This study seeks to develop evaluations that assess user satisfaction with digital exhibitions of archival material. The study also aims to recommend evaluation methodologies appropriate for cultural heritage institutions with few resources. The study evaluates an exhibit created for Durham County Library in Durham, North Carolina, by using an online survey and one-on-one interviews. These two methodologies are compared qualitatively on their abilities to suggest improvements or enhancements for the exhibit, and quantitatively on three factors: number of usability problems revealed, response rate, and implementation cost. On the substantive factors of suggested improvements and usability problems, using both methodologies is most effective. For response rate and implementation cost, however, the online survey was far more effective than one-on-one interviews.
COMPARING EVALUATION METHODOLOGIES FOR A DIGITAL EXHIBITION:
THE END OF TOBACCO ROAD: SCENES FROM LIGGETT & MYERS TOBACCO COMPANY’S FINAL DAYS IN DURHAM, NORTH CAROLINA, 1999

by
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Research Problem

Archival repositories have long created exhibitions of their materials both to educate the public and to publicize their holdings. These repositories are also creating digital surrogates of their holdings for preservation and access purposes. As digitization projects proliferate at a rapid pace in the cultural heritage world, exhibitions are moving online and reaching far wider audiences than ever before. Too often, cultural heritage institutions are creating digital projects without examining or evaluating what makes these projects successful. This is largely because an adequate method for evaluating digital exhibits has not been determined.

Curators and developers of physical exhibitions conduct visitor studies and evaluate the exhibitions at various stages throughout exhibition design. Web developers also perform user studies and evaluate the usability of their products. These methods, however, have not transferred smoothly to web exhibit evaluation. Strict usability testing, often performed for software and websites, is insufficient because it typically measures task completion, with speed being a prime factor. In educational environments such as an exhibition, however, a slow pace may, in fact, indicate a higher rate of learning. Evaluation of e-learning software recognizes and accounts for this factor, but it too is insufficient for evaluating exhibitions because students performing for a grade behave differently from users who visit an exhibit in their leisure time. Evaluation of digital exhibitions must wed the concepts of education, web navigation design, and user
satisfaction. This study seeks to implement evaluations that cover this complex interplay at work in digital exhibitions.

Even with evaluation questions that adequately address the complexities in an online exhibit, how best to administer the evaluation remains an issue. Countless methodologies, from surveys to interviews to heuristics exist. Determining an appropriate methodology can be difficult, especially for small cultural heritage repositories with few resources. Many studies have compared evaluation methodologies, offering metrics for which evaluation methodologies are most effective in certain situations. A problem with these methodology comparison studies, however, is that they largely measure the differences between methodologies based solely on the number of usability problems identified.

While it is important to discover usability problems through evaluations, usability, as noted above, is not the only factor at play in web exhibits. Other factors, like the evaluation's ability to produce qualitative suggestions for improving the exhibit, response rate, and implementation costs, also play roles in how institutions choose methodologies. Existing studies do not systematically take into account these additional factors. This study seeks to explore the benefits and limitations of using a one-on-one interview methodology versus an online survey methodology to evaluate user satisfaction with a digital exhibition of archival materials. This study compares the methodologies qualitatively on their ability to offer suggestions for exhibit improvement and quantitatively on three factors: the number of usability problems identified, the response rate, and the cost of evaluation implementation.
Data was gathered through the evaluation of a digital exhibition created by the researcher for the Durham County Library’s special collection, the North Carolina Collection. The exhibit uses photographs taken in 1999 of the Liggett & Myers Tobacco Company in Durham to document the last days of cigarette manufacturing in Durham and to explain the process of manufacturing cigarettes. An online survey evaluation was available for the first two weeks the exhibit was live, and one-on-one interviews were conducted during the same two weeks.

In this study, the terms ‘exhibition’ and ‘exhibit’ are used interchangeably. Likewise, ‘digital,’ ‘online,’ ‘virtual,’ and ‘web’ are all used interchangeably to describe the exhibition that exists in an online environment. These adjectives are in opposition to ‘physical’ exhibits. Digital ‘exhibitions’ are further distinguished from digital ‘collections’ or digital ‘libraries.’ Many cultural heritage repositories have enabled public access to their digitized holdings. Unlike exhibitions, however, “digital libraries are not ends in themselves” (Borgman, C. L., Solvberg, I. & Kovacs, L., 2002). Digital exhibitions do more than provide access; they provide context for the items on display, and they relate a narrative to the public that enhances the understanding of the digital items. While several studies have been conducted to evaluate physical exhibits, websites, digital libraries, or virtual collections, far fewer have been applied to digital exhibitions. This study seeks to contribute to this growing field of literature.
Literature Review

Value of Exhibitions for Archival Institutions

Archival repositories exist primarily to organize, preserve, and make available for reference and research historical documentation. Creating exhibitions might not seem like a primary charge of archival institutions. The literature, however, argues strongly for archival exhibitions. Bradsher and Ritzenthaler (1989) discuss generally the benefits to archival institutions of creating exhibitions to display their holdings, including education, community support, and publicity. Nicholls (2003) describes specifically a physical exhibit put on by the National Archives of Australia. Based on her case study, she concludes that exhibitions should be core functions to archives because they embody archival principles of access, preservation, and historic documentation.

Another benefit of archival exhibits noted in the literature is the potential for increasing archives’ audiences. The exhibit Nicholls (2003) studies toured Australia, providing exposure to archival materials for a wider audience. Archival principles of documentation and access are certainly present in the move from physical to web exhibits, but it is perhaps the potential for audience growth that has most driven archives and museums to create digital exhibitions. Silver (1997), in his web exhibit review, and Schweibniz (1998), in his literature review of museums and the web, recognize the potential for museums to use the web to display artifacts and to widen their audiences.
These early articles primarily see potential. Later articles, written after web exhibits became more prevalent, reflect on deeper issues inherent in moving exhibits online.

Lester (2006) discusses the power physical exhibitions have in connecting people to authentic objects. The virtual world, he argues, erases this power. Yet, the web exhibit offers visitors the opportunity to interact with objects and documents in ways they never could in person due to the fragile nature of the exhibited items. As an example, he cites the British Library’s *Turning the Pages* where visitors can view multiple pages of medieval books, which, when on physical display, are open only to one page.¹ Lester further argues that the primary value in archival material is its content and that web exhibitions facilitate interaction with this content in a way often impossible to replicate in a physical exhibit or even in a reading room. Lester’s article concludes that the web exhibit is the “natural successor to the physical” (Lester, 2006, 96).

Even before Lester’s conclusions, the web exhibit was becoming more common and established evidenced by, for example, Kalfatovic’s (2002) guide on how to create successful digital exhibitions. Kalfatovic highlights several case studies of web exhibits and illustrates the growth of the field. Focusing on the web exhibits of established institutions such as the Smithsonian helps convey the growing acceptability of web exhibits. The how-to tips Kalfatovic offers also begin to outline some of the elements that contribute to an effective web exhibit. These guidelines provide the beginnings of a discussion of the evaluation of web exhibits. Beyond the assertion that evaluation is important and should be conducted, however, few studies in the literature exist that provide concrete evaluation recommendations. The cultural heritage world has focused

¹ [http://www.bl.uk/onlinegallery/tp/tpbooks.html](http://www.bl.uk/onlinegallery/tp/tpbooks.html)
primarily on evaluation of physical exhibits. For the digital world, evaluation centers on usability, but usability testing does not transfer well to the web exhibit.

**Insufficiency of Usability Testing**

Usability testing typically measures the effectiveness of online interactive systems to facilitate users’ task completion. Traditionally, usability testing is done in a laboratory employing various methods such as eye-tracking, where a camera tracks the locations on the screen on which the users’ eyes focus, and think-aloud, where users talk through their thinking as they proceed through an online system, giving the testers insight into how users think they should accomplish tasks within the system. Remote usability testing is also employed whereby the testers and the users are in different physical locations, but they interact either through an asynchronous survey or through synchronous methods to accomplish tasks similar to those in a traditional laboratory setting. Houck-Whitaker (2005) compares traditional laboratory usability testing to remote usability testing and in doing so describes elements of both.

The literature discusses four major aspects of usability, stating that a product should be easy to learn, useful, easy to use, and pleasant to use (Dicks, 2002, 27). These concepts are useful when thinking about web exhibits, but they do not encompass all elements of web exhibits which also involve education, leisure, and user satisfaction. Evaluators of e-learning software see similar insufficiencies in traditional usability testing.

Masemola and de Villiers (2006) and Mayes and Fowler (1999) discuss why traditional usability testing is inadequate to measure the effectiveness of e-learning
Because “typical usability metrics include the time taken to complete a task, degree of completion, number of errors, time lost by errors, time to recover from an error…and so on,” they do not capture the learning process inherent in e-learning software or web-ware (Masemola & Villiers, 2006, 187). A student taking more time or recovering from an error can actually illustrate the effectiveness of the product because it reveals that the student is learning the subject. Both articles advocate that closer attention be paid to the usability not only of the interface but also of the content to test how effective the content is in conveying the desired lesson. Doing so, they argue, will accommodate the educational environment. For the same reasons that traditional usability testing needs adjustments for e-learning, an online exhibition that seeks to educate needs adapted evaluation. The literature suggests, however, that visitors to a digital exhibit are different from students using e-learning software.

Dierking and Falk (1998), drawing from the field of ‘free-choice learning,’ describe the studies that have been conducted to define the type of people who visit museums. They argue that while not enough research has been done to draw definitive conclusions, the traits of museum-goers might be applied to digital exhibit visitors. “Museum-goers…value learning; seek out the challenge of exploring and discovering new things; and place a high value on doing something worthwhile with their leisure time” (Dierking, L. D. & Falk, J. H., 1998, 3). Other factors also play into a person’s decision to visit a museum. “A disproportionate number of museum-goers go to museums expressly for the benefit of their children” (Dierking, L. D. & Falk, J. H., 1998, 3). Finally, people who visited museums as children are more likely to go as adults, and “other childhood leisure behaviors” like “reading, taking family trips, and participating in
clubs, associations or scouts” also contribute to adult museum-going (Dierking, L. D. & Falk, J. H., 1998, 4). While an interest in learning is clearly valued by visitors to physical museums, museum-goers do not seek education in the same way that students using e-learning software do. User studies in online museum environments have continued to develop.

Peacock and Brownbill (2007) also focus on visitor studies in the online setting, but they write after the museum web presence has had more time to become established. They call for a more multidisciplinary approach to visitor studies than has typically been embraced in the field by incorporating concepts from marketing and human-computer interaction into museum visitor studies, especially in the web environment. Clearly, strict usability testing is insufficient for the digital exhibition. Museum visitor studies, however, illustrate that e-learning’s accommodations to usability testing also do not present sufficient solutions. A wide range of factors play into the museum visit, and the same is true of a visit to a web exhibit. To evaluate user satisfaction with web exhibits, concepts from education, web navigation, and museum studies must be combined.

Evaluation Methodologies

Clearly evaluation questions that adequately address the complexities of a web exhibit visit must be devised—questions that go beyond usability testing or e-learning testing and incorporate aspects of leisure and user satisfaction. Miller (2004); Hill, Brierly, and MacDougall (2003); and Spunt (1999) offer suggestions on how to create surveys that will best elicit user opinions. Abdinnour-Helm, Chaparro, and Farmer (2005) and Doll and Torksadeh (1988) discuss implementation of an instrument called
the End-User Computing Satisfaction (EUCS). These authors’ general suggestions for evaluating user satisfaction are executed using many methodologies across many disciplines. Because so many methodologies exist, choosing among them can be difficult.

A common and widespread evaluation methodology discussed throughout the literature is the survey. Oulanov and Pajarillo (2001, 2002) used a survey to elicit users’ views on the usability of the City University of New York’s (CUNY) online library catalog. The survey questions focused specifically on aspects of the site’s usability, and the CUNY evaluators saw promise in using the survey instrument in future studies. Cunliffe, Kritou, and Tudhope (2002) compare a number of different methodologies for evaluating a museum web site. One methodology they highlight is the online survey, concluding that it produces useful results, but that the response rate can be low. Hecht (2006) also used an online survey to help inform further usability testing of the National Gallery of Art’s website.

Another methodology discussed throughout evaluation literature is that of heuristics whereby experts devise a rubric against which they rate products. Breaden (2005) applies this methodology to appraise digital exhibitions that use audio. Using his heuristic, he evaluated the effectiveness of twenty-five online exhibits. Goldman and Bendoly (2003) question whether evaluators should interact at some point with users/visitors or whether heuristics alone present a sufficient methodology to evaluate museum websites. Squires and Preece (1999) argue for the use of heuristics in evaluation of educational software.
Another common evaluation methodology is to conduct interviews with users. In their comparison of various evaluation methodologies, Cunliffe, Kritou, and Tudhope (2002) also focus on interviewing users about their experience with the museum website. They used interviews in conjunction with direct observation of users interacting with the site, and they felt the interviews produced useful feedback. Economou (1999) also used interviews. Her study evaluates a multimedia application created for a physical exhibit. Again, interviews were one of many methodologies used. Harold and Dusenbery (2005) also used interviews to evaluate MarsQuest on-line, a web component created to supplement a physical exhibit. They interviewed three different groups of people: those who had seen both the physical and web components of MarsQuest, those who had seen only the physical, and those who had seen only the web.

A factor discussed throughout the literature that influences methodology choice is the environment in which the testing takes place. Remote testing conducted with subjects at a distance and on-site testing are both used in product evaluation. Andraesen, Nielsen, Schröder, and Stage (2007) compare formal usability laboratory tests to remote usability tests to determine whether one revealed more usability problems. Arbach, Bazley, and Boyd (2007) also discuss environment, making it a vital part of their methodology. They discuss the effectiveness of evaluating e-learning material by bringing teachers into the laboratory for interviews and testing versus the effectiveness of evaluating e-learning material by observing its use in the classroom.

Museum studies distinguish less between evaluation methodologies than between stages in the exhibit development process at which the evaluation occurs. Borun and Korn (1999) discuss museum evaluation methodologies, detailing the process of
conducting visitor studies before exhibitions are developed (front-end user studies),
evaluating the exhibition after mock-ups of the displays have been produced (formative evaluation), evaluating the exhibition after it has opened to the public (remedial evaluation), and evaluating the exhibition after it has closed to determine its success and to plan for future exhibitions (summative evaluation). These stages necessarily change in the online environment. The nature of digital exhibitions is such that evaluation is almost always remedial and almost never summative because websites can be changed and updated more readily than physical exhibitions.

Surveys, heuristics, interviews, laboratory usability tests with eye-tracking and think-aloud requirements, and synchronous or asynchronous remote usability tests are all options. They can be performed at various times throughout the process and in various environments. Given so many options, it can be difficult to choose the most appropriate methodology for the project at hand.

Selecting an Evaluation Methodology to Evaluate User Satisfaction with a Digital Exhibition

Many studies have compared evaluation methodologies in an attempt to recommend one over another. Studies have compared methodologies for evaluating physical exhibits, websites, and software, but most have compared the methodologies based solely on the number of usability problems discovered. Cunliffe, Kritou, and Tudhope (2001) compare methodologies for evaluating websites based on this factor. While Arbach, Bazley, and Boyd (2007) focus on environment in their study, their main comparison factor, again, is number of usability problems discovered. Goldman and
Bendoly (2003) seek to determine whether heuristics alone is a sufficient methodology for discovering usability problems. Houck-Whitaker (2005) compares remote usability testing to laboratory testing in the technology industry, and again, the comparison is based on which method exposes more usability issues.

While usability problems are important to discover, evaluations of digital exhibitions should seek to uncover more about the visitors’ experience. As discussed above, the complexity of how and why users visit a digital exhibit renders usability testing insufficient to evaluate an exhibit’s success or failure. Therefore, choosing an evaluation methodology based solely on the number of usability problems revealed would not adequately capture the factors at play in a cultural heritage environment. Other factors important in determining which evaluation methodology is most appropriate for a given situation, especially in a cultural heritage setting where resources are scarce, are response rate and cost of performing the evaluation. While few studies focus closely on these factors as variables, many cover them in general discussion.

Response Rate

User feedback is invaluable, but it can be difficult to obtain. While Cunliffe, Kritou, and Tudhope (2001) decide the use of interviews in evaluating usability can be a useful technique, and Diamond (1999) and Hill, Brierly, and MacDougall (2003) offer guidelines for interviewers seeking to measure customer satisfaction, finding people willing to participate in interviews or willing to respond to online surveys can be difficult. Harold and Dusenbery (2005) were surprised by the low response rate in their evaluation of MarsQuest. Thompson and Bonney (2007) perform a study that involved
surveying participants in an online citizen science project and following up with a second survey about eight weeks later. They discuss the response rate, noting that not everyone who responded the first time responded the second time.

The qualities of a typical museum-goer discussed in Dierking and Falk (1998) are important not only in designing the exhibition but also in approaching potential interviewees. Peacock and Brownbill’s (2007) discussion of a more holistic approach to user studies is also important to consider when measuring response rate. These authors offer a better idea about the probable exhibit audience, and thus about the probable user pool from which to recruit interviewees or survey respondents. Any user feedback is important, but it is preferable to obtain opinions from those users who are more likely to visit the exhibit, and traits and methods discussed by these authors can help evaluators target these users.

*Implementation Cost*

In looking at usability issues, studies have also commented on the cost of implementing evaluations. Many investigations of remote usability testing versus on-site laboratory testing, such as those conducted by Bartek and Cheatham (2003) and Houck-Whitaker (2005), hope to find that remote testing is as effective as on-site because it is often cheaper both monetarily and in staff time. Arbach, Bazley, and Boyd (2007) discuss cost as a concern for employing their dual environment methodology, but they try to allay fears by saying that the costs are not prohibitive and that the benefits outweigh them. Khoon, Ramaiah, and Foo (2002) discuss the development of an online exhibition in Singapore, including evaluation techniques used and their cost effectiveness. They
chose their evaluation methodology, a combination of interviews and surveys, because it “offers the best compromise in terms of resource and time requirements” (Khoon, L. C., Ramaiah, C. K., & Foo, S., 2002, 4). Hilke (1993) discusses his career as an academic researcher and as an exhibition designer. Seeing evaluation from both perspectives, he recognizes that though evaluation is vitally important, the time and resources involved in performing evaluations can be prohibitive. While not an outcome variable in these studies, cost is clearly an important factor in determining appropriate evaluation methodologies.

**Literature Review Conclusion**

While many studies test user satisfaction and/or usability of physical exhibitions or websites, fewer evaluate digital exhibitions. Additionally, few studies target the overlapping elements in a digital exhibit of web design, education, and museum studies. Further, many studies compare evaluation methodologies, but they do so based almost entirely on the number of usability problems revealed. Some studies discuss additional factors like response rate and cost of evaluation implementation, but none include these factors as outcome variables. My study seeks to remedy this issue and offer a more inclusive discussion of evaluation methodology, while employing evaluations that assess aspects of education, web design, and cultural heritage, appropriate for digital exhibitions.
Methodology

The evaluated exhibition was created for the Durham County Library’s special collection, the North Carolina Collection. The exhibition, *The End of Tobacco Road: Scenes from Liggett & Myers Tobacco Company’s final days in Durham, North Carolina, 1999* features scanned photographic negatives of Liggett & Myers Tobacco Company’s Durham factory taken in 1999. Working with the special collections librarian, the photographer, and a Liggett Group contact, the researcher selected images that illustrate the process of manufacturing cigarettes and scanned them to create digital surrogates at resolutions according to professional standards. The researcher also composed the introductory and supplementary explanatory text and the XHTML code to display the exhibit on the web. The exhibit went live on February 25, 2008.

The exhibition was advertised on various local and statewide library email lists and e-newsletters to which the North Carolina Collection librarian has access. These included the Society of North Carolina Archivists (SNCA), the North Carolina Library Association (NCLA), the Federation of North Carolina Historical Societies, the North Carolina Literature and History Association, and North Carolina Exploring Cultural Heritage Online (NC ECHO), an organization that collects and digitally publishes information on cultural heritage holdings throughout the state of North Carolina as well as offering guidelines to smaller institutions on digitization projects. The North Carolina

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2 [http://www.durhamcountylibrary.org/L&M/index.html](http://www.durhamcountylibrary.org/L&M/index.html)
Collection librarian also emailed personal contacts in the local cultural heritage world, alerting them to the exhibit. A link to the exhibit also appeared on the Durham County Library home page.

When the exhibition went live, a link was posted to an online survey which was designed to evaluate satisfaction with the exhibition experience. Figure 1 shows the location of the survey link on the exhibit layout. Many of the questions asked respondents to rate their agreement with a statement on a five-point Likert scale. The survey link remained on the exhibit site for two weeks, coming down on March 10, 2008.

Additionally, during the two weeks that the survey was available, one-on-one interviews were arranged. Interviewees were recruited from a pool of people who regularly

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See Appendix 1
volunteer in the North Carolina Collection. A recruitment email message was also sent to the ABCD—Arts and Business Coalition of Downtown Durham email list. Interviews only resulted with North Carolina Collection volunteers, however. Interviewees were asked to view the exhibition before the interview and were requested not to fill out the online survey. Interviews were conducted by asking questions identical to those asked in the survey but soliciting more open-ended responses.4 They were audio-recorded, but full transcripts were not produced. Rather, the researcher used the recordings as references while analyzing the data.

Once completed, the online survey responses and the interviews were analyzed qualitatively to suggest improvements to the digital exhibition and were compared quantitatively on three factors: number of usability problems identified, response rate, and affordability of implementing the evaluation. Suggestions for improvement were defined as proposals for components that would enhance the content of the exhibit. Usability problems, on the other hand, were defined as any issues encountered when viewing the digital exhibition that caused the user difficulty in understanding how to find the information for which she was looking or that caused the user confusion about how to proceed through the exhibition. Response rate was measured by the number of people whose experience with the exhibition was evaluated. Since the researcher created the exhibition and conducted the evaluation in a volunteer capacity, cost was measured in time spent creating and administering the evaluations and analyzing the results.

4 See Appendix 2
Results

Qualitative Suggestions for Improving the Exhibit

The qualitative information obtained through the online survey and the in-person interviews suggests that users were satisfied with the exhibit. For the questions “Were you satisfied with your experience viewing the exhibition,” and “Did you enjoy the exhibition,” 82% of online respondents strongly agreed, with the remaining 18% somewhat agreeing. All interviewees responded, “yes” to these questions. Likewise, for the question, “Did you find the exhibit pleasing to the eye,” 75% of online survey respondents strongly agreed, and another 18% somewhat agreed. Only 8% of respondents marked a lower answer. Interviewees also agreed with one responding, “Yes, I think it’s very well laid out…. The design is very crisp and clean,” further remarking that it was not too cluttered.

Even with these positive responses, both the online survey and the interviews produced constructive suggestions for how to improve and expand the exhibit. One survey respondent expressed a desire for color photographs instead of black and white. Another survey respondent mentioned that images of the exteriors of the factory buildings would be useful. An interviewee mentioned this as well, stating that exterior images would allow for better contextualization. This interviewee further suggested that these exterior photos be tied to the map of the Durham factory complex and that additional information about what is currently happening in the buildings be included.
Both survey respondents and interviewees suggested including historic images parallel to the modern images to illustrate how the cigarette manufacturing process has changed.

Both interviewees and survey respondents expressed an interest for either an oral history audio element or a narrative component to the exhibit so as to gain a personal perspective from the factory employees. One interviewee said, “I was disappointed that it didn’t have any personal aspects…but of course, this is about the process, not the people, so I had to give myself a little lecture about that.” One survey respondent even suggested the exhibit employ Web 2.0 technology to achieve this personal component such as a “moderated wiki or a blog” where former or current employees or other people who know something about the process could offer their perspectives to enhance the exhibit content. These many suggestions provide excellent qualitative feedback for exhibit improvement and enhancement, but these suggestions do not constitute usability problems that caused users difficulty in finding the information for which they were looking or that caused them confusion about how to proceed. Both evaluation methodologies did reveal usability problems, however.

Number of Usability Problems Identified

Usability was not tested in the traditional method; users were not requested to complete tasks. Rather, they were asked to evaluate the usability by rating their agreement with this statement, “I had no difficulty understanding how to proceed through the exhibition.” Response was overwhelmingly positive. 93% of online survey participants strongly agreed, with the remaining 7% somewhat agreeing. One respondent added, “Love the clear navigation verbiage on the left side! The terms made perfect sense
and the groupings seemed quite logical.” Another stated, “Excellent organization of the photographs, which made the exhibit understandable. This was a very complex manufacturing process.” Interviewees agreed here as well, with one stating, “Oh no, it’s easy as pie.” While the respondents felt that overall usability was very strong, both survey methodologies revealed some usability problems. The online survey identified four usability problems, and the interviews identified five.

One problem identified in the online survey was the desire to enlarge the photographs. Because the photographs were the focus of the exhibit and relayed as much information as the textual explanations, finding them too small would seriously inhibit the viewer’s ability to locate the information for which she was looking. Another minor usability problem was highlighted by an interviewee: the user felt that the next and previous links to navigate between images were not prominent enough.

Another usability problem revealed by the online survey was confusion about a particular explanation of the process of attaching a tobacco rod to a filter. The textual explanation for this step in the process reads:

The Max 80 section of the Protos machine used tipping paper to attach the tobacco rods to the filters. Filter rods were created so that they were four times as long as the filter used in a cigarette. These filter rods were cut in half, and tobacco rods were attached on either side. Then, the filter was cut in half again to make two cigarettes, and every other cigarette was flipped so that the cigarettes all faced the same direction when packed.

The viewer felt that an explanation of the creation of the rod was missing and that the explanation of the filter attachment was a bit confusing. Figure 2 shows this section of the exhibit. An interviewee identified a usability problem along these same lines, and the image for this caption illustrates it well. The interviewee felt that some images of the
machinery may have been enhanced by including graphic arrows that better explained the process accomplished by each individual machine section.

The interviewee stated,

Some of the pictures weren’t that self-explanatory. In other words, the directions, you couldn’t really determine on some of the machinery what was going on by just reading about it…. Some of the pictures were a little indistinct. Possibly maybe some graphic arrows could have been pointed at certain parts of the machines so you could get a feel as to which way the belts were moving… otherwise it just looked like a big machine and…it just wasn’t that clear.

The type of graphic documentation this interviewee requested might have helped explain the caption that confused the survey respondent.
One interviewee identified two usability problems having to do with the glossary. The image captions link directly to the glossary when glossary words are used in them. Definitions in the glossary also link to each other where appropriate. The interviewee said, “Sometimes it felt a little disjointed when I was going say to the glossary and then from one place in the glossary to another one…. There were times when I just felt like I was going back and forth, back and forth.” Further, about the glossary, the interviewee stated, “Occasionally I went to the glossary…and sometimes I noticed that the definition was pretty much what I had already read under the picture.” The glossary did not always present the user with additional information that he expected to find.

Another minor problem was identified by an interviewee. As shown in Figure 3, the homepage for the exhibit is labeled “Introduction” in green and in the menu buttons along the left hand side of the screen. The text body, however, is labeled “Historical Background.” The interviewee felt this difference in labels was slightly confusing and misleading.

Figure 3. Exhibition homepage with labels that confused a user.
A survey respondent wished that an introduction similar to this historical background for the exhibit had been included for each of the sections. The survey respondent felt that such an introduction would have helped, “to know whether or not I was interested in going further along that path or choosing something else to look at.”

Finally, a number of respondents commented that the “narrative was too detailed and technical.” Alternatively, other respondents mentioned that they “thought there would be a lot more” information provided. These general comments certainly highlight a usability problem because the users were not able to find the information for which they were looking, finding instead either an overwhelming amount of information or too little.

Response Rate

Three interviews were conducted. Interviewees were recruited from a pool of people who regularly volunteer in the North Carolina Collection and through the ABCD—Arts and Business Coalition of Downtown Durham email list. Interviews resulted only with the North Carolina Collection volunteers. Twenty-eight surveys were completed. Four surveys were opened, but no answers were registered. Two surveys were begun, but only the first two questions were answered.

Implementation Cost

This study measures cost in time spent creating and administering the evaluations and analyzing the results. The questions for the survey and the interviews took approximately one hour to devise and went through several drafts. Since the questions are nearly identical, the time spent does not weigh one methodology more heavily and
was not calculated in the total time spent. Once the questions were developed, the online
survey took approximately one hour to create and test using Qualtrics Survey Software
available to University of North Carolina at Chapel Hill students. Once the site went live
with the survey link, little additional maintenance was required. After the two weeks
were up, it took approximately thirty minutes to remove the link from the exhibit. The
total time spent on the survey, then, was approximately one and a half hours.

The interviews took approximately thirty minutes to schedule and arrange. Travel
to the interview site and conduction of the interviews took approximately four and a half
hours total. Total time spent on the interview, then, was approximately five hours.

Analysis of the results from the survey was performed simultaneously with results
from the interviews, so the time spent analyzing the results does not weight either
methodology’s total implementation time. Analysis took approximately four hours.
Discussion

Qualitative Suggestions for Improving the Exhibition

Both the online survey and the interviews produced numerous qualitative suggestions for improving the content of the web exhibit. These suggestions were distinguished from usability problems in that they did not inhibit a user’s understanding of how to obtain the information for which she was looking. The methodologies produced virtually the same number of suggestions. Many interviewees and survey respondents made the same or similar suggestions for improvement. Often, the survey respondents made the same suggestions as the interviewees, yet, the interview format allowed the user to expound in greater depth. The suggestion to include images of the building exteriors offers an illustrative example of this.

An online survey respondent stated, “It would be interesting to have photographs of the buildings and note of what was done in them. The map is good, but photos would also add a lot to the exhibit.” Another survey respondent said, “Some exterior shots of teh [sic] building would have been good for contextualization.” Finally, an interviewee suggested this same improvement and spoke about it for approximately four and a half minutes at different points throughout the interview, bringing it up as an answer for numerous questions. If the survey had been the only evaluation methodology, this suggestion would certainly have been registered, but the interview gave more emphasis to the case for adding exterior images, and allowed for a more in depth explanation of how
this addition might improve the exhibit. Even though the interview offered greater detail, this suggestion would have been made with the survey alone. Suggestions were offered by the methodologies, however, that did not overlap. Based on this factor, it would seem that having both methodologies would produce the most effective evaluation.

**Number of Usability Problems Identified**

The interview methodology did not uncover a significantly larger number of usability problems than the online survey: the interviews revealed five problems, while the survey identified four. Some of the problems were repeated by multiple users on the online survey and were counted only once. Little overlap existed, however, between the survey responses and the interviews. The usability problems identified by each methodology were almost completely unique. Additionally, the descriptions of these problems on the survey were relatively lengthy, especially compared to some of the other open response sections. Because users took the time to explain these problems more fully, the interview format did not afford greater depth as might have been imagined. The interviewees who identified usability problems did so without going into great detail like the interviewee who suggested including exterior images. It would seem that both methodologies were successful in this category, and that using both of them would be the most effective approach since few overlapping problems were revealed.

**Response Rate**

The online survey yielded nearly three times as many responses as the interviews. It proved difficult to recruit interviewees. No active recruitment of survey respondents
occurred. Those who filled out the survey learned of the exhibit through the publicity described above, but none were specifically encouraged or solicited to fill out the survey. Arranging, scheduling, traveling to, and conducting the interview presented many additional barriers that made the survey seem a more appealing option. At the same time, a smaller group of people was targeted for interview recruitment. Widening the audience for interview recruitment or possibly including an incentive to interviewees would likely result in a higher response rate. Still, based on the response rate, the survey was clearly more effective.

*Implementation Cost*

Time spent creating, arranging, scheduling, and administering the interviews was close to five times greater than that spent creating and administering the online survey (approximately five hours and one and a half hours respectively). The questions for each methodology were identical, so time spent in their design did not weight one method more than the other. Likewise, the results were analyzed simultaneously and used in concert with one another, so time spent in analysis did not change the total time for either methodology. If there had been a larger number of interviewees, this cost difference would have been even greater. The online survey is clearly the more affordable option.
Problems with the Study

There are several flaws with this study. First, one interviewee admitted to having filled out the survey as well. While this did not seem to skew any results, it was hoped that interviewees would not also be survey respondents. This also highlights that these sample sizes are not large enough to constitute statistical significance. Secondly, it became apparent during result analysis that a fine line exists between a qualitative improvement suggestion and a usability problem. Some of the issues highlighted by users could have fallen in either category. This is perhaps greater evidence that the web exhibit environment is truly complex and does not conform well to strict usability testing.

Third, the interviewee recruitment method had flaws. Recruitment proved difficult, and it also targeted only a select group of people who the librarian and the researcher felt would be likely to volunteer. No attempt was made to obtain a random sample. Nor was there an attempt to define and find a ‘typical user’ for the exhibit. The online survey was targeted to a larger group of people: anyone who happened to visit the exhibit. Targeting a wider audience for the interviews could have resulted in a higher response rate and perhaps in more balanced feedback, which raises the next issue with this study.

The evaluation results were overwhelmingly positive. While this feedback was flattering, it is unlikely that every person who visits the exhibit in the future will be extremely satisfied with the experience. Those who gave feedback did offer constructive
criticism, but most of them were alerted to the exhibit’s existence through an email from
the librarian or photographer or through an email list subscription. These people are
likely predisposed to appreciate this type of project. Targeting a wider audience to
participate in the evaluations would reveal additional problems and might offer
researchers new thoughts on web exhibit audience and marketing strategies.
Future Research

This study leaves space for future research. As implied above, a similar study could be conducted using different recruitment methods for both the interviews and the online survey. Recruitment methods that target wider audiences could yield new and interesting data on the type of person who visits web exhibitions and on the kind of marketing that could expand the audience for digital exhibits.

Other studies could be conducted that compare different evaluation methodologies additional to interviews and online surveys. The literature discusses and analyzes countless methodologies, but, as illustrated in the literature, these studies do not exhaustively address web exhibits, and they do not compare on factors additional to number of usability problems revealed. Applying this study’s outcome variables to additional methodologies could provide interesting results.

Another important direction this research could take is to determine whether the questions asked in these evaluations capture the complexities present in web exhibits. As discussed, strict usability is insufficient, and e-learning testing targets a different audience. Further investigation into whether this instrument adequately addresses user satisfaction with a web exhibit would be illuminating.
Conclusion

This study has attempted to create an evaluation that adequately addresses the complex interplay of usability, education, and leisure present in a digital exhibition. An online survey and interviews were used to evaluate the web exhibit *The End of Tobacco Road: Scenes from Liggett & Myers Tobacco Company’s final days in Durham, North Carolina, 1999* created for the Durham County Library’s North Carolina Collection. The two evaluation methodologies were compared qualitatively on their ability to offer suggestions for improving the exhibit and quantitatively on three factors: the number of usability problems revealed, the response rate, and the cost in time of creating, implementing, and analyzing the results.

On the more substantive elements (suggested improvements and usability problems), the methodologies identified a relatively equal number of suggestions and problems. Some of the issues documented overlapped between the survey and interview responses, but many times, the two methodologies revealed completely different issues. Because of this, the combination of both methodologies seems to be the best solution. With these qualitative aspects being essentially equal, however, the survey was cheaper and elicited a better response rate. For institutions with limited resources, it would seem that an online survey alone is a good option for evaluating web exhibits. Regardless of methodology chosen, it is vital to continue emphasizing web exhibit evaluation as this field expands and develops.
References


Nicholls, C. Exhibiting evidence: A case study. *Archivaria, 55*.


Appendix 1

Online Survey

1. Are you a Durham County resident?
   Yes      No

2. Do you have a Durham County library card?
   Yes      No

3. How would you describe your experience using computers?
   No experience Some experience Average experience Above average experience Expert

4. Have you visited a digital exhibition before?
   Yes      No

5. How did you hear about this exhibition?

6. Why did you decide to visit this exhibition?

   For the following statements, rate your level of agreement:

7. I learned something about the process of creating cigarettes.
   Disagree Somewhat disagree Neither agree nor disagree Somewhat agree Agree

8. I found the exhibition pleasing to the eye.
   Disagree Somewhat disagree Neither agree nor disagree Somewhat agree Agree

9. If you disagreed, tell us what you found displeasing.

10. I had no difficulty understanding how to proceed through the exhibition.
    Disagree Somewhat disagree Neither agree nor disagree Somewhat agree Agree

11. If you disagreed, tell us what confused you.

12. I found the information I expected to find.
    Disagree Somewhat disagree Neither agree nor disagree Somewhat agree Agree

13. If you disagreed, please tell us what you expected to find.
14. I found information that surprised me.

Disagree  Somewhat disagree  Neither agree nor disagree  Somewhat agree  Agree

15. If you agreed, please tell us what surprised you.

16. I felt the exhibition was missing information.

Disagree  Somewhat disagree  Neither agree nor disagree  Somewhat agree  Agree

17. If you agreed, please tell us what you felt was missing.

18. I felt the information was presented in a clear manner.

Disagree  Somewhat disagree  Neither agree nor disagree  Somewhat agree  Agree

19. If you disagreed, tell us what you found unclear.

20. I would return to the exhibition again.

Disagree  Somewhat disagree  Neither agree nor disagree  Somewhat agree  Agree

21. Why or why not?

22. I would recommend the exhibition to others.

Disagree  Somewhat disagree  Neither agree nor disagree  Somewhat agree  Agree

23. I was satisfied with my experience viewing the exhibition.

Disagree  Somewhat disagree  Neither agree nor disagree  Somewhat agree  Agree

24. I enjoyed the exhibition.

Disagree  Somewhat disagree  Neither agree nor disagree  Somewhat agree  Agree

25. What topics would you like to see addressed in a digital exhibition in the future?

26. Please feel free to leave any additional comments you might have.
Appendix 2

Interview Questions

1. Are you a Durham County resident?
2. Do you have a Durham County library card?
3. Do you consider yourself an experienced computer user?
4. Have you visited a digital exhibition before?
5. How did you hear about this exhibition?
6. Why did you decide to visit this exhibition?
7. Did you learn something about the process of creating cigarettes?
8. Did you find the exhibition pleasing to the eye?
9. Did you have difficulty understanding how to proceed through the exhibition?
10. Did you find the information you expected to find?
11. Did you find information that surprised you?
12. Did you feel the exhibition was missing information?
13. Did you feel the information was presented in a clear manner?
14. Would you return to the exhibition again?
15. Would recommend the exhibition to others?
16. Were you satisfied with your experience viewing the exhibition?
17. Did you enjoy the exhibition?
18. What topics would you like to see addressed in a digital exhibition in the future?
19. Do you have any additional comments you’d like to share?