS

From the data collected through the initial usability study of the SILS web site, it can be concluded that there are immediate improvements to be made that will improve the basic usability of the site. Error rates and qualitative commentary from test participants indicate that top priority for any future site redesigns needs to go to top-level navigation cues and the entire underlying site structure, as well as to adding navigation functionality to all sub-level content pages. Future design efforts need to make concentrated efforts to improve site wide uniformity of navigation, content format and visual elements.

Once these improvements are made a new usability study needs to be undertaken to measure the effectiveness of the implemented changes. As web site revisions and data

about them are collected, there will finally be a body of data with which designers can confidently build improved future versions of the SILS web site.

FURTHER SUGGESTIONS

For now, with a site redesign on the horizon, the current data should be combined with basic web design heuristics to create a new and improved SILS web site. Once prototypes of this site are designed, another round of usability testing should ensue to catch any new or previously undiscovered usability problems. This iterative design method will ensure that the quality of future SILS web sites improves and benefits all who interact with it. This study is but the first step to improved future SILS web sites.

Based off the data collected in this study, a prototype page was designed that could be used as a template for future page designs (seen in Appendix H). Note that this is simply an interpretation on a good page design that meets the usability needs discovered in this study. Notably, the page has a clearly defined and consistent head at the top of the page, with the SILS logo and an image of Manning Hall for decoration. Navigation is present in two primary locations – across the top of the page under the head and down the left of the page. Content areas fill the rest of the page area, and long-content pages can use anchor tags, located above the main page content. The overarching goal of this design is to address the biggest discovered shortcoming with the current SILS site – poor or no end-user navigation ability through the site content.

This design is based on study participant comments regarding the poor navigation of the current site and common web-design heuristics, and it is offered as a suggestion for future SILS page designs.

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APPENDICES

Appendix A – Test Procedure

Appendix B – Orientation Script

Appendix C – Consent Form

Appendix D – Pre-Test Questionnaire

Appendix E – Task List

Appendix F – Post-Test Questionnaire

Appendix G – SILS Web Site Screen Captures of Current and Old Sites

Appendix H – Proposed Page Redesign

Appendix A: Test Procedure

Preparation:

1. Open Internet Explorer.
 - Open menu item “tools-> Internet options...-> General”.
 - Set <http://ils.unc.edu/> as homepage.
 - Choose “Delete Files...” in Temporary Internet Files section.
 - Choose “Clear History” in History section.
2. Power up audio equipment. (see steps 6-9 of Test Procedure).
 - Load tape. Check sound.

Briefing:

1. Lead participant to the lab.
2. Read participant orientation script.
3. Ask participant to read and sign the consent document. (Participant is allowed to change his/her mind after orientation.)
4. Ask participant to complete pretest questionnaire.
5. Train participant to think out loud using <http://weather.com/>.
 - Have them locate the weather for Chapel Hill using the ZIP code ‘27514’.

Test:

1. Start audio recording.
2. Click “Home” button on Internet Explorer to start logging.
3. Give participant the task list.
4. Observe, take notes, encourage participant to talk.
5. Log participant activities.
6. Stop participant when going offsite.
7. Next task.
8. Stop audio recording after finishing all tasks.

Debriefing

1. Give participant post-test questionnaire.
2. Go over the participant’s answer. Get more feedback if possible.
3. Escort participant out.
4. Complete log sheet:
 - Edit notes, user comments, check tape to complement the notes.
5. Put all participant materials in folder.

Cleanup

1. Stop the tape recording.
2. If this is the second recording on the tape: Eject Tape.
3. Log off of both workstations.
4. Put all the paperwork into the file folder in the designated locker.

Appendix B: Transcript of the Orientation Script

Welcome and thank you for participating in the School of Information and Library Science web study.

The focus of this test is to study the usability of the SILS web site. Neither you as a participant or your personal ability to complete the tasks will be evaluated during our analysis.

I will ask you to fill out a short pre-test questionnaire, then complete a list of tasks, and then fill out a short post-test questionnaire.

As you begin and throughout this process of completing the tasks we ask that you speak out loud explaining your thought process when solving the task at hand. Please remember that if you enter text from the keyboard to speak clearly and indicate what you are typing.

You may use any web site features to complete the task, but you have to stay on the web site.

After I have begun the audio recordings you will receive a question booklet. Please wait for me to indicate that you can begin and follow the following procedure:

1. At the beginning of each question start from the library homepage by clicking the 'home' button.
2. Turn to the first unanswered question. To signal the beginning of the task please read the question out loud.
3. Begin completing the task. Remember to speak out loud during the entire process.
4. To signal that you have completed the task please simply say "done".
5. Return to the homepage and begin the next task.

I understand that you may not be able to complete a task. This is an acceptable response. Please simply state that you have decided to stop work on the task and begin the next one.

It is also acceptable that I may stop your work on a given task. This is not a reflection on your abilities but rather an indication that I have received the information I need. Please simply return to the homepage and begin the next task.

Thank you, again, for your willingness to participate in the study.

Appendix C: Participant Consent Form

Dear Usability Test Participant,

Thank you for your participation in our “Usability Test on the School of Information and Library Science Web Site.” This project will test how easily the users can use the chosen web site to get needed information.

About 12 participants will take the test individually in the computer lab at the School of Information & Library Science, UNC-Chapel Hill. Each participant will be asked to complete a pre-test questionnaire and a post-test one. During the test, you will conduct 10 tasks, such as searching the online catalog for a book. Meanwhile, you are encouraged to speak aloud your thoughts, describing and explaining your every move. Your activities will be closely observed by the investigator and will be audio taped. The whole test will take about 40 minutes.

All your personal information will be kept confidential, and be used for research purposes only. The tapes that record your activities will be erased upon the completion of the study.

With your participation, we can improve the usability of the library web sites, making information more accessible to users. Thanks again for your cooperation.

Matthew Carroll
(contact information removed)

Prof. Gary Marchionini
march@ils.unc.edu
919- 966-3611

You may contact the UNC-CH Academic Affairs Institutional Review Board at the following addresses or telephone number at any time during this study if you have questions or concerns about your rights as a research subject.

*Academic Affairs Institutional Review Board
Barbara Davis Goldman, AA-IRB Chair
CB #3378, Room 605, Bank of America Center, Franklin St
University of North Carolina at Chapel Hill
Chapel Hill, NC 27599-3378*

*aa-irb-chair@unc.edu
919-962-7760*

After you have read the above description of our usability test, if you still agree to participate in the test, please sign below:

Participant: _____

Date: _____

Appendix D: Pre-test Questionnaire

Thanks for your participation in our usability test. Please provide us with some basic information about yourself:

Participant ID: _____

1. Gender: ___ Male ___ Female

2. Academic Status:

___ 1st semester masters or less

___ 2nd semester masters

___ 3rd semester masters

___ 4th semester masters or longer

___ faculty member

___ administration member

3. Program Track:

___ Information Science

___ Library Science

___ Not Applicable

4. What is your Internet experience level:

1

2

3

4

5

(novice)

(expert)

5. What is your computer expertise level:

1

2

3

4

5

(novice)

(expert)

6. How often do you visit the SILS **Web Site**?

1 (Once a month or less)	2 (2-3 times a month)	3 (Once a week)	4 (2-3 times a week)	5 (Almost everyday)
--------------------------------	-----------------------------	-----------------------	----------------------------	---------------------------

Thank you!

Appendix E: Task List

- Locate the email address of professor Joe Hewitt. Answer: _____
URL where answer found: _____

- Locate the four suggested areas for MSIS areas of study for master's students under the suggested courses listing. Answers: _____
URL where answer found: _____

- Locate and write down all the student chapters of organizations at SILS as they are named on the web site. Answers: _____
URL where answer found: _____

- Record the institution and date that Dean Joanne Marshall obtained her doctorate degree. Answer: _____
URL where answer found: _____

- Locate and record the (non-email) mailing address of SILS. Answer: _____
URL where answer found: _____

- Locate who is leading the Metadata Generation Research Project. Answer: _____
URL where answer found: _____

- Locate the resource reservation schedule and record how many video capture PCs are available for scheduling. Answer: _____
URL where answer found: _____

Appendix F: Post-test Questionnaire

Participant ID: _____

Please circle the numbers that most appropriately reflect your impressions about using this web site:

1. What is your overall impression of this web site? Is it easy to use?
(difficult) 1 2 3 4 5 (easy)

2. Overall, is the web site organized in such a way that information is easy to find?
(not very organized) 1 2 3 4 5 (very organized)

3. Do you feel comfortable with font, size and color of the page text?
(uncomfortable) 1 2 3 4 5 (comfortable)

4. Is page layout helpful for you to search for information?
(unhelpful) 1 2 3 4 5 (helpful)

5. Is the navigation layout (links) helpful for you to search for information?
(unhelpful) 1 2 3 4 5 (helpful)

6. Can you predict where a link will lead you?
(unpredictable) 1 2 3 4 5 (predictable)

7. In general, was it easy to find what you were looking for?
(hard) 1 2 3 4 5 (easy)

8. How do you like the images displayed on the pages?
(dislike) 1 2 3 4 5 (like)

9. Overall, how do you like the web site?
(dislike) 1 2 3 4 5 (like)

10. Overall, finding specific information was:
(hard) 1 2 3 4 5 (easy)

11. Overall, while using the site, did you feel?
(frustrated) 1 2 3 4 5 (comfortable)

In your opinion, what is the best feature or worst problem of the web site?

Thanks for your participation!


Appendix G – SILS Web Site Screen Captures

Welcome to the School of Information and Library Science


http://ils.unc.edu/

UNCCH

[Text-only site](#)

 **UNC**
SCHOOL OF INFORMATION
AND LIBRARY SCIENCE

About the School
Dean's Welcome - Admissions - Catalog - Fast Facts - Mission - History - Accreditation
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Continuing Education - Field Experience - School Library Media Coordinators - Int'l Programs

Research
Faculty Research - Technical Reports - Doctoral Research - Dissertations
Master's Papers - Carnegie Grants

Labs & Learning
ibiblio.org - Interaction Design Lab (IDL) - Internet 2/DSI - Plant Information Center
Open Video Project - CoRE - Bioinformatics - NC Health Info - Metadata Generation Project
Digitization for Cultural Heritage Professionals Workshop - Digital Libraries (CRADLE)

Facilities
SILS Library - Computer Lab - Rooms/Resources

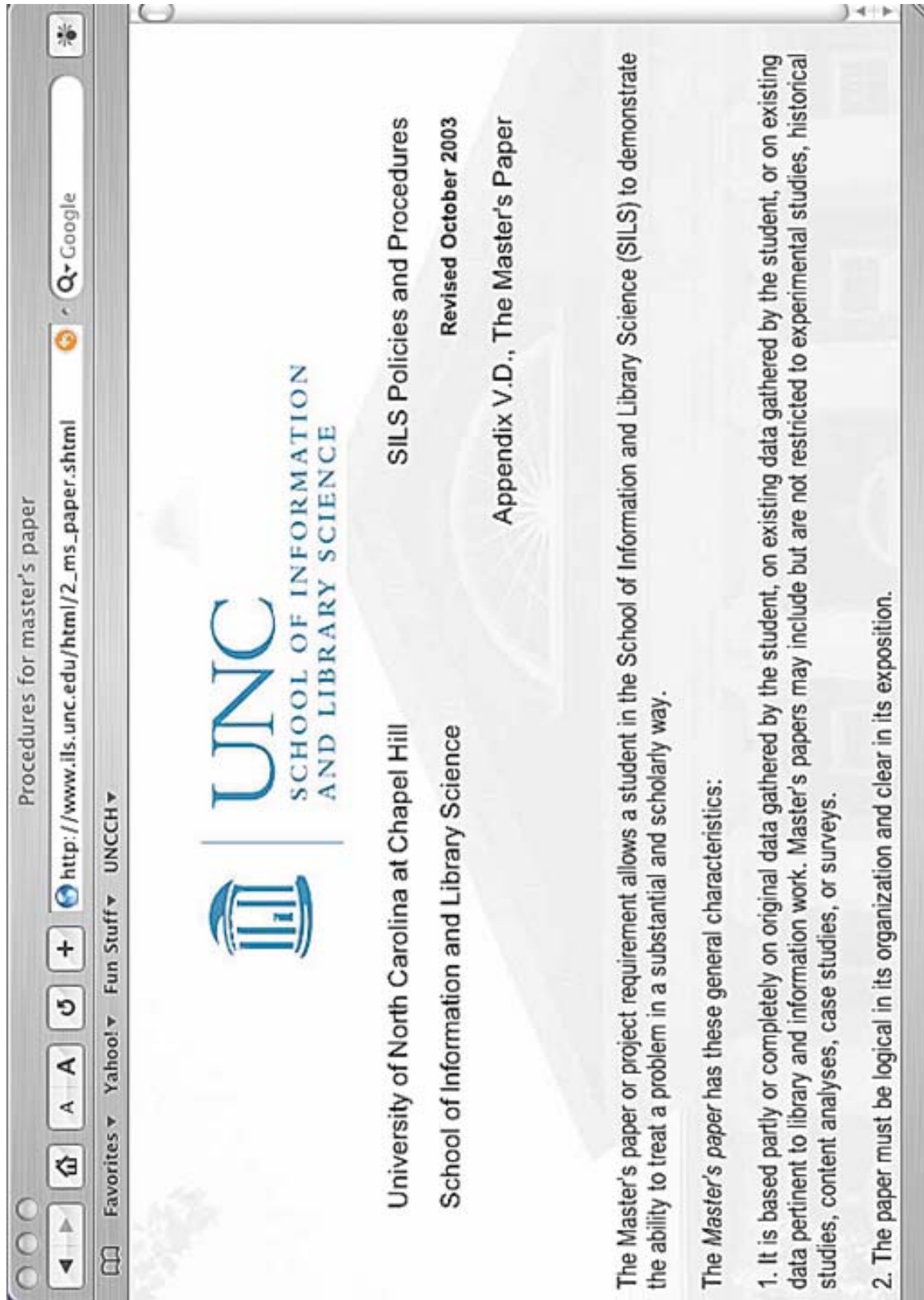
News & Events

Learn more on Feb. 2...
Major in Information Science

Open House
for prospective students

Completed opening the page with 1 error (see Activity window for details)

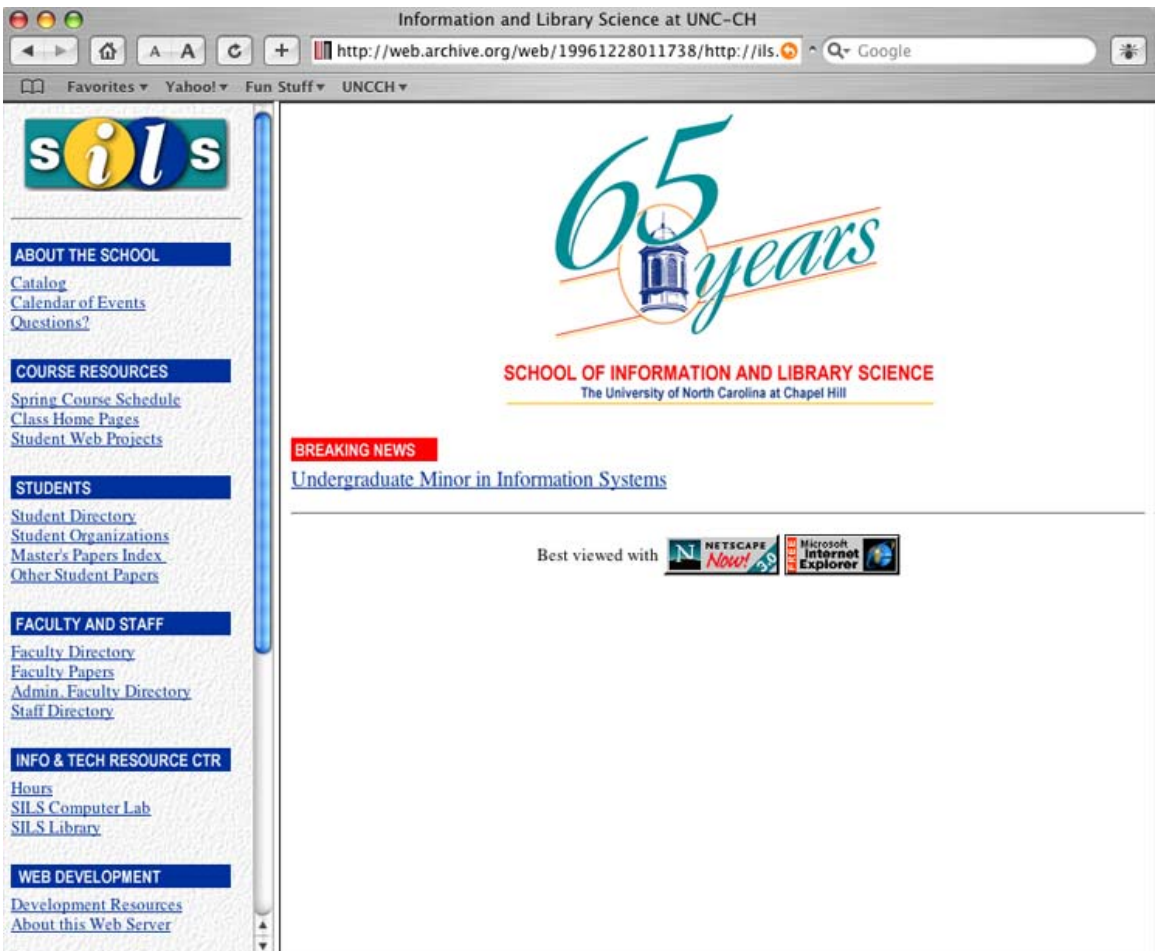
Current Main Page Feb. 2004



A current content page Feb 2004.



A current content page Feb. 2004.



The original SILS web page circa 1996.

Information and Library Science at UNC-CH

http://web.archive.org/web/19980519184904/http://ils.unc.edu

Google

Favorites Yahoo! Fun Stuff UNCCH

sils

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[Summer 98 Schedule](#)
[Calendar of Significant Events](#)
[Course Frequency](#)
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[Admin. Faculty Directory](#)
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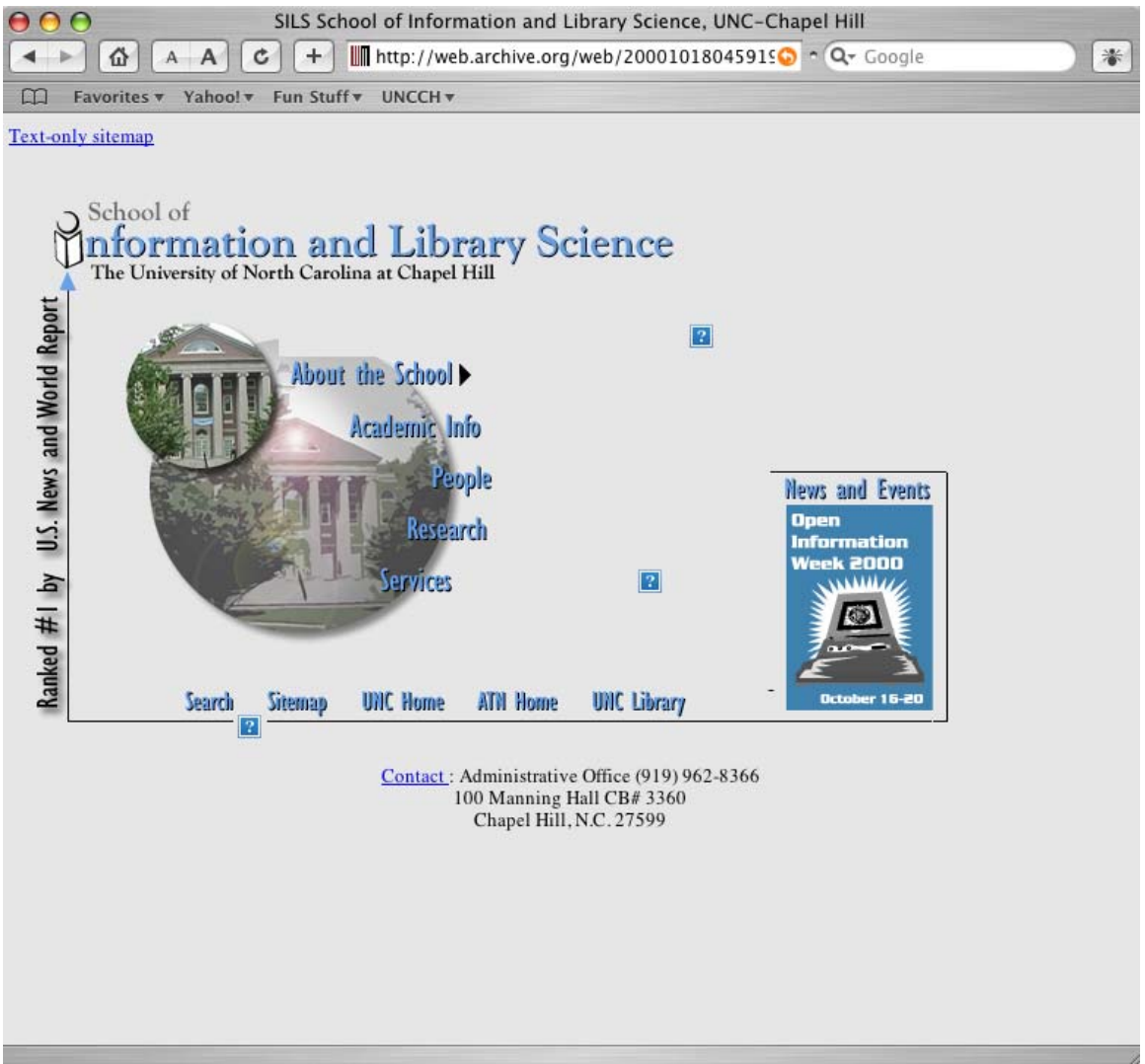
SILS
School of Information and Library Science
UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL

BREAKING NEWS

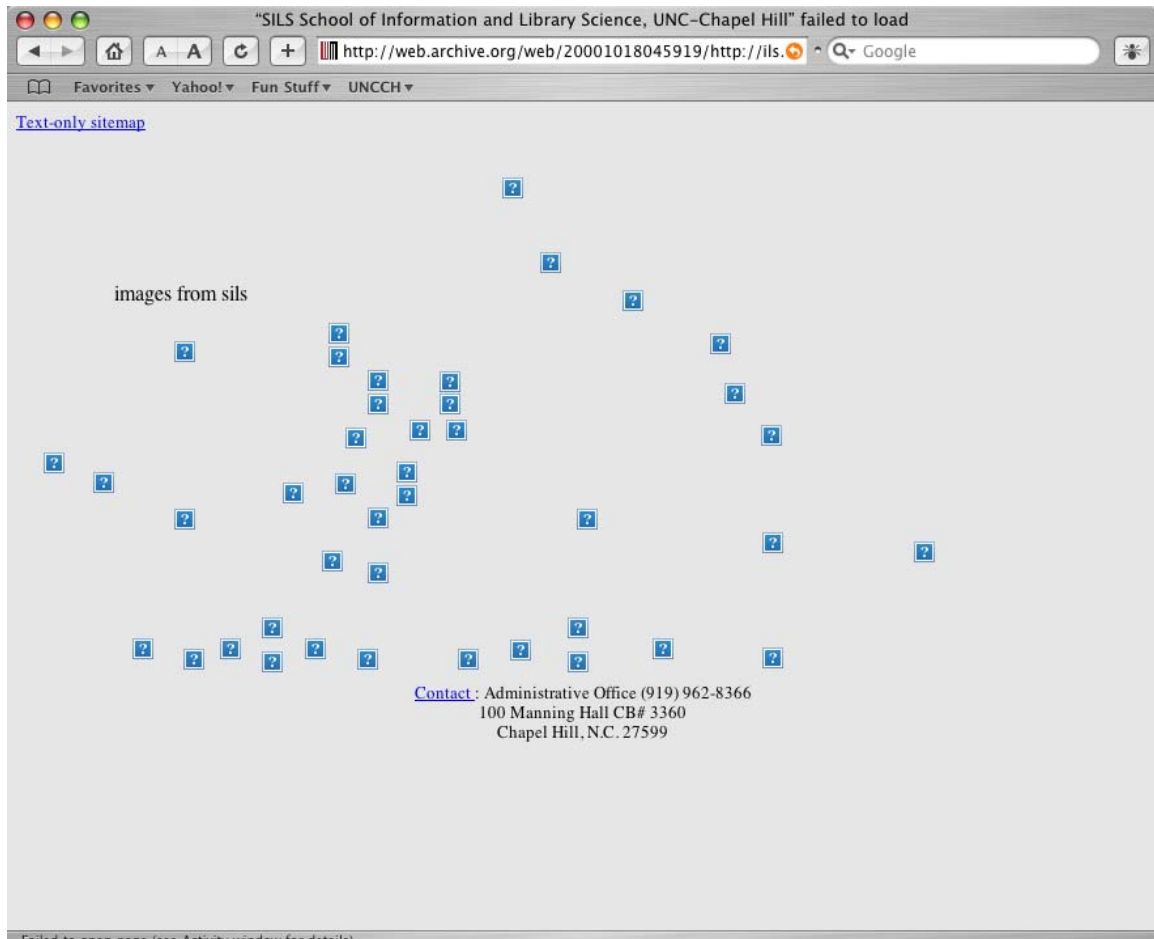
[SILS to benefit from \\$2.4 million Intel gift](#)
[Graduation speaker, Martin Dillon](#), to address changing future of information professions.
[Mary Pope Osborne, renowned children's author, visits SILS](#)
[SILS welcomed three new faculty members in 1997-98 year](#)
[Spring trip to Oxford, England](#), offers opportunity to study at world-renowned Bodleian Library
[Professor Emeritus Edward Holley receives ALISE award](#) for professional contribution to LIS education
[Swets & Zeitlinger, Inc. establishes the Marcia Tuttle Serials Scholarship Fund](#): First recipient is named
[The Lester E. Asheim Scholarship Fund](#) grows by another \$137,000
[Baker & Taylor scholarship](#) will fund student trip to Oxford each spring
[Internet Training Institute](#) for School Librarians and Technologists

Best viewed with

The first site redesign circa 1998.



The third site design circa 2000.



The third site design circa 2000 when images fail to load.


Welcome to the School of Information and Library Science

http://web.archive.org/web/20020124045346/ Google

UNCCH

[Text-only site](#)

INFORMATION AND LIBRARY SCIENCE @Carolina



Ranked #1 by U.S. News & World Report

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Labs & Learning

[Ibiblio.org](#) - [Interaction Design Lab \(IDL\)](#) - [Internet 2/DSI](#) - [Plant Information Center](#) - [Open Video Project](#) - [CoRE](#)

Facilities

[SILS Library](#) - [Computer Lab](#) - [Rooms/Resources](#)

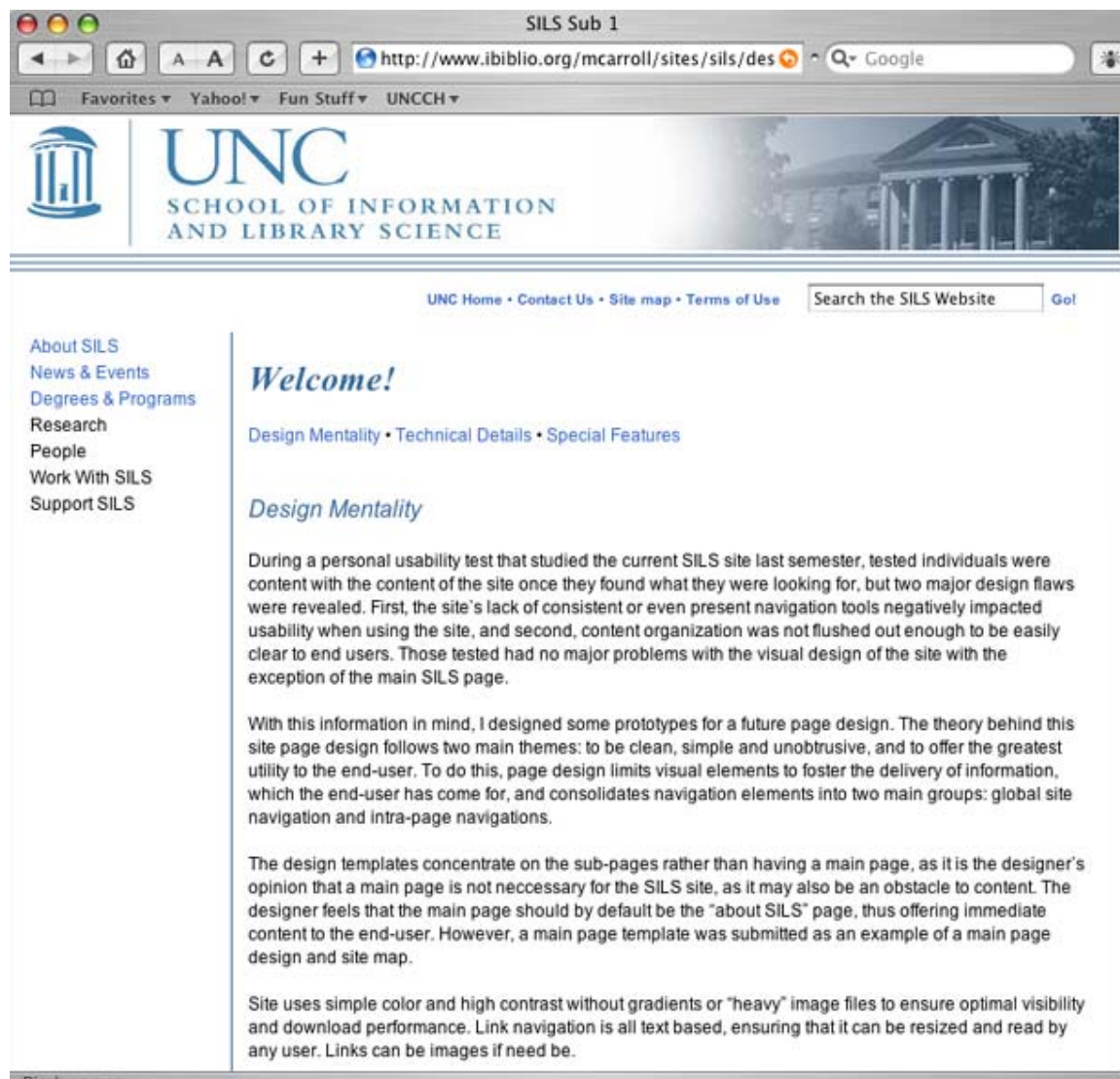
<h2>Employment</h2> <p>Career Services - Jobs at SILS Post to SILS Jobs Listserv</p>	<h2>News & Events</h2> <p>Headlines - Calendar SILS Newsletter - Commencement</p>
--	---

[Search](#) [Site Map](#) [UNC Home](#) [UNC Library](#) [Contact Us](#)

SILS: CELEBRATING SEVEN DECADES OF LEARNING, DISCOVERY AND ENGAGEMENT

The fourth site redesign circa 2001 (banner image did not load).

Appendix H – Proposed Page Redesign



Proposed redesign of a content page following this study.