This paper presents the results of a usability study conducted on the mobile website for the UNC-Chapel Hill library. The study focused on basic information-finding tasks prioritized by the existing mobile site: locating a book, getting information about branch library hours and locations, and contacting a librarian for help. Findings indicated that the mobile version of the website was highly usable for the tasks tested, with all participants successfully completing all tasks performed on the mobile interface. However, navigating to the mobile interface itself proved difficult, as there is no automatic redirect from the full site to the mobile site for users of mobile devices. When not provided with the pre-loaded mobile site as a starting point for a task, most participants used the full site, where they encountered problems with overall usability and site functionality.
USABILITY OF THE UNC LIBRARY MOBILE WEBSITE

by
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1. **INTRODUCTION**

1.1. **WEBSITE USABILITY, MOBILE WEBSITES, AND LIBRARY WEBSITES**

Usability studies are a common tool for assessing the effectiveness and efficiency of websites. In a typical usability study, participants are asked to complete a series of tasks using the website being assessed; their attempt to complete each task is recorded, and successes and breakdowns are noted. Often a small sample is tested iteratively in the interest of finding major and common problems, in a variation called “discount usability testing” that is credited to usability expert Jakob Nielsen (1989). Usability studies are generally focused on improving a specific website, but many findings can be generalized into recommendations for best practices.

Usability for mobile websites raises specific challenges. Devices are smaller than standard desktop or laptop computers, and screen space is limited. The content that is usable on a larger screen may be difficult to navigate on a smaller screen. Users’ modes of interacting with websites are also different. A mouse and keyboard combination will rarely be present, and with the increased use of smartphones, users may be working through a touchscreen or other non-standard input method. A current study by Nielsen found a success rate of 62% for tasks performed on mobile websites, as compared to 84% for desktop versions. Having a dedicated mobile-specific website raised the average success rate to 64%, and having a freestanding mobile app resulted in a much higher success rate of 76%. Nielsen’s recommendation is therefore to design a separate website or app for mobile devices (2011).

Usability for library websites is another space with specific design challenges. The typical library has many resources and services to promote and limited webpage space in which to do
so. For library systems within larger institutions, there may be many stakeholders competing for priority. Prioritizing information within a page to provide options without overloading the user is a significant challenge, as is creating and maintaining a clear navigation system. These complex websites are furthermore operating in the context of expectations set by apparently simple and usable tools such as Google and Wikipedia (Dougan & Fulton, 2009). There is a significant body of literature detailing usability studies on library websites that have addressed these sorts of issues, discussed in the review below.

Given these factors, the usability of mobile versions of library websites is a particularly complex challenge. As the use of smartphones for web browsing increases, it is increasingly important for libraries to create website versions that can provide this new type of traffic with a satisfactory browsing experience. This is relatively new territory; the adoption of mobile-specific sites is, for most libraries, a recent development. In reviewing the academic literature, I found case studies from libraries that have built mobile sites, along with articles providing advice for those that wish to do so, but few published usability studies of existing mobile library web sites.

Likely contributing to the shortage of published mobile usability studies in this field is the relatively undeveloped status of mobile usability testing more generally. As the literature review below shows, methods for mobile usability testing are less well established than for otherwise similar studies on non-mobile websites. This is largely due to technical issues. Screen capture methods comparable to those available for desktop usability testing are not currently available on mobile devices. Practitioners are currently trying, and informally writing about, a range of alternatives with varying merits.

This study is based on usability testing conducted using one of these options: screen capture taken by suspending a camera over a mobile device using a rig. The study is centered around task-based usability tests, with pre- and post-test questions to gather supplementary
information. The usability tests employed a think-aloud protocol with audio recording of participants’ comments. The study overall is intended to be representative of methods that will be practical for practitioners to use in the field, for tests more or less formal and more or less extensive than this one.

1.2. STUDY SITE

The website being tested was the University of North Carolina at Chapel Hill (UNC) Library mobile website. This site was launched in August 2009 with the intention of letting users “search for books and view library hours, location branches, and other basic information about the University of North Carolina libraries on their iPhone, Android phone, or other smartphone” (Haefele, 2010, p. 117). Little usability testing had previously been conducted on the site, although features have been added since its launch (C. Haefele, personal communication, November 16, 2011). So far, usability testing has not been a major priority because mobile traffic to the library website has been only a small percentage of overall traffic.

However, Google Analytics data for the library website shows a gradual but steady increase in the percentage of visits coming from mobile devices. I was given access to the library’s Analytics account while conducting this study, and I was therefore able to view statistics about site usage over several different spans of time. These data primarily come from the report provided under Audience > Mobile > Devices, which includes a count of mobile visits both as a raw number and as a percentage of all visits to the library website; to obtain semester-by-semester totals, I filtered the report based on the start and end dates of each semester. During the spring 2011 semester (defined as January 10-May 4, 2011), mobile devices sent 1.14% of overall traffic to the library website (n=14,028). During the fall 2011 semester (defined as August 22-December 16, 2011), they sent 2.15% of overall traffic (n=31,752). This is an increase of over
15,000 visits, more than 100%, on mobile devices from one semester to the next, which shows a large population in its own right, even though the percentage of overall traffic is still fairly small. For the spring 2012 semester (January 9-May 4, 2012), the numbers climbed steeply again, to 51,729 visits and 3.45% of traffic.

Interestingly, most of these numbers exclude visits to the mobile version of the website, as those pages did not contain the Google Analytics tracking code needed to record data until April of 2012. The 31,752 visits by mobile devices in the fall semester, for instance, therefore represented only the portion of traffic that visited the non-mobile version of the site on a mobile device. In the time period since analytics have been implemented for the mobile site, pages with mobile URLs (starting with http://www.lib.unc.edu/m/#) have received 0.47% (n=5,792, out of 1,239,307 total) of the pageviews received by the library website. During that same period, 4.91% of visits came from mobile devices (n=28,436). The iPad is the most frequent mobile device registered and does not necessarily require the same type of layout as a smartphone-sized device. Still, even when excluding iPad visits, there were another 15,933 visits from other types of mobile devices, comprising 2.75% of site traffic. Given those numbers, the 0.47% of pageviews directed toward the mobile site seems like significant underperformance.

There are multiple possible reasons for the mobile site’s obscurity, including a lack of aggressive promotion, but a key point highlighted in this study is that there is no automatic redirect from the full version of the site to the mobile version. As the percentage of mobile traffic continues to increase, it should ideally be sent to a version of the website that will provide a satisfactory mobile browsing experience. The mobile site should therefore take on increasing visibility.

Given this volume of, and rapid increase in, mobile traffic, usability testing of the mobile site experience is clearly in order. This study began that work by focusing on a set of basic core tasks and drawing from a limited population of UNC undergraduates. That limited scope was
chosen based on the timeline and resources for the current study. As mobile traffic to the site continues to increase, however, further studies may be desirable to focus on other populations and/or more specific features of the site.

The major research question addressed by this study is: How usable is the current UNC Library mobile website for the types of tasks that it currently prioritizes?

2. LITERATURE REVIEW

2.1. INTRODUCTION

This literature review will establish a grounding for the study by examining the ways mobile website development and usability testing have been discussed in the library literature. Although very few library mobile usability studies have been published, usability is a major consideration in articles dealing with mobile sites more generally. The first section of the review will cover the technological landscape and options for mobile development that have been used by libraries thus far. The second section will focus on usability testing that has been done by libraries for non-mobile websites. The literature in this area is very rich and offers much guidance. By examining these two topics, this review aims to assess the current state of the art and show how a mobile usability study will draw on and complement work that has already been done. The literature review will conclude with a section discussing mobile usability testing options that have been tried and examining their relative advantages and disadvantages.

2.2. LIBRARIES AND MOBILE SITES

Libraries have been aware of the impending importance of mobile technology for several years now. In a review of the literature, Bridges, Rempel, & Griggs (2010) point to case studies of mobile development from as far back as 2006. In the time since then, there have been rapid and frequent shifts in the mobile technology landscape, especially the increased popularity
of smartphones, the development of touchscreen devices, and the accompanying increase in mobile web browsing. For instance, Haefele (2010) describes the rise of the Android platform starting in March 2009, when the UNC Chapel Hill library web team began preliminary work on a mobile site version. At that point, a user survey conducted by Haefele’s team showed only 0.9% (n=2) of respondents primarily using Android as a mobile platform (p. 119). The same study has not been since repeated, so a direct comparison with later numbers is not available. However, my examination of the library’s web analytics data shows a significant rise in Android usage just over the time that such data has been collected, starting in January 2011. Comparing the time periods from January 21-February 21, 2011 versus November 7-December 7, 2011, there is a 181.2% rise in traffic from Android devices, from 750 to 2,110 visits. For the same time span, BlackBerry, which had been the second most popular platform in Haefele’s 2009 study, actually dropped slightly in terms of traffic, from 173 visits to 112 visits. These numbers also suggest that Android had well outpaced BlackBerry among the UNC Library site’s users by even the earliest date represented, in January 2011. The point is that in less than two years, a technology that was barely in use at the time that the mobile site was built has since become prominent and important to consider in mobile development.

Recommended practices change along with the technologies available. With those practices still being established, they are frequently the focus of the literature about library use of mobile websites, which is heavy on case studies, recommendations for practitioners, and overviews of trends.

**Mobile Services Offered by Libraries**

In a survey for *Library Journal*, Thomas (2010) looks at current and planned mobile offerings among libraries. Of the 291 academic libraries that participated in the survey, 44% currently have a mobile offering, and another 21% “plan to offer” mobile services. Thomas
further distinguished between libraries that “offer a mobile-friendly site” (39%) and those that “offer a mobile-friendly catalog” (36%). Thomas also found that “academic libraries were more likely to develop mobile library services in-house, rather than outsource development to vendors, with one exception: SMS reference.” This tendency to do things in-house may increase the importance of literature providing best practices for mobile development. The response rate for the survey was only 15%, opening the possibility that results are skewed toward those libraries that are more interested in mobile services; nevertheless, the survey still provides a useful bird’s-eye view of trends and relative popularity of offerings. Of the four kinds of services considered (mobile website, mobile catalog, SMS reference, and text message notifications), all but SMS reference service showed 50% or more of academic library respondents in the “plan to offer” category. The gaps the survey indicates between plans and actual offerings suggest significant work left to do with initiating mobile services.

**Platforms, Offerings, and Site Development Options**

There are many approaches that libraries can take to providing mobile services. Each option brings with it different usability considerations. One key decision to make is which platforms and devices to support. Haefele (2010) lists this as one of the earliest steps in the mobile development process, immediately after the initial research. In a recent update on mobile usability, Nielsen (2011) divides mobile devices into three categories:

- **“Feature phones:** primitive handsets with tiny screens and very limited keypads that are suited mainly for dialing phone numbers.”

- **“Smartphones:** phones with midsized screens and full A–Z keypads.”

- **“Touch phones:** devices with touch-sensitive screens that cover almost the entire front of the phone.” (Nielsen, 2011)
Because many articles in the library literature discuss Nielsen’s “smartphones” and “touch phones” as a unified category, generally referred to as smartphones, this review will do the same. Smartphones are distinguished from feature phones, which Nielsen eliminated from his latest mobile usability research. Among the reasons he lists for excluding them:

- “Our first research found that feature phone usability is so miserable when accessing the Web that we recommend that most companies don't bother supporting feature phones.”
- “Empirically, websites see very little traffic from feature phones, partly because people rarely go on the Web when their experience is so bad, and partly because the higher classes of phones have seen a dramatic uplift in market share since our earlier research.” (Nielsen, 2011)

At least one discussion of mobile development for libraries recommends against excluding feature phones from consideration. Griggs, Bridges, & Rempel (2009) argue that “this is leaving a large portion of mobile users out in the cold [...] there are still quite a large number of people using small-screened devices for Web browsing. Therefore, if a library’s initiative is to provide a mobile version of their site they should develop applications that work on both smart phones and Web-enabled phones equally.” However, while still including feature phones in the discussion, Bridges et al (2010) posit the increasing popularity of smartphones specifically as a reason to develop mobile-optimized sites.

Surveys about device use can fuel this decision. Asking about access to library resources through mobile devices in spring 2010, Cutshall, Blake, & Bandy (2011) obtained “overwhelming results” of iPhone and Android devices. On the other hand, the team at UNC Chapel Hill decided to focus on the iPhone even though a survey also showed significant numbers of Blackberry users (Haefele, 2010). The rationale in this case was based on market research showing that
Blackberry had a disproportionately low share of mobile web traffic compared to its overall market share. While popular, Blackberry devices tend to be used less for web browsing. Haefele also notes that the user survey showed “slightly more than one-fifth did not have a smartphone. This served as a reminder during our development process, pointing out that whenever possible we should make sure our mobile site was usable on both new and older devices” (p. 119). Decisions about platform ultimately aim at providing the best usability for the most popular devices.

Another decision is whether to create a freestanding app or to focus on optimizing the existing website. Haefele (2010) explains the distinction: “An app is roughly analogous to a traditional desktop computing application [...] installed on the smartphone. A webapp is simply a webpage optimized for display on mobile devices” (p. 119). Nielsen (2011) found that either approach provides some usability benefit. Users accessing the standard version of websites on mobile devices showed only a 58% success rate across tasks, whereas users accessing mobile site versions did somewhat better at 64% success. The improvement for apps was more dramatic, a 76% success rate.

However, as Haefele explains, each approach has its tradeoffs. Apps must be built for one specific type of device (p. 120), making the kind of purposeful cross-device usability recommended by Griggs et al. (2009) or the opportunistic cross-device usability recommended by Haefele (2010) impossible. To support more than one platform, more than one app is required. This adds to the already substantial investment of programming time and expertise required to create an app. As Nielsen (2011) says, despite the usability benefits, “we can really recommend building mobile applications only if you're either rich or offer a service that's particularly suited to mobile use.” Arguably libraries may offer the latter kind of service, but resources still may not be available for app development. Haefele describes the decision to
create a mobile site rather than a freestanding app as a straightforward one: “A fully installed app was beyond the capabilities of programming resources we had available, so by default we focused our development on a webapp” (p. 120).

Similarly, Cutshall et al. (2011) referred to both usability and feasibility reasons for creating a site rather than an app: “Since the library wasn’t equipped technologically to develop an in-house application platform and because we wanted the content to work across all mobile platforms, we decided to focus on creating a mobile web-based platform” (p. 24). Some libraries do find ways to incorporate apps into their offerings, though. Cornell University Library was able to take a best-of-both-worlds approach by enlisting students from a computer science class to create an iPhone app (Connolly, Cosgrave, & Krkoska, 2010). However, the authors “did not want to disenfranchise any of our users,” so they first developed a web site version intended to provide a “device-neutral approach” (p. 28).

For libraries that choose to create mobile sites, yet another question is what technical approach to take to “mobilizing” the main website. Connolly et al (2010) list three main options. First, separate, mobile-specific pages can be created—this may make for straightforward optimization but entails more maintenance. Griggs et al. (2009) discuss using a version of this technique at OSU Libraries but qualify their discussion by saying “Rather than maintaining multiple copies of content, it is better to have content that can dynamically adapt for the type of device accessing it.” Haefele (2010) discusses using database-generated content where possible to minimize this double maintenance. A second option is to use mobile-specific stylesheets to reformat the main site’s content. This is the type of approach used by Tidal (2011); data did not show sufficient mobile use to justify building a separate site, so a Drupal plug-in was used to provide alternative stylesheets. Connolly et al. (2011) decided against a CSS-based option because “we felt that creating mobile-friendly templates for the many content types and
sections of our site would be too time-consuming” (p. 29). They instead chose a third approach, “to use a site transcoder: a rule-based interpreter that sits between a web site and a client, intercepting content as it is sent from the site to the client and reformattting it as needed for a mobile device” (p. 29). They were able to use an open-source tool to create rules for how content would be displayed.

2.3. LIBRARIES AND USABILITY STUDIES

Usability studies are commonly used by libraries to assess their websites. In a study of practices at Association of Research Libraries (ARL) institutions, Chen, Germain, & Yang (2009) found that 85% of respondents (n=71) had done some testing on their site and / or OPAC. This matches with more informal comments in literature reviews (e.g. Letnikova, 2008; Emde et al., 2009) as to the large number of usability studies in the literature. Some trends can be noted among them. Blummer (2007) points to a chronological progression in website studies, from a more limited focus on design to increased attention to usability and navigation, as the complexity of library websites grew. Looking at more recent studies, many arise in the context of redesigns (e.g. Emde et al., 2009; Dougan & Fulton, 2009; Teague-Rector et al., 2011; Swanson & Green, 2011); these tend to involve comparison between existing and proposed, or old and new, versions of the site. Another trend is focus on the homepage in testing. Chen et al. (2009) found that of libraries that had done some usability testing, 91.5% (n=61) had tested the homepage. Again, this survey finding matched with the literature; in their review, they described homepage tests as the “most common task reported in the literature” (p. 954). This focus aligns with other sorts of studies that have focused on homepages, such as a content analysis by Kasperek et al. (2011) that examined allocation of space on the page. Given that there are some similar issues between homepage and mobile site design (allocation of limited
real estate), this kind of study could also make a useful counterpart to usability testing of mobile sites. One more recent testing trend is a focus on federated search (e.g. Emde et al., 2009; Swanson & Green, 2011; Teague-Rector et al., 2011). This might be interpreted as reflecting the status of usability testing of library websites as a relatively established field, in which an existing groundwork can support work on specific trends within the library field.

One notable aspect of the usability testing done in libraries is that it tends to reveal information about the user as well as the site. This might be seen as a deviation from standard usability testing, in which care is taken to establish that the site, not the user, is being tested. However, the nature of libraries and library websites makes it difficult to achieve a strict separation between the two. Standard tasks such as finding resources can require a significant amount of preexisting knowledge, and using navigation relies on familiarity with academic terminology. Several approaches to this issue can be seen. Letnikova (2008) regards it as largely a methodological problem: “researchers frequently report problems and limitations related to this testing, assuming that the wrong wording of questions or tasks during the testing disorients test participants, especially those not familiar with the basics of library research” (p. 381). As a solution, she recommends adopting a standardized list of questions for usability tests.

Meanwhile, in Blummer (2007), the studies reviewed show recurring problems with user comprehension of library terminology. Blummer discusses these issues as part of the studies’ usability findings rather than a separate issue (although it is still possible that there were issues with the way the usability studies were conducted). Other researchers treat usability testing as an opportunity not only to test the website, but also to learn something about their users. For instance, Emde et al. (2009) say that “The study also provided the opportunity to observe the practices of faculty and graduate students in locating and retrieving information on the Libraries’ website” (p. 24). Dougan & Fulton (2009) state secondary purposes for their study of
investigating users’ understanding of library terminology and differences in search behavior among user groups. Any usability testing of library mobile websites will likely reveal something about participants’ use of mobile devices for finding information as well as testing the site itself.

**USABILITY TESTING METHODS**

In many case studies of usability testing in the library literature, the methods used adhere to aspects of the “discount usability testing” methods recommended by experts like Jakob Nielsen and Steve Krug. Nielsen in particular is mentioned in many articles (e.g. Emde et al., 2009; Swanson & Green, 2011; studies discussed in Blummer, 2007). One of Nielsen’s (2000) key recommendations is limiting the size of studies; “The best results come from testing no more than 5 users and running as many small tests as you can afford” (para. 1). Building on this advice, Krug (2006) provides an example of a representative testing session. It is based around a series of tasks, guided by a moderator working from a script. During the introduction, the moderator explains that the test is of the site, not of the user; he also explains that he won’t answer questions during the test but will answer them afterward if wanted. A think-aloud protocol is used throughout. Krug recommends using a screen recorder like Camtasia to capture the user’s screen and what the user and moderator say during the session (p. 143). The time for the sample session is described as around 45 minutes (p. 155).

Many elements of this approach show up in the library literature on usability. For instance, Dougan & Fulton (2009) used a “think-out-loud task-based usability test” (p. 223) and recorded sessions using Camtasia, a popular screen recording application. Theirs was a relatively long study, featuring 11 tasks. All participants were users of the library in question. The tests were followed by a survey for demographic information and other feedback on the site; such surveys are used in many of the studies described in the literature. Swanson & Green (2011) also used a “talk-out-loud protocol” (p. 224), recording the sessions with Camtasia and taking
notes during the session. Their study used students as participants. In one more example, Emde et al. (2009) also recorded sessions, in their case using Morae (another recording application). This study also included follow-up interviews with the participants. Each of these studies used a larger sample size than those discussed by Nielsen or Krug (15 participants for Dougan & Fulton, 16 for Swanson & Green, 10 for Emde et al.). The study design reflects the summative context of their use: as mentioned above, each took place at the beginning or end of a redesign, rather than as a routine part of an iterative development process. In this respect, they are more similar to the current study than to the more formative studies discussed by Nielsen and Krug.

Although the literature highlights these formal and summative studies, though, they may not be the norm for library usability testing. In their literature review, Chen et al. (2009) find that “Formal testing using think-aloud protocol is the most commonly employed method” (p. 954). However, looking at separate aspects of the method, they found variations in popularity. Observation (86%; n=61) and think-aloud protocol (80%; n=57) were the most frequent methods. Filming (32%; n=23) and recording keystrokes (24%; n=17) were significantly less common. In efforts to make testing more feasible, screen capture may be seen as useful but not necessary.

Two specific testing efforts are interesting for their variance from the norms. The study conducted by Teague-Rector et al. (2011) at NCSU employed in-the-field, rather than in-the-lab, testing. Rather than recruiting a few participants for full-length sessions, the researchers recruited 28 participants and asked each to complete two or more tasks from a set of 10, rather than each completing all tasks. Although the article does not specify, it seems unlikely that screen capture would have been used for these kinds of on-the-fly tests.

In a very different approach, the New York Public Library designed a tool to involve website visitors in low-commitment usability-based surveys (Lascarides, 2009). Question types
include multiple choice, five-second tests for recall, and “Where would you click” on attached screenshots. Each participant received at least one question, but many opted to answer more; “In just over seven months of use, it has fielded over 100,000 responses from over 10,000 respondents.” While this type of testing accomplishes different ends from in-person testing, it can serve as a useful complement, allowing for ongoing, low-stakes, iterative testing of the kind that discount usability testing is also meant to enable. Similar surveying could be useful in conjunction with more extended in-person sessions.

2.4. Usability Testing Options for Mobile Sites

Compared to the common and well-established approach for usability testing on standard websites, little has been written about how to translate testing methods to the mobile environment. Session structure can presumably be similar, but recording poses a challenge; no equivalent to Camtasia or Morae exists for mobile devices. While some sort of testing is typically mentioned and / or recommended in mobile development case studies, little detail is generally provided about the details of the tests. Bridges et al. (2010) simply say, “You can apply the same types of evaluation techniques used in non-mobile applications to ensure a usable interface” (p. 317). Connolly et al. (2011) mention that a prototype of their iPhone app was tested by “the library’s usability group” in “formal usability studies” but provide no further detail on that part of the process (p. 30). Moving toward more specifics, Griggs et al. (2009) say: “Evaluations and user testing can be performed on simulators, but nothing beats testing on mobile devices in the real world. Hallway usability testing can easily be performed on mobile devices and provides the on-the-go context of mobile users.” This recommendation registers a preference for field rather than lab testing and for use of a real mobile device, but the format of the tests is not discussed further. Cutshall et al. (2011) provide still more specific recommendations for task-based testing
with a think-aloud protocol. They suggest recruiting 5-10 participants and having them try the
tasks on their own mobile devices, but they do not discuss any results from their own testing.

A small handful of articles, most of them very recent, address the question of how to
assess mobile offerings in more detail. Wang, Ke, & Lu (2012) describe the evaluation of mobile
library services offered by the Oriental Institute of Technology. Their study focuses primarily on
SMS-based reminder services, rather than a mobile website, and uses system logs to identify
impact on renewal behavior, rather than using test sessions to assess usability. Another study by
Rosario, Ascher, & Cunningham (2012) does prominently feature usability testing of a library
mobile website. However, the testing was done in the midst of a redesign process and used
paper prototypes rather than a live website. This more formative type of usability testing is a
very useful complement to the summative testing discussed in previous sections; however, the
technical considerations presented are significantly different than for the current study.

The closest published analog to the current study that I found is one conducted at
Portland State University (Pendell & Bowman, 2012). The technical approach is similar to the
one described in the methods section below; sessions were conducted in a library conference
room, and the researchers used a document camera to record the mobile device screen,
participants’ hand gestures, and audio of the sessions. However, there was a significant
difference in the study design, which is that participants used their own mobile devices rather
than being provided with a standard one. The researchers chose this approach in order to
capture usability problems across a range of devices and platforms. In recruiting, they purposely
sought out users with different types of devices, including Android, iOS, and others (and
including one feature phone). Because of this study design choice, their findings revealed
significant differences in the functionality of different features across the platforms, including
multiple instances of “fatal” errors where a task could not be completed on the device used.
There were also differences in the devices’ network configurations and the wireless networks used among different sessions, which again revealed unexpected differences in behavior between authenticated and unauthenticated networks.

Two other studies discuss efforts to assess usability for sites that are not offered by libraries but are potentially related in that they support mobile information seeking. One examines use of the Wikipedia app on the iPod Touch (Hahn, 2010). Rather than lab-based sessions with predetermined tasks, this study involved loaning mobile devices to a group of students for a period of one week, then assessing their use of the app based on search logs and follow-up surveys. While substantially different in nature than the kinds of usability studies discussed above, this alternative approach could provide another useful complement by examining mobile information seeking in a more authentic mobile context.

The other is a more formal usability study of EBSCOhost Mobile (Hegarty & Wusteman, 2011). Here the methods seem generally in line with those used for desktop testing, with a think-aloud protocol and pre- and post-test questionnaires administered. The authors also discuss the decision to test in a lab rather than in the field, and to use an iPhone 3GS for testing. No mention is made of any efforts to record the sessions. While this study includes some useful recommendations and will be of interest to libraries planning to integrate other mobile resources with their websites, it represents a different scenario than navigation of a mobile library site proper.

Since the formal library literature provides little discussion of options for recording mobile usability tests, this review will conclude by outlining several suggestions made elsewhere. Given that they address technical rather than methodological questions, the origin of these suggestions outside of the refereed literature should not be held against their credibility. One option is emulation, in which the screen of a mobile device can be approximated on a
desktop computer screen; this approach is recommended by Wisniewski (2011). A potential advantage of emulation is that since the interaction takes place on a standard computer, it can be recorded using screen capture software. A major disadvantage is that the interaction will not accurately represent the experience of using a mobile device. While the screen size may be correct, the experience of using a mouse and keyboard is very different from trying to navigate a site using a mobile device’s inputs. Griggs et al. (2009) recommend desktop testing as a “first line of defense,” to make sure that the site is actually working, but recommend “testing on actual devices” to address device-specific usability issues.

Another option mentioned by Wisniewski is device sleds. Lee (2011) details the process of building this kind of rig for testing at the California Digital Library. The sled holds a small camera in place above the screen and records the interactions. Lee rates the quality of the resulting video as good, and an advantage to this setup is that the user’s own mobile device could be attached to the rig without damage, adding verisimilitude to the tests. A disadvantage, mentioned by Mazzola (2011), is that attaching the device to a rig leads to less natural interactions with it (conversely, Lee reports that participants adapted quickly to the situation and used the rig “as though they were holding just their mobile devices”).

Mazzola’s approach is perhaps the closest to a standard desktop usability test in that he found a way of actually capturing the phone’s screen. This involved jailbreaking an iPhone to install a non-iTunes-store app for screen capture. For those willing to take this approach, there are several app-based options, none of them apparently uncomplicated. The major advantage of this approach is being able to accurately record the device’s screen. At least two obvious disadvantages present themselves; one, this rules out testing using the participant’s own mobile device; and two, for what’s described as the best screen recorder, audio / video of the participant would have to be recorded separately and combined with the screen capture.
Nevertheless, this is an intriguing option for achieving something close to what’s possible with desktop usability testing.

3. METHODS

3.1. OVERVIEW

The general form of this study was usability testing with a think-aloud protocol. The think-aloud protocol was included as a way of gathering qualitative information about participants’ real-time reactions to the site as they used it. As is common with think-aloud protocols (Wildemuth, 2009, p. 183), I also used other methods to gather supplementary information: a brief survey beforehand to gather data about prior technology experience; a follow-up interview to probe participant opinions beyond what the think-aloud protocol revealed; and during the testing sessions, recordings of screen activity. The combination of methods proved valuable, as participants frequently commented upon difficulties during the think-aloud protocol that were not mentioned in the follow-up interview, and vice versa. The recordings were made using the device sled option mentioned in the literature review and described in more detail below. This testing condition is based on emerging methods described informally in blog posts (see literature review) but apparently not yet represented in the formal LIS literature. The justification for this approach is based on identifying methods that practitioners are realistically likely to be able to use in the field. My literature review suggests that budget is often a concern for university libraries taking on mobile web projects. However, as the literature review also suggests, librarians working on these types of projects often recognize the importance of doing some form of usability testing. Given the frequent lack of funding for bigger studies, “discount usability testing” methods like the ones used here are likely to be the most practical option for many libraries.
3.2. DEVICE SETUP

The mobile device used for testing was the iPod Touch. The Mobile Devices report in the library’s Google Analytics account suggests that the iPod was a reasonably representative device to use. For the year 2011, three of the top four mobile operating systems visiting the library site were versions of iOS (with iPad at #1, iPhone at #2, and iPod at #4; 48, 291 of the total 65,351 mobile visits came from iOS devices). I had considered letting participants use their own mobile devices, which would have provided the advantages of creating greater realism, testing the site across a greater variety of devices, and further separating usability problems with the site itself from any effects of unfamiliarity with the device being used. However, I ended up choosing to provide the device instead to ensure greater consistency among sessions, and borrowed the devices from a set the library has available for staff use. There were two different iPods used during the course of the study, due to the availability of each device. The iPods were different generations and therefore had slightly different form factors, but both had a standard display and ran the same version of the iOS platform. It is possible that the difference in form factor may have had an effect on interactions, although speed was not used as one of the metrics in this study. The Safari browser was used in all sessions. In one task (Task 4, find a branch library location), successful participants were automatically directed from the library website to the iPod’s Maps app, which as of the time of the study, used Google Maps.

While using the iPod went smoothly overall, it also introduced a few minor complications. Since the device being used was not actually a phone, it was not possible to make phone calls or send text messages from it. While neither of those actions was necessary to complete the tasks, texting would have otherwise been a valid option for completing one of them (discussed in the results under Task 3, contact a librarian for help). In addition, the email app on the testing devices was not set up with a valid email account. This was the result of
incomplete planning on my part; none of the tasks specifically required using the email app, and I had assumed that participants would primarily stay within the browser. However, for Task 1 many of the participants tried to shift into the email app (again discussed further in the results section), at which point they faced a registration screen. Rather than de-anonymize the session by having them set up their own email account on the iPod, I resorted to having them describe at that point what they would normally do on their own mobile device. With better advance preparation, it would have also worked to set up a dummy account for the study and let participants use that.

The recordings were made using a webcam positioned above the iPod using a device sled and attached via USB cable to a MacBook laptop (see Figure 1). The sled itself was low budget; it consisted of a strip of metal with an iPod case mounted on it using Velcro. The webcam had a gooseneck that connected it to the sled and allowed for adjusting to an appropriate angle for recording. While this setup served its purpose overall, it was not lightweight or stable enough to allow participants to interact with the iPod naturally. In particular, it was not easy to rotate the device to landscape orientation, and no participants did so during the sessions. The use of the sled did not prevent completing the tasks, but it did make typing more difficult than it normally would have been, which reduced the usefulness of time on task as a measure. The recordings were taken from QuickTime using the webcam as the recording source. The recording quality was sufficient to see most of the gestures made on the device (see Figures 2-4). The interaction design of the iPod was particularly helpful for reviewing the recordings, as all selections were strongly highlighted and easily visible. Audio was captured using the laptop’s built-in microphone.
Figure 1: Camera rig
In this image, the iPod’s orientation in relation to the camera is opposite of that used during the testing sessions. As shown here, the image transmitted to the computer screen would be right side up, but the iPod screen would be upside down to a user. For the study, the orientation was reversed, resulting in the images seen in Figures 2-4.
Figure 2: Screen capture

Figure 3: Selecting a menu option
Figure 4: Typing

3.3. SAMPLE AND RECRUITMENT

The general population for this study was the UNC community, as those are the most likely users of the UNC Library mobile site. I intended to recruit 12 users and ended up testing with 14. As Wildemuth (2009) notes, there is disagreement among experts about what size sample is needed to identify a significant proportion of usability problems, and the purpose of the study affects the appropriate sample size (p. 123). This study is more summative than formative. Rather than taking place as part of a series of rapid iterations of the website’s development, it was positioned at the beginning of a potential redesign, and rather than focusing on finding the most pressing few problems to resolve, it aimed to provide a more general picture of the site’s overall usability. These circumstances made appropriate a larger test group than the minimum recommended by Nielsen and Krug for more formative purposes. The sample size used puts my study on par in that regard with most of the usability studies
covered in the preceding literature review, many of which were similarly positioned at the outset of a redesign. Each usability testing session involved one individual participant, and all sessions took place in a conference room at UNC’s House Undergraduate Library.

Although I had considered a true guerilla testing approach of recruiting study participants in person and conducting the usability tests on the spot, the advantage of being able to secure a quiet space for the testing in advance led me to recruit via email instead. All recruitment was therefore conducted via UNC’s campus-wide informational listserv, with a filter set to include only students. To make recruitment easier, I offered $10 for participating in the study. Given the blanket nature of the recruiting method, my sample was necessarily a convenience sample. Wildemuth describes this sampling technique thus: “you will try to recruit people because they are available. You can still impose inclusion and/or exclusion criteria, specifying the characteristics of the people who are eligible for study participation” (p. 121). The importance of a representative sample is debated by usability experts. For instance, Krug (2006) advises: “For most sites, all you really need are people who have used the Web enough to know the basics” (p. 139). However, one exception he points out is cases where “your site is going to be used almost exclusively by one type of user and it’s no harder to recruit from that group” (p. 139). That condition applies to this study; it is most likely that people using the site will be UNC affiliates, and recruiting those users on campus was not significantly harder than recruiting other users elsewhere.

Given the relatively small sample used, I further limited the study to focus on UNC undergraduates to increase consistency. Graduate students, faculty, staff, and other users would all make useful populations for future usability studies of the mobile site. Testing with each of these groups would follow another of Krug’s (2006) recommendations for recruiting: “If your audience is split between clearly defined groups with very divergent interests and needs,
then you need to test users from each group at least once” (p. 140). In fact, the example Krug uses to illustrate this point is itself a university site. For this initial study, however, I chose to limit my scope by focusing on a more specific population (undergraduates) because that group is likely to have more similar needs than users from the UNC population more broadly defined. This limitation made it possible to include a single, reasonably relevant set of tasks in the usability testing portion of my study.

The following criteria were included in the recruitment email:

“To participate, you must:
• Be a UNC undergraduate student
• Be at least 18 years old
• Speak and read English fluently
• Have owned a touch-screen smartphone for at least 1 month.”

The final criterion, owning a touch-screen smartphone, was imposed to reduce the likelihood of apparent usability problems arising due to a subject’s lack of familiarity with mobile web conventions in general, rather than due to the specifics of the site being tested.

Beyond the criteria mentioned for recruitment, no further demographic information was collected about users.

3.4. PROCEDURES AND DATA COLLECTION INSTRUMENTS

For each participant, the usability testing procedure consisted of these steps:

1. INTRODUCTION.

At the beginning of each session, I read a short script introducing the study (Appendix A: Moderator Guide). The key purposes of this script were explaining the nature of usability testing and explaining the consent document. After reading the script, I asked for any questions, and then asked the participant to read and sign the document if they agreed to participate.

2. PRE-QUESTIONNAIRE.
Before starting with the usability test proper, I asked the participant to complete a brief questionnaire (Appendix B: Participant Handout) to gather information about technological experience and familiarity with the library website. The questionnaire was presented as a written document to make it easier to complete questions involving a scale for the response. The first two questions were about usage of the (non-mobile) library website: how often the participant uses the site, and (if they do use it) what they use it for. This information was intended to gauge the participant’s familiarity with the library’s online services. Participants who are familiar with the main website may attempt to apply that cognitive model to the mobile site. There may therefore be differences between them and participants who are effectively starting from scratch. The next question asked how frequently the participant accesses websites on a mobile phone or other mobile device. This information was intended to provide a better sense of the user’s general familiarity with mobile web conventions, which may affect their ease in using the library mobile site. The next question asked whether the participant has specifically used the library site from a mobile device before, and if so, what for. Participants who have used the mobile site before would presumably be more familiar with at least some of the features covered in the task set. The final question asked what features and information the participant expected the library mobile site to contain. This was intended to provide a brief glimpse into user expectations that may not have been elicited by the tasks included in the usability test.


At this point, I started the recording, and the participant began with Task 1. For the first task, I did not specify how the user should reach the site. A note of interest is that mobile devices are not automatically directed to the mobile version of the website. Instead, the full website displays, and a link appears at the top saying, “On a mobile device? Visit http://www.lib.unc.edu/m.” Rather than initially telling participants to use that link, I noted
whether they noticed and followed it. Given that real mobile site users are expected to find and use the mobile site link, I wanted to see whether the study participants would do so without being directed. For subsequent tasks, I loaded the mobile site homepage as a starting point, after first clearing the browser history.

The usability test consisted of a set of four tasks (Appendix C: List of Tasks). The tasks were drawn from the main options available on the mobile site homepage, intended to provide wide coverage of the site’s features. Task 1 was to locate a specific book in the library catalog, determine whether it was available, and email information about the book to a given address. This task focuses on the ease of use of the mobile catalog. Task 2 asked the participant to find out how late the Art Library would be open on the day of the usability test. This required the participant to locate and use the Library Hours section of the website. It also required moving from the mobile site to a non-mobile-specific page for that particular branch library, demonstrating whether that switch caused confusion. Task 3 asked them to send a question to a librarian. There were theoretically two options available for doing this, either via instant messenger or via text. However, since the device used for testing was an iPod Touch rather than a phone, texting was not possible. Locating either option therefore counted as successful completion of the task. Finally, Task 4 asked the participant to find out where the Stone Center Library is. This required them to find and use the Contact & Find Us section of the website.

As a set, these four tasks focused on the main menu options that were available on the mobile site and had been developed by the library’s web team. These options reflect the library’s prior judgment as to which features would be most useful in a mobile context (C. Haefele, personal communication, November 16, 2011). The study’s primary focus is therefore to assess how usable the mobile site is for the tasks so far prioritized by the library, rather than to assess the appropriateness of that prioritization. The study further did not include tasks
focusing on either the Mobile E-Research Tools or the Refworks Mobile sections of the site, as both of these feature products from outside vendors that the UNC Library web team would not be able to change.

After each task, I asked the participant to complete three brief questions, asking for their perception of whether they completed the task, whether the website made the task easy, and how much they liked the interface used for the task.


After the usability test portion of the session was over, I verbally asked a few additional questions to gather more qualitative data. I first asked which parts of the site the participant found easiest and most difficult to use. Next, I asked how the site matched the participant’s expectations and if there were any other features they would want to see. Finally, I provided an open-ended opportunity to make any other comments about the participant’s experience with the website. Other questions were included based on the content of the session; for example, if the participant had not used the link to redirect from the full site to the mobile site, I asked whether they had seen and opted not to use it or not seen it.

5. *Compensation.*

Once the testing procedure was complete, I stopped the recording. I then provided the participant with $10 for their assistance and asked them to sign a receipt. Once they left, I marked their handout with a participant number, added the same number to the file name of the recording, and cleared the browser history on the iPod Touch.

Given the small number and relative simplicity of the tasks involved, each session typically lasted around 30 minutes or less, from introduction to compensation. The time taken by the session was the extent of each subject’s participation.
3.5. Evaluation Measures and Data Analysis

Once testing was complete, I reviewed the handouts completed by the participants and the recordings made of the session. For the handouts, I compiled answers to each question and compared the results across tasks. For the recordings, I documented several types of events: pages visited, interactions with on-page elements, and notable comments from the think-aloud protocol and the post-session interview.

Data collected for quantitative analysis included all pre-session questions about frequency of website usage; completion of each task; the number of total and unique pages visited per task; use of the back button as an indicator of lostness (with context of the use considered); task-specific items such as whether participants used the mobile site for the first task; and participants’ Likert-scale assessments of success and satisfaction. I opted not to use some measures that are typical of usability tests; in particular, I did not note time on task as the think-aloud protocol may lead to unrepresentative task completion times (Wildemuth, 2009, p. 178-179). It is also possible that the somewhat artificial condition of using a device sled might have impacted participants’ efficiency. I therefore did not consider the usability tests as reliable indicators of how long it might actually take someone to complete a given task in the wild.

Furthermore, given the small sample size, I did not treat the data from the pre-test questionnaire as usable on its own, for instance as an indicator of how many UNC undergraduates might be expected to use the mobile library website. That information might be of anecdotal interest to the web development team, but its primary function was to provide a general portrait of the users involved, as context for the qualitative data from the usability test and post-test interview.

Qualitative data includes the interview responses, audio recordings of the think-aloud protocols, and screen capture from the session. Each of these sources of information was
assessed for common reactions, problems that arose, and other notable themes.

3.6. ADVANTAGES AND DISADVANTAGES OF THE STUDY METHODOLOGY

Most of the disadvantages discussed throughout this section can be consolidated under one broader concern: this study was not truly experimental. It seems fair to say that this is typical of usability studies. As Krug (2006) says, “The point of testing is not to prove or disprove something. It’s to inform your judgment [...] No one has the resources to set up the kind of controlled experiment you’d need [to scientifically prove a hypothesis]” (p. 135). Given the relatively small sample sizes here, for instance, information about the participants’ prior use of the library mobile site cannot be extrapolated to the UNC student population as a whole.

The primary advantage of the study is that it is informative. The methods included are relatively accessible ones that could feasibly be applied by practitioners, even given a limited budget and timeframe. In addition to its results as to the usability of the website in question, this study also provides a starting point for practitioners deciding how to design a usability study of a mobile website of their own.

4. RESULTS

4.1. PARTICIPANT PRIOR EXPERIENCE AND EXPECTATIONS

The results presented in this section are from the pre-session questionnaire, which asked about participants’ prior use of the UNC library website and of mobile sites generally. Because participants were required to own a touch-screen smartphone, it could be assumed that the users tested were fairly technically savvy. This assumption was apparently borne out in the results of the question asking about frequency of mobile web browsing. Of the 14 participants, 12 answered that they used a mobile phone to access a website “daily or almost daily” (Figure 5).
Behavior during the session also supported this self-reported experience. All participants demonstrated facility with touch screen gestures such as scrolling and zooming; some also used less intuitive techniques such as copy / pasting or taking screenshots. When talking about preferred methods for transmitting information as in Task 1 (locate a book and email information about it), participants mentioned a range of technical options making use of different phone features, including in one case an Evernote app. And during the think-aloud protocol and interview questions, users employed language suggesting strong familiarity with mobile conventions and considerations, including talking about optimization (using that word), browsers, and layouts, and in at least one case distinguishing between a mobile site and a mobile app. Overall, the participant group were experienced users with considered opinions about the technology involved.

On the other hand, the users tested did not have any particular relationship to the library and therefore had a less uniform level of experience with the library website. Indeed,
because the desire was to have a somewhat typical group of participants, I purposely avoided recruiting from the library’s undergraduate employees. The participants turned out to be moderate library users overall; eight of the 14 said that they used the library website “a few times per month” (Figure 6). Smaller numbers selected the other options; only one reported using the site “daily or almost daily,” and no one confessed to never having used it.

![How often do you use the UNC library website?](image)

Figure 6

In the follow-up question about how they used the site, 13 of the participants mentioned some variation of looking up books, articles, and other resources. Two mentioned looking up hours, and one said they used the site primarily for booking study rooms.

While all participants had at least some experience with the library website, most reported not having used it in a mobile context before. To the question “Have you ever used the UNC library website on a mobile phone / device before?”, nine of the participants answered no; four answered yes (one of them specifying “once”); and one answered “Probably?”. Of the four who had used the site on a mobile device, three mentioned looking up hours and one
mentioned reserving a study room. Only the respondent who said “Probably “ mentioned “Searching on the catalog.” The participants’ experience using the site in a mobile context can thus fairly be characterized as limited, and substantially different in purpose than their reported use of the site outside of that context. No one reported having used the site for research while on a mobile device.

While the question did not specifically ask this, it also seems clear that even among those with some prior mobile usage of the library website, no one had previously used the mobile site specifically. As the discussion of Task 1 will show, the overwhelming majority of participants did not find or use the link from the full to the mobile version of the site. Although the mobile site is publicly accessible, there is no way that users can reach it without using that link (or even more unlikely, typing in the mobile URL directly). Indeed, several participants made comments indicating that they had not known that the mobile site existed. One commented that even after having used the mobile site in the usability test, they were not sure how to reach it. The library’s mobile site was therefore new territory for all participants, with a few having previously used the full version of the site on their phones. Any prior familiarity with the tasks came from the context of the non-mobile site or general awareness of the library’s services.

The final question on the pre-session questionnaire was “What features or information do you expect that the library’s mobile site will contain?” Out of the 14 responses, 10 mentioned specific types of content, including:

- The catalog, or item location / availability (9 responses)
- Hours (6 responses)
- Other library info, including location and what’s there (3 responses)
- E-research tools or online documents (2 responses)
- Account access, for renewing or reserving books (2 responses)
• Contact info (1 response)
• Ability to reserve study rooms (1 response)

Five responses speculated about the relationship between the mobile and full websites. Of these, most had high expectations for comparable functionality (“Most if not all of the normal site”; “Everything the non-mobile version contains in terms of functionalities”; “The same means of narrowing searches as the website”). One of the comparison-based responses speculated about the layout rather than the content (“More concise layout so that it’s more accessible on a small screen”). Four responses discussed usability directly, with comments focused on ease of navigating, reading, pressing buttons, and accessing the search bar.

4.2. Task 1

“You need to find a copy of a book for a class you’re taking. The title of the book is Eating Animals. You want to see if the library has a copy of the book that you can use.
> Use the UNC library website to find the book Eating Animals.
> Tell me if it’s checked out or available.
> Send the information about the book to mobile-lib@unc.edu.”

**OPTIMAL PATH**

The first task involved three subsections:

• Finding the book required use of the online catalog. In this case a simple search would suffice, because the correct book appeared at the top of the results when its title was used for the search.

• Determining the book’s availability was slightly more complex, because the catalog contains two listings for Eating Animals. For the duration of the study, all copies from the first listing were checked out. However, at least one copy from the second listing (for the Undergraduate Library Browsing Collection) was checked in.
• The last subsection required finding and using the “email this item’s info” option offered within the catalog.

Because no starting point was specified for this first task, participants could use either the mobile or the full site. There were therefore two separate paths that would allow completion of all parts of the task:

**Option A: Full site.** Starting on the library homepage (1; Figure 7), search using the catalog.

Predictive search results appear as you are typing (Figure 8); these can optionally be used but do not affect the number of pages visited. Another option is choosing an “In Title” search instead of an “In Keyword” search, which again does not affect the path forward. The next page is the search results list (2). From here, it is possible to see the availability of each copy of the book (Figure 9). To access the email form, however, it is necessary to visit the item details page (3; Figure 10). At the top right of the page is a set of options including a link titled ‘Email’ (Figure 11). Clicking the link opens a div containing a form, with a required email address field and optional subject line field (Figure 12). Once the email has been sent, a confirmation message appears in the div, which can then be closed.

*(Total pages: 3; unique pages: 3)*
Figure 7: Full site home screen

Figure 8: Predictive search

Figure 9: Full site search results

Figure 10: Full site item details page
**Option B: Mobile Site.** Starting from the library homepage (1), choose the link at the top that says, “On a mobile device? Visit [http://www.lib.unc.edu/m](http://www.lib.unc.edu/m)” (Figure 13). This leads to the mobile site homepage (2; Figure 14). From there, choose the Catalog option (Figure 15) for the catalog search page (3; Figure 16). There are no predictive results on the mobile catalog, but there is still the option to change from a keyword to a title search. The search results page (4) shows title and author only for each listing (Figure 17). It is necessary to go to each item’s details page to see whether it is available; in this case, since there are two listings, you have to click on the first listing (5), check its availability, go back to the search results page, click on the second listings (6), and check its availability. Under the list of locations, there is a link to “Email this item’s info” (Figure 18). Unlike on the full site, this leads to a new page (7) instead of just opening a popup (Figure 19). Once the email is sent, the confirmation message is also its own page (8).

*(Total pages: 9; unique pages: 8. Excluding the full homepage, 8 total / 7 unique)*
Figure 13: Link to mobile site (highlighted)

Figure 14: Mobile site home screen

Figure 15: Catalog menu option

Figure 16: Mobile catalog
Figure 17: Mobile catalog results

Eating animals, by Foer, Jonathan Safran, 1977-

Eating animals, by Foer, Jonathan Safran, 1977-


Figure 18: Mobile item details page

Eating animals
Author: Foer, Jonathan Safran, 1977-
Notes: Includes bibliographical references (p. 271-331) and index.

Locations:

Undergrad Library Browsing Collection

Call #: Foe
Checked Out, due 06-28-2012

Undergrad Library Browsing Collection

Call #: Foe
Checked Out, due 07-10-2012

Email this item's info
Text this item's info
Task 1 was the only task with no specified starting point. Aside from testing use of the catalog, another goal was to see whether participants would find and use the link that directs from the full to the mobile site. For those participants who asked where to start, I said that they should get to the library website as they normally would if they wanted to use it. Of the 14 participants, 6 used the browser’s search bar to search for the site and clicked through from the results. Seven typed the library website’s URL into the browser’s address bar from memory. The remaining participant went to the bookmarks page looking to see if the library website had been stored, found the link, and followed it.

The use of bookmarks proved somewhat problematic for the study. Both the full site and the mobile site were bookmarked in Safari to facilitate providing users with the correct start page in subsequent tasks. However, the existence of these bookmarks meant that users who
started typing the library URL in the address bar were then provided with both bookmarked pages as predictive search options. Most chose the first option, which was the full site, and proceeded as normal. However, two users (one starting from the address bar, the other from the bookmarks page) chose the link directly to the mobile site, thus bypassing the step of clicking through from the full site to the mobile site. All users who opted for search landed on the full site, as this was what the Google result linked to.

In total, 12 users landed on the full library site, and 2 landed on the mobile library site. Of the twelve who landed on the full site, one saw and clicked the link to the mobile site, which was then used for the first task. Of the two who landed on the mobile site, one saw and clicked the “View full site” option, so the full site was then used for the first task. Of the 14 participants in the study, then, 12 used the full site for the first task, and 2 used the mobile site. Given these numbers, it would have been better to vary the order of the tasks so that the books search was not always performed on the full site. As it is, this study does not provide a substantial evaluation of the mobile catalog’s usability, since only two participants interacted with it.

**SUCCESS RATE AND NAVIGATIONAL PATHS**

Task 1 proved the most difficult section of the study. Of the 14 participants, only 5 were able to complete all three subsections of the task (35.7%). All participants were successful in completing the first step by finding the book (100%). For the second step of determining whether a copy was available, though, four participants (three using the full site, one using the mobile site) only looked at the first listing and therefore missed the available copy in the UL Browsing Collection (71.4% completion). For the final step, only 6 participants (including both mobile site users) were able to locate and use the email form (42.9% completion). Seven of the 8 participants who did not send an email had never clicked through to the item details page and thus did not realize that there was a form available. Of those seven, five attempted to use the
iPod’s email application to send the information. The remaining participant in this group did find and attempt to use the form, but was unable to successfully submit it due to technical problems (see “Errors and Problems” below).

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Found book</td>
<td>14</td>
<td>0</td>
</tr>
<tr>
<td>Found available copy</td>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td>Sent email using form</td>
<td>6</td>
<td>8</td>
</tr>
</tbody>
</table>

**Figure 20: Success across parts of Task 1**

Since no email account was set up to use in the phone’s email app, users who did not find the email form had no alternate way of actually completing the last part of the task. Instead, I asked them to describe what they would do to complete the requirement if their email accounts were available. These users demonstrated a good deal of technological ingenuity in describing ways that they would send the information to themselves. Four said they would copy and paste the information (although one of these then had trouble with the copy / paste functionality in the browser when attempting to demonstrate). Two said they would take screenshots of the search result to attach to the email. One found Safari’s built-in option to mail a link to the page. While any of these options would have worked fine given an operational email app, these participants had all been unable to find the email function that the task was intended to test. (One actually noted the apparent lack of such a function on the page being viewed: “I just, I don’t see anything on here to just email, so that’s what I would do is just take a screenshot of it”). I therefore did not count these responses as fulfilling that segment of the task. A number of users, both successful and unsuccessful, did also mention that outside of the context of the task, they would probably opt for some method other than email of capturing the information with their phone—several mentioned texting, but there were also users who said
they would just save a screenshot, type in the call number for later without sending it, or store the information in an Evernote account. Overall, the stated preferences for, and apparent ease in devising, other transmission methods call into question the importance of offering a purpose-built email option (although it is possible that the option is more popular among other audiences).

Counting the pages visited for this task posed a couple of challenges. I opted not to count any steps participants took that involved leaving the browser—so for the five participants who actually entered the email app in search of a way to complete the final part of the task, I did not count any of their activity there. All of these participants were in the group that did not visit the item details page and did not successfully send an email. For those who used the email form, I did not count it or its confirmation message as pages on the full site, since the form opened and operated within the existing page. On the mobile site, however, the form constituted a separate page, and so I counted it toward the total.

As described above, then, a full site user needed to visit 3 total / 3 unique pages to complete all parts of the task. Figure 21 shows the different numbers of pages visited by each participant, along with their success on each part of the task. Of the 12 participants who used the full site, four followed this ideal path (counting the one who started on the mobile site and switched). Another five visited only the homepage and the search results page, for 2 total / 2 unique pages. The remaining cases were all unique. One user unintentionally clicked on a link and immediately went back. Another clicked on the Google Book Preview link to see what that was, then returned to the search results page. Both of these users ended up with 4 total / 3 unique pages without ever having visited the item details page. The final participant in this group clicked through to both item detail pages instead of just one, for 5 total / 4 unique pages.
This participant successfully completed all three parts of the task, so while not strictly necessary, the extra effort was not ultimately harmful.

<table>
<thead>
<tr>
<th>Participant</th>
<th>Part 1 success</th>
<th>Part 2 success</th>
<th>Part 3 success</th>
<th>Total pages</th>
<th>Unique pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>P2*</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>P3</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>P6</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>P7</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>P8*</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>P9</td>
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<td>No</td>
<td>No</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>P10</td>
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<td>Yes</td>
<td>No</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>P12</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>2</td>
<td>2</td>
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<tr>
<td>P13*</td>
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<td>Yes</td>
<td>Yes</td>
<td>5</td>
<td>4</td>
</tr>
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<td>P14</td>
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</table>

<table>
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<tr>
<th>Mobile site users</th>
</tr>
</thead>
<tbody>
<tr>
<td>P4</td>
</tr>
<tr>
<td>P5*</td>
</tr>
</tbody>
</table>

* = successful on all parts of Task 1; green = used ideal path for their context

Figure 21: Task success and navigation paths

A user starting from the mobile site would need to visit 8 total / 7 unique pages to complete all parts of the task. One of the two mobile users followed this pattern exactly. The other only visited one of the two item details pages, therefore missing the available copy of the
book, and ended up with 6 total / 6 unique page views. Since there were only two mobile site users, it remains unclear if one of these experiences is more typical than the other.

**ERRORS AND PROBLEMS**

For this task, by far the most frequent error on participants’ part was not going far enough to complete the second and / or third part of the task. Eight total users (57.1%) did not visit all of the pages required to complete the entire task for their version of the site. Lostness was less of a problem. Only three participants visited unnecessary pages, and of those, one was the result of an unintended click (more of a mechanical error than a navigation error). The full site user who visited both item details pages was arguably not lost, since the pages were relevant to the task, but simply taking a longer path than was necessary. Only the participant who clicked through to the Google Books page seemed to be legitimately confused about where to go, and that participant quickly returned to the library website. Perhaps reflecting the lack of an overall sense of lostness, the only participants who used the Back button on this task were those three, plus the successful mobile site user—in that last case, it was necessary to navigate backward to check both results, and so in that context the Back button did not indicate any error or confusion.

The five participants who did find the email form on the full website encountered substantial technical difficulty using it. The form appears in a popup that seems to be positioned to appear in the middle of the page. This works as expected when using the full site on a larger monitor, or when using the full site on the iPod without zooming at all. However, when the screen is zoomed in enough to read the text and accurately click on the link, the popup behavior becomes difficult and confusing. Problems included the form opening out of view, making it seem as if the link didn’t work (Figure 22); the form elements flickering in and out of view as users typed, making it difficult to tell whether any information was actually being entered; and,
when it came time to hit ‘Send,’ the form repeatedly snapping into position so that the send button was off-screen. The form behavior made it resistant to efforts to scroll it into view, and several participants tried strategies such as holding the form in place with one hand while attempting to press the button with the other.

![Image](mp_p8.mov)

**Figure 22**

Ultimately, four of the five participants who tried to use the form did ultimately succeed in sending an email, but the time on task (the one case in which time was unambiguously telling) hovered around 2 minutes, just to type in the email address and hit send. Outside of the testing context, it seems highly unlikely that many users would have persevered for so long. This was the main technical problem encountered during the study. The two participants who used the email form on the mobile site encountered no difficulties.
**TASK PERCEPTION AND SATISFACTION**

Although most participants were not actually able to correctly complete all three aspects of the task, most of the breakdowns happened in ways that were invisible to the user. Participants who did not find the available copy of the book obviously did not realize there was an available copy they had overlooked. In the case of the email portion of the task, it seems likely that participants did not assume there was a specific email function they might have used. When asked on the post-task handout how much they agreed with the statement “I successfully completed that task,” only two participants marked anything less than “Agree” (Figure 23). These two were the participant who gave up on the email form and the participant who commented specifically on being unable to find an email option. For the most part, participants did not know what they were missing.

![I successfully completed the task](image)

**Figure 23**

On the two measures of post-task satisfaction, responses were somewhat less positive. Whereas a majority of participants were confident that they had completed the task, fewer
were as confident that the website had made it easy to do so (Figure 24). Even fewer said that they “strongly agreed” with the last statement, “I liked the interface that I used for this task” (Figure 25). A strong majority still chose “Agree”; nevertheless, this was the least positive overall response to any of the post-task questions, across all four tasks.

![Graph showing the website made it easy for me to complete the task](image)

Figure 24
Aside from the factors already mentioned, there were a few other points of interest for this task. Of the 12 participants who used the full version of the site, all 12 zoomed in order to complete the task. It would have been quite difficult to complete the task otherwise; however, zooming in often contributed to overlooking page elements that were now offscreen.

Of those same full sites users, 9 (75%) made use of the catalog’s predictive search results by tapping the book’s title when it appeared rather than waiting and hitting ‘Search.’ No equivalent functionality was available in the mobile version of the catalog.

Exactly half of all the study participants (n=7) made use of the option to perform a title search instead of a keyword search. This group included both of the mobile site users.

Finally, out of the ten users who found the available copy of the book, eight (80%) made some mention of its location in the Undergraduate Library Browsing Collection. Most of these comments indicated some degree of confusion as to what the Browsing Collection was.
PARTICIPANT COMMENTS

What was helpful (full site): When asked what about the website had been helpful for this task, users of the full website commented on the fact that the catalog was central on the homepage when they arrived there:

“The search bar's right there in the middle of the page, so you don't have to look to where you're going to have to type that in.”

“It was helpful that the catalog was right on the main page – like usually people go to the library to find books, so that's very helpful.”

One participant commented on the predictive search:

“It was good that once you start typing in the book that it popped down just like it would, um, like on the regular, on the real website.”

What was not helpful (full site): When asked what about the site had not been helpful, participants did not always mention issues that had clearly been annoyances during the task. For example, not everyone who had struggled with the email form mentioned that, and those who did were polite in their phrasing (“...but I've never tried to send something via email, so, um, I guess that's something that could be fixed”; “Um, it seemed like that didn't work well, at least here”). Most of the other criticisms had to do with the typical pains of trying to navigate a non-mobile site on a mobile device, especially the excess of content on the page and the need to zoom:

“There's too much information that I don't care about, so all I need is whether you have the book or not. Especially if the screen is so small.”

“It was really busy, so if it was a simplified version of the website, that would be easier.”

“I think the sizing of the page on the mobile site, it wasn't like optimized for mobile really [...] so I had to like expand and close it to get a better view of it.”

One participant described confusion over the fact that there were two listings for the book in the catalog, and others made similar comments during the task:
“It seemed like there was two different, um, of what appeared to me to be the same book.”

“I’m just personally not sure why there would be two different listings.”

"I'm seeing two of them, which is confusing.”

**What was both (full site):** Many of the participants assumed that what they were using was in fact the “mobile site,” and so there were several comments on its similarity to the full site. This was described as both a good and a bad thing, in at least one case by the same participant:

“Well, I guess this could be both, um, the same. What was helpful is that it looks just like the UNC website that I use on my computer. But I don't know, maybe in the same token that could be something that was not helpful, too, just because I guess when I think about iPhone apps, I think about them as a simpler version of the website.”

A couple of others mentioned the site’s familiarity as something helpful:

“It was good that it was like basically the same as the normal website, because I know how to use that.”

“Well, it appeared exactly like it does on computers...I was familiar with like how to search for things.”

On the other hand, the root of almost all the criticisms for this task was the fact that participants were using a site that was not really optimized for mobile.

**The mobile site:** Since there were only two participants using the mobile site, their comments were fewer—but they were positive. Both participants focused on the format and the ease of use:

“I like the list. I guess the list versus buttons is probably a good idea.”

“I did like how when we pulled up the book, all the options were right there. Like I didn't have to search for the option menu or something like that.”

“I mean, what’s helpful, in any mobile website, is that it's not, um, it doesn't have the layout, it's more of just options. So it's more like an application as opposed to a normal page. So things are easier to, you know, sort through and, you know, search tools are a lot easier, more clear.”

“It couldn't have been more straightforward.”
The sole criticism, focused on design, came from a participant for whom design is a “key interest”:

“I don’t know if you can put like a background or the UNC logo at the top instead of just saying Home [...] I just think, you know, for people that are looking at the website, I mean the website just looks really professional, so they expect the mobile app to be, you know, to look really professional too.”

4.3. TASK 2

“You need to use some books for a paper, and most of them are over at the Art Library. You’re trying to figure out if you can make it there after class today. Use the library mobile site to find out how late the Art Library is open before they close tonight.”

OPTIMAL PATH

The second task was much more straightforward than the first. All participants were instructed to start from the mobile site homepage, and more so than for any other task, there was truly a single best path to take from there. Starting at the mobile homepage (1), the first menu option is Library Hours (2; Figure 26). That page in turn is a menu of options, with the largest libraries listed out individually and the smaller libraries combined into a “Branch libraries & departments” option (Figure 27). The Art Library is included on that page (Figure 28). From Branch Hours (3), selecting Art opens a new window that takes you off of the mobile site and to the non-mobile-optimized hours page for the Art Library (4; Figure 29). The required information is available there.

(Total pages: 4; unique pages: 4)
Figure 26: Library Hours menu option

Figure 27: Hours page

Figure 28: Branch hours page

Figure 29: Art Library page
SUCCESS RATE AND NAVIGATIONAL PATHS

Reflecting the relative straightforwardness of this task, the success rate was much higher here than for task 1. All 14 participants completed the task accurately (100%). Twelve of the 14 followed the optimal path to complete the task (85.7%). Of the two others, one accidentally double-clicked from the start page, which led to selecting the wrong option from the Library Hours page. This participant was immediately aware of the error and backtracked to the correct page; this error was mechanical rather than indicative of lostness. The other had more trouble, first accidentally clicking through to the catalog (a similar mechanical error), then getting confused at the Branch Hours page and backtracking several steps. This participant only visited one excess unique page, and that one was unintentional; however, the confusion about “Branch libraries & departments” led to 10 total pages visited (including the retreads), for an overall 10 total pages / 5 unique pages. These two participants were the only ones to use the Back button on this task, indicating a low overall level of lostness for task 2.

ERRORS AND PROBLEMS

The only errors in completing this task were the two already mentioned. The site itself also did not present any substantial technical problems. The wording of the Library Hours menu did give many of the participants pause, as reflected in the participant comments below. Six participants (42.9%) made some reference in the think-aloud protocol to the fact that they were unsure or guessing about whether the Art Library was under Branch Libraries & Departments. However, only one participant was confused enough to backtrack, and no one actually made the wrong selection.

TASK SATISFACTION

The responses to the task completion question for this task were almost unanimous:
Figure 30

The responses to the other questions were also quite positive:

Figure 31
Other factors

The one other factor of note for this task was that the final page was not part of the mobile-optimized site. This did not cause any apparent confusion. However, the task structure eliminated one source of potential problems: since the Art Library page opened in a new window, the Back button in Safari would not return users to the library hours page. Since the task ended on this page, participants did not have to try to figure out how to get back to the mobile site, which may have otherwise been the main potential problem with navigation. Of the 14 participants, 6 opted to zoom in on this page (42.9%), and the rest did not.

Participant comments

What was helpful: All of the participants reacted positively to this task. When asked what was helpful, they used words like “straightforward,” “self-explanatory,” and “easy.” Most of them commented on the ease of navigation and the prominence of the Library Hours option:
“This website was definitely more useful. It’s categorized in a way that’s simple and intuitive, so I just have to click on the relevant and correct category and I’ll be able to get the information I need easily. Especially for this task.”

“I liked it because it already had a shorter menu there, so it wasn’t like a whole lot of things to look up.”

“It just has everything laid out really easy for you to find. That was even easier than the actual website for finding hours.”

**What was not helpful:** There were relatively few criticisms of the site for this task, all centered around the wording of the Library Hours menu:

“I guess the one confusing thing is that when I click on Libraries that it’s not mentioned [...] I mean, maybe just a simple reword, to ‘Additional libraries’ or ‘Other libraries’ [...] just, ‘Branch libraries and departments,’ I was just unfamiliar with the language there.”

“But then once you hit hours, it gets a little bit more confusing as to where the different libraries are listed. Especially if you’re unfamiliar with what library would fall under what department.”

### 4.4. Task 3

“Your math professor has said that the solutions manual for your textbook is at the library. You’ve already looked it up and gotten this information:

- **Title:** Swokowski/Cole’s Precalculus Functions and Graphs: Student solutions manual.
- **Location:** Undergraduate Library Reserve Textbooks
- **Call number:** QA331.3 .S95 2008 Suppl.

Based on that info, you’re not sure how to find the book, so you decide to ask someone from the library for help. Use to library mobile site to ask someone how to find the book you need.”

**Optimal Path**

To complete this task, the idea was for the participant to actually be able to contact a librarian in real time, which is possible through two options: IM and text message. Starting on the mobile site homepage (1), choose IM / Text a Librarian (2; Figure 33). That page presents a menu item for each of those options (Figure 34). Choose IM (3) and a new window opens with the chat window (Figure 35); or, choose Text (3) and theoretically Messages should open (Figure
36), but on the iPod it gives a browser error message instead (Figure 37). For the IM option, all further interaction happens within the chat window.

(Total pages: 3; unique pages: 3)
Figure 35: Chat window

Figure 36: Text screen
SUCCESS RATE AND NAVIGATIONAL PATHS

The wording in this task was chosen to avoid priming participants as to which menu option to choose; it avoided the words “contact,” “text,” or “IM” in favor of the more generic “ask someone from the library for help.” Given that wording, there were several options that a participant might reasonably have believed to fulfill the task. I therefore counted as successful attempts that used a variety of options. In the context of this study, which used an iPod rather than a phone, texting was not possible. However, it should otherwise have been a valid way of completing the task, so here I count as “completed” any attempt that successfully navigated to the “Text us” option, as well as any attempt that navigated to and made use of the IM feature. I also count as complete one attempt in which the participant chose “Contact and Find Us”
instead of “IM / Text a Librarian.” This is also a valid way to seek research help, since phone numbers for all of the libraries are listed on the page and hyperlinked to be easily dialable. However, it is not as direct a method of contact as either of the other two options, which both are routed directly to a reference desk.

Given these counting conditions, all 14 participants successfully completed this task (100%). All followed the optimal navigation path for their option, including the participant who chose “Contact and Find Us” (2 total / 2 unique pages in that case—everyone else visited 3 total / 3 unique pages). No participants used the Back button, and there were no apparent problems with lostness.

Eleven of the participants (78.6%) chose the IM option, versus two (14.3%) who chose the text option. This imbalance may have been influenced by participants’ knowledge that the iPod lacked full phone functionality, so it should not be taken as indicative of a strong preference for IM over texting under more realistic conditions. However, it does seem safe to say that the wording on the menu also influenced choices in the direction of IM. The IM menu option is followed by a note saying “(works best on smartphones)”, and several participants commented on that note as a reason to choose IM during the think-aloud protocol. A representative comment was, “It looks like IM works best on smartphones, so I’ll do that.” On the other hand, two participants explained their choices in terms of preferences between the communication methods. One of them chose IM due to the iPod’s limitations but would have preferred to text because “I feel like IMing is kind of outdated now.” The other chose IM because “it seems cool.” Further research would be needed to make any kind of definitive statement about these preferences.

**ERRORS AND PROBLEMS**
There were no substantial navigation errors on this task. One factor of interest in the task design had been whether participants would see the IM / Text option on the menu, or would immediately select the Contact & Find Us option which was listed sooner. Almost all participants did select the IM / Text option, although many did also mention at least some brief confusion between the two (see Participant Comments below).

There were also no serious technical problems with completing this task for those who used the IM option. These participants were able to successfully conduct conversations with the librarians on chat duty. The one point of difficulty was the set of buttons offered in the IM window (Figure 38). First, there is a green Send button that is part of the chat feature itself. Using that button both closes the keyboard (which occupies much of the screen while typing) and sends the message that was typed, which makes the Send button on its own the most efficient option. Within the keyboard, there is another button labeled Done; clicking this button closes the keyboard but does not send the message. Finally, there is also a button on the keyboard labeled Return, which sends the message but does not close the keyboard. For some participants, the difference among these buttons caused at least minor confusion, although it did not prevent anyone from completing the task. The greatest difficulty was encountered by a participant who used the Return button. Although this did actually work to send the message, the fact that it did not retract the keyboard meant that the sent message was not visible onscreen, leading to uncertainty about whether it had worked. The participant did figure out that hitting Done would close the keyboard and continued using the two buttons in sequence, but commented, “This is a little tricky, that you have to exit the keyboard thing to see the screen.” More commonly, participants used the Done and Send buttons in combination. This was slightly less confusing, since the message remained visible after hitting Done, but at least
one participant expressed surprise that the message had not actually been sent yet. Few participants used the Send button on its own.

![Image](image.png)

Figure 38: Chat window button options

**TASK SATISFACTION**

Again, all participants were ultimately successful on this task, and the post-task questionnaire reflects this. Solid majorities of participants chose “Strongly agree” for both “I successfully completed the task” and “The website made it easy to me to complete the task,” and no one chose less than “Agree.” The responses to “I liked the interface that I used for this task” were slightly less strong, with more “Agrees” and a “Neutral,” but “Strongly Agree” still received the majority of responses.
**Figure 39**

I successfully completed the task

**Figure 40**

The website made it easy for me to complete the task
PARTICIPANT COMMENTS

What was helpful: Many of the participants had either not heard of or not used the IM-a-Librarian feature before (even outside of the mobile context), and so several comments focused on the usefulness of the feature itself rather than its mobile implementation specifically. Otherwise, most of the comments on what was helpful focused on the ease of finding and using the IM feature:

“With this short menu here, I was able to just go straight to it.”

“I just really like the mobile interface, because everything's laid out like that. You don't really have to look anywhere, it's right there.”

“That was kind of just very straightforward as to what to do to get help.”

“Once again, on the home screen, it was just one of the options that was - one of the first things you see. You don't have to look for it or anything. I would never have thought about doing that if it weren't really obvious that you could click on that, on the home screen.”
One participant also commented on the fact that the chat box opens in its own window:

“It connected me to the chat box, which is really all I needed, so it's good to have the whole chat box on the screen.”

**What was not helpful:** As with Task 2, the majority of comments for this task focused on aspects of the site that were helpful. Among the comments about what was not helpful, the most common theme was confusion on the main menu between “Contact & Find Us” and “IM / Text a Librarian”:

“The only thing that might have thrown me off a little bit was the Contact & Find us, because that's what I almost clicked first.”

“I saw the Contact & Find Us and I was going to do that one, but then when I saw IM / Text a Librarian, I knew that that was more direct.”

“That was a little confusing. If they were closer together, that would be more helpful. [...] Because I would have gone to Contact & Find Us first.”

“If it said like Contact Info, then that would have maybe signaled to me exactly what that was.”

There were also a few comments about the difficulty of typing on a mobile device. While this is not a factor specific to the library’s site, it may affect overall willingness to engage with the relatively typing-intensive chat feature. Another comment noted confusion about the buttons used within the IM feature itself, as discussed above:

“But when typing - after typing the message I thought I'll just press enter on the keyboard, and then usually I didn't see the green box on top. So yeah, maybe that was the only part that's a bit confusing. Inconvenient or something. Because I thought usually I just press enter and the message would go.”

However, as in Task 1, not every participant who had experienced difficulty with the buttons commented on it after the fact. Finally, one comment said that the only problem was with the design:

“If anything the design I think is just the biggest thing, you know, just colors and whatever else.”
4.5. TASK 4

“You're supposed to meet up with a TA in the Stone Center Library, but you've never been there before. Use the library website to figure out where the Stone Center Library is.”

*OPTIMAL PATH*

To complete this task, participants needed to use the Contact & Find Us option that served as a red herring in the previous task. Starting from the mobile homepage (1), choose Contact & Find Us (2; Figure 42), which contains a list of libraries with a phone number and a map link (Figure 43). Scroll down to find the Stone Center, then choose the map link, which opens a Google Map showing the location (3; Figure 44).

*(Total pages: 3; unique pages: 3)*
SUCCESS RATE AND NAVIGATIONAL PATHS

This task presented only one real option for completion, and all participants followed it perfectly. The completion rate for the task was 100%. All participants followed the optimal path with no use of the Back button. No one demonstrated any degree of lostness.

ERRORS AND PROBLEMS

No significant errors occurred during this task, by either participants or the website. One participant did try to click on the name of the Stone Center Library, which was not hyperlinked, but the lack of a linked page for the library did not seem to cause any general confusion.

TASK SATISFACTION

Again, reflecting an accurate assessment of the success rate for this task, most participants chose “Strongly agree” for both “I successfully completed the task” and “The
website made it easy for me to complete the task.” As on other tasks, the ratings for the interface were not quite as overwhelmingly positive, but all participants still marked either “Strongly agree” or “Agree.”
OTHER FACTORS

One other factor noted for this task was whether participants engaged in any further interaction with the map after landing on it. This was not necessary to complete the task and was not counted as part of the navigation path, but some participants did make use of additional options to gain a better understanding of the locations shown on the map. Five participants (35.7%) zoomed in; one did not zoom but scrolled; two used the Directions option; and one interacted with the pin showing the location of the Stone Center. Seven (50%) did not interact with the map further after it had loaded.

PARTICIPANT COMMENTS

What was helpful: There were several themes in the comments about what was helpful for this task. Again, the ease of navigating the main menu came up frequently:

“Not that many choices on the main screen. I could see all the choices without having to scroll down.”
“The mobile interface right there is just - like, I think that's much easier than anything on the regular website, because it's just right there, you don't have to look through anything.”

“...just that, once again, there was a tab on the homepage, that wasn't hard to find or obscure about anything. It was very simple.”

Many participants commented approvingly on the fact that the page provided a direct link to a live map, allowing access to other map features and ruling out the need to search:

“I didn't have to actually type in the Stone Center in the Google map, you guys have the link for the map, so that was very helpful.”

“I liked that fact that it linked you directly to – it wasn't just a picture of a map, I liked that it linked you directly to the map and showed your position on it as well.”

“It seems to me like it linked right into the map app on the phone instead of just like giving me a map that's kind of wonky to use when you're on your mobile phone. So, I really like that about it. Because it makes it really easy to, you know, just go ahead and find directions.”

One comment noted that the page was optimized to make the map option easy to find:

“I like that I didn't have to drag over the find the word map.”

What was not helpful: Criticisms on this task were fairly minimal. A few participants noted that when going to an unfamiliar library, they would be looking for directions within (not just to) to the building—although they also noted that it would be possible to call for those directions, or that they would expect to see a sign when they reached the building. One participant commented that the wording of the menu item was somewhat confusing:

“Maybe for the Contact & Find Us, maybe say Contacts and Maps or something? Because I guess – just, Find Us in multiple different ways.”

What was both: The format of the Contact & Find Us page came up as both helpful and not helpful. Whereas the Library Hours page lists only the largest libraries and includes the rest in a submenu, the Contact page is an alphabetical list of all the libraries on campus. It therefore
contains all of the needed information but is quite long. On the one hand, several participants said that the alphabetical order made the list easy to understand:

“It’s alphabetical, that’s nice.”

“And then the list of things was in ABC order which is always helpful.”

“It was really helpful that it was all in alphabetical order, so it was pretty easy to find.”

On the other hand, one participant mentioned the size of the list as something not helpful:

“But then because there's such a huge list of the libraries. So I guess it'd probably help with that to select like A-B-C-D at the top, so it helps me get to the library I need instead of just scrolling down and down looking for the library.”

There weren’t many other criticisms of this page after the task, but during the think-aloud protocol another participant did react to the list by saying, “And, whoa” upon page load. Finally, one participant reasoned through why the format of the Hours and Contact pages might be different:

“At first I was surprised that it had the whole list of all the libraries there, because you know, on the other one it was just like Davis, Undergrad. But then I guess thinking about it, most people, if you’re going to the map, you’re going to be looking for the other libraries, you’re not necessarily going to be looking for Davis because every undergraduate knows where Davis is.”

4.6. POST-TASK INTERVIEW

After the tasks were completed, I asked the participants a series of questions about their overall experience using the website. The answers to these were often similar to comments made during the session, but they also often added new information.

OVERALL SATISFACTION

Participants were asked to answer four final Likert-scale questions on a handout. These addressed the website as a whole and asked about ease of use, ease of navigation, clarity of information, and overall satisfaction. For all four questions, all participants marked either
“Strongly agree” or “Agree,” and the majority in each case marked “Strongly agree.” On “It was easy to find what I was looking for on this website,” one participant added a written note saying, “This was great.”

![Figure 48](image1.png)

**Using this website was easy for me.**

![Figure 49](image2.png)

**The information on the website was clear and understandable.**
It was easy to find what I was looking for on this website.

My experience using this website was satisfying.

WHAT WAS EASY
When asked what about the website was easy to use, the responses overwhelmingly focused on the simplicity of the navigation:

“It was very easy [...] the first main menu had all the key information most people would be looking for.”

“Just navigating from the home screen, it was really easy to get wherever you wanted to from the home screen. You didn't have to click on something and hope that directs you to something else. You knew exactly where you were going.”

“I liked the menus. When it was the full-screen menu it was really easy to use.”

“I like the listing part [...] I think the most useful options are up at the top. There's not a whole lot of options, which is great, because I don't have to, you know, search through a bajillion of them. I felt like when I was looking for stuff, the option that I wanted to be there, was. So that's, you know – just a lot of times you have to really search and try to figure out if the option that's there really matches what you want. But this was simple.”

“The sections are really clear. And they're not really long titles, so they make it really easy to look at.”

“I felt that it was fairly straightforward. Just, if you know what you're looking for, then it's pretty clear about where to find it.”

“I just liked that it was straightforward. Everything was clearly labeled, so it seemed liked for each of these sections, I knew exactly where to go just by looking at the title of each tab.”

“It's all pretty easy to navigate. The instructions are pretty clear, like you're not exactly confused about where to find library hours or phone numbers or whatever you need [...] I think it's pretty self-explanatory. I think even if you've never been to a library before you would know what to do.”

“The layout. Everything is in an organized place. It's in logical organization so that, you know, if you want to find hours, there's hours, and more broad like Contact Us, Find Us.”

“Again, I think it was just the fact that it gives you a list right there. There's not any kind of visual separation there, you just kind of read, look down the list and find what you need to find. And again it looks like it's optimized for the website so, you know, you don't have to zoom in or zoom out or anything like that, it's just all right there for you.”

“Just the short number of choices it had. Once again, how I didn't have to scroll down to the website to get all the choices, like I could see everything right there. It wasn't a lot, like it didn't, I guess, make me anxious, or it really didn't take me long to find exactly which category I needed to go to.”
A few comments brought up more specific features of the site. Interestingly, three of these brought up the catalog, with one of them specifying that it was good not to have to fill out many options before searching. Two more responses mentioned the IM or Text options and the convenience of having a librarian on call. Finally, one commented generally on the simplicity of the mobile site:

“Since it's optimized for mobile users it took out all the frills of everything, right, so the information that I don't need. And I'll probably be using my mobile phone to get to information, some essential information, so it helps that it cuts away all the clutter and I'm able to get the information I need easily.”

**WHAT WAS HARD**

When asked what about the site had been hard to use, several participants said that nothing had been hard. Most of the other comments referred back to issues that had already been mentioned, especially on Task 1 (find a book and email its information):

“Just the email thing. But I don't know if anyone ever uses that.”

“That email thing.”

“The main screen when it was really cluttered.”

“I guess the main site was hard to use. But for the mobile site, no, I've got no complaints about it.”

“I was just confused by the language of the way things were worded with the first one, where it was the browsing section versus the ones that you can check out, so I wasn't sure what the difference was.”

“Just probably at the last part where I have to find the Stone Library and do the scrolling.”

“Again I think just the Contact and then the IM / Text a Librarian would be the only, or is the only slight confusion.”

One of the participants who had used the mobile site for Task 1 raised a new issue, about distinguishing the different listings on the catalog search results page:
“The returns on the book, when you're searching for a book [...] On the computer there's more of a separation between them. In here, it's more – especially with the ones with longer entries, it was hard to tell where it ended.”

Aside from these specific factors, one participant commented on the inclusion of non-mobile-optimized pages more generally:

“But some of the other pages, when they're reopened in the browser, it's the full version format again, I need to zoom in. So, I like the ones resized for small screens better.”

Finally, one participant said that the mobile site was easy to use, but they had no idea how to find it:

“Well, that part of the website that we used for the second, or the last three tasks, that was that list of places, I would have absolutely no idea where to find – like that was really easy to use, but I would have absolutely no idea where to find that on the website.”

**LINK TO THE MOBILE SITE**

Along those lines, I also asked participants about whether they had noticed the link from the full site to the mobile site on Task 1. By following up on that point, I wanted to establish whether they had seen and decided not to use the link because they preferred the full site, or whether they had overlooked the link altogether. This question was not applicable for three of the participants, since two had landed on the mobile site, and one who landed on the full site had used the link. Of the remaining eleven participants, all eleven said that they had not seen the link. Of the 12 who landed on the full site, therefore, only one (8.3%) had seen the link at all.

Several participants elaborated on why they may not have noticed that sort of link:

“I don't know, because usually when you get to a mobile site when you search on something from Google, it automatically directs you to a mobile website. And if you need more information, the option is on the mobile site to ask you if you need to visit the full site [...] This works the other way around, and if it directs me to the full site, I probably won't be, I won't know that there's a mobile site available.”
“I mean, what I'm most used to is when websites detect that the person who's using the website is on a mobile phone, it'll automatically switch to a mobile browser.”

“I wasn't really even aware that there was a – because I don't think I get automatically redirected. It's not really what I'm looking for, you know? I'm just usually used to having them kind of redirect me [...] I'm not sitting there looking for some sort of mobile site because it does work.”

“Right here, this screen, is what I was looking, or what I thought it would be once I went to l-i-b dot u-n-c, I thought this would happen, like I thought maybe it would automatically switch over or something, like it would detect I was on a smartphone. [...] Because I guess like when I – the moment I saw that site, I was just going to go straight to find a book.”

In addition, I asked the one participant who used the link to the mobile site about why they had noticed it. The answer was that being in a study about a mobile site had heightened their expectation that something like that might be available:

“Knowing that I was going to have to try to use the mobile app, I did it [...] Otherwise: I mean, I don't know if I would have necessarily noticed it as much. [...] What I'm, what I think most people who use smartphones a lot are used to is being automatically put into that and then a link at the bottom saying Use Full Site. And if you just, you know, don't like the mobile site, or you know, want to look at the way it looks, then you can opt out, but I'm more used to being opted in.”

**Additional Feature Requests**

Each participant was asked, while looking at the mobile website’s main menu, whether there were any additional options they would want to have available if they were using the mobile site. I also noted ideas for additional features that came up during the think-aloud protocols for the individual tasks. Overall, most participants did not suggest any additional features (although this does not necessarily mean that they would not have come up with anything if given more time). Of those who did:

- Two mentioned account access, and another mentioned being able to renew books more specifically.
- Two mentioned being able to reserve a room / study room
• One asked for a “search bar on the homepage.” This participant had not interacted with or noticed the mobile catalog at this point, so it is unclear whether that option would have met the perceived need.
• One participant suggested adding an option along the lines of “‘how to’ – how to understand call numbers, and titles, and just the stuff like that. And the location. ‘What's a call number?’”

**EXPECTATIONS**

When asked how the mobile site compared to their expectations, seven respondents (50%) said it exceeded them, and another three (21.4%) said it met them. Other participants said they hadn’t been sure what to expect, or described what they had expected without specifying whether the mobile site was better or not.

Many participants made more in-depth comments about what they had expected to see. These ranged from something like the full site, to something more like the mobile site, to something radically different from either:

“It was a lot more user-friendly than what I expected...I was expecting actually, you know, like this site [points to non-mobile site] that I see on the computer screen to be on the smaller smartphone, but you guys actually had a main menu.”

“I guess I was just expecting to use the regular UNC site and maybe seeing, like, trying to see if it was even necessary to have a mobile site? [...] But I don’t know, this seems to be a very useful tool.”

“I kind of pictured it just as the website but on the screen, kind of like I used in the first task. But this was pretty simple. It's nice.”

“I guess it matches my expectations, because this is probably what I usually see on mobile sites, especially for this kind of search and directions kind of information that I would need.”

“I think what I expected was buttons, actually, like little images. But I like this better, actually [...] Because I've had a lot of buttons where the logo's just not really understandable and it's like, “‘uh, ok...”

“Um, maybe some icons instead of the straight layout of sections [...] because that's what software would be like in most cases. But I do like this layout, because it's more straightforward in a sense.”
“I honestly expected maybe like icons, like how the home screen of an iPod or iPhone looks. But I actually do like this better, because it's just more in a line whereas icons you have to go through the different rows to find what you want.”

There was one participant who had landed on the mobile homepage for Task 1 but opted to click back to the full site, saying that they were “just more comfortable with the way that computer sites usually are.” At the end of the session, that participant said:

“I need to, I guess, familiarize myself more with the mobile site so I actually use it on my phone from now on. It definitely – I guess the feedback would be, it definitely was easier to use than the full site.”

Along those lines, another participant noted:

“It's better than I expected. I think a lot of mobile sites don't actually have all the options that regular websites do, which is why I tend to use the regular websites on my phone [...] What I use it for is looking up books and looking up journal articles, and the catalog is right there and the e-research tools is right there. So that's what I need.”

**OTHER NOTABLE COMMENTS**

Several participants made comments to the effect that having a mobile site was a good idea and / or that they planned to use the mobile site in the future. One participant commented that it would be nice to have available as a downloadable app.

5. **DISCUSSION**

5.1. **OVERALL USABILITY AND SATISFACTION**

Overall, the UNC Library mobile site proved highly usable for the types of tasks covered in this study. This outcome was borne out both by the task outcomes and by the participants’ perceptions. For the four ratings assessing the site as a whole (“Using this website was easy for me”; “The information on the website was clear and understandable”; “It was easy to find what I was looking for on this website”; “My experience using this website was satisfying”), all participants selected either “Strongly agree” or “Agree,” with substantial majorities selecting “Strongly agree.”
It is worth delving into more detail here by separating out Task 1, which in most cases took place on the full version of the website, from the other three tasks, for which all participants used the mobile site. A clear distinction is noticeable, again for both outcomes and perceptions. First, the rate of successful task completion was much different for Task 1 than for the others:

<table>
<thead>
<tr>
<th>Task 1</th>
<th>Task 2</th>
<th>Task 3</th>
<th>Task 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finding book</td>
<td>Availability</td>
<td>Email</td>
<td>Entire task</td>
</tr>
<tr>
<td>100%</td>
<td>71.4%</td>
<td>42.9%</td>
<td>35.7%</td>
</tr>
</tbody>
</table>

**Figure 52: Task completion rates**

All participants completed tasks 2, 3, and 4 accurately. For Task 1, however, success rates dropped off sharply across the different parts of the task.

Since only two participants used the mobile site for Task 1, it is uncertain whether the difference was primarily in the difficulty of using the full site, or whether the task itself was more difficult than the others. However, some observations can be made about how that task plays out on each version of the site. On the full site, an item’s availability can be seen directly on the search results page in the catalog, whereas the email option is available only on the details page. Furthermore, the email link is toward the top right of the details page, which means that a user who has zoomed in to look at the core information in that view will not be able to see it. Finally, as discussed in the results section, the email form proved technically problematic on the full site, leading one participant who did find it to give up on using it, and requiring a perhaps unrealistic degree of perseverance from those who did complete it. On the mobile catalog, by contrast, little detail is given about items in the search results list, so the user has to click through to the details page to find out about availability. Furthermore, most of the information on that page is below the fold, which means that the user also already has to scroll
down to find out about availability. And the email form itself is handled differently here, so that it is much easier to complete and submit. As a set, these conditions mean that a user on the full site is less likely to click through to the item details page in the first place, less likely to see the email option if they do click through, and less likely to be able to complete the email form than a user on the mobile site. Reflecting these differences, both of the participants who used the mobile site for this task were able to find and make use of the email option with little difficulty, while fewer than half of those using the full site even found it at all.

For the second part of the task, determining availability, the situation is less clear. The book used as the query for this task posed some unintended (although not unrepresentative) complications in that it had two apparently identical records in the catalog and therefore showed up in two places in the search results. For the duration of the study, only the second result showed an available copy of the book. So to answer the question correctly, participants had to notice the second entry as well as the first. The format of the full site would seem to make this part of the task easier; since it’s possible to see more information about the item on the results page, including a thumbnail image, it may be more visually obvious when two entries are the same. On the other hand, since it’s optimized for a small screen, the results list for the mobile catalog is likely to be more quickly scannable. To actually read the results page, users of the full site are likely to zoom in far enough that the second result may not be visible. As it happened, 9 of the 12 full site users for this task did notice the second entry and come up with the correct answer. One of the two mobile site users did not. Further study of the mobile catalog would be required to determine how typical it is for users to overlook duplicate results.

The relative frequency of participants not finding needed information made Task 1 an outlier in completion rates. This was also the only widespread navigation problem that came up among any of the tasks. There were very few cases throughout the study of anyone actually
being lost—two instances out of a total of 4 X 14 task attempts, for both of which the user was able to backtrack and finish the task successfully. In another two instances, mechanical errors (such as double clicking instead of single clicking) led someone to the wrong page; both of these mistakes were unintentional and quickly corrected. On Task 3 (contacting a librarian), one participant provided a solution to the task that was workable but not the optimal one; however, that participant did follow the optimal path to reach the given solution. Overall, there were very few problems with navigation for tasks 2-4. Even on Task 1, the problems came from users not going far enough, rather than going to the wrong place. The user perception also matched the numbers on this matter, with ease of navigation overwhelmingly dominating comments about the mobile site’s strong points.

Looking at participants’ ratings of the site task by task, there is again a substantial difference between Task 1 and tasks 2-4. Participants significantly overrated their own performance on Task 1, with most agreeing that they had completed the task (when in fact only 5 had completed all sections). Still, the pattern of responses for that task differs from the others, where almost all participants selected “Strongly agree.”
A similar comparison can be made for the other two statements. For Task 1, even those who had completed the task were (rightly) less willing to credit the website with making it easy
to do so. For the other three tasks, clear majorities again chose “Strongly agree,” and no one chose anything less than “Agree.”

Figure 54
Finally, the statement “I liked the interface that I used for this task” got the worst ratings of the three statements (although they were still fairly good ratings). On this question, only two participants marked “Strongly agree” for Task 1 (one of them a mobile site user); the majority chose “Agree,” which makes this the weakest response on any of the Likert scale questions. For the other tasks, majorities still chose “Strongly agree,” but they were smaller majorities than for the other statements. Consistently across tasks, the interface was rated as less pleasing than easy to use. The reason for this is not totally clear, but it may be related to the simplicity of design that one participant repeatedly mentioned. As a participant who had not otherwise mentioned design said in the post-task interview, “I mean, it doesn't need to be pretty to do all the tasks.”

Given the pattern of the ratings, it is clear that participants had a significantly worse experience with Task 1 than with any of the others, and it also seems clear that this was because they were using the full site for that task. Although they were generally able to make the site work well enough to believe that they had completed the task, they were still well aware of having encountered difficulties. The mobile site, on the other hand, was uniformly perceived as easy to use, and the task results are in accord with that perception.
5.2. TASKS

A few observations can be made about the tasks that were used for this study. The tasks were designed around the existing menu of the mobile site; each task corresponds to one of the
major menu options. As such, they are primarily suited to assess how well the mobile site does what it was designed to do. They do not necessarily provide insight as to what it should be doing, or how well it would meet the needs of a typical user.

Some insight into how realistic the tasks are can be provided by comparing them with participants’ responses to the pre-session question about what they expected the mobile site to contain. The top two responses to that question were the catalog or information about item location and availability, and library hours. Tasks 1 and 2 (finding a book and looking up hours) therefore seem pretty well on target. Other library information including location also came up, which is represented by Task 4. Of the other responses, e-research tools were not covered by the study, since those interfaces are controlled by vendors rather than the library; account access is currently not provided through the mobile site and was therefore not included; and reserving a study room is technically something that would best be done through the chat feature, although that may not be what the participant had in mind. (Chat would also be the best option for reserving a study room through the full library website; on neither site version is there an automated room reservation system or a purpose-built form for reservations.) Otherwise, the ability to contact a librarian was not mentioned as an expectation.

In some cases, I also asked the participants in the follow-up interview if the tasks seemed realistic for what they might be trying to do on a mobile device. I only started asking this question partway through the study, so the results are not consistent; it also seems like the kind of question where respondents might be especially like to answer yes for the sake of being agreeable. This is to say that the responses should be taken with a grain of salt. Given these caveats, most participants said that most of the tasks were realistic, especially the first part of Task 1 (looking up a book), Task 2 (checking hours), and Task 4 (finding a branch library location). For the final section of Task 1, emailing the item’s information, several participants
said that they would probably choose a different method of sending the information. However, the method several mentioned was sending a text message with the call number, and there is also a text option in the catalog that is located directly by the email option and has similar usability considerations. One participant also said that the obvious presence of an email option would make emailing the information more likely:

"Because I didn't see that option right there to just email myself this info, then I'm not really going to think to do that. I'm probably just going to make a note in my phone or something like that. [...] But if that was there, then I would probably be pretty likely to do that."

The other task that was mentioned as less likely was Task 3 (contacting a librarian), with comments that participants wouldn’t normally think to do that or that it would be too much typing on a phone. On the other hand, several participants were able to think of scenarios where it would be useful to be able to message a librarian from a phone, and most seemed to like the idea that someone was available to talk to.

Another question is whether the tasks, realistic or not, were too easy. There was some variation in the difficulty level, with tasks 1 and 3 being more involved than tasks 2 and 4. Nevertheless, almost everyone completed almost every task perfectly, with the exception of Task 1, for which much of the difficulty may have come about from using the non-mobile version of the site. This may simply reflect the fact that, for the kinds of tasks it has primarily been designed to support, the mobile site turns out to be fairly easy to use. Since the study focused on these supported use cases, none of the tasks themselves were terribly complex. For tasks 2 and 4 in particular, there was one right path to follow, and once participants had found it, there wasn’t too much else to figure out or too much other insight to draw. Another limiting factor is that the current mobile site only has a certain level of depth; once you pass that point, you are directed back to the full version of the site, because mobile versions are not available
for all content. Delving more into the most useful potential features for the mobile site would be a good topic for future research and would help establish an appropriate extent for the site.

One more point is that the tasks were all fairly similar in structure: they were known-item searches, looking for a piece of information that had a right answer. Participant comments hinted at how this task type helped to create the positive outcome:

“I just knew Libraries, I already knew what department I was going to, it was just really easy to find.”

“I felt that it was fairly straightforward just, if you know what you're looking for, then it's pretty clear about where to find it.”

The use case that was not covered was one where you don’t know what department you’re going to, where you don’t really know what you’re looking for. This study did not get at more exploratory uses of the mobile site, and it would be useful for future studies to do so.

5.3. MENUS AND SATISFICING

One question of interest for this study was how participants would interact with the mobile site’s menus: would they satisfice by choosing the first likely option, or would they look for the best option available? This question was most relevant to task 3, where the Contact & Find Us option (acceptable, but not the best; Figure 56) appeared before the IM / Text a Librarian option (the better choice; Figure 57).
As it turned out for task 3, almost all participants (13 out of 14) did the latter. Several did mention the presence of both options as a point of confusion, but of these, all chose the IM / Text option. The think-aloud protocols and post-task question showed that Contact had indeed been tempting; several participants said that they “almost clicked” or “would have gone to” it. Considering the full set of options, though, it became clear which one to choose:

“The only thing that would probably, like possibly cause a little bit of confusion is that there's a Contact & Find Us. But again, that's something that, you know, once you look at all the options, it becomes pretty obvious what you're trying to do.”

“I saw that there was a Contact, but that's usually like contact information, and I saw the IM/Text Librarian, and that seemed to be the best option.”
“I saw the Contact & Find Us and I was going to do that one, but then when I saw IM / Text a Librarian, I said that - I knew that that was more direct.”

A key phrase here is “once you look at all the options”; it was an open question whether users would do so.

Not only for task 3, but for all of the tasks using the mobile site, users repeatedly performed what I would describe as an anti-satisficing gesture. Most of the menus used were no longer than the length of the screen, or if so, barely so. Nevertheless, participants repeatedly showed the same behavior: they would start from or land on a menu, drag the screen slightly to scroll the menu and check for other options, then let it snap back into place when it was apparent there weren’t any. Rather than choosing the first thing that seemed plausible, they routinely started by making sure they knew what all was there. Of the 14 participants, the screen recordings unambiguously show 12 using a version of this gesture at least once.

This behavior can’t necessarily be taken as representative, for the simple reason that it happened in a usability study. In this context, with its connotations of being tested, participants may have felt the need to get things “right” in a way that was different from what might have counted as “right” for their own purposes. One participant even commented on this in reference to the Contact Us / IM a Librarian question:

"...although I'm not sure if I read them all first because I knew that this was a study on the thing, or if I – if I was by myself I probably would've just clicked it right off the bat."

It’s hard to say whether the anti-satisficing gesture would have still prevailed outside of a study context. Still, one factor that helps the case is the shortness of the menus, which several participants commented on. The fact that it is possible to see all options without scrolling makes it seem more likely that someone would actually scan them all.

5.4. TERMINOLOGY
The literature review for this study showed that it is common for usability studies in a library context to unearth questions of terminology, whether intentionally or inadvertently. This study turned out to be typical in that regard. As it happened, the main question of terminology that came up was totally incidental to the mobile website being studied; it came up because of the location of the book used as the query for the first task. Most of the participants had not heard of the Undergraduate Library Browsing Collection. Of the ten participants who got far enough in the task to see that name mentioned, five speculated that “Browsing” might mean the book couldn’t be checked out (not true). Three more mentioned uncertainty as to what it was, and one was confused by the format of the call number, which did not follow Library of Congress style as with the other copies of the book. One participant was sufficiently confused to remember and comment on this point at the end of the session, when asked what had been difficult about using the website. As with the related issue of there being more than one listing for the book, which also caused confusion, this is something that isn’t really specific to the mobile site. Nevertheless, it had a noticeable impact on the experience of those who were trying to use the site.

The other issues that came up with terminology were mostly more isolated. One participant suggested changing “Contact & Find Us” to “Contact Info.” After another task, another participant suggested changing the same label to “Contact & Maps.” There was also a suggestion that “Branch libraries & departments” be changed to “Other libraries” or “Additional libraries”—however, even if the wording was a bit obscure, most participants seemed to get the idea as to what they could find there. Other than that, there seemed to be little confusion, and there were several comments in the post-session interview about the labels or sections or instructions being clear.

5.5. FULL SITE VERSUS MOBILE SITE
All but one participant failed to notice the link from the full site to the mobile site. Many landed on the homepage and, focused on the task at hand, immediately zoomed in, ensuring that the link would remain offscreen for the duration of the task. Zoom is not the only reason for the oversight, though. The design likely contributes, as the text of the link is very small and not very prominent on the page. When the link was later pointed out, participants discussed two main reasons why they hadn’t seen it:

- Because they assumed that if there was a mobile site, they would have been directed to it. Several participants explained that they were used to being “opted in” to mobile sites automatically, based on device recognition, rather than having to manually opt into them. Once they landed on the full site, they did not assume that there was a separate mobile site they should be on the lookout for.
- Because they were focused on the task at hand. As one participant said, “The moment I saw that site, I was just going to go straight to find a book.” This could be another instance where behavior outside the context of the usability study, without an assigned goal, might differ. But it seems more likely that users of the site on mobile devices would indeed have some specific goal in mind when they arrived on the site.

Google Analytics data for the mobile version of the site has only been collected starting in April 2012, so there is limited data about the actual use of the mobile site. However, given the difficulty that the study participants had finding it, it seems likely that relatively few people were using it overall at the time the study was performed.

In the comments made during the think-aloud protocols and interviews, participants expressed interest in having a mobile version of the library website available. Several participants expressed the intention to use the mobile site after the study, although one of them expressed confusion about where to find it. And several more made comments to the effect that this was a great thing for the library to be offering (when, in fact, that offering has existed since 2009). At the same time, though, there was clearly no previous awareness among participants that there was any mobile version of the site. The mobile site was rolled out fairly quietly and has not been publicized much recently. The primary means that any user would have for finding
the mobile site is by the link at the top of the full site—which, as this study shows, may often be overlooked.

It seems clear that the mobile site is an offering that could benefit users, and also clear that it is not currently reaching most of those potential users. The satisfaction ratings from this study suggest that, for the given tasks, participants had a significantly better experience using the mobile site than when they tried to use the full site on a mobile device. Participants confirmed that conclusion in their comments after the session: “It seems really helpful, and a lot more straightforward than using the full site on a mobile phone.” Users also had high success rates on the tasks that used the mobile interface, although the study design does not allow for direct comparison with how they would have done on the full site.

One remaining concern is that even if the mobile site provides a generally better experience, it may not be what all users want. In this study, the participant who landed on the mobile site and navigated back to the full site represents that user group. After completing the other tasks, though, that participant admitted, “It was definitely easier to use than the full site.” For people who are uncomfortable with mobile layouts, the “View full site” link seems to be reasonably accessible (or at least the study participant who wanted it, found it). The converse is not true; most participants who used the full site did not see the link to the mobile site.

Automatically directing mobile users to the mobile site, with the option to visit the full site if preferred, would therefore provide more choice to users than the current setup. Judging by comments made about why participants hadn’t seen the redirect link, it would also be a better match for users’ mental models derived from other mobile experiences.

Based on this study, it appears that users would benefit from having easier access to the mobile site via an automatic redirect for mobile devices. Aside from that, more targeted outreach efforts also seem appropriate. Comments during the session suggested that the mobile
site would be viewed as a useful tool, but that can only be the case if potential users know about it.

5.6. AREAS FOR FUTURE RESEARCH

This study was an initial effort, limited in scope due to the timeline and resources of the current project. There are several unpursued avenues that would make useful next steps, both in assessing the UNC Library mobile site and in pursuing mobile usability for libraries more generally:

• Further user research and interview-based task construction. A major limitation of this study is that it asked only what users were able to do on the existing site. It did not first ask in any detail what they would want to do. Research into users’ needs is an important aspect of determining how the UNC’s library mobile site is (or is not) satisfying and useful to end-users.

• More wide-ranging tasks. This study was purposely constrained in the users targeted and the types of tasks included. It would be useful to conduct further studies focused on other user groups, such as graduate students or faculty. Representative tasks for these users may well be different than those targeted toward undergraduate users. It would also be useful to branch out by including tasks that were more complex or open-ended than the ones here, and seeing how users navigate the mobile site when there isn’t one obvious correct path.

• Research into mobile usability methods. An idea for this study, which was scrapped due to time limitations, was to use varying testing conditions based on different methods discussed in the informal literature, to see if the method used affected the nature and usefulness of the results. As the field of mobile usability continues to take shape, this type of research would be valuable for informing the many practitioners and researchers who are interested in conducting some form of mobile usability study.

6. CONCLUSION

This study sought to investigate the usability of a library mobile website. A review of the LIS literature found few published case studies of equivalent usability testing of such websites, and aspects of the methods for conducting mobile website usability tests have not been well established. The focus of the study was the UNC Chapel Hill Library’s mobile website, which had existed since 2009 but had undergone little formal usability testing. Fourteen undergraduate
students completed a set of four tasks based on major sections of the mobile site. Results indicated that the mobile site was very usable for the given tasks, with ease of navigation being a particular area of strength. However, the study also showed that when not specifically directed to the mobile version of the site, users were mostly unable to find it, as they are not automatically redirected there. The study’s most immediate recommendation is therefore to establish an automatic redirect that would make the site more accessible to mobile users. Participant comments indicated that a mobile version of the website would be seen as a valuable offering.

Mobile web user interfaces are still new enough that there are many possibilities for work in this area. The literature review grounding this study shows a field still under development and in constant flux. This study takes its place within that field by drawing on what has already been done. To one side is usability testing more generally, which is an established practice for libraries developing websites and other online services. To the other side is the published literature on mobile development for libraries, which has so far largely taken the form of case studies of mobile projects. There is more to be done in that area still, but the time also seems right for more different ways of looking at the field. This study therefore also takes its place among a constellation of other work that will be done: more comprehensive surveys of user needs, more attention to the specific design considerations of library mobile sites (as opposed to mobile sites more generally), more kinds of usability studies of more sites with different populations and different methods. With all of this work to be done, the best thing to do seems to be to start. This study has been an attempt to do just that.
7. BIBLIOGRAPHY


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**8. APPENDICES**
APPENDIX A: MODERATOR GUIDE

Thanks again for participating in this usability study. My name is Sarah, and I’m going to be walking you through the session.

Before we begin, I have some information for you, and I’m going to read it to make sure that I cover everything. Let me know if you have questions at any point.

The purpose of this study is to assess the UNC Library mobile website. We’re asking people to try a set of brief tasks so we can see whether the site works as intended. I’ll also ask you a few questions before and after the tasks. The session should take 30 minutes or less.

The first thing I want to make clear right away is that we’re testing the site, not you. There are no right or wrong answers here, so you don’t have to worry about making mistakes.

As you use the site, I’m going to ask you as much as possible to try to think out loud: to say what you’re looking at, what you’re trying to do, and what you’re thinking.

Also, please don’t worry that you’re going to hurt anyone’s feelings. We’re doing this to improve the site, so we need to hear your honest reactions.

I won’t be able to answer most questions as we go through the tasks, since we’re interested in how people do when they don’t have someone sitting next to them to help with the site. But if you still have any questions when we’re done, I’ll try to answer them then. And if you need to take a break at any point, just let me know.

During this session, I’m going to record what happens on the phone’s screen and record audio of our conversation. No one except for me, my academic advisor, and a team of three librarians working on the website will see or hear the recordings.

Do you have any questions before we begin?

[***Give them a consent form and a pen.***]

[***Start the recording.***]

[***Give them Participant Handout.***]

Before we start on the tasks, let me get you to answer the questions on the first page of this handout. They’re about your experience with the UNC library website and with using mobile websites.
[***Pause while they complete questions. Ask for clarification on answers if necessary.***]

Do you have any questions before we move on to the first task?

Task 1

[***Hand them Task 1 printout.***]

I’ll read each task before asking you to start on it.

Task 1: You need to find a copy of a book for a class you’re taking. The title of the book is *Eating Animals*. You want to see if the library has a copy of the book that you can use.

> Use the UNC library website to find the book *Eating Animals*.

> Tell me if it’s checked out or available.

> Send the information about the book to mobile-lib@unc.edu.

Remember as you go to think aloud as much as possible about what you’re seeing and thinking.

[***Encourage them to think aloud as necessary.***]

Notes:

Great. Now let me have you answer a few questions about this task. Turn to the next page of your handout, and answer the questions under Task 1.

[***Take phone, clear cache, and set to start page.***]

For this task, what about the website was helpful to you, and what was less helpful?

Great. Let’s move on to the next task.

Task 2

[***Hand them Task 2 printout.***]

Task 2: You need to use some books for a paper, and most of them are over at the Art Library. You’re trying to figure out if you can make it there after class today. Use the library mobile site to find out how late the Art Library is open before they close tonight.

[***Encourage them to think aloud as necessary.***]
Notes:

Great. Now let me have you answer a few questions about this task. Look at your handout, and answer the questions under Task 2.

[***Take phone, clear cache, and set to start page.***]

For this task, what about the website was helpful to you, and what was less helpful?

Great. Let’s move on to the next task.

Task 3

[***Hand them Task 3 printout.***]

Task 3: Your math professor has said that the solutions manual for your textbook is at the library. You’ve already looked it up and gotten this information:
Title: Swokowski/Cole’s Precalculus Functions and Graphs: Student solutions manual.
Location: Undergraduate Library Reserve Textbooks
Call number: QA331.3 .S95 2008 Suppl.
Based on that info, you’re not sure how to find the book, so you decide to ask someone from the library for help. Use the library mobile site to ask someone how to find the book you need.

[***Encourage them to think aloud as necessary.***]

Notes:

Great. Now let me have you answer a few questions about this task. Look at your handout, and answer the questions under Task 3.

[***Take phone, clear cache, and set to start page.***]

For this task, what about the website was helpful to you, and what was less helpful?

Great. Let’s move on to the next task.
Task 4

[***Hand them Task 4 printout.***]

Task 4: You’re supposed to meet up with a TA in the Stone Center Library, but you’ve never been there before. Use the library website to figure out where the Stone Center Library is.

[***Encourage them to think aloud as necessary.***]

Notes:

Great. Now let me have you answer a few questions about this task. Look at your handout, and answer the questions under Task 4.

For this task, what about the website was helpful to you, and what was less helpful?

That’s the end of the tasks. Before you go, I want to ask some final questions about your overall experience using the site. There are a few questions at the end of your handout, and then I’ll ask a few more qualitative questions. Let me get you to start with the questions on the handout.

All right, now the final questions:

-What about this website did you find easy to use?

-What about this website did you find hard to use?

[Follow up on task results as necessary, e.g. ask why they did / did not select the mobile site link in the first task]

-How did this site compare to your expectations before using it? Are there any other features you would want to see added if you were going to use it?

-Are there any other comments you would like to make?

That’s the end of the session. Thank you so much for participating!
[***Stop the recording.***]

[***Take handout. Mark participant # on the handout and moderator guide.***]

[***Give them their incentive.***]

[Participants leaves]

[***Clear cache and browser history.***]

APPENDIX B: PARTICIPANT HANDOUT
Thank you for participating in this usability study. The study will take approximately 30 minutes to complete. I will ask you to complete 4 tasks using the UNC Library mobile website in order to better understand the usability of the site.

**Pre-session Questionnaire**

How often do you use the UNC library website?

- ○ Never or almost never
- ○ A few times per semester
- ○ A few times per month
- ○ Weekly
- ○ Daily or almost daily

> If you do use the UNC library website, what do you typically use it for?

How often do you use a mobile phone / device to access any website?

- ○ Never or almost never
- ○ A few times per semester
- ○ A few times per month
- ○ Weekly
- ○ Daily or almost daily

Have you ever used the UNC library website on a mobile phone / device before?

> If so, what did you use it for?

What features or information do you expect that the library’s mobile site will contain?
**Task 1**

After completing this task, how much do you agree or disagree with the following statements?

<table>
<thead>
<tr>
<th></th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly agree</th>
<th>Don't know</th>
</tr>
</thead>
<tbody>
<tr>
<td>I successfully completed the task</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>The website made it easy for me to complete the task</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I liked the interface that I used for this task</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

**Task 2**

After completing this task, how much do you agree or disagree with the following statements?

<table>
<thead>
<tr>
<th></th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly agree</th>
<th>Don't know</th>
</tr>
</thead>
<tbody>
<tr>
<td>I successfully completed the task</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>The website made it easy for me to complete the task</td>
<td>○</td>
<td>○</td>
<td>○</td>
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<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I liked the interface that I used for this task</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>
**Task 3**

After completing this task, how much do you agree or disagree with the following statements?

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly agree</th>
<th>Don’t know</th>
</tr>
</thead>
<tbody>
<tr>
<td>I successfully completed the task</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>The website made it easy for me to complete the task</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I liked the interface that I used for this task</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

**Task 4**

After completing this task, how much do you agree or disagree with the following statements?

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly agree</th>
<th>Don’t know</th>
</tr>
</thead>
<tbody>
<tr>
<td>I successfully completed the task</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
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<td>○</td>
</tr>
<tr>
<td>The website made it easy for me to complete the task</td>
<td>○</td>
<td>○</td>
<td>○</td>
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<td>○</td>
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</tr>
<tr>
<td>I liked the interface that I used for this task</td>
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<td>○</td>
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<td>○</td>
</tr>
</tbody>
</table>
Post-session Questionnaire

After completing all tasks, how much do you agree or disagree with the following statements?

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly agree</th>
<th>Don’t know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Using this website was easy for me.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>The information on the website was clear and understandable.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>It was easy to find what I was looking for on this website.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>My experience using this website was satisfying.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

APPENDIX C: LIST OF TASKS

1. Find the information about the website’s services.
2. Navigate to the homepage and search for information about the service.
3. Compare the services offered by the website with other similar websites.
4. Evaluate the content quality and navigation ease.
5. Rate the overall user experience.

... (List of tasks continues with similar descriptions)
Task 1
You need to find a copy of a book for a class you’re taking. The title of the book is *Eating Animals*. You want to see if the library has a copy of the book that you can use.
> Use the UNC library website to find the book *Eating Animals*.
> Tell me if it’s checked out or available.
> Send the information about the book to mobile-lib@unc.edu.

Task 2
You need to use some books for a paper, and most of them are over at the Art Library. You’re trying to figure out if you can make it there after class today. Use the library mobile site to find out how late the Art Library is open before they close tonight.

Task 3
Your math professor has said that the solutions manual for your textbook is at the library. You’ve already looked it up and gotten this information:
Title: Swokowski/Cole’s Precalculus Functions and Graphs: Student solutions manual.
Location: Undergraduate Library Reserve Textbooks
Call number: QA331.3 .S95 2008 Suppl.
Based on that info, you’re not sure how to find the book, so you decide to ask someone from the library for help. Use the library mobile site to ask someone how to find the book you need.

Task 4
You’re supposed to meet up with a TA in the Stone Center Library, but you’ve never been there before. Use the library website to figure out where the Stone Center Library is.