Usability Testing by Older Americans of a Prototype Google Map Web Site To Select Nursing Homes

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Abstract

We report a usability study of a prototype Google Maps web site – the “Nursing Home Screener” (NHS) site – intended for locating quality nursing homes. Usability testing was conducted in April of 2008 at a health-related public library computer training class for older adults. A total of ten older adults between 57-83 years of age that had little computer experience participated in the testing. Data from the interviews, surveys, and observation showed that the Google map page was puzzling to the majority of these older adults, who lacked the knowledge and skills to be effective with it. Age-related declines in vision and fine motor skills and the library setting also contributed to these participants’ difficulties in using the NHS site. Based on the testing findings, we suggest a number of design and training guidelines that may help to facilitate older adults’ adoption and use of Web map applications.

1. Introduction

It has been estimated that 35% of American retirees will get some nursing home care in their lifetime [11]. Annually, there are over 3 million admissions to American nursing homes [4]. For these individuals and their families, being able to obtain timely, comprehensive, and accurate information – with relative ease – about the quality of nursing homes is critical in making decisions about nursing home placement. This task is challenging given that there are more than 16,000 nursing homes nationwide from which to choose [3].

The Internet holds great potential for meeting the needs of families and individuals looking for information about nursing homes, given that by April 2006, 73 percent or approximately 147 million of adult Americans have gone online [16]. While older adults’ use of the Internet still lags behind younger age groups, they nonetheless constitute the fastest growing age group of Internet users [17]. Because older adults are likely to be a key target user population of any web site that provides information about nursing homes, it is critical to design senior-friendly web sites to facilitate older adults’ use of the Internet for this purpose.

In this paper we report a usability study among older adults of a prototype Google map web site that aims at providing information about nursing homes in the United States. With the increasing adoption of broadband Internet access (by April 2009, 63 percent of adult Americans have high speed Internet connections at home [15]), the use of electronic maps to find needed information is likely to gain more popularity. Thus, our findings have implications for designing electronic maps for older adults for not only nursing home information but also other information.

Due to age-related changes in motor, sensory, and cognitive abilities [1], older computer users usually make more errors and require more time, practice, and technical assistance than their younger counterparts; however, these difficulties can be at least partly compensated for through senior-friendly computer interface and software [5, 8, 22]. A number of guidelines have been developed for designing senior-friendly computer interfaces and software. Among the most widely used guidelines for web site design are the National Institute on Aging/National Library of Medicine (NLM) guidelines [13], the Section 508 guidelines [19], and the World Wide Web Consortium’s Web Accessibility Initiative guidelines [20]. (The latter two were developed primarily for persons with disabilities but they can be useful with web design for older adults as well. For a comparison of these three sets of guidelines, see [10]). Yet, to our best knowledge, no specific guidelines have been developed for guiding the design of electronic map interfaces for older adults, a gap this study begins to address.

2. NHS nursing home screener Web site

In the United States, nursing homes that wish to be government-funded for their services must meet criteria established by the federal Centers for Medicare and Medicaid Services (CMS). These criteria are enforced by and reported through individual state government agencies. The reporting includes a “Minimum Data Set” (MDS), a per-resident assessment survey every 3 months. From this, CMS derives MDS Quality Measures (QMs) for each nursing home. Since November 2002, CMS has made this information publicly available online, through its “Nursing Home Compare” web site [3, 7]. Yet, because this site in...
2008 presents the searchable data in tabular form, it can be challenging if the user desires quick screening [14]. For instance, to compare three homes, each is selected to appear as a column of a table, whose rows are specific home attributes. The user must then visually compare the three text values in each row, and mentally weigh the importance of each row overall. This is cognitively demanding, and becomes more so for cities with a larger choice of candidate homes. This often compounds the problem posed for the general public by often the unfamiliar terminology of nursing home evaluation developed by professionals [2].

To aid quick and convenient screening of nursing homes by location and quality by not only the professionals but also the general public, NLM, part of the National Institutes of Health, is developing an alternative interface – the “Nursing Home Screener” (NHS) web site [14]. In April, 2008, the NHS site has two relatively separate site components. The first has four initial steps on the home page that screens nursing homes by location (state, town, zip code, or home name) and long/short stay (Figure 1).

Upon completion of these initial screening steps, the user is led to the second component: the map page that shows these initially selected nursing homes on an embedded Google Map, where the user can use additional criteria to further winnow and evaluate nursing homes (While there are web sites, including CMS in 2009, that use CMS data to rank homes in a list, none to our knowledge show multiple ranked homes on a map as NHS does). Each selected nursing home is shown as a marker on a Google map, with each marker having a shape and color representing the ranking of the home on a quality measure. The NHS site allows quick switches among four categories of quality measures: (1) healthcare deficiencies, (2) fire safety deficiencies, (3) staffing level of licensed nurses and certified nurse assistants, and (4) quality of care (Figure 2).

There are three potential target audiences for the NHS: (1) seniors considering a home for a spouse or themselves, (2) middle-aged adult children who seek a home for a parent, and (3) placement professionals who assist the foregoing. We report here, as a collaborative effort between the University of Maryland, College Park and NLM, the first usability testing of the prototype with group 1 (seniors), which is in many ways the most difficult audience. (Concurrently, usability testing with group 2, adult children, was done through a separate collaboration between NLM and Rochester Institute of Technology, and will be reported elsewhere. Specialization for the needs of group 3 – professionals – is for the future.)

3. Methods

3.1. Participants

A total of ten older adults – all native English speakers – participated in the two usability testing sessions of this study. The testing sessions were held on two consecutive days in mid-April of 2008. Four participated in the first, pilot session, and six in the second session. Participants were recruited from trainees of an ongoing, free, senior-oriented, 4-week long computer training class. Participants were between 57-83 years of age (M=69.75, SD=7.87). Six participants had no prior experience with computers before signing up for this computer class, and another 3 participants started using computers and the Internet less than 1 year ago (1 person did not report on this item).

3.2. Task list and data collection instruments

A list of 12 tasks (shortened to 11 after the pilot) was developed, involving manipulation of the NHS site to find specific nursing home information, e.g.:

- “Using the map provided on the screen, please find two nursing facilities near your home. Say their names to your note-taker” (Task #1); and
“Change the background of the map to a photographic or ‘Satellite’ view. Then return to the home page of this Web site” (Task #3).

Besides the task list, data collection instruments prepared in advance included questionnaires filled out by the participants, and forms for the note-takers as they observed. These are described below in context.

3.3. Procedure

3.3.1. Pre-testing session. Two days before each of the two usability testing sessions, one of the authors visited the computer class to solicit participation. After the study was explained and questions answered, all but two of the students ultimately chose to participate. After consent forms (approved by the Institutional Review Board of the first author’s university) were signed, participants completed a brief pre-testing survey questionnaire (see Section 4.1 below).

3.3.2. Testing. A usability testing session took place at the same location and time period (9 -11 AM) as a regular class session. First, one author served as the facilitator to greet everyone and asked all participants and the note-takers to introduce themselves (the note-takers were graduate students or NLM staff persons; the instructor of the class, a graduate student, served as one of the note-takers). Then, each participant was paired with their own note-taker, who took them to the home page of the prototype site, and instructed them to explore the site independently for as long as 10 minutes. (This proved a bit short, and was extended to 15 minutes for the second testing group the next day.) Participants were asked to “think aloud” during this independent exploration and the subsequent work with a sequence of tasks as described above. During the testing, note-takers wrote detailed observations into a set of forms. Recorded during each task were performance time and degree of completion, as well as participant’s remarks and session behaviors including misunderstandings and errors. Following the detailed instructions provided to them several days prior to the testing, note-takers played a generally passive role during the testing – that is, they tried to avoid giving participants information on how to do a task. Instead,
note-takers were instructed to ask participants to verbalize their problem, poke around a little, and, if participants got too frustrated or stuck, directed them to go on to the next task (with more guidance if in a strange place from which to start the next task).

Based on lessons learned from the pilot session, the test protocols in the second session were modified to reflect the special needs of this age group, namely:

- four tasks were made more specific (e.g., Task #1 was changed to: “The screen has the home page of Nursing Home Screener. Starting with Step 1 shown, please find two nursing facilities near your home. Say their names to your note-taker’’);
- a task was dropped as too advanced; and
- note-takers were asked to provide more assistance when users became obviously stuck at a step, and to document that in detail.

Around 10:40 AM, all participants were asked to stop working and were given the quantitative post-test questionnaire to fill out (see Section 4.3.1 for the question items and results). Next, note-takers collected these and used the debriefing questionnaire to prompt and record qualitative feedback. At the session’s end, people were thanked. Once all participants left, the facilitator and note-takers met to share results.

3.4. Data analysis

Quantitative data were entered into SPSS for descriptive analysis. Qualitative data were analyzed by using the techniques of microanalysis or “detailed line-by-line analysis”. First, open coding identified salient themes (i.e., major problems participants encountered). Next, axial coding systematically explored the salient themes’ properties. Finally, selective coding integrated and refined the salient themes and their properties [18].

4. Results

4.1. Pre-test survey

This survey, filled out directly by participants, first asked: “In general, what aspects would you consider important in evaluating the quality of a nursing home?” Participants rated all nine given aspects as “very important” or “important”, except one person chose “neutral” for “accepts Medicaid/Medicare”. As for other questions, four participants had personally looked for nursing home information for themselves or a significant other. Two had used an electronic map (on a Web site, computer program, or electronic device) and, more specifically, a Google map.

4.2. Task performance

Each task had a nominal time limit of 10 minutes, but the enforcing note-takers had discretion to exceed that, and a participant could give up on a task. Most participants could not fully complete most tasks (Figure 3). Only two participants (#1 and #10 in figure) finished more than half (blue bar at 58% and 55%, respectively). Whether tasks were completed or not, the fastest participant averaged 6.2 minutes per task, the slowest 11.5 minutes, and the overall average across all people and tasks was 8.23 minutes.

Figure 3. Full, partial, and no completion rates on tasks. Each vertical bar is a different person. “Partially complete” means progress was made before timeout or quitting.

4.3. Post-test surveys

4.3.1. Likert-scale questions. This questionnaire, also filled out by participants directly, had five Likert scale (1 to 5) questions about one’s experience and satisfaction with the site (Table 1).

Table 1. Post-test quantitative responses.

<table>
<thead>
<tr>
<th>Ease of finding information</th>
<th>Difficult/very difficult</th>
<th>Neutral</th>
<th>Easy/very easy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality of information found</td>
<td>Dissatisfied/very dissatisfied</td>
<td>Neutral</td>
<td>Satisfied/very satisfied</td>
</tr>
<tr>
<td>Site overall</td>
<td>Dissatisfied/very dissatisfied</td>
<td>Neutral</td>
<td>Satisfied/very satisfied</td>
</tr>
<tr>
<td>Would use it if needing home info</td>
<td>Definitely/likely not</td>
<td>Not sure</td>
<td>Definitely/ most likely yes</td>
</tr>
<tr>
<td>Would recommend to others</td>
<td>Definitely/likely not</td>
<td>Not sure</td>
<td>Definitely/ most likely yes</td>
</tr>
</tbody>
</table>
4.3.2. Open-ended questions. Note-takers read a debriefing questionnaire to prompt participants’ qualitative feedback. Overall, participants felt positive about the information available (or would be if one could find it), yet not so positive about the site’s navigation and information presentation. Also, some half-joked about using the site for mental or physical exercises. Since the site was not so intended, that indicates the design needs improvement.

4.4. Major problems seen during testing

A number of major problems associated with the initial four screening pages (the non-map pages; see Figure 1 above) were revealed during the test session. These included having difficulties scrolling the Web pages horizontally or vertically or using the pop-up/drop-down menus. Our observations helped to identify key factors that contributed to these problems. These included: 1) Poor computer knowledge (e.g., did not know how to use the pop-up/drop-down menus); 2) Poor fine motor skills (having difficulties using the mouse/moving the cursor); and 3) Poor vision (e.g., having difficulties seeing or finding the scroll bars on the screen). (Because the primary focus of this paper is the Google map pages, we reported here only briefly key findings associated with the non-map pages.)

For the Google map pages (see Figure 2 above), we will discuss first the left column of the map page, from top to bottom, then move to the map in the right column, and report in this order the main problems participants encountered with each part. Finally, we report the difficulties encountered with the connection between these two columns.

4.4.1. The left column of the map page. Three major problems were observed. First, what was clickable and what was not clickable was not intuitively obvious to these less experienced computer users. Three particular areas on this side were not clickable by design, yet users thought – or wished – that they were:

- the “Homes Ranked By…” phrase at the top left corner;
- the key icons and phrases in the middle of the left side (e.g., “Top” … “Bottom”, “2+ homes at same spot”, “Some data missing” … “Highlight home in printlist below”); and
- the print list below the map (the red “Results” list).

Users got frustrated clicking on these icons or words when nothing happened. Conversely, two particular areas in this column were indeed clickable yet often not seen as such:

- The “Explain/Options” link in the green tab was too small and not obviously clickable. Because it’s a text link rather than a button, this link’s active region was not visibly demarcated. Thus, unless a user was able to precisely point the cursor to this small area and click, s/he could easily be clicking ineffectively on the green tab while trying to click this link. This was stressful.
- Similarly, “Hide Certain Homes”, as a text link rather than a button, was neither sufficiently prominent, nor obviously seen to be clickable.

Second, some terms were too technical for laypersons. The terms denoting ranking criteria in the green tabs to the left of the map page (e.g., “Fewer Healthcare Deficiencies”) were not plain language and difficult for laypersons to understand. Also, participants had trouble understanding what the words “Top”, “Above average”, etc., mean. When asked to select one nursing home that “seems best,” one user selected one “above average,” suggesting a misunderstanding of these categories. Another participant stated directly: “How do I know what is the ‘Top’ group? I’m not sure what ‘Top’ means.” Another participant thought the plus “+” of the “2+ homes at same spot” was a rating mechanism – that is, “+” means good as compared to “-”. Although there is a “Key” link that leads to explanations of these categories, few users realized that or actually clicked on it. (This relates to the inconsistent clickable elements discussed above).

Third, clicking into the “Explain/Options” or “Hide Certain Homes” pages exposed too much information. This could easily overwhelm users. One participant, viewing the amount of information in the “Hide Certain Homes”, said: “Can’t figure this out.” She was completely confused. Another participant, who initially had trouble seeing the “Explain/Options” link, eventually was able to click on it; when the information appeared, she commented: “This may be more than you want to know.” She looked at the information for a while, unclear how it would answer the task question: “Not sure if this was the information we needed. Need to go somewhere else for this.” She then went back using the Back button, but did not know where else to look. She finally concluded: “I don’t think they told you anything you need to know.” The attitude changes observed in this participant – first thought there was too much information, then confused, and finally declared that there was no useful information on the page – was alarming.

4.4.2. The map in the right column. Participants were unfamiliar with the terminology of and techniques for using electronic maps like those of Google. This affected their use of NHS in at least three ways. First, Google maps provided three display options: Map,
Satellite, and Hybrid. Yet, many participants didn’t understand “Hybrid” or “Satellite” in this context. One user commented (during the initial independent exploration period of the testing): “What does ‘hybrid’ mean? The only hybrid I know is a Prius”.

Second, there was confusion about the foreground and background of the map pages (Figure 4). Google maps show the names of geographic landmarks (e.g., town, neighborhood, university, river, and road) in the background; yet, it might not be intuitively obvious to inexperienced Google map users that those names were not clickable elements. Participants repeatedly clicked on those background names and got frustrated when clicking did not lead to more information about nursing homes. Also, when next to an icon, a name in the background could easily be misperceived as the name of a nursing home. For instance, in Figure 4, background word “Dublin” adjoins the gold star, while “Post Rd” is beneath the dimpled gray icon; users may reach spurious conclusions in both cases.

![Figure 4. Confusing background text.](image-url)

Third, participants were unfamiliar with map manipulation methods. For instance, they did not know how to manipulate the map by dragging and zooming in and out. One participant – although with more computer experience than others – did not know that he could zoom in to get a closer view of the locations. Instead, he tried to visually locate cities on a large scale map to find a nursing facility near his home. This required fine cursor movement, as well as geographic knowledge – as this participant half joked about: “I need to know more geography to use this site!”

On the other hand, when zoomed into a smaller geographic area, there might not be any nursing homes to show, particularly in less populous areas. Participants did not realize that they could drag the map to see a different area or zoom out to see facilities in a larger area. Further, when the cursor was over the map background, it would automatically change into a hand shape with all five fingers out ( ![hand shape](image-url) ). This is slightly different from the hand shape shown on non-map pages where only the index finger pointing ( ![hand shape](image-url) ). Google uses the former to indicate that the map is “draggable” instead of clickable. This distinction was not clear to users unfamiliar with electronic maps.

Besides these problems mainly attributable to users’ inexperience with Google map, other problems were due to NHS design. For one thing, consider the “Key” icons as placed on the map (e.g., in Figure 2). These (especially the “Below average,” “Bottom,” and “2+ homes at same spot” icons) were found to be too small and looked too similar (in terms of shape, shadow, and color) to distinguish easily, especially when seen against the busy map background.

Also, on the map page there was no “Homepage” phrase or icon anywhere to lead the user back to the NHS homepage. Although there was an underlined “NLM Nursing Home Screener >>” link at the top of the map pages (see Figure 2 above) for that purpose, this clickable element was not obvious to participants. (One who was more computer literate than others even thought the “>>” sign was a bug.) They instead had to repeatedly use the browser’s “Back” button to return to the home page.

4.4.3. Connecting the left column controls with the map. Participants also had problems in making conceptual connections between the left and right column items. For instance, they often did not associate maps with the four left column tabs (e.g., “Fewer Healthcare Deficiencies”), of which the active tab button was green and the rest gray. Either they did not realize that these tabs (not of traditional button shape) selected map results, or did not notice screen changes to the map when clicking on different tabs. After a new tab was clicked, the system was slow to update, contributing to this confusion and perceptual disconnect.

Similarly, not everyone recognized that the key’s words (“Top”, etc.) and icons in the lower left corner were to explain the iconic markers on the map.

There were also false connections: The active tab, for “Fewer Healthcare Deficiencies” by default, was green and one user equated that with something to look for on the map – i.e., homes with fewer healthcare deficiencies would be depicted in green. This was not the designers’ intention.

Further, there were design problems with checkmarks and the print list. When highlighting a particular nursing home on the map ("Highlight Me" in the balloon), a checkmark is placed in front of that particular nursing home on the print list below the map. The location of the print list (where one needs to scroll down to see it) and small size/font type of this checkmark make it difficult to see that this particular nursing home was indeed checkmarked.

4.5. Overall impressions

Overall, the map page was puzzling to the majority of these older adults, who lacked the knowledge and skills to be effective with it. As reported in the pre-
testing survey, most participants had never used an electronic map before. One participant said repeatedly during testing: “It is still that stupid map”, and later even more explicitly stated “I don’t want that map.” Another participant stated: “I don’t do maps” and that “The map is not going to tell me a thing.” Even a participant who was a more experienced computer user and able to complete most tasks relatively quickly, made negative remarks about the maps during testing (e.g., “I guess it is in this mess.” “Do you mean I need to find them again in this mess?” “I am finding it very difficult.” “Confusing”). She clearly did not like the map. Another commented: “There is no listing [of homes in text], just maps – how many of us can read this map with so many points”? At least half of our participants indicated that they expected and preferred a clear, ranked text list of homes. (Map familiarity appears to be one area with a clear generational difference among our target groups.)

Also, participants seemed indifferent to satellite or hybrid views, reflecting the probably unmotivating test task design. A user commented: “What good is this doing?” and “I don’t care (about this feature).”

5. Discussion

5.1. Inexperience, particularly with maps

Although older adults’ adoption and use of more mature Internet applications (in particular, email) have recently risen to a roughly equivalent level to those of younger age groups, their adoption and use of newer applications (e.g., blog, Google maps) still lag behind significantly. This situation is even more severe among older adults who have less formal education and income, are members of ethnic minority groups, and/or are at more advanced ages [17].

Thus, our participants, as inexperienced computer and Internet users, are likely representative of their cohort. None had more than a year of experience with computers, and six had no experience prior to the class. Not surprisingly, they had very little prior exposure to electronic maps such as Google’s. These participants’ unfamiliarity with the technology significantly affected their overall use of the NHS site, in ways that experienced users (and NHS designers) may not anticipate (e.g., not understanding what “Hybrid” meant, or how to drag or zoom the map).

One solution is to provide training to help users to gain necessary knowledge and skills. Face-to-face training can be very effective, especially for older, less experienced computer users [21]. But for broadest reach, further training assistance can be built into the site. For example, built-in video clips on the NHS site could demonstrate its fundamentals, with specific emphasis on how to read and navigate the map pages, including examples of techniques that designers and experienced users would take for granted (e.g., the names of geographic landmarks in the map background are neither clickable elements nor names of the nursing homes; dragging and zooming techniques). In addition, there could be “on page” cues, explanations, or tool tips that help the user to understand a specific term or step and the options he or she has to proceed. For example, when moving the cursor to the word “Hybrid”, there could be a pop-out message to explain it and hint why the user might or might not want to use it (although such a pop-out may be something only Google employees can accomplish). When there is no facility shown on a zoomed in map, a transient message on the screen could suggest the user zoom out to encompass a larger area. Also, in compliance with the Section 508 requirements [19], there should be a text-only version that supports all of the same screening functions but presents the information in words (e.g., a print list of selected nursing homes, with the names, addresses, phone numbers, etc.).

5.2. Accommodating age-related changes

Our older adults, like their age peers, have been experiencing age-related declines in cognitive, motor, and sensory abilities. While this study was not designed to investigate how participants’ psychological or physiological abilities might affect their use of the site, the testing did reveal instances where these older adults’ fine motor skills and vision made it more difficult to use the technology. To better accommodate such age-related changes, it is necessary to design senior-friendly Web sites [10, 13] that can eliminate or at least minimize the amount of scrolling and the use of pop-up/drop-down menus, and also enlarge small items like radio buttons.

5.3. Accommodating a range of literacy levels

Older adults, especially those with certain characteristics (e.g., less formal education, lower income, within certain ethnic minorities, or more advanced age), have low literacy levels [12], making it more difficult for them to understand technical terms on the Google map pages (e.g., “percentile”). It is thus important to avoid using technical or grammatically complex terms and instead use plain language that is easier for laypersons to understand (e.g., change “Fewer Healthcare Deficiencies” to, say, “Healthcare Quality”). Nevertheless, trying to span multiple target groups in site design (in this case, seniors, their adult
children, and professionals) can be a challenge. For the latter two groups, language can be “too simple”, with vague, uninformative, flat phrasing that can reduce the site’s credibility and try users’ patience. Perhaps the best approach is to separate pages or even entire sites optimized for different groups.

5.4. Map usage affected by recent training

Participants of this study were students of an ongoing computer class. This affected their use of the prototype site: for one thing, the computer class focused on teaching older adults to use the NHISeniorHealth and MedlinePlus Web sites to find health information [21]. These older adults thus had learned – and had been practicing during the last few weeks – that, when the cursor changed into a hand shape, it meant that the area it was pointing at was a clickable element. However, this was not the case with the Google map pages on the NHS site, where the cursor would change into a slightly different hand shape (all five fingers instead of only the index finger pointing out) – to indicate a “draggable” (but not “clickable”) area. This slight difference was not well perceived by our participants, who either did not see the difference (likely due to poor eyesight plus busy background of the maps), or noticed the difference but did not know that it indicated something different. To address this issue, it is desirable to make all the clickable elements more consistent and put them in prominent positions to make it intuitively obvious that they are clickable. Training will also be necessary, especially in terms of helping users to understand what is clickable and what is draggable but not clickable on the map pages.

5.5. Role conflict: student vs. study participant

Also, as students of this computer class, these older adults had become used to being quite frequently helped by others – the class instructor and assistant, as well as fellow students – in figuring out how to use the technology. Because the usability testing was conducted in the same class context that they were used to, participants might have had similar expectations about getting detailed instructions and extensive hands-on assistance from the note takers. Yet, obviously, the testing protocol did not allow for this degree of interference, which might have contributed to part of the frustrations reported. To avoid this situation, we need to be more explicit about the independent-exploration nature of the testing, and to make this clearer to every potential participant at the very beginning of the study.

5.6. The library as a test site

This study was carried out in a public library instead of a usability testing lab, because, in our experience, it is much easier to recruit older adults when the study location is familiar [6]. Since our class attendees were already used to going to the library, transportation would not be a barrier to study participation. Also, this familiar environment could reduce anxiety associated with alternative – potentially intimidating – environments (e.g., a usability lab at the University or elsewhere).

However, this choice of test site also effectively restricted data collection to manual note-taking. For one thing, we could not install any usability software to track participants’ movements, since the library’s computers were centrally managed and locked-down. Also, because of the difficult logistics of the computer class setting (group testing, in a public area), we did not video- or audio-tape the testing. While we used multiple methods (survey, interview, and observation) to gather participants’ experience with and opinions about the NHS site, still, we might have missed some important information that would have been captured by software and video or audio recording.

The most significant unanticipated drawback of this setting was that, with the low screen resolution of the library’s computers (fixed at 1024 x 768 or 800 x 600), parts of some NHS pages – including the “Next” button – were not visible until the user scrolled the page down and to the right. This required both knowledge about scrolling and the fine motor skills to carry it out. Our older adults’ difficulties here impacted task times and completion rates.

Also, the library setting revealed potential problems worsened by slow network speed due to heavy LAN usage. During the first hour of testing, the library was closed to the public; once opened, the network speed slowed down noticeably. In particular, when clicking on a new left-side tab of a map page (e.g., “Fewer Healthcare Deficiencies”), the old tab remained highlighted while the page updated. As the network slowed, the period of time before a visible change happened grew. This added to participants’ confusion and difficulties in making connections between the left (non-map) and right (map-part) side of the page.

To address these issues, it is vital to support lower-resolution screens, and to add feedback that the system is working to retrieve new data and update the page (both now implemented). This will help both those who access NHS in public libraries and those at home with old computers and slow networks (who are more likely to be older adults, a prime NHS target group).
6. Conclusion

While there is great need among older adults, caregivers, and healthcare professionals for information about nursing homes, it must be well organized and presented to be of real use. A map-based interface can reach younger, technology-savvy users (e.g., adult children of older adults) but be challenging to older, less experienced users. To better address the needs and preferences of diverse users, both design and training interventions can be recommended, as follows.

6.1. Design interventions

6.1.1. Presentation.

- Add “on page” cues or explanations that help the user to understand and proceed (e.g., when moving the cursor to the word “Hybrid”, there could be a tool tip explaining what this is; when there is no facility shown on a zoomed in map, there could be a message on the screen reminding the user to zoom out to be able to see a larger area).
- Distinguish the “Key” icons more from the map background (e.g., larger, different shapes).
- Make support for lower-resolution screens a priority, as these may be common in public settings like libraries and with old computers (more often used by older adults, a target group).
- Change technical terms like “Fewer Healthcare Deficiencies” to plain language.
- Better organize the information (e.g., reduce the amount on one page by moving less-essential information to secondary level Web pages).
- Provide clear indication when the system is working to retrieve new data (now done for NHS).
- Add a text-oriented presentation of home rankings, for those less interested in maps.

6.1.2. Navigation

- To the extent possible, make all the clickable elements consistent (e.g., change the shape of the mouse cursor into a hand with extended index finger) and their clickability intuitively obvious.
- Eliminate or reduce the use of pop-up/drop-down menus (e.g., allow users to directly type in state, town, and/or zip code to screen nursing home).
- Enlarge or replace the radio buttons to reduce the requirement for fine motor skills.
- Add a “Homepage” link at a consistent and prominent position on the page.

6.2. Training interventions

- Provide training to help less experienced users to learn and practice computer and Web skills, especially about electronic maps (e.g., video clips about using the site, with emphasis on the map).
- In particular, provide guidance about the specific valid connections – and invalid ones to be avoided – between the non-map and map parts of the page.

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**Figure 5. Screenshots of Search Results, July 2009 Implementation.** Both List View (left) and Map View (right) can be viewed in Quick & Easy mode, or in Full Featured mode (shown) with controls in left hand column. Map View has new, larger icons. Training material is also now provided.
6.3. Work to Date, and Going Forward

These findings and those of testing at RIT with adult children, our target “group 2”, drove a redesign (discussed further in [14]). As a taste of the implementation, Figure 5 shows the results of a search, in the new “List View”, complementing the map view.

The modified site recently received further “group 2” usability testing at NLM. The results are still being analyzed, but areas needing further revision and build-out were uncovered, and are being addressed.

7. Acknowledgements

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8. References


