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Digital library technologies have become increasingly more sophisticated in the effort to provide more and better access to the collections they contain. The evaluation of the usability of these technologies has not kept pace with technological developments, however, and the end-user has in some cases been left behind. This research study evaluates the usability of digital collections created using the CONTENTdm™ Digital Collection Management System. Using usability testing techniques with actual end-users, this study attempts to assess the efficacy of the CONTENTdm™ public interface as well as user attitudes toward it. Ten participants from three user groups performed eleven tasks designed to test the key functions of CONTENTdm™-created collections and then answered a series of questions about their experiences. Results from this study may be used to improve this software system and add to the literature surrounding the usability of digital libraries in general.

Headings:

CONTENTdm™ Digital Collection Management Software

Digital Libraries

Human Computer Interaction

User Interface Design - Usability

User Interfaces - Evaluation

CONTENTdm™ Digital Collection Management Software and End-User Efficacy

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INTRODUCTION AND BACKGROUND

As the Web has become increasingly popular, many traditional libraries and archives have attempted to keep up with new technologies by developing digital libraries (DL). While there is currently no one clear definition of a digital library, the Digital Library Federation defines digital libraries as:

“... organizations that provide the resources, including the specialized staff, to select, structure, offer intellectual access to, interpret, distribute, preserve the integrity of, and ensure the persistence over time of collections of digital works so that they are readily and economically available for use by a defined community or set of communities” (Digital Library Federation website)

Today the digital library component of an institution is integral to its function and goals, in some cases superseding or even replacing the traditional library, and a large amount of resources is allotted for the creation of progressively more sophisticated DL systems. Associated with DLs are digital collections, which along with services and infrastructure, are typically components of the DLs. Digital collections are comprised of digital objects that are either digital surrogates of physical items or are themselves born digital, which have been purposefully collocated by an individual or institution. Digital objects can represent information in myriad formats, such as books, newspapers, photographs, maps, art objects, etc. The purpose of a digital collection is often defined as twofold: to make available to the public items that have limited accessibility due to their format and physical location and, at the same time, preserve those items by providing a digital surrogate that allows the institution to limit the handling of the physical object. The possibilities for

improving access and services by way of digital libraries and their corresponding digital collections seem endless, and research is constantly being undertaken to create new technologies and improve old ones.

The 1980s saw the development of digital collections management, originally intended to support large businesses and organizations, but recognized by libraries, archives, and museums as having great usefulness for their institutions. In 1989, the Library of Congress began the work that would result in the creation of the American Memory Project in 1995. With the collaborative efforts of the Library of Congress and other institutions around the world came an increased interest in the usefulness of digital libraries and collections as a means of providing access to cultural heritage materials in addition to traditional bibliographic materials. By the late 1990s, Content Management Systems (CMS), which provide a suite of software tools to create and manage digital collections, were being offered commercially to libraries and repositories, and by 2001 there were nearly 100 software products from which to choose, and over 5,000 systems had been implemented (Boss, 2006).

The original systems were expensive and not necessarily designed for use with library or archival materials. In response to the need for a system oriented specifically to the management of digital collections of cultural heritage materials, such as rare books and other publications, manuscripts, art objects, and the like, came the development of CONTENTdm™ Digital Collection Management Software in the late 1990s. This software was designed to “meet the needs of a wide range of users ... [including] universities, public libraries, museums, commercial and government entities, and nonprofit organizations” (CONTENTdm™ website).

CONTENTdm™ is an increasingly popular choice for institutions looking to create digital collections. The design is intended to be user-friendly in regard to implementation, so that digital collections may be created quickly and easily without a great deal of technical expertise. CONTENTdm™ is intended to be “scalable,” meaning that small, volunteer-run institutions should be able to use the software as easily and fully as large institutions with many resources. The software package’s growing, diverse customer base indicates that this is in fact the case.

Much of the focus of CONTENTdm™'s website is on the user, but the user here is the user of the software, not of the final products the software presents. In fact, the term “end-user” is conspicuously absent from the CONTENTdm™ site. This is not because the end-user is a minor player in the world of CONTENTdm™ and of DLs and digital collections in general. In this world, the end-user is of utmost importance, for a digital library is not merely a repository for information, but a “social and pedagogical space in which users interact with items in the collection to determine their own personal interpretations and views” (Jones, 1999). Unfortunately, end-user concerns for people like the makers of CONTENTdm™ have traditionally been relegated to second place to other areas of research on DLs, taking a back seat to the structure and management of collections and technical concerns (Theng, 2000; Hartson, 2005). As stated in Collection Principle 4 of the NISO *Framework of Guidance for Building Good Digital Collections*, “A good collection is broadly available and avoids unnecessary impediments to use.” The failure to address potential user problems can result in a system that does not adhere to this principle.

LITERATURE REVIEW

Within CONTENTdm™, collections of digital objects can be organized and described with appropriate, interoperable metadata, and then served up to the public via the CONTENTdm™ interface. Implementers of the software want it to be easy to use from the standpoint of the librarians and archivists managing the digital objects, and assume that using the final products – the digital collections – will be intuitive as well. End-users, who could potentially be anyone with interest in the materials and an Internet connection, should find it easy to search, browse, and view objects using the public interface.

The end-user is, quite obviously, a very important part of digital libraries and collections in general. Unfortunately, it has often been taken for granted that the needs of the end-user are served by most digital libraries. While significant research has been done on nearly every other facet of digital library production and development, the usability of DLs has been largely neglected. This neglect has recently gained notice, however, and an emerging body of research is now identifying and addressing end-user needs in regard to DLs, and working to implement changes to existing systems to try to correct usability problems. In a 2002 publication of the Digital Library Federation (DLF), *The Digital Library: A Biography*, the authors identify a feature of the “maturing” digital library – one that has already experienced its original growing pains – as one that has renewed interest in and focus on the end-user (Greenstein and Thorin, 2002).

In 2000, Daniel Greenstein, then the director of the DLF, reviewed libraries and their DL counterparts in order to help refine the programmatic goals of the DLF

(Greenstein, 2000). By performing desk-based research on the documentation and technical reports that informed members of the DL community, as well as taking part in extensive discussions about DLs at 27 different sites, he was able to identify five key challenges facing libraries investing in online collections and services:

1. Architectural and technical challenges
2. The development of standards and best practices
3. Collection development
4. Penetrating and mobilizing user communities, and
5. Long term access to digital information

While these challenges are certainly all interrelated, it is the fourth challenge – to penetrate and mobilize the user community – that is most relevant to this research. In this section of his review, Greenstein noted that the user needs to be “re-engaged”, implying that somehow during the development of DLs, the end-user was disengaged, removed from the development process.

The Human-Computer Interaction Group (HCI-G) at Cornell University performed a number of evaluations of digital libraries and collections in the late 1990s resulting in the publication of several of papers pertaining to the problem of usability and DLs. “Project Soup: Comparing Evaluations of Digital Collection Efforts,” an article written by the independent evaluators of five digital collections, details the findings from the review (Rieger *et al*, 1999). The authors based their findings on three core issues: backstage concerns, collection maintenance and access, and usability findings. Their findings indicated a need for user-centered design, noting that effective collections are not simply repositories for information, and that without addressing user needs, a digital collection containing high-quality, copyright-cleared, and fully described content can still be a failure. The paper also noted that

the issues that initially seem unique to particular collections have repercussions for future projects, and that the real value of many studies comes from applying analysis to future challenges. The importance of integrating users into the design and implementation process early and using their input to structure research priorities is highlighted. The authors also note that the course of future DL research will probably be changed by involving users in such a manner, but that this inclusion will result in the creation of better systems.

In another study based on the HCI-G's involvement in the evaluation of digital imaging initiatives, Rieger and Gay (1999) identified a current problem facing these initiatives as the need to evaluate the effectiveness and usability of their delivery systems. The purpose of the study was to identify and describe methodologies and techniques that could be used to evaluate the usability of web sites providing access to digitized collections. The authors noted two basic methods of measurement: observation of users interacting with systems and the collection of user opinions about the system. They also described tools for observing user interactions and methods for gathering user feedback. They advocated synchronous data collection, analysis and reporting, and promoted the importance of "triangulating" evaluation projects by using data from usage statistics, interviews with experts, and user focus groups.

In 2000, a preliminary study was undertaken to try to understand the purpose of DLs and investigate whether meaningful results could be obtained from a small user study (Theng *et al*, 2000). This study worked with 45 subjects, randomly divided into three groups, who were asked to complete an extensive questionnaire

evaluating their satisfaction with the design and structure of a given DL, comment on the purpose of DLs in general, and suggest future design features. The three DLs chosen for study were the ACM Digital Library (ACMDL), the Networked Computer Science Technical Reference Library (NCSTRL), and the New Zealand Digital Library (NZDL). The subjects were all third-year undergraduate students participating in a module called “HCI Interface Building.”

Two insights on DLs were gleaned from this study: one, that people generally prefer tradition, and so setting up a digital library with components that mimic a traditional library is preferred by many patrons; and two, that many users experience a state of “lostness” when navigating DLs. The latter finding supported the need for further study regarding the usability and design of DLs. Another issue that arose in this study was the need for standards for evaluation. The researchers determined that if a DL feature scored a 75% “acceptance rate” (meaning that 75% of the subjects approved of it), then it was “well-implemented”; however, this benchmark of 75% was, as the authors themselves noted, an arbitrary one, not based on any prior empirical research. The authors were confident that their findings supported the usefulness of small studies because their findings were consistent across both small and large groups of participants. The generalizability of some of the findings is somewhat questionable, however, considering that their group of participants could all be classified as “expert” digital library users.

The findings of this preliminary study had implications for a number of other institutions beginning to examine the usability of their DLs, and several case studies relating to the usability of particular digital libraries and collections have been

performed and published. According to Jones, Gay, and Rieger (1999), although the findings of these case studies seem particular to the individual DLs they describe, they are relatable to other DLs and so contribute to the development of good usability practices for DL design.

A case study of the University of Buffalo library website identified several usability issues that would not have been considered, or even discovered, had the usability testing not been performed by the researchers (Battleson *et al*, 2001). Published in 2001, the paper noted that libraries were only beginning to apply usability testing to their digital components. The authors provided background information on the subject of usability engineering and human-computer interaction, which is used to support their hypothesis that usability testing is an integral and necessary part of a good web site's development and evolution. Dumas and Redish's five facets of usability testing are described in the paper:

1. To improve the usability of the interface
2. Testers represent real users
3. Testers perform real tasks
4. User behavior and commentary are observed and recorded, and
5. Data are analyzed to recognize problems and suggest solutions

Using these facets, the authors designed a study comprised of a series of tasks performed in an academic library website by eleven undergraduate students. The study incorporated think-aloud protocol, and test results support Nielsen's argument that a successful usability study can include as few as five subjects.

In a special edition of the *International Journal of Digital Libraries*, Hartson, Shivakumar, and Perez-Quinones (2004) published a paper representing the findings of a case study of the Networked Computer Science Technical Reference Library

(NCSTRL), a part of the *Collaborative Project: Core Integration for the National SMETE Digital Library* at Virginia Tech. For the study, the researchers performed a usability inspection of the NCSTRL. This was not their preferred method of testing usability; had their resource base been larger they would have conducted a true usability study with real users. As it was, they performed the 40-hour inspection of the NCSTRL digital library by using a team of three evaluators (the authors) to perform four categories of representative tasks. While the results indicated that the library is generally easy to use, they identified problems with the following aspects of the library: consistency, feedback, wording, layout and graphic design, the user's system model, searching, filtering, browsing, and inter-system navigation. The paper also included a useful cost/importance analysis, detailing the importance of fixing each problem along with the cost in person-hours to do so.

A case study of the *Documenting the American South* (DocSouth) digital library at the University of North Carolina at Chapel Hill in 2005 was conducted to demonstrate the importance of usability testing and, following an iterative design process, to develop sustainable and user-friendly DLs (Norberg *et al*, 2005). The researchers identified three user groups: faculty, staff, and students; the general public; and K-12 teachers. They then conducted a series of usability tests involving tasks and think-aloud protocol with subjects from each of the identified groups. In addition to traditional usability testing, the researchers held focus groups to further examine the potential end-user issues surrounding the DL. The study found that users' interactions with DLs are task-oriented. Through the study the researchers identified several usability issues within the DocSouth website, which they were able

to resolve through an iterative design process. The findings support the importance of maintaining dialog with real users and using that dialog to engage in iterative design.

A case study of the IUPUI (Indiana University-Purdue University at Indianapolis) Image Collection was also conducted in 2005 (Kramer, 2005). This case study is the only published empirical research this author was able to locate involving the issue of usability and a digital collection/library using the CONTENTdm™ Digital Content Management System. The purpose of the study was to measure the functionality and content of the collection, as well as user awareness of its existence. The paper posits in its introduction that the growth of the Web has made it more important than ever for libraries to engage in the creation of digital collections, and for those collections to be easily accessible and well-documented.

The IUPUI Image Collection consisted of approximately 5100 images at the time of the study. Seventy participants, recruited from among the faculty, staff, and students at Indiana and Purdue universities, were observed while engaging in a controlled search for a specific image in the collection. After completion of the task, the participants were asked to respond to questions with the objective of improving the site. Findings indicated that most users had not previously heard of the IUPUI Image Collection and had some level of difficulty in locating it. The issue of “lostness” was again raised in this study, as many users’ navigation and information literacy skills seemed to lag behind what was needed to use the site successfully. This study was a very basic one, recommending larger studies for effective feedback on functionality and metadata as it pertains to CONTENTdm™’s design.

Veering somewhat away from the traditional usability evaluation techniques of the case studies mentioned above, Koohang and Ondracek (2005) designed a study taking a different approach toward the usability of digital libraries. Rather than simply studying the usability of DLs, the authors chose to examine users' *views* about the usability of DLs. The study defined its key topics and provided a background for both usability and digital library usability, setting forth the theory that users' views of digital libraries affect the usability of those libraries. The research focuses on users' views about the usability of DLs that they access for their personal research, their perception of the importance of DLs in general, and how they thought the systems should function. The study used two Likert-type surveys administered to 111 students enrolled in a BS degree in an Information Resources program at a midwestern university, and incorporated an instrument consisting of twelve DL usability properties that were developed by Koohang (2004). Examples of these properties are simplicity, navigability, consistency, etc. Analysis of the data collected showed a gap between the perceived usability of systems students were currently using and their sense of how usable DLs should be ideally.

In a more recent study with a similar focus, researchers solicited users' suggestions for the improvement of DLs in addition to gathering their opinions on a range of possible DL features (Kani-Zabihi, 2006). The authors of the study note that the problem with prior studies has been the lack of opportunity for users to discuss their understanding of and experience with DLs. This lack has led to a gap between what users want out of DLs, and what they actually get from them. The study consisted of three parts and 48 subjects from different information technology

backgrounds – novice, intermediate, and advanced. First, users completed two sets of tasks within the realms of two different DLs, ScienceDirect and Classical Music Library. Second, they filled out a questionnaire with two parts: the first asked for opinions on what features they believe DLs should include; and the second asked them to prioritize five “requirements” for DLs. Third, the subjects were asked to express their opinions about 19 suggestions for DL improvements by way of a Likert-type study.

The findings of the study indicated that no matter what level of expertise users have, they tend to have similar expectations, believing that DLs should be easy to understand and reliable in terms of obtaining search results. This study attempted to define the needs of users from a wide variety of backgrounds.

The studies that have been undertaken in the past few years have included reviews of DLs and usability issues. In her 2005 paper on this topic, Judy Jeng attempted to review how usability had been defined in the context of the DL, what methods had been applied, and how informative they were. She further proposed an evaluation model and a suite of instruments for evaluating academic DLs. The paper includes both a background on usability, generally focusing on the definition of usability according to Jakob Nielsen, and discusses its five attributes:

- Learnability
- Efficiency
- Memorability
- Low error rate or easy error recovery, and
- Satisfaction

Jeng provides a chart detailing attributes of usability and the authors of those attributes, and a chart reviewing the usability tests undertaken thus far in academic

DLs. Using Nielsen's attributes, the author proposes an evaluative model for assessing the usability of DLs, as well as the results of a pilot study testing the model on three students at Rutgers University. The model instruments consist of a pretest questionnaire, a list of tasks, and a post-test questionnaire. The usability techniques employed include formal usability testing, questionnaires, interviews, think-aloud protocol, and log analysis.

Findings of the study indicate that there is a relationship between effectiveness, efficiency, and satisfaction. Again, user "lostness" is noted. This paper reiterates that while DLs themselves are maturing, the evaluation of these systems has not kept pace. It echoes the need to further analyze usability and the methods used to evaluate and analyze it.

The fact that the literature surrounding DLs and their usability has been chiefly produced in the past few years indicates a growing interest in the subject. Usability is increasingly being viewed as an important aspect of the development of DLs, and efforts are being focused to determine how best to meet user needs and expectations. Despite this momentum, a great deal of work must be done before the gap between user needs and what is currently being provided by DLs is closed. Even with this increased interest, the evaluation of commercial products for digital libraries has largely been neglected (Saracevic, 2005). Evaluating these products is clearly necessary to ensure that they adhere to usability principles. Further studies, both case studies of individual DLs and broad surveys, are needed to achieve this important goal.

THE PRESENT STUDY

As the review of the literature has shown, there has been limited research surrounding the usability of digital libraries and collections. To date, the many technologies and interfaces of which digital libraries are composed have not been evaluated as to how well they work for the end-user. This is an unacceptable state of affairs, for even if an institution provides digital Web-based access to the most desirable of materials, the collections will remain underutilized and unseen if their target users find the interfaces that deliver them difficult to use.

The CONTENTdm™ Digital Collection Management System is experiencing growing popularity within libraries, archives, and other cultural institutions. However, like other commercial products for digital libraries, it has not been sufficiently evaluated. There is currently only one published paper which studies a digital collection created with CONTENTdm™ software from the perspective of end-user usability, and its findings are preliminary and suggest the need for further research in this area (Kramer, 2005).

The data collected in the present study begins to fill the gap in evaluative research, providing the some of the data necessary for the creation of usable collections with CONTENTdm™. The study attempts to identify potential end-user problems with CONTENTdm™ software by conducting usability testing wherein participants performed a series of basic tasks in a controlled CONTENTdm™ environment and then, upon completion of the tasks, filled out a survey about their experience. Specifically, this study addresses the following questions: Does CONTENTdm™ meet users' needs? Is the interface sufficiently intuitive for them to

use it? Is the experience of exploring digital collections using CONTENTdm™ satisfying to users?

It is hoped that this research can be used by others as a point of departure for further studies into the usability of digital collections using CONTENTdm™ and other related products. By conducting studies such as this one, researchers can gain unique perspectives into the habits and attitudes of end-users toward digital libraries and collections they offer them.

METHODOLOGY

This study attempts to assess the usability of digital collections, which for the purpose of this study are operationally defined as digital collections created using the CONTENTdm™ Digital Collection Management System. Usability testing is a type of pre-experimental one-shot case study, meaning that the responses of a single group of participants to a set of stimuli are measured and analyzed (Babbie, 2004).

The intent of usability testing is to ensure that products are easy to use and learn, satisfying to use, and provide utility and functionality that are highly valued by the target population (Rubin, 1994). In the case of digital collections, these three facets are of course highly important, and so usability testing was an appropriate method for this study. A major advantage of the application of usability testing is that it incorporates actual end-users. By studying how actual users interact with the interface, as well as their feelings and attitudes about their experience, system designers can provide a better product. Other methods of testing that do not employ end-users are useful as well, but cannot substitute for usability testing.

In this study, data was collected from participants who performed a series of tasks designed to test the usability of digital collections created using CONTENTdm™ software. In addition, basic demographic data was collected from participants. Prior to testing on actual participants, the procedures and instruments were pilot tested.

Participants

The unit of analysis in this study is the individual participant, who fell into one of three groups: university faculty, library science graduate students, and members of the general public. As recruitment for this type of study can often be difficult, the researcher relied on non-probability purposive and convenience sampling. The sampling technique varied across the three sample populations. In the case of the faculty group, participants were recruited via an email invitation sent to faculty members based on random selection of a sampling unit: every third person listed in the faculty directories for the History, Center for the Study of the American South, English, and Education departments were sent a recruitment email. Library science graduate students were recruited by way of an email sent to the School of Information and Library Science at UNC-Chapel Hill student listserv. Members of the general public were recruited through the placement of flyers posted at the Chapel Hill Public Library, the Carrboro Cybrary, and the Arcadia Cohousing Community bulletin board.

The study collected data from three faculty members, four graduate students, and three members of the general public. While this may seem to be a relatively small number of participants, usability literature, as mentioned above, supports the

notion that good, useful results can be gained from studies consisting of as few as five subjects. In fact, using too many participants can be both a waste of time and a waste of money (Nielsen, 2000).

Participants were notified of the nature of the study and other pertinent details, and were asked to contact the researcher by phone or email if interested in taking part in the study. The researcher provided no incentives for participation, financial or otherwise, and no costs were borne by the participants other than their time.

Study Procedures

Half of the participants were given directions to meet the researcher at the usability testing lab in Davis Library on the UNC campus at a mutually agreeable time. The other half of the participants met with the researcher at the location of their choice, provided a wireless Internet network could be accessed from that location, and completed the testing on a laptop on which the usability software was installed. Sessions were limited to one participant at a time, and lasted 25-50 minutes per participant.

Once at the usability lab or other testing location, the participant was greeted and seated and provided with a consent form that included general information about the study and the participant's role in it. The participant was notified of the fully voluntary nature of the study and told that s/he could withdraw from the study at any time. Any questions s/he had were answered at this time.

Usability testing was conducted using Morae Usability Testing software. This software allows for the participant's screen movements and comments to be recorded and time stamped. The usability session may also be observed by others from a

remote site. For further details about Morae Software, see the product website at <http://www.techsmith.com/morae.asp>. At the usability testing lab, the researcher worked with a colleague (Lisa Norberg or Kim Vassiliadis of the UNC University Library Instructional Services) to conduct the sessions: one person sat with the participants throughout the session and answered any questions s/he might had, while the other monitored the session from an adjoining room networked to the lab.

During the session, the participant was asked to perform a series of tasks using digital collections created with CONTENTdm™ software (see Appendix A). While comments were recorded, the participant was not asked to engage in think-aloud protocol, meaning that he or she was not asked to “talk through” actions. The exclusion of this type of data collection was due to the belief that think-aloud protocol can be distracting and disorienting to the participant, perhaps resulting in less “natural” interaction with the digital collections.

The first set of tasks involved digital collections from the UNC-Chapel Hill libraries website, but the second set of tasks used a digital collection from another institution, Dickinson College. The reason for the inclusion of another institution’s website was that, as UNC-Chapel Hill is in the early stages of implementation of CONTENTdm™ when the study was done, there were only a few projects available for study, and none of them employed all CONTENTdm™ functions. By including a collection from Dickinson College, this study was able to more fully explore CONTENTdm™’s functionality.

The tasks were broken down into two parts. Part 1 involved digital collections at UNC-Chapel Hill. The tasks in this section were designed to test the interface

based on navigability, searchability, and functionality. The participant was asked to locate one of UNC-Chapel Hill's CONTENTdm™ collections, the Gilmer Civil War Maps Collection (<http://dc.lib.unc.edu/gilmer/index.php>). Once s/he located the collection, s/he was asked to determine how many maps of North Carolina are in the collection, and then find a particular map depicting the battleground of Bull Run. Once the participant located this map, s/he was asked to use the zoom and pan features, without being told exactly how to do so, and then to “clip” and save a section of the map to her/his desktop. These tasks were designed to explore how intuitive these features are. During Part 1, the participant was also asked to navigate to another CONTENTdm™ collection, the Billy E. Barnes Collection (<http://dc.lib.unc.edu/barnes/index.php?CISOROOT=%2Fbarnes>) at UNC-Chapel Hill, starting from within the Gilmer Civil War Maps Collection. S/he was then instructed to use the browse and search features. The intention of these tasks was to determine how well users are able to navigate in and out of particular collections and whether or not they understand which collections they are looking at.

Part 2 employed a digital collection from Dickinson College, and tested the “compound object” interface available through CONTENTdm™. The compound object functionality allows institutions to create hierarchical objects made up of related digital images to mimic the structure of a book, newspaper, or other multi-level item. The tasks in this section were designed to see if the participant was able to intuit how to navigate and search the different parts of the object. The participant was asked to imagine that s/he was looking for historical sources regarding the Underground Railroad, and that s/he had heard that the Dickinson College Archives

and Special Collections had a digital collection of books and pamphlets online that included a digital copy of a book on this subject by an author named William Siebert. The participant was provided with the URL for this collection (<http://deila.dickinson.edu/theirownwords/>), as the ability to locate this collection on the Web was not of interest to this study. Once s/he navigated to the collection s/he was asked to locate the book, find two particular pages in the book, and identify some of the page metadata and affiliated hyperlinking. The tasks in Part 2 were designed to determine how intuitive and navigable the compound object interface is.

After finishing the tasks, the participant was asked to complete two questionnaires. The first questionnaire asked for demographic information as well as an indication of how familiar the participant felt s/he was with the Internet and digital collections in general (see Appendix B). The second questionnaire (Appendix C) used a combination of Likert-type and open-ended questions to ask participants about their experience performing tasks using CONTENTdm™-created collections. These questions can be categorized in terms of Rubin's four factors of usability: usefulness (Question 2), effectiveness (Questions 3, 5, 9 and 10), learnability (Question 4), and likability (Questions 7 and 8) (Rubin, 1994). Four of the questions (1, 6, 11, and 12) were intended as general follow-up questions.

Ethical Issues

There was very little possibility of ethical conflict in this study. The potential for a participant to have prior knowledge of the researcher or her research posed a small degree of concern. However, the likelihood of harm from this study was minimal.

This study was approved by the Institutional Review Board of UNC-Chapel Hill prior to commencement; the study number was 07-0070.

RESULTS

The data collected in this study was qualitatively analyzed. Initially, participants were assigned numerical identifiers, and their demographic information and answers to questions about their experience performing the tasks was recorded in spreadsheet form. Demographic information was only evaluated in the aggregate; data was not analyzed individually.

This research was concerned with two facets of the end-user's experience with CONTENTdm™-created collections. First, the researcher monitored the participants while they performed the tasks, taking notes on how they seemed to be doing. These notes were analyzed alongside the audio and video recording of the usability session to determine how navigable and understandable the interface was for the participants.

Second, the data gathered by way of the second questionnaire, which focused on the user's satisfaction with the interface experience, was used to draw conclusions about features the user liked or did not like, and how these features may be manipulated to better serve the target audience.

Demographic Data

The participants, of whom half were male and half were female, ranged in age from 30 to 69 years, with an average age of 48 and a median age of 44. The participants constituted a highly educated group of people, all holding college degrees and eight out of ten holding graduate degrees. Most considered themselves very

familiar with the Internet, most claimed to have visited UNC's digital collections before, and nine out of ten reported having viewed digital collections or images on the Internet in the past. This demographic data indicates a group of people who generally consider themselves to be familiar with the Internet and digital collections. See Appendix D for a chart showing the demographic data.

Analysis of the audio/video recordings, paired with the follow-up questionnaires, indicated that the divisions separating the three types of groups – faculty, graduate student, and general public - were nominal. No major trends were identified within the groups, and so the bulk of the results have been discussed with little focus on the participants' group types.

Part 1.

Task 1. UNC-Chapel Hill has a collection of Civil War-era maps on line. Open the browser of your choice and see if you can find the location of the collection on line.

In all but one of the sessions, the web browsers defaulted to open on the UNC Libraries home page (Figure 1). The most direct route from this page to the Gilmer Civil War Maps Collection (Figure 2) is to click on the Digital Collection icon on the right hand side of the page. However, not one of the participants selected this option. Three of the participants attempted to find the collection in the Maps Collection. One participant from the student group seemed convinced he would find the collection in the Maps Collection, scrolling back and forth through the list of historical maps. When informed that the maps in question could not actually be found through the Maps Collection, he responded, "Well, that seems like a flaw. If you're looking for maps, wouldn't you go to the Maps Collection?"

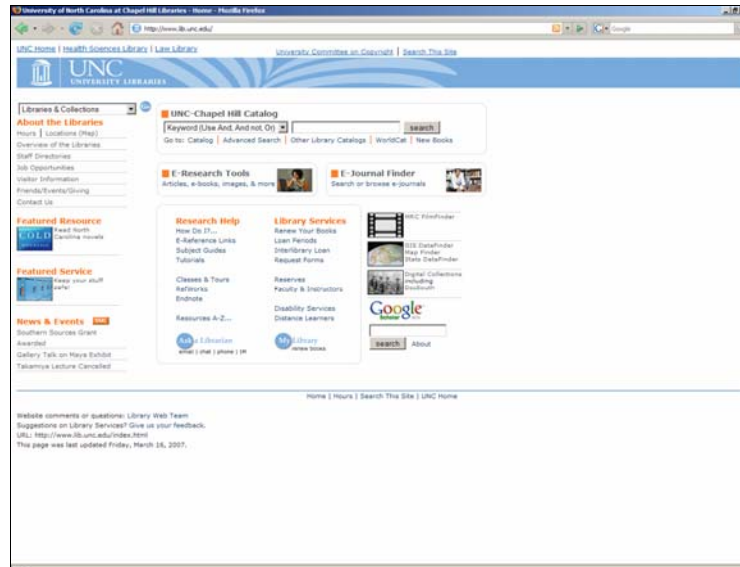


Figure 1.

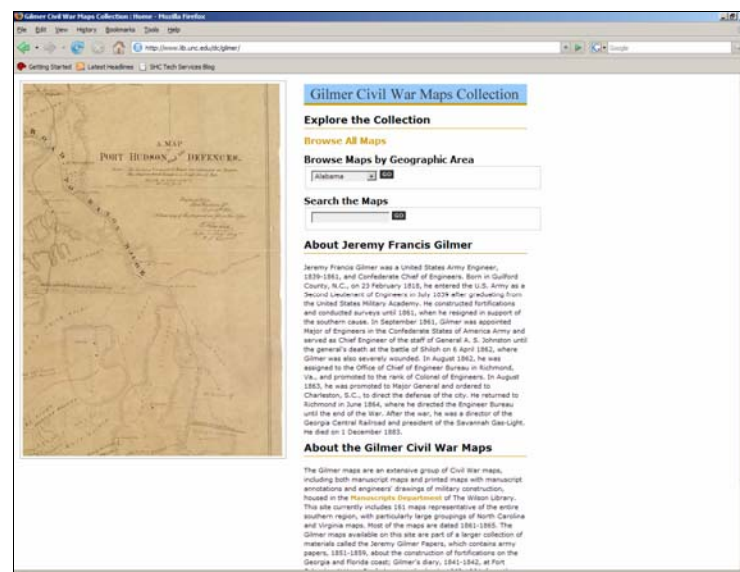


Figure 2.

Two of the participants, one from the student group and one from the faculty group, attempted to find the collection through the Manuscripts Department website, accessing it from the “Libraries and Collections” drop-down list on the library homepage. Presumably these participants had prior knowledge of the Gilmer Civil

War Maps Collection and so knew to start in the Manuscripts Department. However, neither of the participants was able to find the collection using this route.

Four participants performed keyword searches in the catalog, searching on “civil war maps”. These searches proved futile, however, and confusing to the participants. Very often the participant was unclear as to what formats the results represented, whether they were digital or physical maps, and generally needed guidance to find the collection.

Two participants, a faculty member and a member of the general public, performed Google searches to find the collection, both stating that “googling” was their preferred method for web searching. Both participants performed reasonable searches and were able to access the collection in this manner. Interestingly, the results listed by Google were not for the front page of the collection, but instead were for individual items within the collection.

Task 2. How many maps of locations in North Carolina are in the collection?

Task 3. Can you find any images that pertain to the Battle of Bull Run? Please tell me what you have found.

Task 4. Search for a map depicting “Bald Head & Cape Fear”. Once you have found it, zoom in on the image until you can identify the fort that is located on this map. According to the map, what is this fort called? [Hint: the fort is located on the far left of the map.]

Task 5. See if you can clip a section of the image including the fort and save it to the desktop.

In the three tasks involving searching for and finding individual maps, all participants were able to find the correct items with varying degrees of ease. All participants found the North Carolina maps easily (Figure 3). Only half (five) of the participants saw the search results number at the top of the page; the other half scrolled through to find the last map in order to obtain the total number of North

Carolina maps in the collection. However, by the time the participants performed the same sort of browsing function in the Billy Barnes Collection (see Part 1. Task 7), all of them identified the search results number quickly. This could be indicative of the learning curve involved in understanding the interface.

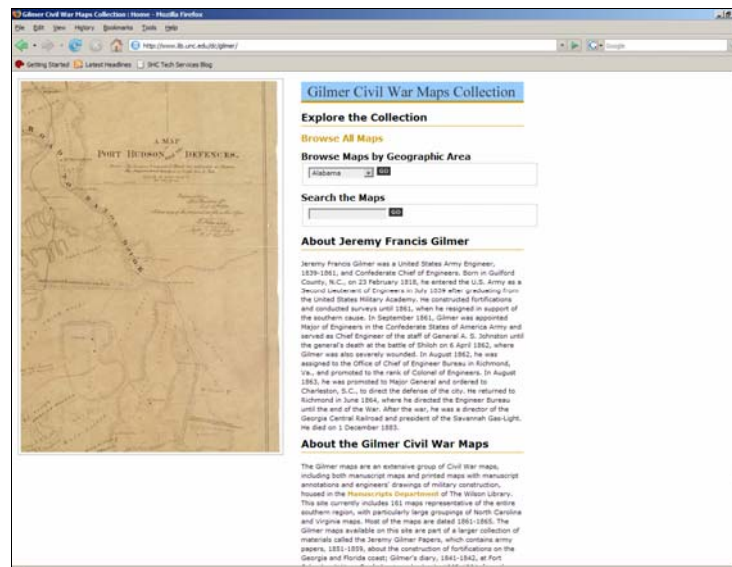


Figure 3.

All participants were able to find individual maps fairly quickly and easily, indicating that this function of the CONTENTdm™ interface is intuitive and understandable.

The task involving zooming in on the map presented more difficulties for the participants. Five of the participants zoomed in on the maps by clicking on it, three used the minimize and maximize icons in the toolbar, and two used a combination of both techniques. While all participants were able to zoom, navigating the image while zooming proved more difficult. All but two of the participants had trouble recognizing the relationship between the magnified section and the red navigation box detailing the magnified section (Figure 4). Two of the members of the general

public had the most difficulty zooming in on the desired section of the map. These same two participants also had great difficulty clipping a section of the image, requiring a lot of prompting in order to get them to the point where they were able to do it. One of them answered, “No, I have no idea. I’ve never done that before” in response to question #5, “See if you can clip a section of the image including the fort and save it to the desktop.” Of the ten participants, four never even identified the clip tool, simply right-clicking directly on the image to save it. In fact, the tool bar including the clip tool seemed to escape the attention of several of the participants entirely.

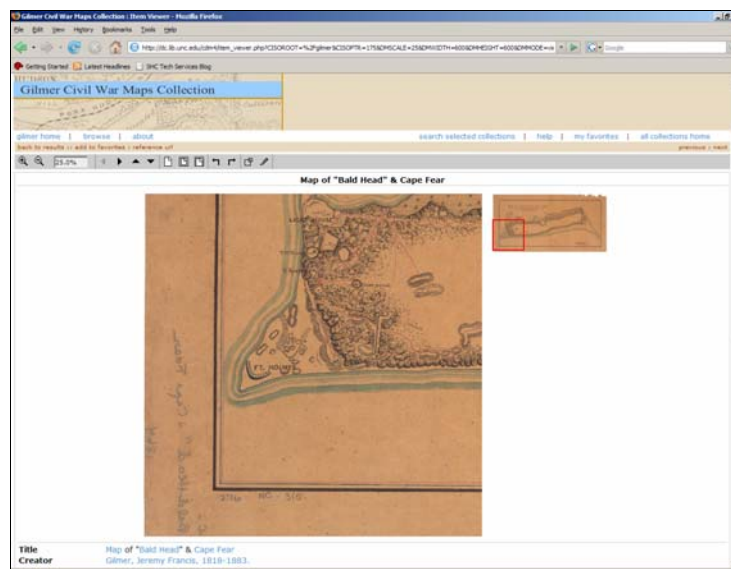


Figure 4.

Task 6. UNC has a digital collection of photograph negatives by Billy Barnes. Starting from where you are now (the map of Bald Head and the Cape Fear), find this collection.

Task 6, which asked the participants to locate the Billy Barnes Collection, posed difficulties as well. Only four of the participants, three from the student group and one member of the general public, used the “All Collections Home” option,

which takes the user to the home page for digital collections at UNC (Figure 5). Four of the participants tried to locate the collection by clicking on the “Search Selected Collections” option and searching within the collections, only later noticing the list of “Selected Collections” at the bottom of the search screen. Three of these participants attempted to click on the “Billy E. Barnes Collection” listed here in order to access this collection. One participant, a member of the faculty group, had so much difficulty with this task, repeatedly attempting to search for the collection itself while actually searching within it, that he needed to be guided to the “All Collections Home” option. At this point he responded, “I have to tell you, it would never occur to me to get there. I would never look up there [at “All Collections Home”]. Just because I would think that I should be getting it down there [pointing to list of selected collections].”

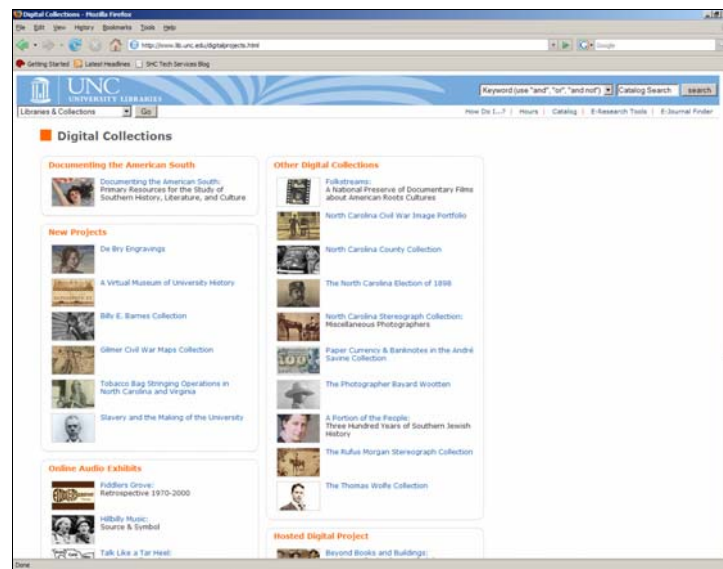


Figure 5.

Task 7. Go to “Browse this Collection”, and browse using the term “New Bern”. How many results do you get?

Task 8. From this results page, select the “Advanced Search” option. Now, search again on “New Bern”. Do you get the same number of results? Why or why not?

Once at the Billy E. Barnes Collection front page, all participants were able to locate the “Browse this collection” option quickly (Figure 6). Likewise, they were similarly able to browse using the term “New Bern” (Figure 7). However, only two of the participants used the “Browse all places” drop-down list; all others used the “Browse all subject areas” list, seeming not to notice the “Browse all places” option. All participants were also able to locate the advanced search option and perform the search for “New Bern” again from this screen. Only one of the participants, a member of the faculty group, thought to deselect the other collections in the list before performing the search. Of the other nine participants, only two, a student and a faculty member, were able to determine that the difference between the two results list was due to the fact that they were now searching across multiple collections, rather than browsing in only one. One of these participants, a member of the general public group, while able to identify this as the reason, could not account for it, stating that “I somehow seem to be defaulting into searching more than one collection, but more is better, yes.” Expressing a similar sentiment after the reason for the two different result sets was explained to him, a member of the faculty group said, “The thing I find with the Web, is that whether I’m in a hurry, or not in a hurry, I don’t mind getting, like, accidental but related stuff, because it can be very interesting. It’s sort of like going into a bookstore and saying, this is the book I want, or, what books are about this [subject]?” Despite this positive reaction, at least on participant, a member of the general public, found this search feature discomfiting, stating

“somewhere you need to say that the advanced search covers all collections”, adding that “somehow if you just had Barnes Collection in this list, that would help”, meaning that he would prefer the name of the collection to show up in the metadata for the results list, which currently lists the item title, subject, and description, but not the name of the collection of which it is a part.

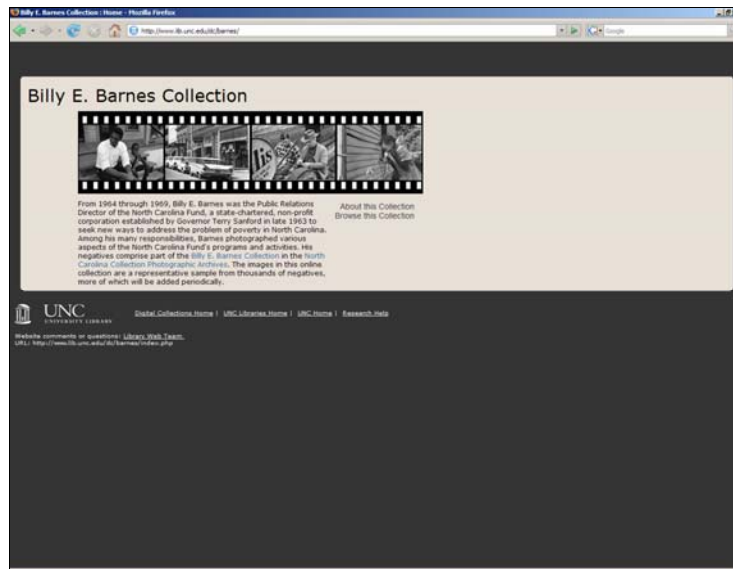


Figure 6.

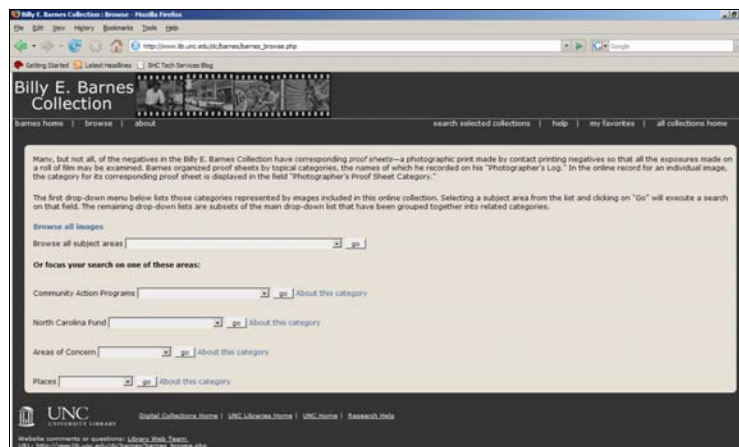


Figure 7.

Part 2.

Task 9. You are looking for historical sources about the Underground Railroad. You have heard that the Dickinson College Archives and Special Collections has a digital collection of books and pamphlets online that includes a digital copy of a book on the Underground Railroad by Wilbur Siebert. Search for this book, starting at <http://deila.dickinson.edu/theirownwords/>

Task 10. Once you have found the book, search it for the slave “Ellen Craft”. How many times does her name occur? Can you find an illustration of her in the book? If so, can you tell me what page it is on?

All participants were able to locate the requested item with relative ease.

Interestingly, once at the front page of the Dickinson College “Their Own Words” collection, six of the participants chose options from the menu in the footer of the page rather than the larger, graphic options at the top of the page (Figure 8). Two of the participants chose to browse through the collection, rather than search it, to find the item. This method took slightly longer, but was just as effective.

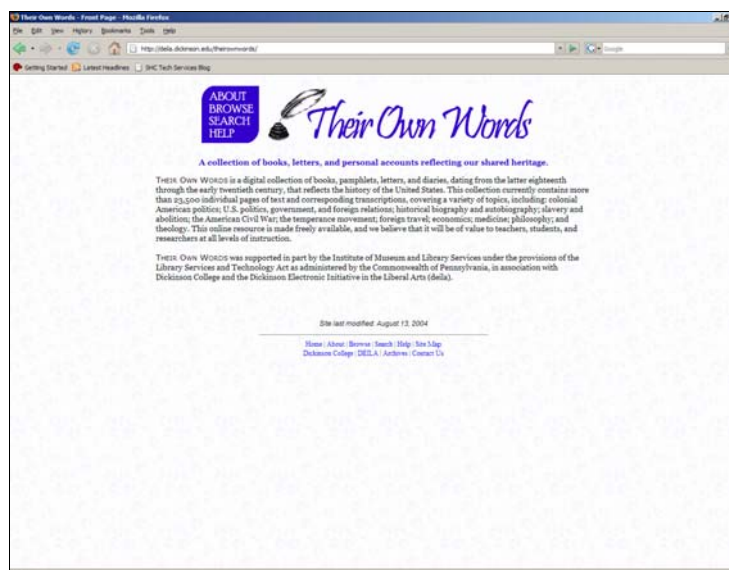


Figure 8.

When asked to search the item, a book on the Underground Railroad (Figure 9), for “Ellen Craft,” all participants located the “Search this Object” search box easily (Figure 10). Once the search was executed, several of the participants either

did not notice at all or took some time to notice the “# of hits” displayed under the search box, and instead scrolled through the page list counting hits. Three of the participants were able to locate the image of Ellen Craft in the book easily, but the rest of the participants struggled with this task. Three participants attempted repeatedly to click directly on the scan of the page, and two of the participants, both members of the general public group, were unable to locate the illustration at all.



Figure 9

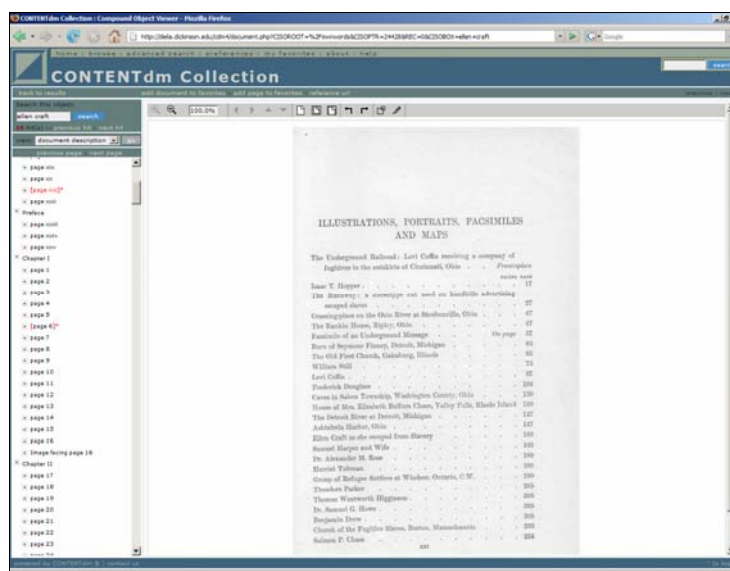


Figure 10.

Task 11. Go to page 170 of the book. Find the description with the full-text transcript for this page. Find the word “pillory” in the transcript. Now, find all the pages on this website that contain this word. How many times does it occur?

All participants seemed comfortable navigating the page list, and located page 170 easily (Figure 11). However, the second part of the task, to find the full-text transcript on the page description and then locate the word “pillory” within that transcript, proved to be the most difficult of all the tasks. One participant, struggling with the task, expressed frustration, saying, “This is causing me physical pain.” Only four of the participants, three members of the student group and one faculty member, located the drop-down box including the option to view the “page description,” without prompting, and of these four, only two seemed to understand what it was they were viewing (Figure 12). The other six participants, once guided to the drop-down box, displayed varying degrees of understanding. Most did not understand the difference between the “page description” option and the “page & text” option. Two of the members of the general public group did not understand that the full-text transcript displayed in the page description was hyperlinked. Of the participants who did understand the hyperlinking, two from the faculty group did not initially understand that by clicking on a hyperlinked word they were accessing all of the instances of that word within the entire website, rather than within the document, or the object, itself. However, once one participant, a member of the faculty group, realized she had searched the entire website rather than the document and exclaimed, “But this is better! For broad research this is useful.”

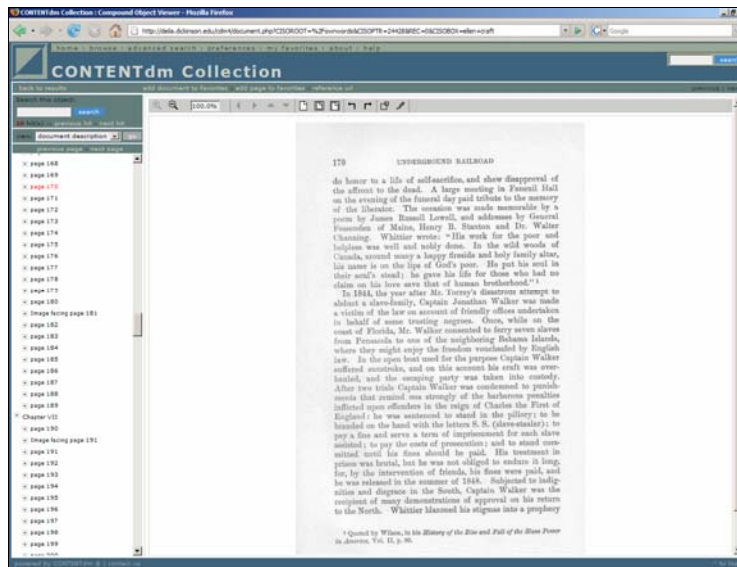


Figure 11.

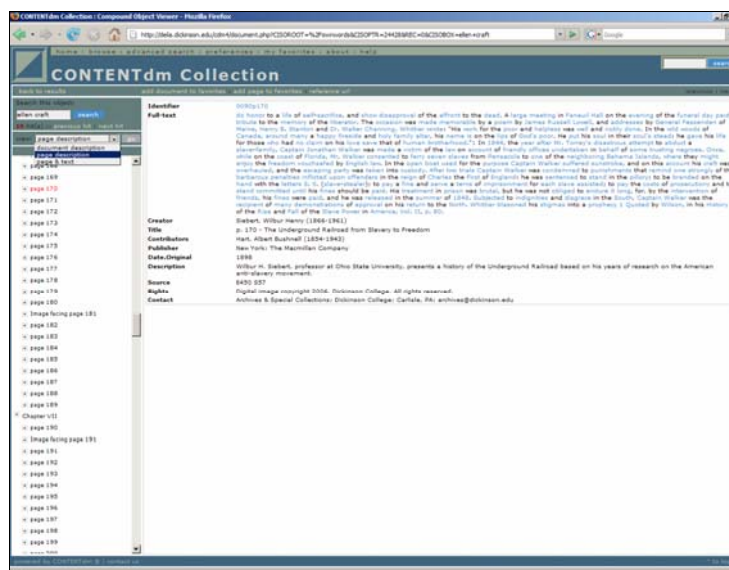


Figure 12.

There was similar confusion with the search box. When asked to find the word pillory within page 170, eight participants thought they could find it by typing the word into the “search this object” box, assuming that the object in question was in fact the page they were currently viewing. When it was explained to participants that the only way to find a particular word within a transcript was to read through the

transcript or use the CTRL-F function, several expressed displeasure. One stated that he had “found it, by reading, but that doesn’t seem very systematic.”

Follow-up Questionnaire

Further data was gathered from a follow-up questionnaire containing Likert-type and open-ended questions. The questionnaire was split into two parts, representing the two parts of the task session. The Likert-type scale was from 1-10, 1 being excellent and 10 being poor. All Likert-type questions also included a space for comments. Six of the questions were solely open-ended and did not contain Likert-type scales. The comments ranged from very positive to very negative, with few trends apparent across user groups. An analysis of the data gathered via this questionnaire follows. See Appendix E for a chart showing ranges, medians, and means.

Question 1. How would you rate your overall experience using the UNC-Chapel Hill digital collections?

Based on responses to the Likert scale, members of the general public group had the least satisfying overall experience using UNC’s digital collections, while members of the faculty and graduate student groups had more positive experiences. This said, one member of the graduate student group scored his experience as being poor, giving it a ten. He further commented, “This was an extremely frustrating experience for me.” However, another member of this participant group had an “excellent” experience, commenting that she “felt that it was clearly labeled so I knew how to find things.” A member of the general public blamed her poor experience on herself, calling herself “computer illiterate.”

Question 2. How useful do the digital collections you looked at seem to you?

Faculty members responded most positively to this question, giving the usefulness of the digital collections a high rating. Members of the general public group and the graduate student group rated the usefulness of the digital collections similarly. One student commented that he “would rather use Wikipedia” to find this sort of information. Three participants commented on the particular usefulness of the Gilmer Civil War Maps Collection.

Question 3. Did you think it was easy to find specific information?

Faculty members as a group found it easiest to find specific information. Graduate students and members of the general public found it neither particularly hard nor particularly easy to find specific information. One faculty member pointed out the difficulty she had had in finding the digital collections themselves, commenting that she “had trouble finding the link to the digital collections on the Library Home page. Once on the digital collections page, no problem.” One graduate student said flatly that “it is not easy to find specific information.”

Question 4. Did the layout of the websites make sense to you? If not, could you describe the parts you found confusing?

Of the nine participants that responded to this question, five responded positively. The other four cited various problems. The difficulty in finding the digital collections was pointed out here by another member of the faculty group. This participant stated that “the Library homepage is cluttered and confusing. It takes too

long to find 'Digital Collections'." One participant, a graduate student, commented that "Civil War maps aren't found in the 'map collection'."

Question 5. Which tasks did you find the most difficult to complete?

Overwhelmingly participants responded that the task involving zooming in on and clipping a section of a map was the most difficult. Of the nine that responded, four had difficulties clipping a section of the map, and three had difficulties zooming or moving around on different parts of the map. One participant, a graduate student, cited "keyword search" as being the task with which he had had the most difficulty.

Question 6. Do you have any suggestions for making the website easier to use?

Six of the participants made suggestions for easier use. The difficulty in locating the digital collections was again noted, this time by a member of the general public: "It's a lot of drill down to get to the collection that I knew was there. If I didn't know of it, I doubt I'd find it." One participant commented on the confusion arising from searching across collections, stating that "going from within a collection to an advanced search across all collections was unexpected – maybe this part of the search should be more visible – at the top of the page." Another participant also requested more "help" from the interface, suggesting that we "make it more user friendly and show an example of how to use it effectively and efficiently."

Question 7. What features of the website did you particularly like or dislike?

Three of the participants, all graduate students, liked the browsing abilities provided by the interface. Two faculty members appreciated the "searchability" of

the interface, one commenting that she loved the ability to search “through many collections.”

Question 8. How would you rate the overall appearance of the UNC-Chapel Hill website?

The overall appearance of the website scored fairly positively across the user groups, with an overall mean score of 2.7. Two participants commented that the website looked “clean” and “neat and orderly.” One participant, a graduate student, noted here that “having two completely different interfaces for the two collections was confusing.”

Question 9. Did you think the Dickinson College website was easy to use?

Faculty members found the Dickinson College website easiest to use as a group, while both the graduate student group and the general public group found the website neither particularly hard nor particularly easy to use. One faculty member commented that “finding hits was OK, what I’m used to, but working within the page was not.”

Question 10. Did you find the tasks using the book on the Underground Railroad easy?

The user groups all found the tasks using the compound object interface to be neither particularly hard nor particularly easy, with an overall mean score of 5.1 across groups. The comments listed by the participants indicated that they had generally found the tasks to be more difficult than they had scored, commenting that the tasks were “not at all easy” and “not easy because search function is separated from text window,” and that “the description and the page viewing options were

confusing.” One participant commented that “searching for the instance of 'pillory' was painful.”

Question 11. How could this website be improved?

Three of the participants suggested that the interface include more instructional advice, such as a “Here’s How” link. One participant, a graduate student, had trouble with the amount of scrolling needed for navigating the page list in the compound object viewer, and suggested that the pages be grouped for easier navigation. Another participant, a faculty member, referred to the trouble she had had understanding her search results, whether they were “specific to the document or based on search within the entire collection/database.”

Question 12. Do you have any other comments regarding your experience today?

The comments for this question were largely uninformative. One participant commented, “It is great to learn how much is now available in the North Carolina Collection”. As only one of the two collections used were actually a part of the North Carolina Collection, this comment points out the difficulties some digital collection users have in differentiating between different collections.

Discussion

This study found that while the included digital collections are useful and desirable to end-users, the interface generated by CONTENTdm™ can be confusing even for those who have considerable experience using the Internet.

The study also revealed that one of the most pressing issues facing the digital collections at UNC-Chapel Hill actually has nothing to do with CONTENTdm™ software, but rather involves promotion of the collections on the Web. As several of the participants noted, and as was confirmed by their experiences attempting to locate UNC's digital collections, those collections can be difficult to find. The fact of a collection being a digital, rather than physical collection, seems to escape many users. For example, several participants attempted to find the Gilmer Civil War Maps Collection in the Maps Collection at UNC. The fact that this particular collection is a digital one did not preclude its inclusion in the Maps Collection for these users. The separation of digital collections into their own distinct category appears to be a problem for many users. This argues for multiple links from many locations to make the digital collections more accessible. Additionally, the volume of information on the Library homepage makes it difficult for end-users to find the appropriate link, in this case the link to the digital collections.

Participants had little trouble with the search and browse interfaces as they exist currently for CONTENTdm™ collections at UNC-Chapel Hill. Several participants, however, had difficulty understanding the lists of results; specifically, half of the participants did not see the “# of results” listed at the top of the page after a search had been executed. This could indicate the need for a redesign of the results page.

The number of problems encountered by participants when viewing individual items indicates that the “Item Viewer” interface is not as intuitive as it could be. The icons in the toolbar that can be used to clip, rotate, and zoom in and out on the image

are not easily understood by participants, and so perhaps a tutorial or help link should be incorporated into the design of the page to aid users desiring to perform these actions.

Additional navigational information would also be useful in the case of cross-collection searches. Many participants were unable to distinguish between inter- and intra-collection searches. For this reason, adding the collection title to the list of metadata that is displayed in a search result list would aid the end-user in understanding what s/he is looking at. The “Advanced Search” page itself presents navigational problems as well, as it is not intuitive to many end-users that the list of “selected” collections at the bottom of the page is actually a representation of the collections currently being searched. This problem could be alleviated by searching only the collection from which the user has entered the search screen as the default, with the option to include other collections in the search if desired. It is generally agreed that the ability to search across all collections is a positive attribute to the search interface; however, it is imperative that end-users know when they are executing cross-collection or single-collection searches.

The “Compound Object Viewer,” in its straightforward, out-of-the-box form, presents many problems for end-users. For this interface to be effective at UNC-Chapel Hill, it will be necessary to include at the very least a tutorial or other help link to guide end-users through the process of using compound objects. The differences between the two search boxes, one that searches the object and one that searches the entire website, are not clear to end-users; either one of these boxes should be removed entirely and replaced with a link to an advanced search page, or

they should be labeled more clearly. Similarly, the “search this object” box should be labeled in such a way that the end-user does not think that it can be used to search the individual scan, or page, that s/he is currently viewing. If possible, it would be good to include an option for end-users to be able to search within a particular page.

The drop-down box including links to the page and collection level metadata, as well as the page and text, is difficult for many end-users to locate and/or understand. These options could perhaps be re-labeled and re-sized to make them more visible. The page list is unwieldy and unclear; this feature could also be manipulated in order to make it more approachable for end-users.

Implementing these changes could potentially render CONTENTdm™-created collections more usable for a majority of end-users. As the individuals who participated in this study were generally very familiar with the Internet and digital collections, the fact that they had so many difficulties in navigating CONTENTdm™'s interface indicates that a majority of potential library patrons would be fully disoriented by these digital collections, and would perhaps find them unusable. At the very least, it is apparent from this study that further work must be done to manipulate the interface to make it an effective way to access digital collections.

Limitations

While usability testing is often a successful method for gathering data about a product or system that could not otherwise be obtained, it has some limitations as well. First, and possibly the most serious of the limitations, is that usability testing is always done in an artificial situation. While participants may attempt to perform

tasks in the same way that they would in organic situations, this is still but an approximation of a real-life interaction. Another limitation is that test results do not *prove* that a product works or does not work – they simply hint that this is so (Rubin, 1994).

A final limitation of usability testing, and one that is applicable to this study, is that participants in usability studies are rarely fully representative of the target population. In this particular case, the participants represented a very highly educated and narrow segment of the population. As it would be prohibitively difficult to actually study a representative group due to the number of participants this would entail, it is almost always necessary to employ an approximate group (Rubin, 1994).

The small size of the participant group also presents limitations. While the size of the group was large enough from which to glean valuable information, it was not large enough for the conclusions to be generalizable to a larger population.

SUMMARY AND CONCLUSION

Digital library technology is a growing industry. Increasingly sophisticated products are being developed all the time to enhance the experience of using digital libraries and collections, and many cultural institutions are jumping on the DL bandwagon in order to keep pace with perceived patron expectations. The past twenty years have seen many changes in the products and services offered by libraries and archives, and the fast pace of the changes has left some users behind. There have been a number of studies that have noted this problem, sometimes identified as user “lostness” (Theng *et al*, 2000; Jeng, 2005; Kramer, 2005).

Additionally, while there has been much emphasis on the development of sophisticated systems and tools, there has traditionally been a dearth of interest in the study of how well these systems and tools perform with the actual users for whom they are developed. As other researchers have noted, a digital library is not simply a repository (Jones *et al*, 1999); rather, it must be designed with usability principles in mind or it will be a failure. In order to determine how principles of usability are manifested in DLs, evaluation must be conducted.

Far too often the end-user is left out of the development process of creating digital libraries and collections, resulting in the creation of systems that are alien and mysterious to many people. This is a curious thing, for if the systems supporting DLs are not designed in such a way to be satisfying and useful for end-users, what purpose do they serve?

This study employed usability testing, considered to be an important and effective (albeit too-often omitted) part of the DL design process, to assess the usability of the CONTENTdm™ Digital Collection Management System. CONTENTdm™ is a content management system that is currently the software of choice for many libraries, archives, and other cultural institutions interested in making their collections available on the Web. As is the case with many commercial products for DLs, the end-user experience with this software has yet to be sufficiently evaluated.

This research conducted a usability study with ten participants who fell into three user groups: faculty, library science graduate students, and members of the general public. These participants functioned as actual end-users, performing a series

of basic tasks using digital collections created using CONTENTdm™. These tasks were designed to assess how navigable the collections are, how intuitive the search interface is, and how understandable certain functionalities (e.g., the tool that allows users to “clip” parts of digital images and save them to their own hard drives) are for the end-user. Upon completion of the tasks, participants filled out a survey asking them questions regarding how well they thought the interface worked and how satisfied they were with the experience.

Data from the study indicated that there are significant problems with the CONTENTdm™ interface, and that many users do not find it intuitive or understandable. Results from the study can be used to inform design decisions when changes are made to existing collections and when new collections, especially those that incorporate the “compound object” interface, are created.

This research supports the importance of comprehensive usability testing and evaluation of digital library products and services. Further research could be used to more deeply study end-users searching habits across the Web and within digital collections, as well as their expectations and comfort-levels regarding such searching.

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Appendix A

TASKS

Part 1.

1. UNC-Chapel Hill has a collection of Civil War-era maps on line. Open the browser of your choice and see if you can find the location of the collection on line.
2. How many maps of locations in North Carolina are in the collection?
3. Can you find any images that pertain to the Battle of Bull Run? Please tell me what you have found.
4. Search for a map depicting “Bald Head & Cape Fear”. Once you have found it, zoom in on the image until you can identify the fort that is located on this map. According to the map, what is this fort called? [Hint: the fort is located on the far left of the map.]
5. See if you can clip a section of the image including the fort and save it to the desktop.
6. UNC has a digital collection of photograph negatives by Billy Barnes. Starting from where you are now (the map of Bald Head and the Cape Fear), find this collection.
7. Go to “Browse this Collection”, and browse using the term “New Bern”. How many results do you get?
8. From this results page, select the “Advanced Search” option. Now, search again on “New Bern”. Do you get the same number of results? Why or why not?
6. UNC has a digital collection of photograph negatives by Billy Barnes. Starting from where you are now (the map of Bald Head and the Cape Fear), find this collection.

Part 2.

9. You are looking for historical sources about the Underground Railroad. You have heard that the Dickinson College Archives and Special Collections has a digital collection of books and pamphlets online that includes a digital copy of a book on the Underground Railroad by Wilbur Siebert. Search for this book, starting at <http://deila.dickinson.edu/theirownwords/>
10. Once you have found the book, search it for the slave “Ellen Craft”. How many times does her name occur? Can you find an illustration of her in the book? If so, can you tell me what page it is on?

11. Go to page 170 of the book. Find the description with the full-text transcript for this page. Find the word “pillory” in the transcript. Now, find all the pages on this website that contain this word. How many times does it occur?

Appendix B

Background Questions:

1) I am a:

- Faculty member
- Graduate student
- Member of the general public

2) Please indicate your gender:

- Male
- Female
- Prefer not to answer

3) Please indicate the year you were born:

19__

4) Please indicate your level of education:

- Secondary School
- High School
- Undergraduate Degree
- Graduate Degree

5) Please indicate your level of familiarity with the Internet:

- not familiar
- somewhat familiar
- very familiar

6) Have you looked at digital collections or digital images on the Internet before?

- No
- Yes
- Don't know

7) Have you visited UNC-Chapel Hill's Digital Collections before?

- No
- Yes
- Don't know

Appendix C

Follow-up Questions to Part 1:

1. How would you rate your overall experience using the UNC-Chapel Hill digital collections?

(Circle one) Excellent 1 2 3 4 5 6 7 8 9 10 Poor

Comments:

2. How useful do the digital collections you looked at seem to you?

(Circle one) Very useful 1 2 3 4 5 6 7 8 9 10 Not at all useful

Comments:

3. Did you think it was easy to find specific information?

(Circle one) Very easy 1 2 3 4 5 6 7 8 9 10 Not at all easy

Comments:

4. Did the layout of the websites make sense to you? If not, could you describe the parts you found confusing?

5. Which tasks did you find the most difficult to complete?

6. Do you have any suggestions for making the website easier to use?

7. What features of the website did you particularly like or dislike?

8. How would you rate the overall appearance of the UNC-Chapel Hill website:

(Circle one) Excellent 1 2 3 4 5 6 7 8 9 10 Poor

Comments:

Follow-up Questions to Part 2:

9. Did you think the Dickinson College website was easy to use?

(Circle one) Very easy 1 2 3 4 5 6 7 8 9 10 Not at all easy

Comments:

10. Did you find the tasks using the book on the Underground Railroad easy?

(Circle one) Very easy 1 2 3 4 5 6 7 8 9 10 Not at all easy

Comments:

11. How could this website be improved?

General Follow-up Question:

12. Do you have any other comments regarding your experience today?

Appendix D

| Group type: | Faculty | Graduate Student | General Public |
|-------------|---------|------------------|----------------|
| | 3 | 4 | 3 |

| Gender: | Male | Female |
|---------|------|--------|
| | 5 | 5 |

| Highest level of education: | Secondary School | High School | Undergraduate Degree | Graduate Degree |
|-----------------------------|------------------|-------------|----------------------|-----------------|
| | | | 2 | 8 |

| Familiarity with Internet: | Not Familiar | Somewhat Familiar | Very Familiar |
|----------------------------|--------------|-------------------|---------------|
| | | 3 | 7 |

| Viewed digital collections/images on the Internet? | No | Yes | Don't Know |
|--|----|-----|------------|
| | 1 | 9 | |

| Visited UNC's digital collections before? | No | Yes | Don't Know |
|---|----|-----|------------|
| | 2 | 7 | 1 |

Appendix E

| Question: | Range: | Median: | Mean: |
|--|---------------|----------------|--------------|
| How would you rate your overall experience using the UNC-Chapel Hill digital collections? | | | |
| Overall | 1-10 | 3 | 4.4 |
| Faculty | 2-3 | 2 | 2.33 |
| General Public | 5-7 | 7 | 6.66 |
| Graduate Student | 1-10 | 3 | 4.25 |
| How useful do the digital collections you looked at seem to you? | | | |
| Overall | 1-10 | 2.5 | 3.7 |
| Faculty | 1-2 | 1 | 1.33 |
| General Public | 2-10 | 3 | 5 |
| Graduate Student | 1-10 | 3.5 | 4.5 |
| Did you think it was easy to find specific information? | | | |
| Overall | 1-10 | 3.5 | 4.6 |
| Faculty | 3-4 | 3 | 3.33 |
| General Public | 3-8 | 5 | 5.33 |
| Graduate Student | 1-10 | 4.5 | 5 |
| How would you rate the overall appearance of the UNC-Chapel Hill website: | | | |
| Overall | 1-5 | 4 | 2.7 |
| Faculty | 1-3 | 2 | 2 |
| General Public | 1-4 | 3 | 2.66 |
| Graduate Student | 1-5 | 3.5 | 3.25 |

| | | | |
|--|------|-----|------|
| Did you think the Dickinson College website was easy to use? | | | |
| Overall | 1-10 | 3.5 | 4.6 |
| Faculty | 1-7 | 3 | 3.66 |
| General Public | 3-8 | 4 | 5 |
| Graduate Student | 3-10 | 3 | 5 |
| Did you find the tasks using the book on the Underground Railroad easy? | | | |
| Overall | 2-10 | 4 | 5.1 |
| Faculty | 2-8 | 4 | 4.66 |
| General Public | 4-7 | 7 | 6 |
| Graduate Student | 3-10 | 3.5 | 5 |