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I. Project Description

Our world population is aging, and the percentage of our population constituting classification as “older adults” is increasing. By 2030 older adults will comprise about 20% of the total population (Administration on Aging, 2002). In response to this increase, researchers in human computer interaction, social sciences, and computing communities are developing applications to help older people live independent and productive lives.

The most popular online activity performed by older adults, following email, is searching online for health related information relating to prescriptions, symptoms, diagnosis, surgery and recovery (Fox and Fallows, 2003).

Older adults experience declining visual and cognitive abilities as they age, which make designing a GUI tailored to their specific needs a challenge that is not being effectively addressed with current search engine implementations.

Problem Statement:

After conducting one-on-one interviews with older adults to determine what problems they experienced when using a search engine, we discovered a disparity among those who were comfortable using computers and those who were novice users. As such, our goal is to provide a more user-friendly search engine for older adults who have at least a general understanding and mastery of basic computer technology while providing optimal search engine results.

To do this, we propose to design a “wrapper-application” that will retrieve search results from Google and displays them in a less-intimidating manner to older adults (see Figure 1). As seen below in Figure 2, we initially developed an idea for a prototype of the GUI to display the results to older adults.

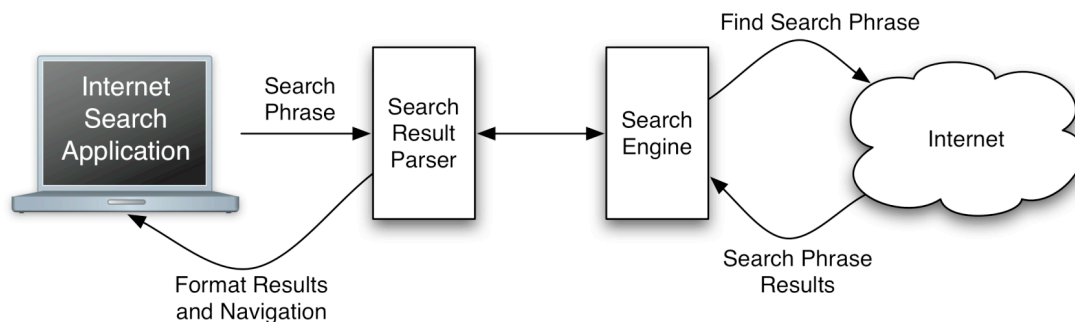


Figure 1: High-Level System Architecture

This implementation displays the search results as previews of the actual Web pages with an option for the user to easily transition between various results. Because the most common item searched for online by older adults is health related information, we will attempt to design a metasearch engine that will gather

multiple results from various general search engines in addition to a medical search engine (WebMD).

Key Background Literature:

While many adult seniors are become regular users of the Internet, a study performed in 2001 found that 37.0% of older adults did not use the internet, citing that they “did not know how to, or were confused by the technology.” (Kuo, 2001) Many theories exist to explain this and similar statistics, but for our team, one of the most interesting proved to be that some groups within society, for whatever reason, associate negative affect with computers and technology. It would be easy to infer that “older adults” in general would constitute such a “group” within society, but various studies have found that such experiences are common to certain racial and ethnic minority groups and also women and that these negative associations amplify their anxiety of using computer technologies as opposed to white males (Rosen & Weil, 1994, 1995; Steele, 1997, 1999; Turkle, 1995).

Although we had a limited participant basis from which to draw conclusion, these findings correspond amazingly well to our results; three of our five participants were women, and all three of them had limited computer skills and also showed discernable signs of anxiety using the computers, or talking about their experience with them in general.

In a 2004 study, researchers sought to demonstrate that Internet access would provide desirable, cognitive, educational and social outcomes for the elderly (Cody, 1994). But this makes a huge assumption, a single one-size-fits-all assumption that, as we found out during our one-on-one interviews, can serve a crippling blow to any assumptions pinned thereupon; for as three separate studies determined, a major cognitive factor that is unquestionably related to Internet use by any demographic is a user's familiarity with the technology at hand (Carnegie Mellon University, 1995, 1997; Kraut et al., 1996) This “prerequisite” coupled with the well-established fact that in general, older adults find accessing information on the Internet to be a difficult, overwhelming process with unreliable results (Heim, 1993, Kroker & Weinstein, 1994) could very well account for the previously mentioned 37.0% of older adults who do not use the Internet. It seems this corroborates (Pollock & Hockley, 1997)'s study which found that search engines were too complex for inexperienced Internet users.

The concept of a search engine has experienced an evolution within the last decade, and as newer types and forms are developed, our society is experiencing a mass proliferation of options with which to suit their individual needs. (Chinnery, 2008) provides a detailed review of many of today's most popular forms and options of search engines. It is interesting that search engines called metasearch engines exist that search various search engine's results to provide you with the most optimized results possible. Another interesting class of search engines is ‘social search engines’ which actually learn from the various searching strategies of the users’ in its community.

After analyzing our participants' input, we believe a combination of 'social search engines' could be used in conjunction with both 'social book marking sites' (which employ user generated 'tags') and 'clustered or federated search engines' (which serve as the theoretical basis for metasearch engines) to provide an optimal search engine solution targeted specifically to the needs of older adults.

A less academic perspective on more relevant current alternatives can be found on the blog of a site (<http://www.cranky.com>), which is a current implementation of what we propose to create. On this site, older adults can search for things just as they would in Google, but the results are displayed 4 at a time with twice as many ads shown. One user sardonically posted that "...the older demographic may not need separate Internet sites, evidently just more sponsored ads. The typical cranky search brings up 5 sponsored results and 4 organic search results. That'll make anyone cranky!" (Too Young, 2007)

II. User Research –

After talking with our project sponsor, Katie Siek, we determined that the best way to approach this problem is to design a "wrapper-application" that would retrieve search results from some general search engine, and display the results in a less-intimidating manner. As seen below in Figure 2, we developed an idea for an initial prototype of the GUI with which we intend to display the results. This was of course refined and redeveloped as we proceeded with our research and gained more user feedback, but it served as a starting point for our group.

Our initial concept of implementation, Figure 2, shows the Google search results as previews of the actual web pages with an option for the user to easily transition between various results. We proceeded with our initial user study interviews with questions related to the usefulness of these basic concepts and features.

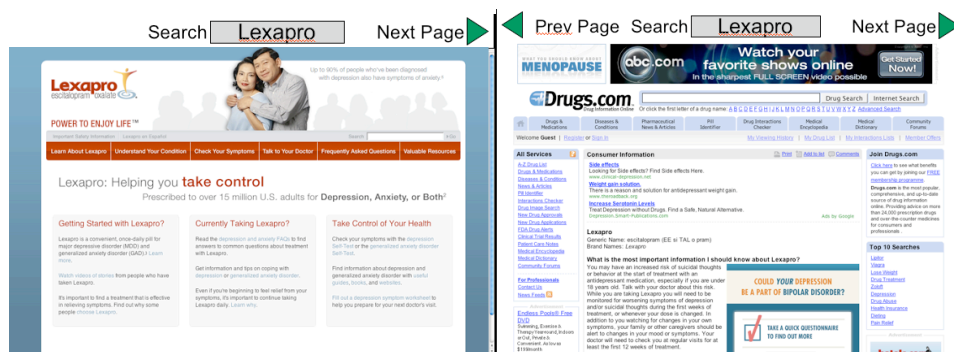


Figure 2: Example of possible Internet search interface for older adults. (a) First website available from search phrase; (b) Second website available from search phrase; Older adults can toggle between search results with the top navigation.

Participants, Methods and Findings:

On February 1st, 2008, our team gave an informal presentation at The Academy in an attempt to recruit participants for one-on-one interviews by generating interest in our project. We gave a PowerPoint presentation to approximately twelve residents outlining our projects goals. We showed screenshots of the results generated by various current search engines such as Google, Yahoo and KartOO in an attempt to illustrate the necessity for a better alternative, while at the same time emphasizing our inability to design and produce one without their input.

After our presentation, we passed around a sign-up sheet for those who felt they would be interested in participating in one-on-one interviews and/or in subsequent focus groups. This list generated approximately ten interested participants, but follow-up phone calls to schedule a time for the interviews filtered out about half of the list of potential interview participants. In the end, we were able to conduct five one-on-one interviews with residents of The Academy.

For each interview session, our team brought a video camera and tripod to record the interviews. To make the environment more accessible for older adults, our setup for the contextual interview included a large flat-screen monitor, a normal keyboard, and a normal mouse – we thought the laptop keyboard and mouse-pad might be too uncomfortable for some of the participants. Additionally, we brought a folder that had been made specifically for each individual interview session that included a copy of our One-on-one Interview Script (Appendix A), our Questionnaire (Appendix B), and two copies of our Consent Form (Appendix C) – one was for the participants to keep for their records and one, once signed, was collected for our records. Because the video camera's battery was completely dead for two of the five interviews (with the charger nowhere to be found), we collected audio recordings for those interviews.

All of the interviews took place in the Parlor of The Academy at a table where our computer system was set up as previously described. The first thing we did at all of the interviews was to talk about, and have the participants read, the consent form. We answered any questions if they had any, and after they signed the consent form, so did the interviewer. After this we read the Questionnaire sheet to the participants and circled the answer they selected; by going through the Questionnaire with them and writing down their side-comments in addition to their answer, we hoped to gain even more feedback. After the Questionnaire was finished, we proceeded to follow the One-on-one Interview Script as a guide for the rest of the contextual interview. On average the interviews took approximately forty minutes to complete.

A general but informative description of each of our participants (with pseudonyms) is provided below, followed directly by a high-level summary of their contextual interview:

1. Linda is a female between the age of 85-90 years old, who has low to average Internet, computer, and technology skills, but expert information searching skills. She spent her entire career as a Librarian, but retired right before technology was introduced as a more efficient means of cataloging the Library's content.

Linda's children bought her a Dell laptop (Windows XP operating system, Windows Internet Explorer v.5.0) which she uses periodically throughout the week mainly to check email from family and friends, never spending more than an hour and a half online each time she uses her computer. Sometimes she uses her computer to play solitaire or write letters with a Word Processor. Although she views photos if they are attached in her email, she does not use her computer to view or edit her own photographs.

Linda becomes overwhelmed by everything going on with her computer when she's using it; she expressed great anxiety over using her computer for anything because of all of the things that pop up on the screen (e.g., a low-battery warning or her virus protection software prompting her to renew her subscription).

Although she rarely, if ever, uses a search engine to find information on her laptop, she has used Google before to search for information. She currently prefers to find information by searching through encyclopedias, newspapers or books.

Interview:

I. Logistics –

Vivian conducted the interview session with Linda – the entire session took approximately 37 minutes. Because of technical difficulties with the video camera (the battery was dead and charger was nowhere to be found) an audio recording of the interview was made instead.

II. Summary of Contextual Interview -

Because Linda's personal computer was a laptop, she preferred to use the laptop without the monitor, keyboard or mouse attached to it. She took a couple minutes to access the Internet, but because she was thinking out loud it was clear that this was taking so long because "[the computer] didn't look anything like her computer." Through a series of questions regarding how her computer *did* look, it was determined that she did not have Windows Vista *or* Windows Internet Explorer v.6.0, so she was very unfamiliar with the general layout.

She did manage to get online (she chose Internet Explorer vs. Firefox), and managed to get to google.com with very little problem. When we asked her what she would search for if she wanted to find out about Aspirin side-effects, she proceeded to type in "Aspirin side effects" to the search box and manually clicked the "Search" button instead of just hitting Enter.

When the result page came up, her first comment was that there was "just too damn much information!" She mulled over the results for about five minutes, thinking aloud as she did – explaining that she liked how some words were bold,

didn't understand why some results were indented, and thought that there should be more color contrast to make certain words (like "blindness") more prominent.

She was then asked to try some various combinations of her keywords to compare the results that came up. She tried two more combinations of words: "Aspirin drug information" and "Aspirin effects," all the while thinking aloud as she analyzed what came up.

Some key comments that she made include that the results "seemed repetitive," and also that she "wished there was more text for each result in the list." At this point I asked her if she thought having pictures of each options – some kind of preview of the Web site or a screen-shot – would help her choose which one she wanted to pick, to which she answered (with great emphasis) that pictures would absolutely *not* help, she much preferred text to pictures. She didn't really elaborate on the reason when I asked, but she was very adamant.

She was directed to return to google.com and try to search for the same information using the "I'm Feeling Lucky!" button; she had no idea what that button was for or what was brought up when it did bring up the first page. After she was informed of the button's purpose and asked if she felt it had been useful, she said she didn't find its purpose useful and said she would probably never use it again.

If Linda finds a Web site that she thinks she'll want to visit over and over again, her first instinct to "save it" is to print it out – she said she wastes a lot of printer ink and paper because she does this all the time. When asked whether or not she had ever heard of "book marking" she said she had not, but after the concept was explained to her, she said that she would like to be able to do that.

As was briefly mentioned before, Linda has a very deep anxiety about using her computer, but when she manages to overcome that and get online (which she does do several times per week), she has very little issue using, or navigating around the results of, a search engine.

A major issue for Linda was figuring out how to get back to either the search results page or google.com itself, but I would be wary of generalizing that pattern of her interview as a "problem" for her, for it could just as easily be attributed to her unfamiliarity with Windows Internet Explorer v.6.0, in which the "back" and "forward" buttons are much smaller than previous versions.

2. Cassie is a female between the age of 80-85 years old, who has average computer and technology skills (given enough time) but low Internet browsing skills. Although it took a lot of time for her to maneuver her way around the Internet, once she got to Google.com she was able to demonstrate relatively average searching skill in respect to selection of key-words. Cassie is a highly educated and well-read individual who holds a PhD in Philosophy. She has two children in their fifties and three grandchildren in their twenties – her grandson goes to CU and consistently tries to talk her into buying a computer for herself.

Cassie does not own a computer, but she does regularly use the community desktop computer at The Academy, so she is relatively familiar with the Windows environment (Windows XP operating system, Windows Internet Explorer v.5.0). She uses the computer to check her email two to three times per week, spending

less than an hour online each time she uses the computer. She no longer uses a Word Processor to type letters because the keyboard makes her hands hurt, so checking her email is the only thing she ever uses the computer for anymore.

Cassie did not verbally express any anxiety about using a computer or the Internet, but the excessive amount of time she took to perform tasks on the computer, in addition to her body language (e.g., squinting at the screen and sighing a lot), led me to believe that she had limited self-efficacy in regards to the tasks she was asked to perform.

Although she knows what search engines are and her grandson tries to show her how to use one all the time, she said that she prefers to search for information from newspapers or friends.

Interview:

I. Logistics –

Vivian conducted the interview session with Cassie – the entire session took approximately 55-60 minutes. Because of technical difficulties with the video camera (the battery was dead and charger was nowhere to be found) an audio recording of the interview was made instead.

II. Summary of Contextual Interview –

Cassie's contextual interview took quite a long time to complete compared to some of our other participants' interviews, but the majority of the time was spent doing basic things such as typing the Web address into the right place – just getting to google.com was quite a task. She said that “normally when [she] clicks the Internet button her email comes right up and she just puts in her name and password.” But when the homepage was not set to her email server, she seemed to be almost at a complete loss of what to do.

After a couple minutes where she was becoming visibly agitated, I pointed her in the right direction (Internet surfing skills were not themselves the point of this project or interview, just as making her feel like *she* was the one being tested was by no means the point).

After a little bit of a rough start, she finally made it to Google's homepage, and when she was asked to search for some side-effects of Aspirin, she trudged through the process of searching for “Aspirin.” When it was time to analyze the search result page, she spent the majority of the rest of the interview reading the little excerpts from various sites. At one point she clicked a link, but when it turned out to be something she didn't find useful, she went back to retype www.google.com all over again instead of hitting a “back” button.

When she returned to Google's homepage through this manner she was directed to try the same search again but to use the “I'm Feeling Lucky!” button instead of the search button. Just as was the case with Linda, Cassie neither understand what it did until she was told, nor found it useful.

She had never used or heard of the “book marking” feature, and said that she probably wouldn't ever use it because she really only uses the internet to check her email.

Unlike Linda, Cassie did not verbally express any frustration with or anxiety about the Internet or computers in general, but it seemed that this was an issue for her. Even when she did manage to pull up some results from the search engine, she spent a very long time reading through all the little details; she was very bogged down by this “task” and despite frequent requests, did not think aloud while she was looking at and analyzing the results.

3. Peggy is a female between the age of 85-90 years old, who has low Internet, computer and technology skills and moderate to high searching skill in regard to her selection of keywords once at the search engine Web site. She spent most of her career as a librarian and retired just after the technological means of cataloging books. However she had not used computers often in her work and she still feels intimidated by them. She had bought a desktop with Windows XP and internet explorer 7.0.

She doesn't use the computer to browse the internet and instead uses it to check her e-mail only a couple times a month, which her children had setup for her to use. When she uses her computer it is only for an hour at most. She had tried to use her computer to play simple games (Solitaire, Hearts,...) instead she had gotten frustrated and only uses her computer for e-mail. She was adept at using keywords to find information once she had managed to get to a search engine however she had stated that she has trouble maneuvering on the internet. We were not able to get much from this interview as she had gotten frustrated and decided to “back out”. Before this she had stated that she like the touchpad on the laptop better then the mouse once she had figured out how to use it.

Interview:

I. Logistics –

Steven conducted the interview session with Peggy – the entire session took approximately 20 minutes. Because of a prior interview taking longer than expected and the inability to make an audio recording this interview was not recorded.

II. Summary of Contextual Interview –

Peggy's Contextual Interview had not too long the survey had only taken about 15 minutes. Then a short interview was conducted, after she searched for aspirin on Google she became overwhelmed with the questions that were in the interview script. At that point she had asked if it was alright if she concluded the interview. Before the interview was concluded she had stated that she didn't feel that she understood the patterns for computer use let alone internet use. She had proven to be adept at searching for information when she was directed to do so. However she could not find where to put the internet address and became visibly frustrated when she could not manage to figure out how to get back to a previous website.

4. Randy

Randy is an older adult in his 90's, who had believed himself to be an average computer user. He uses a computer everyday for a myriad of tasks, these tasks include, word-processing, internet use, e-mail, and viewing photos. He is highly educated and is a retired Psychology professor from University of Colorado, Boulder. He had stated that he frequently accesses the CU library to continue his work. He owns a laptop that he himself bought; it is an apple Mac-book. As a result he was not familiar with the Firefox browser or internet explorer. He was able to complete the tasks given to him and proved to be very skilled at searching for information the internet. He had stated his displeasure about Google's searching scheme and he believed that because Google searches by way of popularity of a website where it forces him to become arbitrary in his information gathering. He uses the internet often and as such his internet searching skill is high.

He stated that he rarely if ever bookmarks a site instead he stated that he will save the link for the particular website to his desktop and will open links from there. He had heard of book marking but stated that he preferred his method instead. He stated that he did not know what the "I'm feeling lucky" button did and wanted an explanation as to how it worked.

Interview:

I. Logistics –

Steven and Leonid conducted the interview session with Randy – the entire session took approximately 45 minutes. This interview was recorded with the video camera Randy opted to use the laptop with the additional monitor, keyboard, and mouse.

II. Summary of Contextual Interview –

Randy started with the desktop he was given a choice of two browsers on the desktop he chose internet explorer. He was not familiar with either of the web browsers. He had a computer with Mac OSX so he was familiar with samba which is the standard web browser on Mac computers. He was very familiar with searching for things on the internet and even gave an example for something that he had recently searched for.

When asked to search for aspirin he searched for the simplest terms then expanded on those. When asked he said that, that was what he thought would yield that best result. He then stated that he didn't like the way that the internet is structured. He believed that the internet was corrupted by companies trying to make money off of people that don't know any better.

He had also preformed fairly well with searching for advanced terms. When asked he didn't know what the "I'm feeling lucky" button did. At the time the last page he had visited was the first one when the term aspirin was searched for. The "I'm feeling lucky" button resulted in going to the same page that was previously visited. He made the inference that the button took you back to the last page that was visited. When told what the button actually did he stated that it is a horrible way to search the internet.

He had heard of book marking before, but he didn't use it instead he saved the links to the various pages to the desktop and used that to contain his links.

5. Max

Max is an older adult in his late 80's, he has is an average computer user and is a fairly competent internet searcher. He uses his computer everyday for various things; these things include word-processing, photo editing and viewing, games, e-mail, and internet browsing. He has a desktop that he bought himself which he uses every day. The computer that he bought for himself had windows XP on it and internet explorer 5.0. When he was shown the desktop of the testing computer he went and opened the internet explorer web-browser.

When he is on the internet he uses it to look at financial information. When he is on his computer he stated that he uses it approximately 50% of the time which averages to be about 2 hours daily. He considered his internet searching skill to be about average. When he was on google.com he had overcomplicated things at the beginning by use a complicated search term. He often uses yahoo to do his searching and to look for financial information as well as check his e-mail. He was aware of book marking however he never used it he just saved the web pages to his desktop. He had seen the Google "I'm feeling lucky" button but he never used it.

Interview:

I. Logistics –

Leonid conducted the interview session with Randy – the entire session took approximately 60-70 minutes. This interview was recorded with the video camera Max opted to use the laptop with the additional monitor, keyboard, and mouse.

II. Summary of Contextual Interview –

When the interview started after Max had filled out the questionnaire. He started internet explorer. When asked about this he had said that his desktop he owns has internet explorer on it. He was then directed to go to google.com there were no problems indicating that he uses the internet occasionally he was then asked to search for aspirin. He typed, "Aspirin – negative effects". When he was asked about his use of search terms he had said that the search term would most likely result in something he is interested about. He had no problem finding information that he would usually be interested in. One of the major difficulties he had was the font size was too small, he had problems making out some of the words.

He was then asked to search for the term aspirin effects which when he did it brought up 297,000 results which he had stated is far too many. He had also stated that previews of the web pages would also be useful so that he can filter the useful websites from the ones that are commercially sponsored. He became agitated as the first result from this search was an ad for a pharmaceutical company however it was grouped with the normal results and didn't specifically

say that it was an advertisement. He had stated that he like it better when the ads were on the side instead of mixed in with the normal results.

To return to the Google home page instead of pressing the back button a couple of times he instead typed the address for Google. He was then asked to search for aspirin using the “I’m feeling lucky” button, which brought up the page for aspirin on Wikipedia. He inferred from this that the “I’m feeling lucky” button searched for your term on Wikipedia. He stated that he believed that it went to more informed information. When we explained that it instead went to the first webpage that would normally appear on the main Google search page. He stated that he didn’t like how that operated and said that the button is restrictive and you will have no way of finding other information.

He had stated that he had heard of book marking before but he never used it instead he had taken the web pages and saved them to some place on his desktop. Toward the end of the interview he had stated that typically he would learn something then at a later time forget how to do it. He also stated that he would like to have a step by step tutorial for how to search the internet.

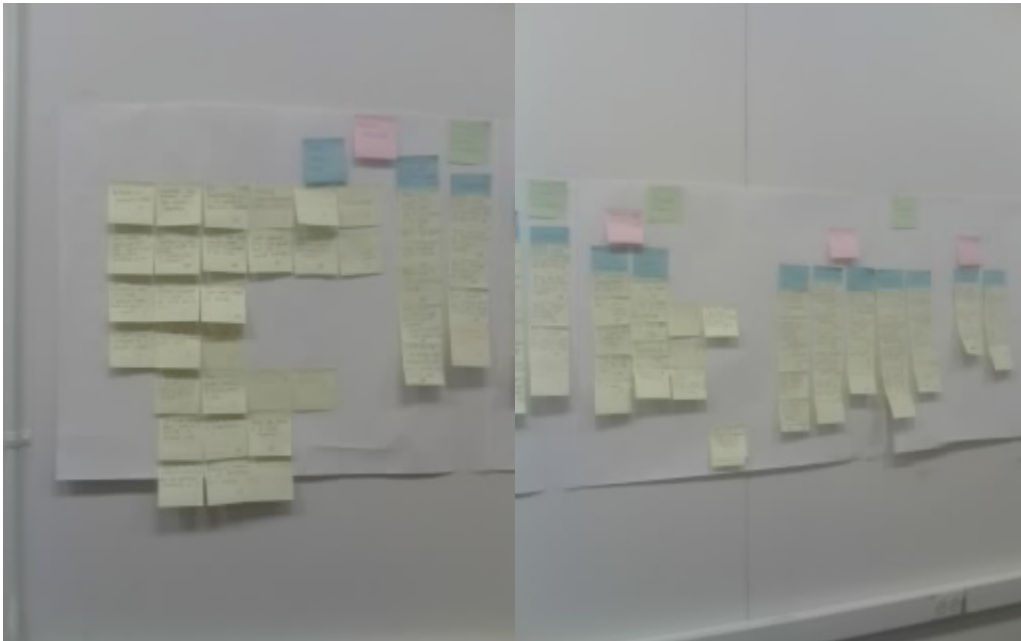


Figure 3: Affinity Diagram from Initial User Research

Recommendations:

- **Top issues resulting from initial user research and corresponding preliminary design ideas -**

1. User’s desire to see various words (not necessarily keywords) “signaled” in the results page to draw attention to more relevant results.

DI: This issue was brought up by a participant who, after analyzing most of the displayed results for side effects of a particular drug, found the most relevant link to be one with many “scary” words such as “blindness”

in the description of the link. They felt that if they could have isolated those words by making them different colors, their attention would have been drawn to that result more quickly, saving time.

We know this will not be easy, but we've been looking into a current method of "keywords tagging" as a system of classification which utilizes an information retrieval method known as "folksonomy" – a play on the words folks and taxonomy - to create a classification system by and for the users. Another example of the implementation we're looking into are "social book marking sites" such as del.icio.us that employ user generated 'tags'. Another example of current implementations are "social search engines" which learn from the search strategies of their community.

This could be used to create a classification system emphasizing words that are important flag words of particular interest to our vertical market of older adults (i.e., health related "trigger" words such as "blindness," "heart failure," or "severe pain."

2. Organize the number of, and manner in which results are displayed. Many users don't see any method in why some links are listed before others, which reduces the credibility of the result in their eyes.

DI: If we provide a means to enable search results to be classified and subsequently ordered in many different ways based on any similar attributes by using a "scalable search that employs faceted navigation". This method was developed and is currently employed by Dieselpoint, Inc. to provide their users with context-dependant browse capabilities. ^[1]

3. Take into account that a major goal of users is to search for information about health issues.

DI: We think that a really interesting way to incorporate this into our search engine would be to make our search engine a metasearch engine which will combine the searching power of multiple general search engines (such as Google and Yahoo!) and also medical search engines such as WebMD

4. The layout should be clearer for the users – they should not be left to infer what they should do next. Provide some means for novice search engine users to learn what they should do and how to go about it.

DI: (Holt & Morrell, 1998) suggest that "steps for performing a search should be simple and clear, and should be kept to the smallest number of steps possible. The user should not have to infer what to do next."

One of our users suggested labeling everything better – that is to say that even the box in which you type your search item into should be clearly labeled.

To provide some means for novice search engine, or Internet users to receive the full benefit of our search engine, we will create a tutorial that is obvious to access. (Echt, et al., 1998) demonstrated that older adults can learn to perform various computer related tasks with

instructions in the form of text and animations, or with instructions presented as text with illustrations.

5. Some users felt picture previews would help, but others *strongly* disagreed! Come to some kind of consensus, whether in follow-up interviews or thorough research, about what the best course of action would be.

DI: We're on the fence about how to approach this problem, but all the related literature that we've found thus far seems to be quite contradictory. (Hartley, 1994) determined that text is important if one is attempting to convey ideas that must be treated in a sequential manner, but that illustrations would be useful if one needs to convey any ideas that need to be considered simultaneously.

This would obviously suggest that search engine results (which cannot possibly *be* considered simultaneously) should be portrayed with only text, but (Hartley, 1999) found that illustrations aid recall of the textual material, which would be important for older adults who have just read down a list of search results and don't want to have to start all over again simply because they have a hard time remembering what they just read.

We believe that with all of this related research in mind, we will have to conduct another follow-up interview with our participants who are willing to really concentrate on this questions and its implications.

6. Develop an obvious way to be able to return to the previous search result screen or an entirely new search – this can be quite confusing as you get further and further into a multi-layered Website.

DI: At this point we believe we will have to work within some kind of frame that remains visible to the user until they explicitly close it that make backtracking and obvious easy option for them (similar to Google's frame when you use Google Images). We're still coming up with some ideas for this because we would like to incorporate whether or not our users would prefer a simple "back" button as opposed to an option for seeing a preview of the screen you would backtrack *to* when you clicked back.

We were also thinking about having a single icon prominently displayed so that users to go back to start a fresh new search if they felt everything was getting to muddled and off-track. We would have to take into consideration the aesthetics of the layout; we are currently throwing around ideas with each other in regards to specifics.

7. Develop some way to help users differentiate between sponsored links and actual results (there is a distinction between sponsored links and ads – a lot of participants were able to filter out ads but ended up clicking a "Sponsored Link").

DI: The reason that this was a problem for our participants on Google was that the colored "box" around the Sponsored Links had incredibly limited color contrast with respect to the background of the general layout that it was

impossible to see. We've been reading various literature related to the cognitive implications of various color combinations, and we've found some really interesting results.

For instance portraying blue hyperlinks among blue or green backgrounds is especially unhelpful, as (Fozard, 1990; Kline & Schieber, 1985) determined that older adults have a harder and harder time differentiating between colors in the blue-green wavelengths.

8. Improve the readability of content – some participants were squinting to read the search results but when they clicked the link the font was better suited to their vision.

DI: There are obvious faux pas to avoid when designing graphics for older adults, for instance any kind of patterned background will make the layout exponentially less hospitable for older adults to use, but (Holt & Morrell, 2002) provide multiple non-obvious and seemingly nuanced formatting suggestions specifically for designing Websites for older adults.

9. The biggest issue is one that we will, unfortunately, not be able to address within the scope of this project – both the tendency to draw away from, and the inability of a large segment of our target user group to access, search engines on the Internet due to an extreme anxiety towards technology or limited computer skills (more often a mixture of both). This became one of the biggest issues of all, and came as quite a surprise to our team – for over half of our interview participants, search engines themselves were not even the issue.

III. User Interface Design -

Based on our interviews, we decided to focus on the following issues:

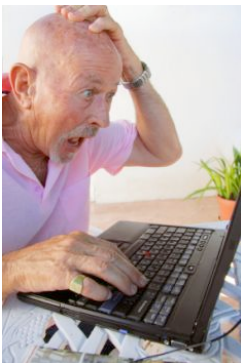
- 1) User's desire to see various words (not necessarily keywords) "signaled" in the results page to draw attention to more relevant results.
- 2) Organize the number of, and manner in which results are displayed. Many users don't see any method in why some links are listed before others, which reduces the credibility of the result in their eyes.
- 3) Take into account that a major goal of users is to search for information about health issues.
- 4) The layout should be clearer for the users – they should not be left to infer what they should do next. Provide some means for novice search engine users to learn what they should do and how to go about it.

- 5) Some users felt picture previews would help, but others *strongly* disagreed! Come to some kind of consensus, whether in follow-up interviews or thorough research, about what the best course of action would be.
- 6) Develop an obvious way to be able to return to the previous search result screen or an entirely new search – this can be quite confusing as you get further and further into a multi-layered Website.
- 7) Improve the readability of content – some participants were squinting to read the search results but when they clicked the link the font was better suited to their vision.

Conceptual Design Tools:

After analyzing the data from the initial user interview sessions, our team developed – both individually and as a group – four separate iterations of low-fidelity prototypes. These enabled our team to effectively prepare for our next and final round of user study interviews, so as not to waste our participants time with trivial errors and obvious mistakes. To prepare for these interviews most effectively, we used conceptual design tools that enabled us to efficiently develop each successive iteration of the low-fidelity prototypes. These conceptual design tools consisted of personas, tasks and scenarios. The personas were based on the participants of our initial user research interviews, and enabled us to view the prototypes through their perspective by subjecting them to various scenarios and tasks specific to a persona.

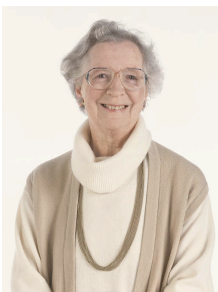
i. Personas:



1. Bob is an 88 year old retired English Professor. He and his wife Trudy have 3 children and 2 grandchildren.

One of their grandchildren is a sophomore at CU in Boulder, CO, and the other is a junior at Fairview High School. His grandchildren constantly talk about the Internet and to connect to his grandkids he has been trying to learn some of the lingo that they use.

Bob uses his computer to play games every day, but really only uses the Internet to check his email. Every now and then he uses Yahoo! to search for information about his prescriptions or about symptoms that he or his wife are experiencing, but is frustrated by the information that comes up.



2. June is an 85 year old retired Librarian. She and her husband Ted have 2 children in their 30's and 5 grandchildren in their late teens and 20's. Although June has used a computer one or two times before, she does not use them often because she finds the experience to be too overwhelming and frustrating.

When June needs to search for information she will use an Encyclopedia, Newspaper, book or friend to find her results, she has never used an Internet search engine before.

ii. **Tasks:**

1. Bob needs to find information on a new type of drug that his doctor proscribed him, specifically he would like to know what, if any, possible side-effects are related to it because he does not remember specifically what his Doctor told him.
2. Bob wants to be able to quickly navigate the search results for the health related topics he has searched for.
3. No tasks for June because we have determined that the user group she represents is not the target group of our final product – her needs and issues constitute an entirely separate project, beyond the scope of our project.

iii. **Scenario:**

Bob is busy playing a new computer game when he starts to experience a really bad headache. It has been about an hour since he's taken his new dosage of Aspirin, although this is a new symptom for him, he believes it could be a side effect related to the new dosage of medication. Although Bob's Doctor told him what side effects to expect, he doesn't remember exactly whether or not headaches were one of the effects mentioned to him. He's already at his computer so he decides to go on the Internet to find out. He doesn't search for things using the Internet very often, but he heard from his friend Jake, who uses the Internet all the time, that he could find a ton of information about medicine or health issues online.

He logs onto yahoo.com to search for side effects of Aspirin, but when looking through the results, he accidentally clicks the first ad that showed up in the results. Not completely sure how to get back to the results of his search, he retypes yahoo.com into the URL box and starts the same search over again. This time he takes a while to read over most of the information provided for each link. He becomes frustrated at the disorganization of the results; he's not sure why one link is showing up before another – is it because it's more important? After reading through the results from somewhere in the middle of the page, he finds a link to WebMD listing the side effects of Aspirin.

Iterative Prototypes:

Each individual in our group came up with a set of first iteration low-fidelity prototypes, which we based on our analysis of our initial user interviews and problem statement. After comparing and talking through the pros and cons of each individual's prototypes, we came to a group consensus for a set of second iteration low-fidelity prototypes, which we then each individually analyzed with a cognitive walkthrough. Our individual analyses coalesced into a third iteration of low-fidelity prototypes, which was then scrutinized with a think-aloud test, which in turn led to our fourth iteration of low-fidelity prototypes.

We have included summaries and representative images of our low-fidelity prototypes in the Figures that follow, while the low-fidelity prototypes at each stage of iteration can be found in their entirety in Appendices D-G.

i. Cognitive Walkthroughs - Second Iteration Prototypes

After condensing our individual sets of first iteration low-fidelity prototypes (Appendix D) into a single set of second iteration prototypes (Appendix E), we each individually conducted a cognitive walkthrough of it (Appendix L). A major issue we uncovered by doing so was that there was no way to return from the "What is a Frame?" screen without using the browser's back button. Other issues we uncovered were minor details regarding the consistency of the background in screen shots and basic grammatical issues.

The major issue our group resolved for our prototypes with our cognitive walkthroughs was the structure of the Tutorials. We originally allowed the users to just click to view a 'Tutorial', at which point they could decide to view the Tutorial as 'Text with Pictures' or 'Video'. After going through the cognitive walkthrough, we decided this was very unclear and ambiguous for the users, and we decided to provide two separate options from the homepage for two separate Tutorials: either as a 'Rapid Tutorial' or as a 'Comprehensive Tutorial'.

Figures 4-6 illustrate our second iteration prototypes which we performed the cognitive walkthroughs on, they do not illustrate the subsequent changes made for the third iteration of prototypes. The comprehensive set of 2nd iteration prototypes can be found in Appendix A.5.

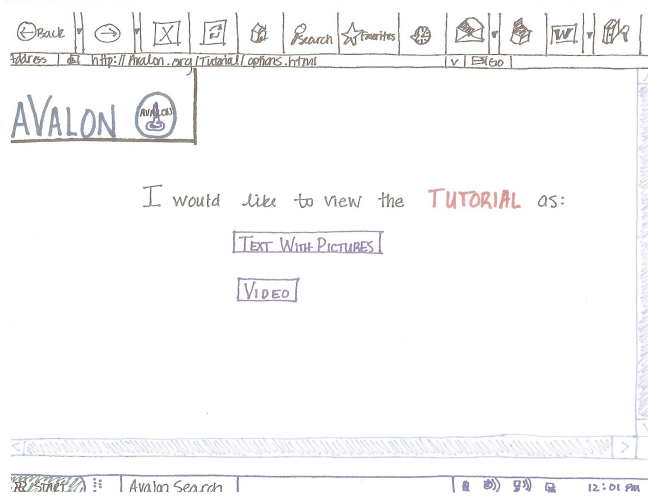


Figure 4: Choose How to View Tutorial (2nd Iteration)

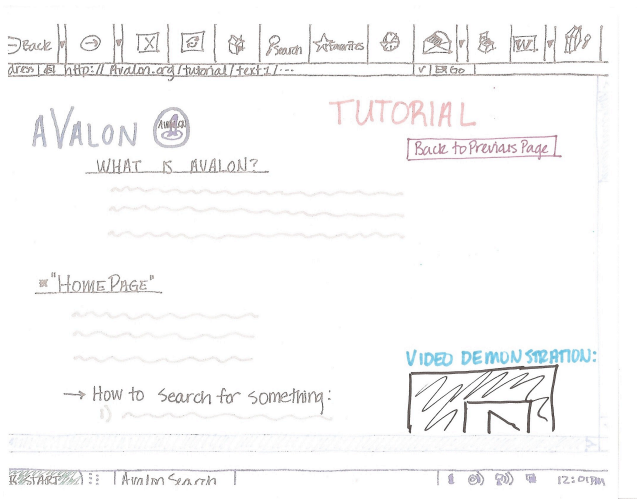


Figure 5: 'Text with Pictures' Tutorial Screen Shot (2nd Iteration)

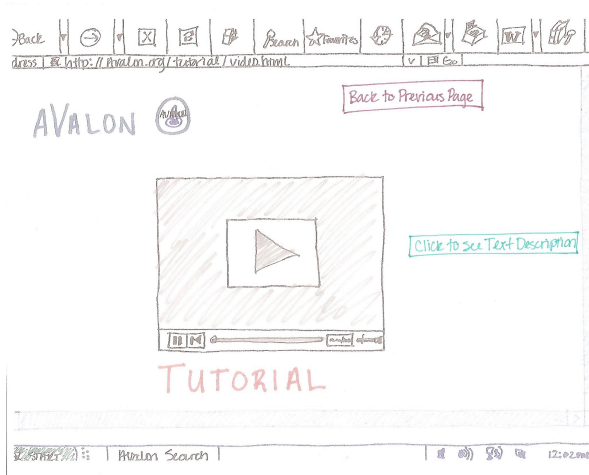


Figure 6: ‘Video’ Tutorial Screen Shot (2nd Iteration)

ii. Think-Aloud Testing - Third Iteration Prototypes

After analyzing the issues and errors of our second iteration low-fidelity prototypes that were uncovered with our individual cognitive walkthroughs, we each found a volunteer with whom to perform a think aloud test (Appendix M). After performing these individually and then comparing our results, the major issue we uncovered was that the term “Frame” was unclear to users – we decided to refer to it as a “Search Box.” We also discovered minor details in the implementation of the PowerPoint hyper linking that need to be addressed before our user study sessions, such as how the “Back” button needed to be implemented very carefully, because it was possible to get to one screen from various other screens.

Figures 7-10 illustrate our third iteration low-fidelity prototypes. These are the prototypes that we performed our individual think aloud tests with, they do not show any changes that we subsequently made due to our findings. The complete set of third iteration low-fidelity prototypes can be found in Appendix F.

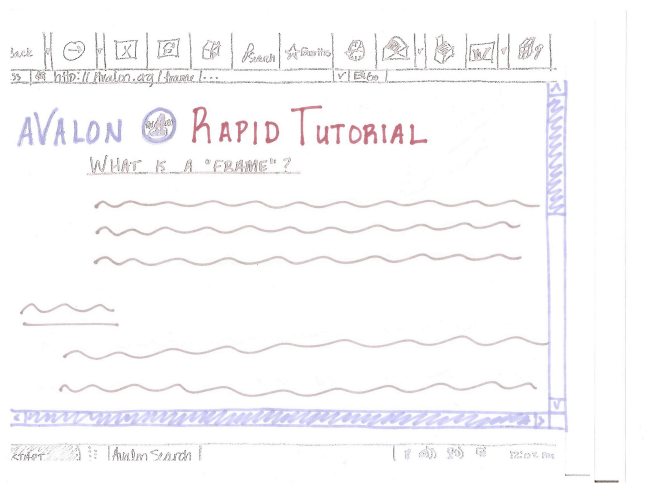


Figure 7: Rapid Tutorial Screen Shot (3rd Iteration)

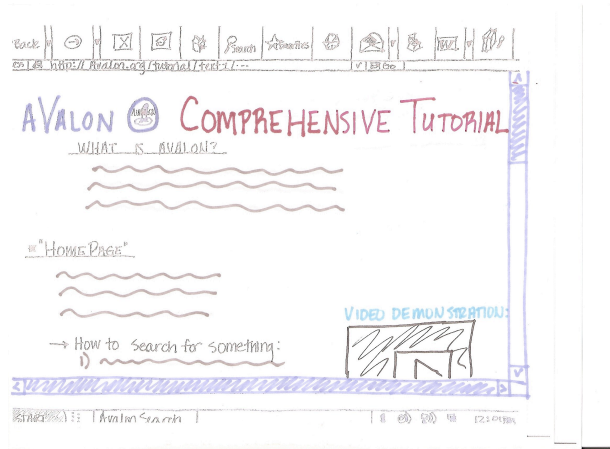


Figure 8: Comprehensive Tutorial Screen Shot (3rd Iteration)

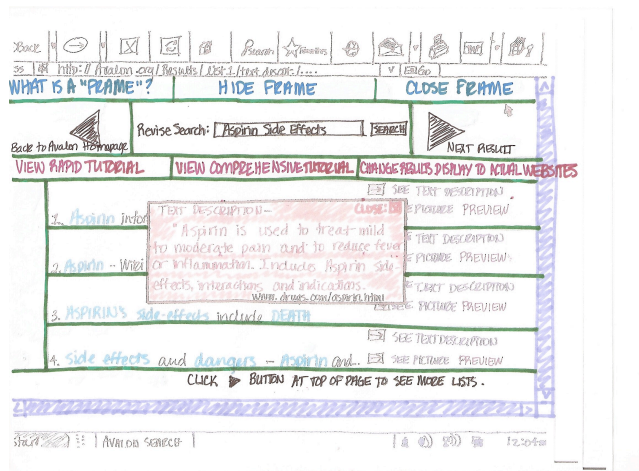


Figure 9: List Results with Text Description Screen Shot (3rd Iteration)

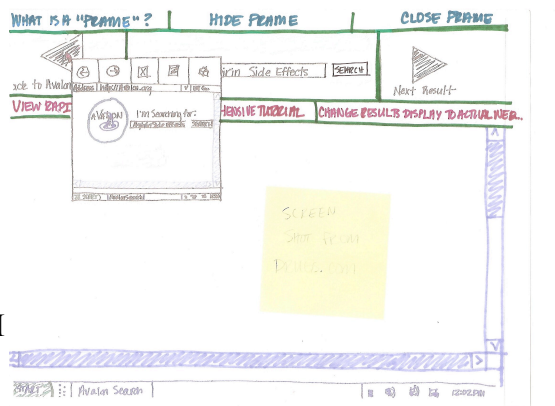


Figure 10: Mouse-Over Preview Screen Shot (3rd Iteration)

iii. Fourth Iteration Prototypes

The following figures show some representative images of our fourth iteration prototypes, which were the prototypes that were used for our final user study interviews. The fourth iteration prototypes include changes made based on our think aloud test findings, and the collective set of prototypes may be found in Appendix G.

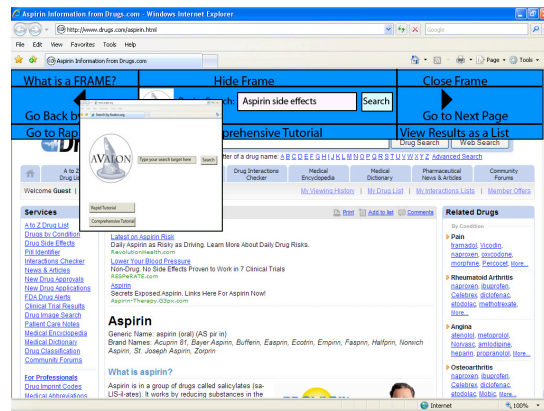


Figure 11: Mouse-Over Preview Screen Shot (4th Iteration)

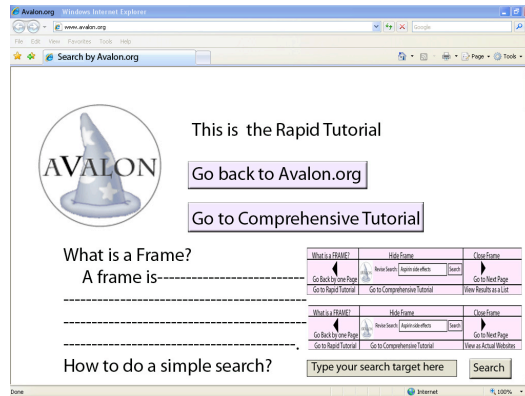


Figure 12: Rapid Tutorial Screen Shot (4th Iteration)

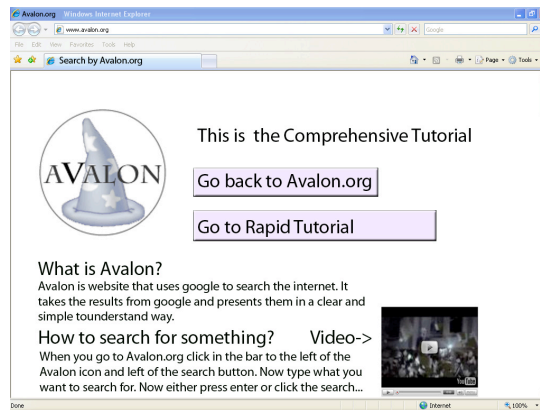


Figure 13: Comprehensive Tutorial Screen Shot (4th Iteration)

IV. Usability Testing

Our group decided to simulate our fourth iteration prototypes in Microsoft PowerPoint, using hyperlinks to simulate functionality. Hyperlinks connected the eleven slides of screen-shots quite effectively, providing a realistic interface for participants to use during our final user study interviews. The participants did not have any notable issues with this method, as all the hyperlinks worked correctly during the session.

Summarized session notes may be found in Appendix N. These notes are the product of our group getting together after the User Study to analyze and greatly condense our observation annotations, and are provided in a clear and concise manner.

Testing Objectives:

During our user study sessions, we attempted to address some design issues that had consistently come up during the design and iteration phase of the system development – issues that we were unable to conclusively decide the ultimate merit of for users without their perspective. In addition to the specifics outlined below, we intended to keep an eye out for any design blunders that were not previously caught through the previous iteration of prototypes.

Through either our observation of the participants completing the tasks while thinking aloud, or through their responses to our User Study Questionnaire (Appendix H), we sought to:

- Determine whether the keyword “signaling” in the list results was obvious – did they feel it was helpful?
- Determine whether displaying four results in the ‘list results’ was too many, too few or just enough.
- Take note of their interaction with being to bring up either the ‘Picture Preview’ or the ‘Text Description’ of each listed result.
- Ascertain whether they believed the layout was clear enough of cluttered information. Determine whether they felt bombarded by information at any point?
- Determine if it was clear to them how they should proceed at every step – was the wording confusing at any point(s)?
- Figure out whether or not the users felt the mouse-over preview feature made the screen look to cluttered.
- Determine whether the interface was legible at every point with respect to the obviousness of buttons (ie: the tutorials).

Participant Recruitment, Numbers and Description:

Two of the participants from our first round of interviews agreed to participate in our final user study session, and one of these participants recruited their friend to participate also, providing a total of three participants. Although this was a seemingly restrictive figure to work with and ultimately draw conclusions from, we believe it was sufficient. We feel that the feedback we sought to gain did not depend on the quantity of input as heavily as the quality – as such, we developed our user study in an attempt to address all the issues of concern while at the same time, attempting to span the spectrum of the capabilities of our system to ensure thorough and comprehensive testing.

The limited amount of interest our project ultimately generated at The Academy (where our initial presentation and interviews were conducted), in addition to the unanticipated selective nature of our project, rendered our recruitment efforts all but obsolete. The amount of interest that was generated at

our initial presentation was not representative of the amount of interest that was followed through.

Selection for participants for our user study was necessarily selective – participants must classify as “older adults” by being over the age of 65, and they must be able to use a computer with relative familiarity. We were not looking for “experts”, but rather people who know how to navigate their way around a computer – participants who can get to the Internet from the Desktop and know how to get to a Web site (such as Avalon.org).

Although our original goal was to appeal to older adults from the spectrum of technological experience, our interviews indicated the naivety of that goal – users who had little to no computer experience would not be able to access and would have no interest in using our search engine. We have therefore proceeded with designs with the assumption that users will have the most basic grasp of using computers and the ability to access and navigate the Internet.

We had three users agree to participate who “qualified” according to the previously mentioned criteria. We contacted two of the participants of our initial interviews (because they were the only two who qualified for our new revised target user group) and asked them if they had any friends of a similar technical background (as per the description below), and if so, if they would mind giving our contact information to them. One of their friends emailed Vivian and set up a time-slot during which to participate in the user study session.

Testing Logistics:

The user study session was conducted at The Academy, on Saturday, April 4th, at roughly 12pm, 1pm and 3pm (the first session ran approximately 10 minutes over the allotted hour, pushing back the second session time, which the participant did not mind too much). The interview sessions occurred in the Parlor, at a large wooden table that had a computer set up on. We provided a large screen monitor and regular mouse and keyboard for the users (who were not all necessarily familiar or comfortable with using laptops). No video of the session was acquired, but audio recordings were required of all the participants.

Vivian was the facilitator of the first of the three sessions, while Leo and Steve collected data (notes of observations); Steve was the facilitator for the second session, while Vivian and Leo collected data; Leo was the facilitator for the third session, while Vivian and Steve collected data. Those taking notes had hard copies of the fourth iteration prototype slides on which to take notes.

We brought two printouts of the consent forms for each participant (one for them to sign which we collected, and one for them to keep for their records) in addition to a questionnaire for each participant to fill out (which we collected). During each session, we ran through the interview script (Appendix I), handing out the questionnaire found in Appendix J when directed by the script.

Testing Procedure Description:

The user study session script can be found in Appendix I, the questionnaire handed out to participants can be found in Appendix J, and our consent for can be found in Appendix C.

Results:

Issue	Severity	Fix
Confusion over what Avalon was - a couple participants suggested we explicitly state Avalon's purpose on our homepage to be clear that is is a search engine.	Low	We will add the text "Your Internet Searching Site" to the homepage of Avalon near the logo to make it clear.
If clicked either tutorial from Search Box, you can return to a fresh new Avalon homepage, but can't go back to the previous page that brought you to the tutorial - still a large tendency to not use back button in the Internet browser itself.	Moderate	We need to add a button (option) for users to return from the tutorial to the immediately preceeding page.
Still hard for users to differentiable between the Search Box and where the actual web site or list or results began.	Moderate	Make a thicker black border at the bottom of the Search Box.
Users could not differentiate between the content of "Rapid Tutorial" vs. "Comprehensive Tutorial" enough to justify having two separate tutorials. Having two caused confusion.	Severe	We need to combine the two separate tutorials and make the name of the tutorial more clear - "Rapid Tutorial" was too confusing - make it called "Getting Started Tutorial"

Table 1: Findings from User Study Session

V. Final Prototype and Conclusions -

The entirety of our final iteration of prototypes can be found in Appendix H, but Figures 14-18 showcase the most notable features of our final set of prototypes; they illustrate some features of our project: a single tutorial labeled "Getting Started Tutorial," a choice to view the results as "Actual Websites" or "A List of Results," the ability to preview the page that will be brought up when the user places the mouse over the back or forth button, being able to view four results in the list result format and finally the ability to bring up a text description for a particular one of these four results.

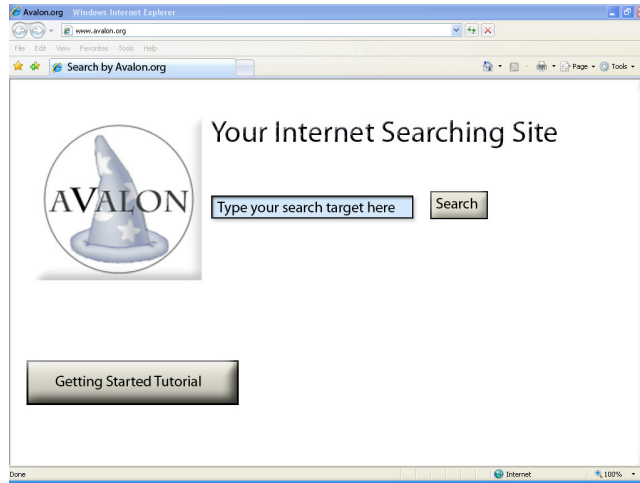


Figure 14: Main Homepage of Avalon.org Screen Shot (Final Iteration)

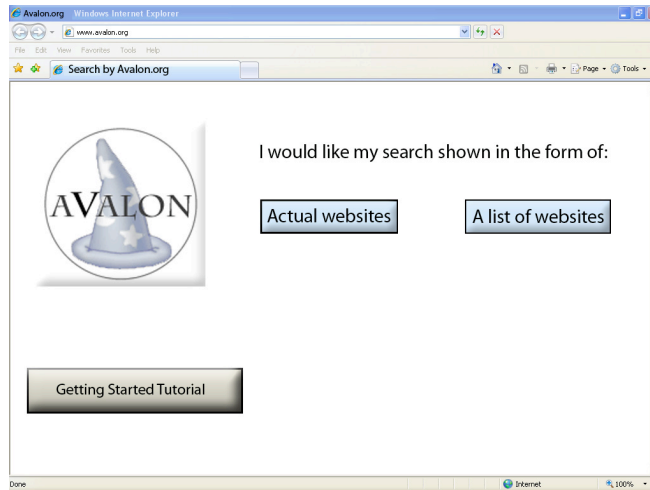


Figure 15: Choose Result Format Screen Shot (Final Iteration)

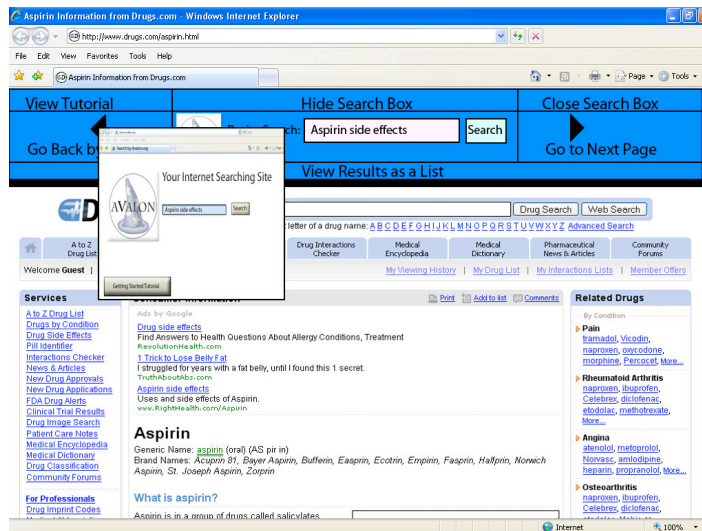


Figure 16: Mouse Over Preview – Actual Web Site Screen Shot (Final Iteration)

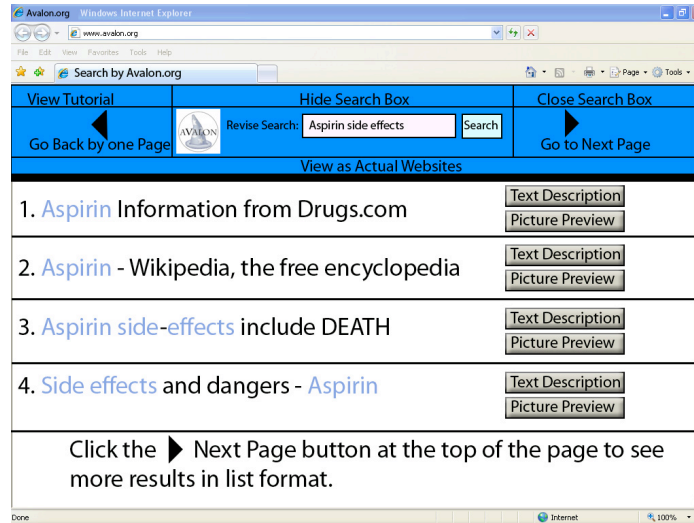


Figure 17: List Results Screen Shot (Final Iteration)

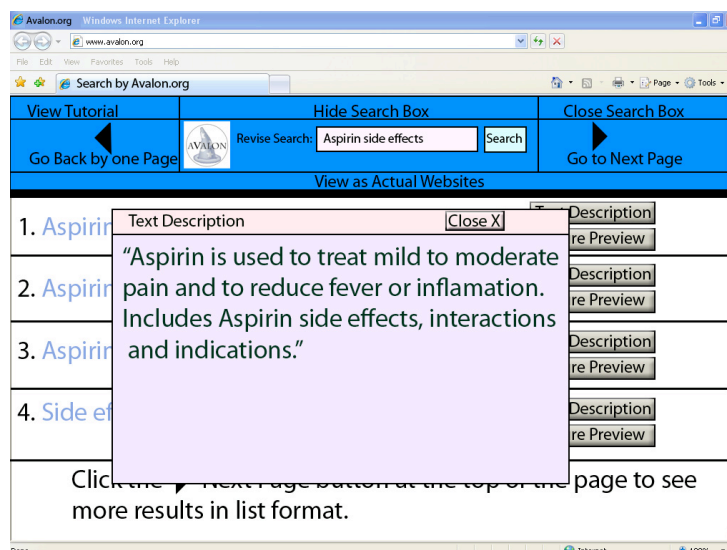


Figure 18: List Results with Text Description Screen Shot (Final Iteration)

Recommendations for Sponsor:

Blackmon et. all have conducted research to create a comprehension-based model of Web Navigation they refer to as the CoLiDeS Model, an acronym for Comprehension-based *Linked* model of *Deliberate Search*. This model expands upon numerous previous models and empirical results, to create a theoretical model which can help Web designers mediate tradeoffs of seemingly contradictory findings based on available design practice guidelines and or usability research findings.

Due to the inconclusive results obtained from our first round of user interviews regarding the use of text vs. pictures as a means to convey information, we believe there is much insight to be gained by applying this model to the prototypes we have designed – in effect compensating for the limited number or participants.

During our initial presentation to potential participants at The Academy, someone made the suggestion that a shopping website specifically for older adults be created, and while we have done no related-work research pertaining to this particular suggestion, we hope to convey that there exists a base of user interest for such a project.

VI. References –

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VII. Appendices – APPENDIX A

One on One Interview Script

[Introduction]

First of all we would like to thank all of you for volunteering to participate in our research. Our names are Vivian Phinney, Steve Carroll and Leo Meltreger. We are third year undergraduate students in Electrical/Computer Engineering and Computer Science. We are conducting research about older adults and information technology to develop a web browser for older adults that will be called Avalon. (will omit one person's information, depending on which one of us is conducting the interview).

[Overview of the Session]

Today we will be asking you to complete several tasks involving the Internet on the

computer and observing how you interact with the computer. There is no right or wrong way to interact with the computer – we are testing the Internet browser and computer – *not you*. If you have questions at any time, please feel free to ask. We will be video taping this session. If you are uncomfortable with this, please let us know and we will remove your images from our videotapes. Everything you say during this session will be anonymized and no one will be aware of your participation except for members of our research team. We expect the session today to last approximately one hour. Do you have any questions before we begin?

[Consent Form]

I am now going to give each of you a consent form. Please read and make sure you understand it thoroughly. If you have any questions, please ask. There are two copies of the consent form. One copy is for you to take with you for your records and the other is for you to sign and return to us. Please be sure to initial the bottom of each page of the consent forms and sign the last page.

[Interview]

Now that we are finished with the consent forms, we will begin the interview. I am going to be asking you to perform tasks on the computer using the Internet. I would like you to think aloud as you perform these tasks. By thinking aloud I mean telling me what you are thinking as you do each task. For example, if I were asked to think aloud about turning on this computer I would say, “Hmmm. I want to turn on the computer, but I do not see a button near the keyboard like usual. I’m looking for that semi-circle with the line symbol that means power. Oh! I see the symbol on the side, but it’s not a button. Oh, it’s a slider. Great now it is on!” Thinking aloud is sometimes difficult when people are concentrating, so sometimes I may prompt you and ask what you are thinking. Please remember that there are no right and wrong answers. We are testing the Internet browser and the computer, not you.

Please let me know if you have any questions at any time. Do you have any questions before we begin? Let’s begin.

[Interview Tasks]

1. Please go on to the computer and access the Internet the way you normally do.
2. Please search for information about _____ and think aloud.
 - a. We may ask...
 - i. Why they chose to use the browser they are using.
 - ii. How they chose the search terms they used
 - iii. How many times would they change the search terms (and let them change the search terms)
 - iv. What do they think of the search results presentation? Is it too textual? Would pictures of the webpages be more helpful? Is the

list too long?

3. If the participant did not use the search term _____, we will ask them to conduct a search using this specific search term and ask them to think aloud while they conduct this search.

4. Please go to Google.com, search for _____ and use the “I’m Feeling Lucky” button.

a. What do you think happened when you pushed the I’m Feeling Lucky button?

i. If participant does not know, let them know that the I’m Feeling Lucky button shows the first website from the Internet search

b. What do you think of this button’s behavior? Is it useful?

[Thank You]

Thank you for participating in our study. Do you have any questions before we conclude this session?

[Give compensation]

Would you be interested in helping with my future studies to create this program? [If so, record name and telephone number]

APPENDIX B

Questionnaire

Please circle the answer that is most applicable to you. You may circle more than one if applicable.

1. What do you consider your computer skill level to be?

- High
- Average
- Low

2. How often do you use a computer?

- Every day
- Several times per week
- Several times per month
- Less than once a month

3. *What do you use your computer for (you may circle all that apply)?*

- Word Processor (Text Editor)
- Photo Editing
- Photo Viewing
- Music Players (i.e. - iTunes, Windows Media Player, Rhapsody...)
- Games (i.e. - Solitaire, Hearts, Chess...)
- Internet Browsing
- Email
- Other: _____

4. *Do you use the Internet?*

- Yes
- No

5. *Approximately how many hours do you spend online when you do use a computer?*

- Less than 1 hour
- 1 hour
- 2 hours
- 3 or more hours

6. *What would you consider your Internet searching skill?*

- Low*
- Average*
- High*
- Expert*

7. *How often do you use a search engine (such as Google, Yahoo, AOL, etc) to search for information?*

- Very often
- Often

- Sometimes
- Rarely
- Never

8. *If you answered something other than 'Never' for the previous question, which search engine(s) do you use the most often?*

- Google.com
- Yahoo.com
- Ask.com
- Other (Please specify) _____

9. *How often to you bookmark the pages you find through any of the search engines mentioned above?*

- Never
 - I don't know how to
 - I don't find information relevant enough to bookmark
- Rarely
- Sometimes
- Often

10. *If you have ever used Google.com to search for information, have you ever used the "I'm Feeling Lucky" feature?*

- Yes
- No

11. *If you answered 'Yes' to the previous question, did the "I'm Feeling Lucky" feature get you the information you were seeking?*

- Yes
- No

12. *If you responded that you feel you have low computer skills, how do you search for information?*

- Encyclopedia
- Newspaper
- Books
- Other (Please specify) _____

Please respond to the following questions in several sentences.

13. What about the Internet do you find most confusing or intimidating?

14. If you could change anything about the way the Internet is set up to use on a computer, what would you change?

15. Please list any additional comments you have about computers, the Internet, and your interaction with them:

APPENDIX C

Evaluation of Usability of Web Browser Interfaces for Older Adults
Principal Investigator Katie Siek
PARTICIPANT INFORMED CONSENT FORM
November 1, 2007 Version 1

Please read the follow explanation of this research study. Signing this form indicates you have been informed about the study and you want to participate. We want you to understand what you are being asked to do and what risks and benefits – if any – are associated with this study. This should help you decide whether or not you want to participate in this study.

You are being asked to take part in a research project conducted by Dr. Katie Siek, Ph.D., a faculty member in the University of Colorado at Boulder's Department of Computer Science, 430 UCB, Boulder CO 80309-430. Professor Siek can be reached at 303-492-5066.

Project Description:

The purpose of this study is to better understand the various obstacles that older adults face when searching for items on the Internet. The results of this study will be used to design and implement a more user-friendly and less cognitively challenging web-search application interface (such as Google, Yahoo, or AOL). You are being asked to participate because you are an older adult. It is your choice whether or not to participate in this study. We are recruiting approximately 15 – 20 participants for this study.

Procedures:

If you agree to take part in this study, you will be asked to participate in a focus group to discuss and/or demonstrate your usage of the Internet. Participating should take about an hour and will take place at The Academy. You will be asked questions about your Internet and computer usage and you may be asked to demonstrate some of your online activities.

Participation in this research will include videotaping. These tapes will be used for richer data capture and will be retained until January 1st, 2010 at which point they will be destroyed. Those individuals who will have access to these tapes will be the research team: Katie Siek, Jane Meyers, Lauren Fosco, and Vivian Phinney. Being video taped is not a requirement for participation. You may still participate in the study if you choose not to be taped; if you choose not to be taped, your image will be edited out of our focus group videos.

Please Initial Here _____

Page 1 of 3

Benefits:

This study may benefit older adults by increasing our knowledge of which interfaces work best for older adults. Your feedback will help us to create an interface that will help you maximize your experience with web-browsing.

Risks and Discomforts:

There are no foreseeable risks to participating in this study.

Source of Funding:

Funding for this study is being provided by the Committee on the Status of Women in Computing Research's Collaborative Research Experience for Undergraduates in Computer Science and Engineering program.

Subject Payment:

You will be paid \$10 for each focus group in which you participate.

Ending Your Participation:

You have the right to withdraw your consent or stop participating at any time. You have the right to refuse to answer any questions or refuse to participate in any procedure for any reason. Refusing to participate in this study will not result in any penalty or loss of benefits to which you are otherwise entitled.

Confidentiality:

We will make every effort to maintain the privacy of your data. Those participants who do not wish to be identified in the video will be edited out after transcription takes place. The videotape will be kept in a locked file cabinet in the computer science department that is only accessible by the research team until it is destroyed on January 1st, 2010. Participant questionnaires and remarks will be numerically coded to protect the privacy of participants. The list linking numeric code with individual data will be kept in a locked file cabinet in the computer science department that is only accessible by the research team. All data will be destroyed on January 1st, 2010. Other than the researchers, only regulatory agencies such as the Office of Human Research Protections and the University of Colorado Human Research Committee may see your individual data as part of routine audits.

Please Initial Here _____

Page 2 of 3

Questions?

If you have any questions regarding your participation in this research, please ask the one of the investigators (Katie Siek, Lauren Fosco, or Vivian Phinney) before signing this form. If you should have questions or concerns during or after your participation, please contact Dr. Katie Siek at 303-492-5066.

If you have questions regarding your rights as a participant or any concerns regarding this project, you may contact the Executive Secretary, Human Research Committee, 26 UCM, Regent Administrative Center 308, University of Colorado at Boulder, Boulder, CO 80309-0026, (303) 735-3702. Concerns may be reported confidentially if you wish.

Authorization:

I have read this paper about the study or it was read to me. I know the possible risks and benefits. I know that being in this study is voluntary. I choose to be in this study. I know that I can withdraw at any time. I have received, on the date signed, a copy of this

document containing 3 pages.

I am consenting to being video taped during the participation of this research.

Yes, I would like to be taped during my participation in this research.

No, I would not like to be taped during my participation in this research.

I am consenting that my video can be used in academic research presentations.

Yes, I would like my tape to be used in academic research presentations.

No, I would not like my tape to be used in academic research presentations.

Name of Participant (printed) _____

Signature of Participant _____ Date _____.

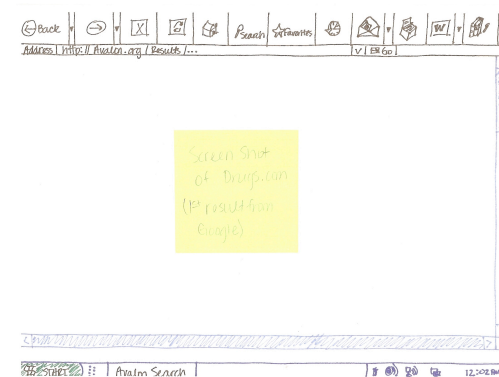
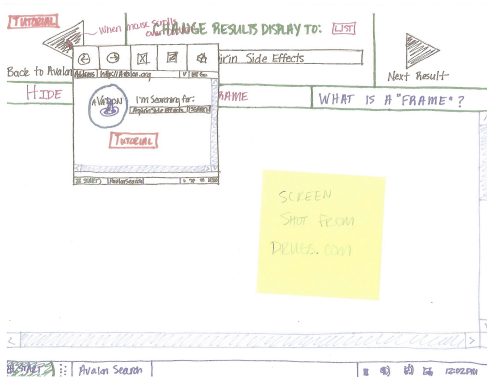
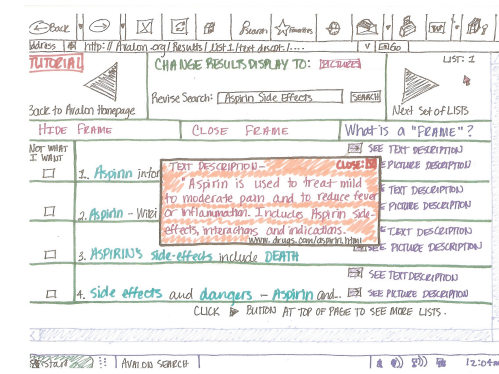
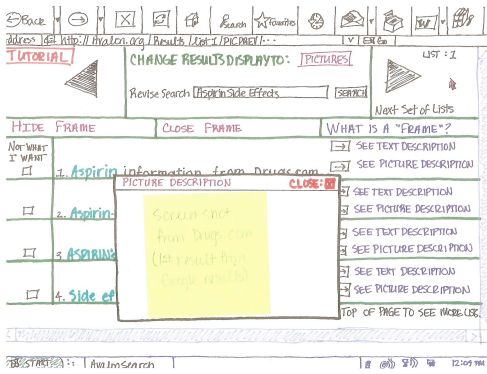
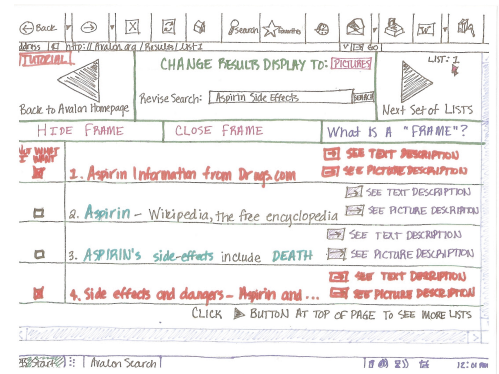
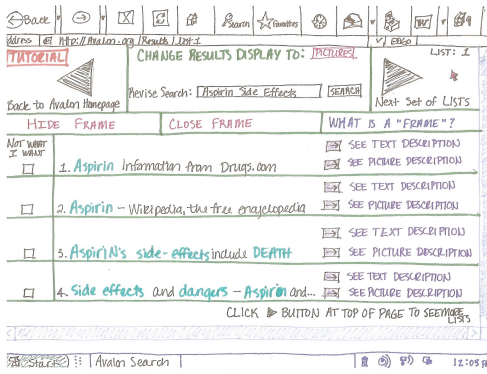
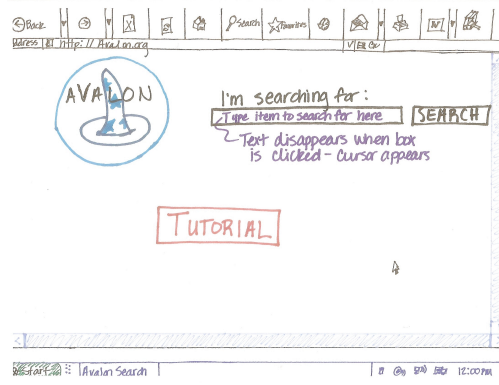
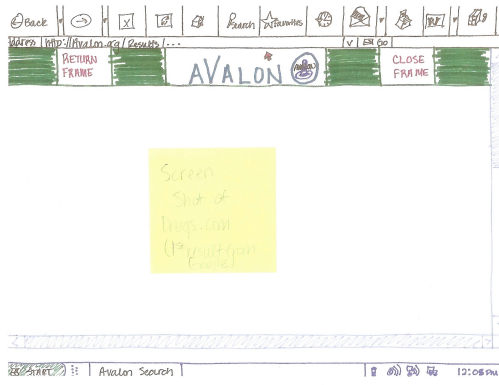
Signature of Researcher _____ Date _____.

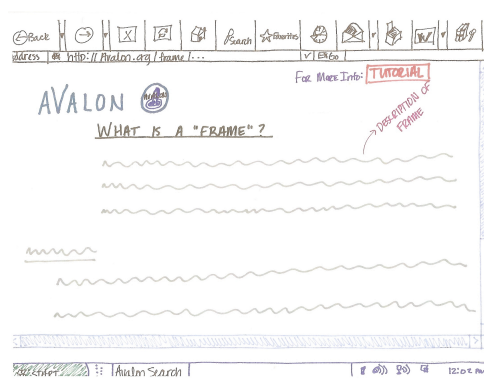
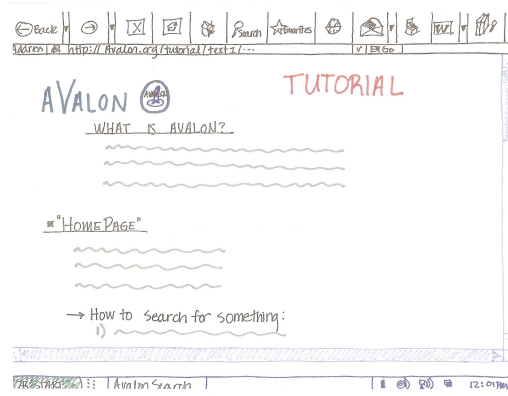
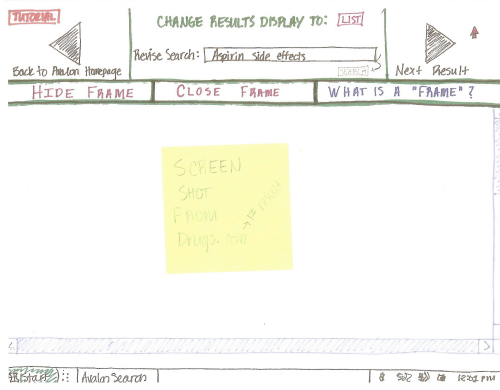
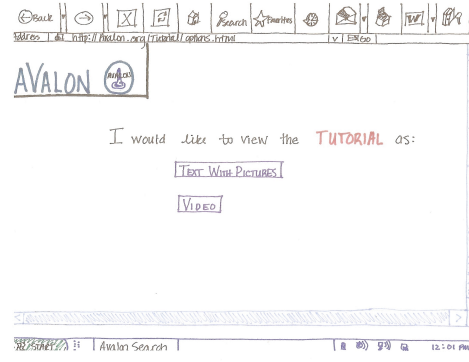
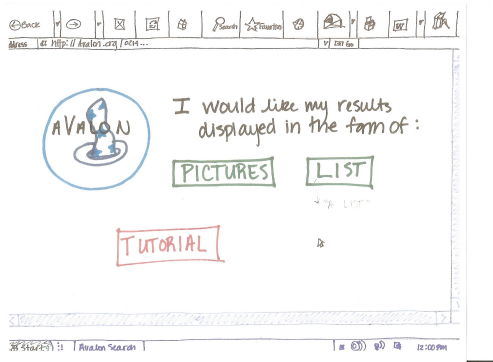
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APPENDIX D

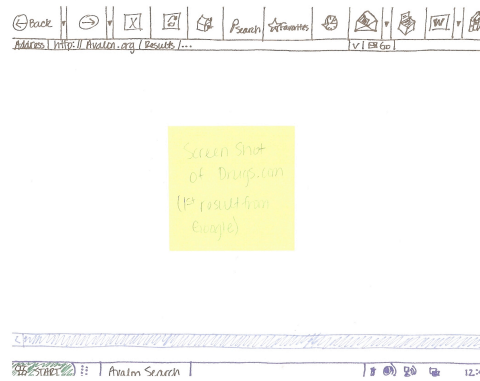
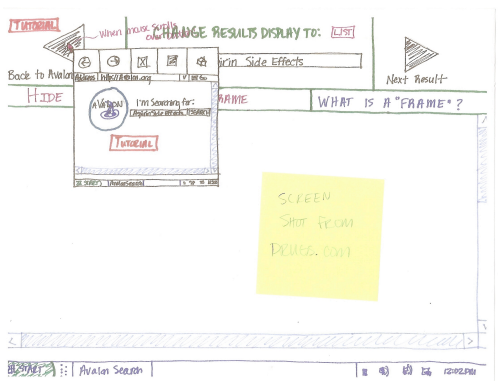
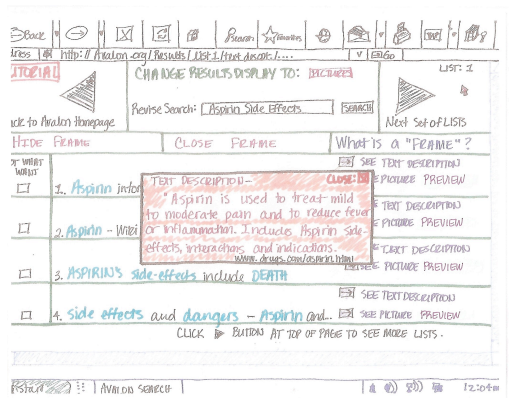
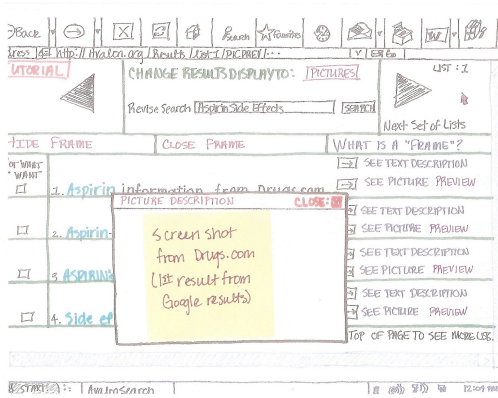
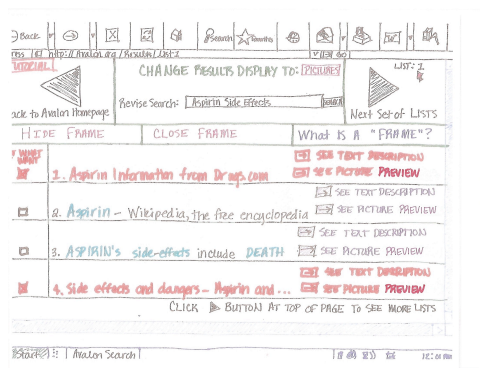
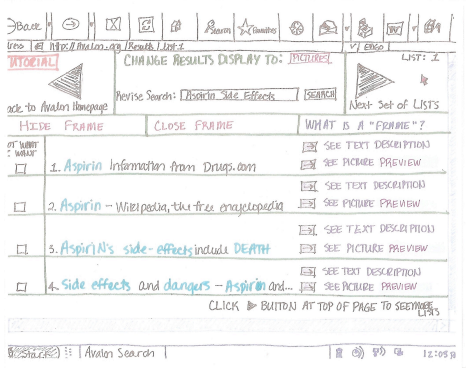
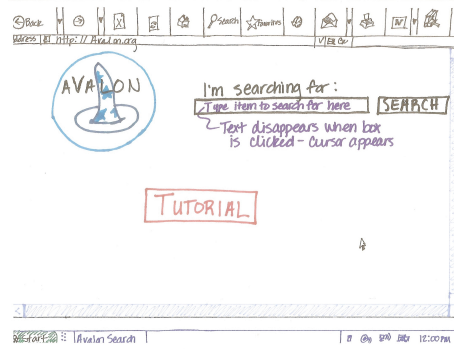
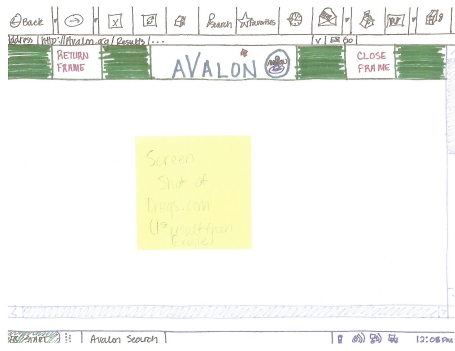
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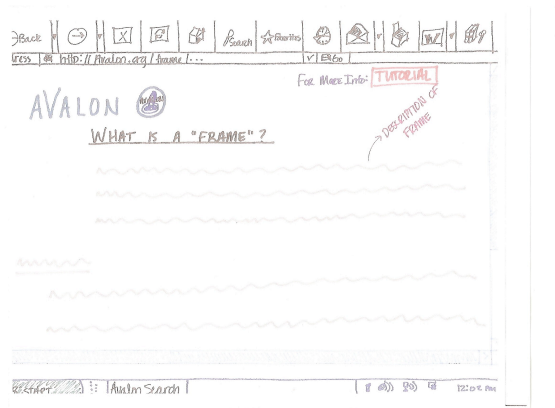
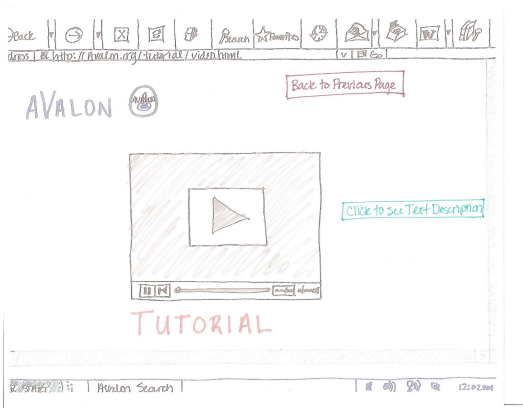
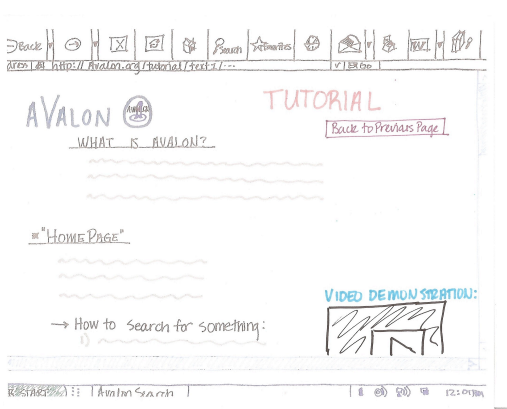
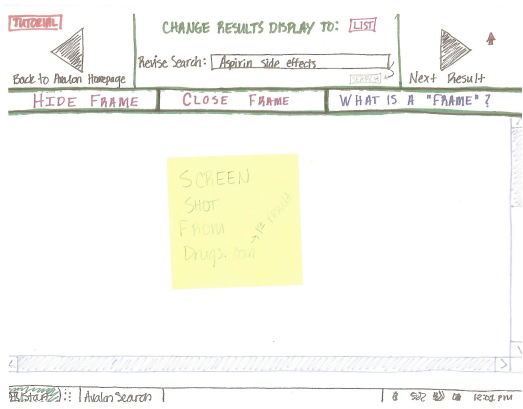
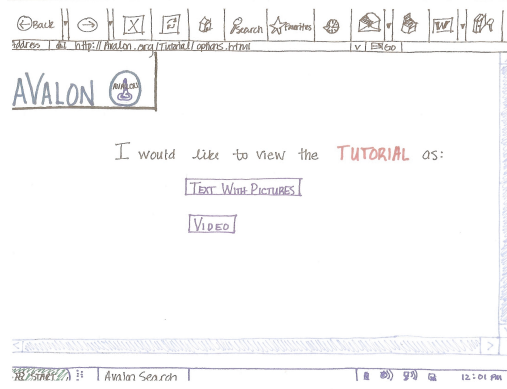
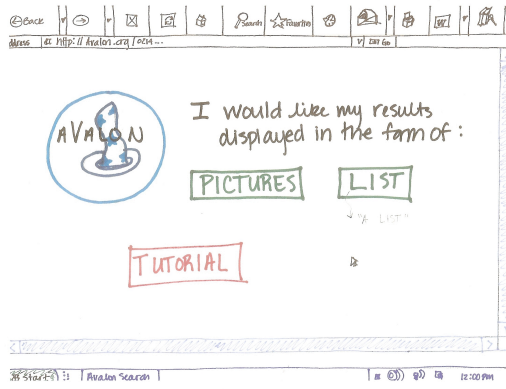




APPENDIX E

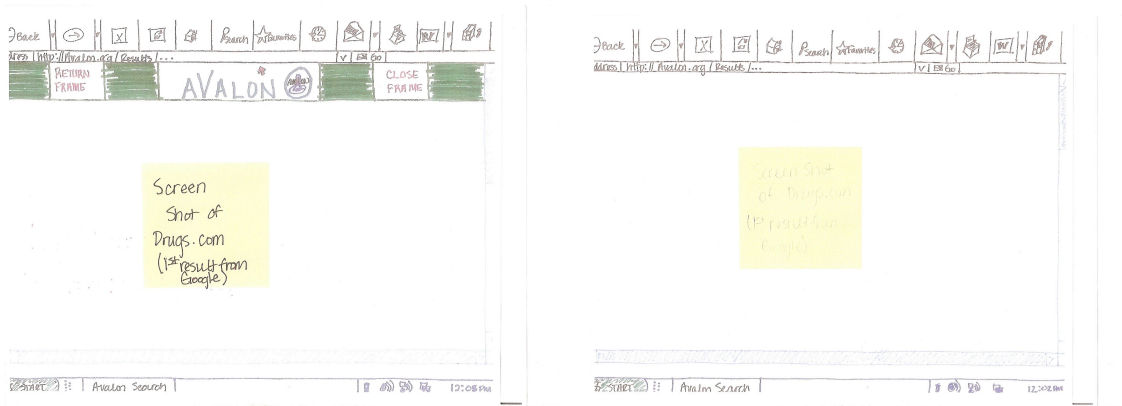
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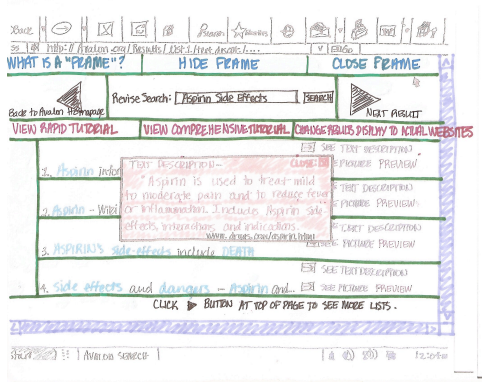
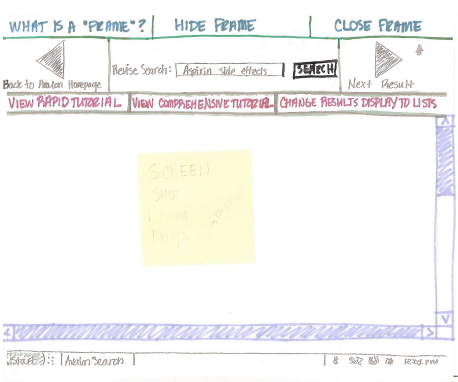
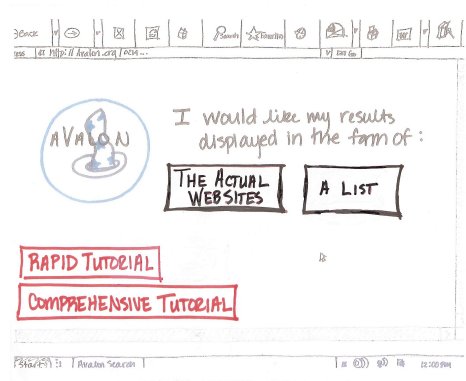
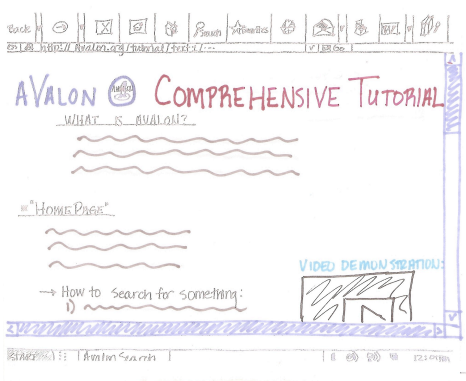
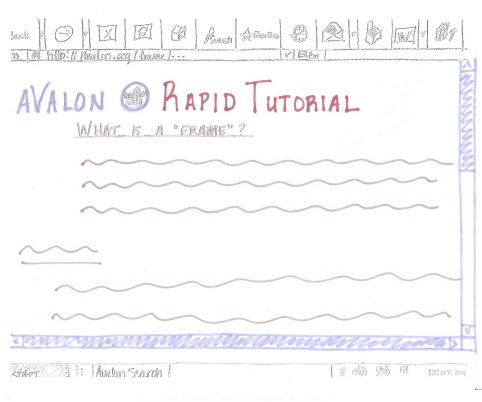
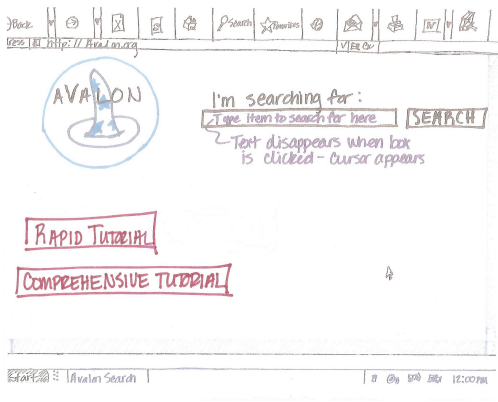


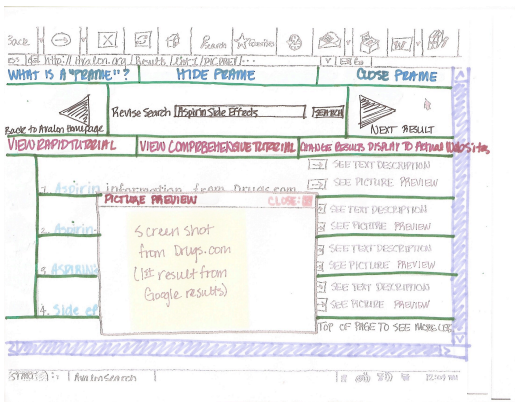
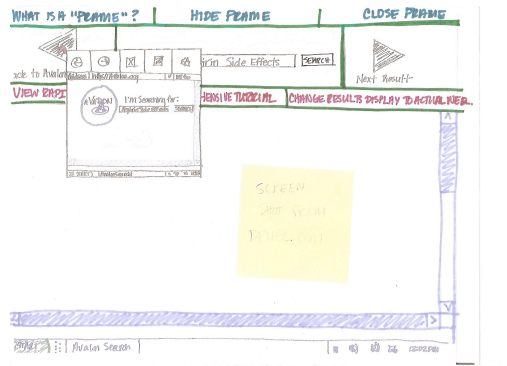
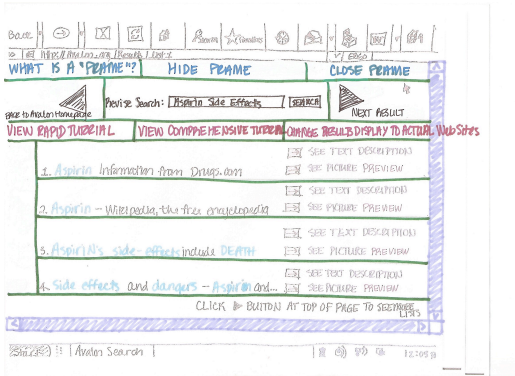


APPENDIX F

Third Iteration Low-Fidelity Prototypes

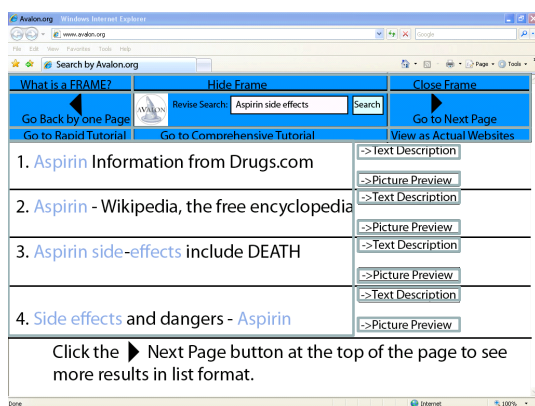
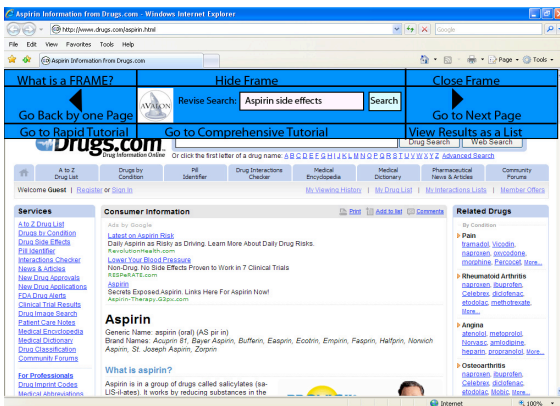
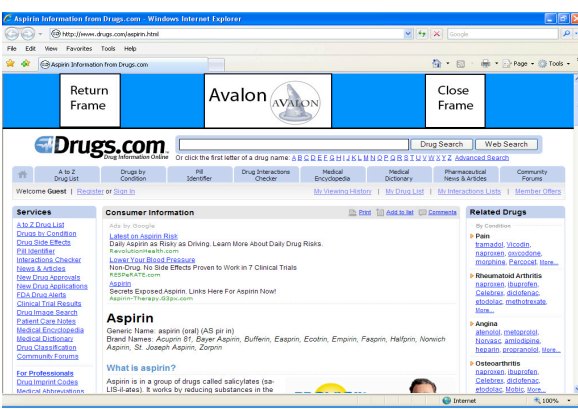
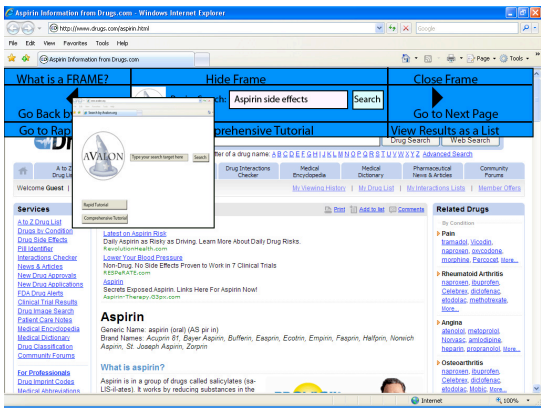
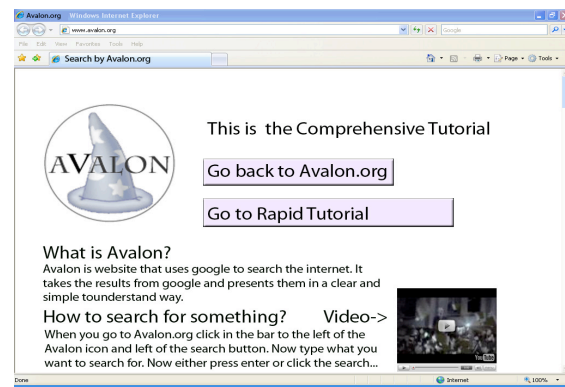
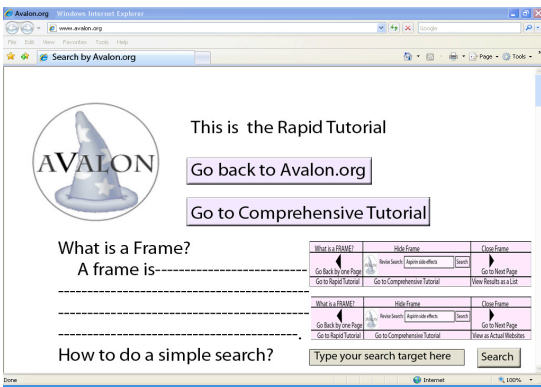
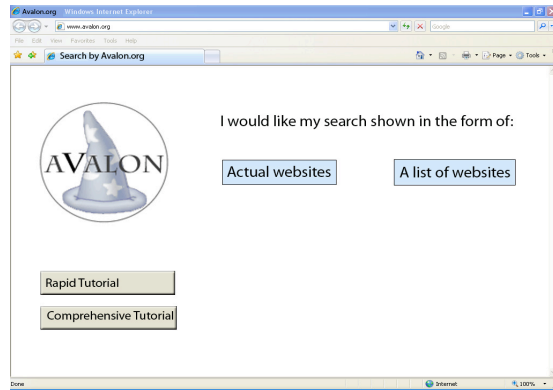


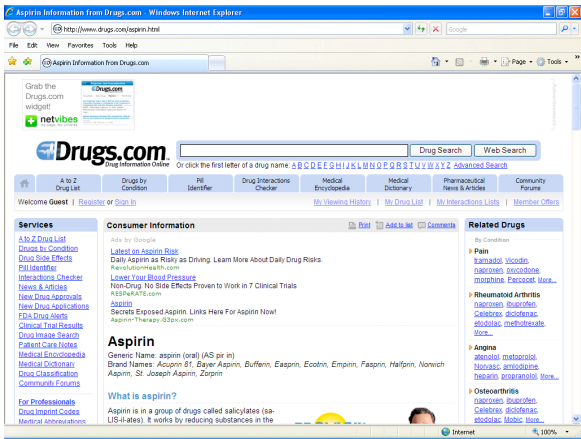
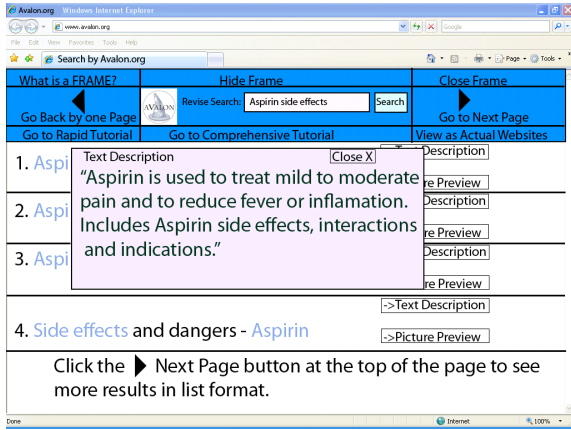
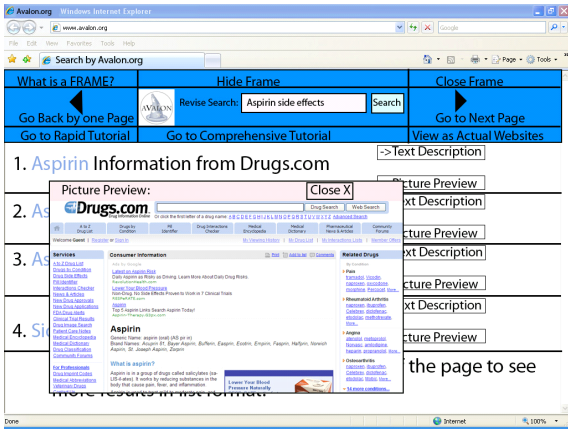




APPENDIX G

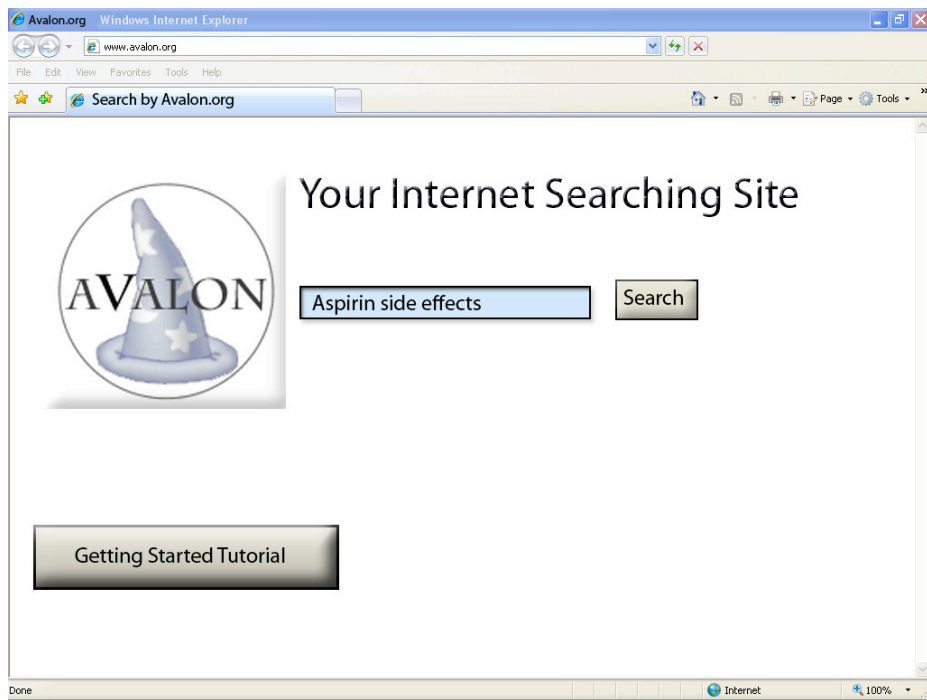
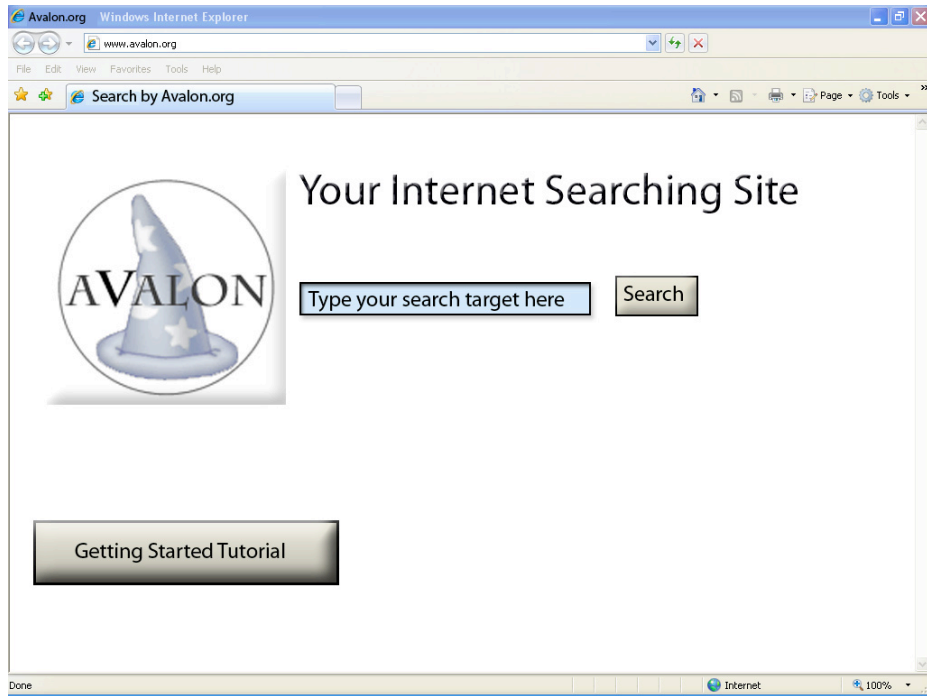
Fourth Iteration High-Fidelity Prototypes

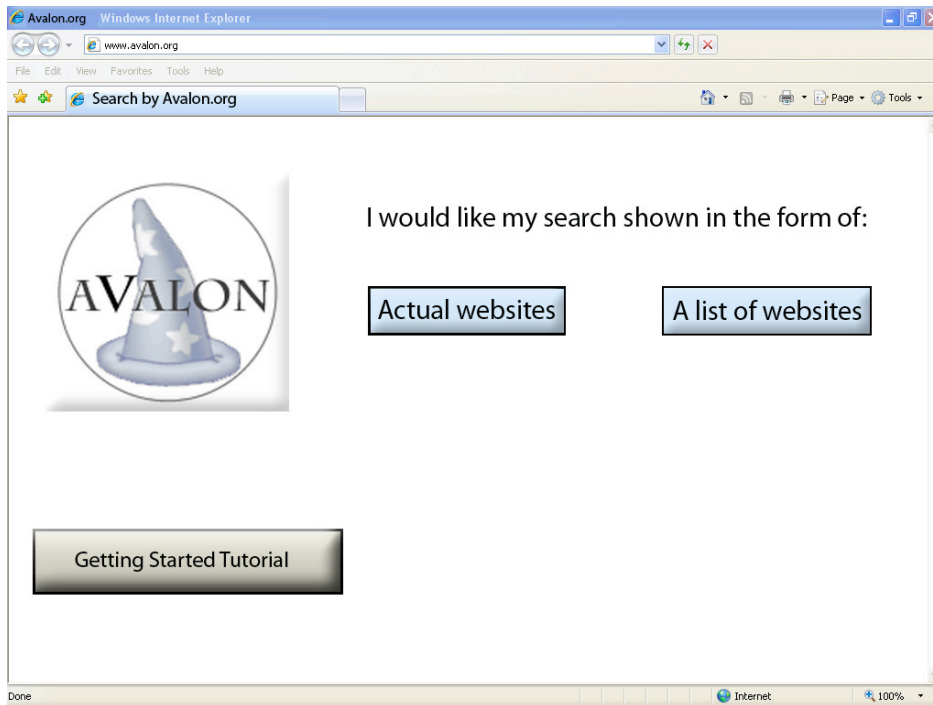
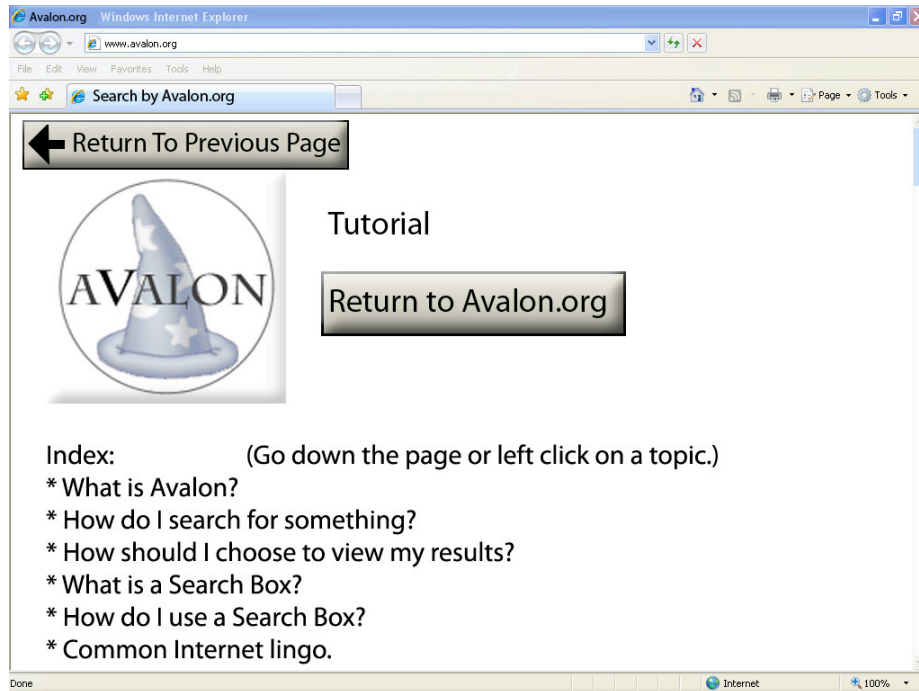




APPENDIX H

Final System Prototypes






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Aspirin

Generic Name: [aspirin](#) (oral) (AS pir in)
Brand Names: [Acuprin 81](#), [Bayer Aspirin](#), [Bufferin](#), [Easprin](#), [Ecotrin](#), [Empirin](#), [Fasprin](#), [Halfprin](#), [Norwich Aspirin](#), [St. Joseph Aspirin](#), [Zorprin](#)

What is aspirin?

Aspirin is in a group of drugs called salicylates.

Related Drugs

By Condition

- Pain**
[tramadol](#), [Vicodin](#), [naproxen](#), [oxycodone](#), [morphine](#), [Percocet](#), [More...](#)
- Rheumatoid Arthritis**
[naproxen](#), [ibuprofen](#), [Celebrex](#), [diclofenac](#), [etodolac](#), [methotrexate](#), [More...](#)
- Angina**
[atenolol](#), [metoprolol](#), [Norvasc](#), [amlodipine](#), [heparin](#), [propranolol](#), [More...](#)
- Osteoarthritis**
[naproxen](#), [ibuprofen](#), [Celebrex](#), [diclofenac](#), [More...](#)


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Aspirin

Generic Name: [aspirin](#) (oral) (AS pir in)
Brand Names: [Acuprin 81](#), [Bayer Aspirin](#), [Bufferin](#), [Easprin](#), [Ecotrin](#), [Empirin](#), [Fasprin](#), [Halfprin](#), [Norwich Aspirin](#), [St. Joseph Aspirin](#), [Zorprin](#)

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Related Drugs

By Condition

- Pain**
[tramadol](#), [Vicodin](#), [naproxen](#), [oxycodone](#), [morphine](#), [Percocet](#), [More...](#)
- Rheumatoid Arthritis**
[naproxen](#), [ibuprofen](#), [Celebrex](#), [diclofenac](#), [etodolac](#), [methotrexate](#), [More...](#)
- Angina**
[atenolol](#), [metoprolol](#), [Norvasc](#), [amlodipine](#), [heparin](#), [propranolol](#), [More...](#)
- Osteoarthritis**
[naproxen](#), [ibuprofen](#), [Celebrex](#), [diclofenac](#), [More...](#)

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Aspirin

Generic Name: aspirin (oral) (AS pir in)
Brand Names: *Acuprin 81, Bayer Aspirin, Bufferin, Easprin, Ecotrin, Empirin, Fasprin, Halfprin, Norwich Aspirin, St. Joseph Aspirin, Zorprin*

What is aspirin?

Aspirin is in a group of drugs called salicylates (sa-LIS-il-ates). It works by reducing substances in the

Related Drugs

- By Condition


- Pain**
[Ibuprofen](#), [Vicodin](#), [Naproxen](#), [Oxycodone](#), [Morphine](#), [Percocet](#), [More...](#)
- Rheumatoid Arthritis**
[Naproxen](#), [Ibuprofen](#), [Celebrex](#), [Diclofenac](#), [Etodolac](#), [Methotrexate](#), [More...](#)
- Angina**
[Atenolol](#), [Metoprolol](#), [Norvasc](#), [Amlodipine](#), [Heparin](#), [Propranolol](#), [More...](#)
- Osteoarthritis**
[Naproxen](#), [Ibuprofen](#), [Celebrex](#), [Diclofenac](#), [Etodolac](#), [Mobic](#), [More...](#)

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View Tutorial Hide Search Box Close Search Box

Go Back by one Page  Revise Search: Search Go to Next Page

View as Actual Websites

1. Aspirin Information from Drugs.com	Text Description Picture Preview
2. Aspirin - Wikipedia, the free encyclopedia	Text Description Picture Preview
3. Aspirin side-effects include DEATH	Text Description Picture Preview
4. Side effects and dangers - Aspirin	Text Description Picture Preview

Click the  Next Page button at the top of the page to see more results in list format.

Windows Internet Explorer
www.avalon.org

Search by Avalon.org

View Tutorial Hide Search Box Close Search Box
Go Back by one Page Revise Search: Aspirin side effects Search Go to Next Page
View as Actual Websites

1. Aspirin Information from Drugs.com
2. Aspirin
3. Aspirin
4. Side effects

Text Description
Close X

Drugs.com
Drug Information Online

Services
Consumer Information
Aspirin
What is aspirin?

Description
Description
Description
Description
page to see

Click the next page button at the top of the page to see more results in list format.

Windows Internet Explorer
www.avalon.org

Search by Avalon.org

View Tutorial Hide Search Box Close Search Box
Go Back by one Page Revise Search: Aspirin side effects Search Go to Next Page
View as Actual Websites

1. Aspirin
2. Aspirin
3. Aspirin
4. Side effects

Text Description
Close X

“Aspirin is used to treat mild to moderate pain and to reduce fever or inflammation. Includes Aspirin side effects, interactions and indications.”

Description
Description
Description
Description
page to see

Click the next page button at the top of the page to see more results in list format.

Aspirin Information from Drugs.com - Windows Internet Explorer

http://www.drugs.com/aspirin.html

File Edit View Favorites Tools Help

Aspirin Information from Drugs.com

Grab the Drugs.com widget! netvibes

Drugs.com Drug Information Online

Or click the first letter of a drug name: [A](#) [B](#) [C](#) [D](#) [E](#) [F](#) [G](#) [H](#) [I](#) [J](#) [K](#) [L](#) [M](#) [N](#) [O](#) [P](#) [Q](#) [R](#) [S](#) [T](#) [U](#) [V](#) [W](#) [X](#) [Y](#) [Z](#) [Advanced Search](#)

[A to Z Drug List](#)
[Drugs by Condition](#)
[Pill Identifier](#)
[Drug Interactions Checker](#)
[Medical Encyclopedia](#)
[Medical Dictionary](#)
[Pharmaceutical News & Articles](#)
[Community Forums](#)

Welcome Guest | [Register](#) or [Sign In](#) | [My Viewing History](#) | [My Drug List](#) | [My Interactions Lists](#) | [Member Offers](#)

<p>Services</p> <ul style="list-style-type: none"> A to Z Drug List Drugs by Condition Drug Side Effects Pill Identifier Interactions Checker News & Articles New Drug Approvals New Drug Applications FDA Drug Alerts Clinical Trial Results Drug Image Search Patient Care Notes Medical Encyclopedia Medical Dictionary Drug Classification Community Forums <p>For Professionals</p> <ul style="list-style-type: none"> Drug Imprint Codes Medical Abbreviations 	<p>Consumer Information Print Add to list Comments</p> <p>Ads by Google</p> <p>Latest on Aspirin Risk Daily Aspirin as Risky as Driving. Learn More About Daily Drug Risks. RevolutionHealth.com</p> <p>Lower Your Blood Pressure Non-Drug, No Side Effects Proven to Work in 7 Clinical Trials RESPeRATE.com</p> <p>Aspirin Secrets Exposed: Aspirin. Links Here For Aspirin Now! Aspirin-Therapy.G3px.com</p> <p>Aspirin</p> <p>Generic Name: aspirin (oral) (AS pir in) Brand Names: <i>Acuprin 81</i>, <i>Bayer Aspirin</i>, <i>Bufferin</i>, <i>Easprin</i>, <i>Ecotrin</i>, <i>Empirin</i>, <i>Fasprin</i>, <i>Halfprin</i>, <i>Nonwich Aspirin</i>, <i>St. Joseph Aspirin</i>, <i>Zorprin</i></p> <p>What is aspirin?</p> <p>Aspirin is in a group of drugs called salicylates (sa-LIS-il-ates). It works by reducing substances in the</p>	<p>Related Drugs</p> <p>- By Condition</p> <p>Pain tramadol, Vicodin, naproxen, oxycodone, morphine, Percocet, More...</p> <p>Rheumatoid Arthritis naproxen, ibuprofen, Celebrex, diclofenac, etodolac, methotrexate, More...</p> <p>Angina atenolol, metoprolol, Norvasc, amlodipine, heparin, propranolol, More...</p> <p>Osteoarthritis naproxen, ibuprofen, Celebrex, diclofenac, etodolac, Mobic, More...</p>
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Internet 100%

APPENDIX I

User Study Interview Script

[Introduction]

First of all, we would like to thank all of you for volunteering to participate in our user study. Our names are Vivian Phinney, Steve Carroll and Leo Meltreger. We are third year undergraduate students in Electrical/Computer Engineering and Computer Science. We are conducting research about older adults and information technology to develop a web browser for older adults that will be called Avalon.

[Overview of the Session]

Today we will be asking you to complete several specific tasks involving the Internet on the computer and observing how you interact with the computer. Then we will be handing out a Questionnaire to complete. There is no right or wrong way to interact with the computer – we are testing the Internet browser and computer – *not you*. If you have questions at any time, please feel free to ask. We will be video taping this session. If you are uncomfortable with this, please let us know and we will remove your images from our videotapes. Everything you say during this session will be anonymous and no one will be aware of your participation except for members of our research team. We expect the session today to last approximately forty-five minutes to an hour. Do you have any questions before we begin?

[Consent Form]

I am now going to give each of you a consent form. Please read and make sure you understand it thoroughly. If you have any questions, please ask. There are two copies of the consent form. One copy is for you to take with you for your records and the other is for you to sign and return to us. Please be sure to initial the bottom of each page of the consent forms and sign the last page.

[Interview]

Now that we are finished with the consent forms, we will begin the interview. I am going to be asking you to perform tasks on the computer using the Internet. I would like you to think aloud as you perform these tasks. By thinking aloud I mean telling me what you are thinking as you do each task. For example, if I were asked to think aloud about turning on this computer I would say, “Hmmm. I want to turn on the computer, but I do not see a button near the keyboard like usual. I’m looking for that semi-circle with the line symbol that means power. Oh! I see the symbol on the side, but it’s not a button. Oh, it’s a slider. Great now it is on!” Thinking aloud is sometimes difficult when people are concentrating, so sometimes I may prompt you and ask what you are thinking. Please remember that there are no right and wrong answers. We are testing the Internet browser and the computer, not you.

Please let me know if you have any questions at any time. Do you have any questions before we begin? Let’s begin.

[Interview Tasks]

1. Please go on to the computer and access the Internet the way you normally do.
2. Search for information on possible symptoms or side effects of Aspirin

[Questionnaire]

Hand out the Questionnaire and clarify any questions the participant has with respect to what we mean by a question if it was not clear.

Make notes on the back of our interview notes if the participants verbally expresses any important opinions as they fill out the questionnaire.

[Thank You]

Thank you for participating in our study. Do you have any questions before we conclude this session?

[Give compensation]

Would you be interested in helping with any follow up interviews? [If so, record name and telephone number]

APPENDIX J

User Study Session Questionnaire

Please circle the answer that is most applicable to you. You may circle more than one if applicable.

1. Did you feel that you would use either Tutorial to help you understand how to use Avalon?

- Yes
- No

1.1. If you answered Yes to Question 1, which Tutorial do you think you would have used?

- The Rapid Tutorial
- The Comprehensive Tutorial

1.2. If you answered No to Question 1, please check all relevant responses relating to why you would not need to use either Tutorial:

- Avalon was clear enough for me to understand without using either Tutorial.
- Both or either Tutorial(s) were not clear or looked too cluttered of information.

Comments: _____

2. Did you notice that certain keywords were highlighted in the title of each listed search result?

- Yes
- No

If you answered Yes to Question 2, do you feel that the highlighting of the words you searched for in the title was helpful?

- Yes
- No

If you answered No to Question 2, please check all that apply and feel free to comment:

- If I had noticed the highlighted words, it would have been more helpful in making my selection from the list of results.
 - I did not notice the highlighted words because the color of the highlighted text.
- It would not have been helpful even if I had noticed them.
 - The colors cause the page to look cluttered and confusing
 - The color was not a good color to make them obvious

Comments: _____

3. Did you prefer to view the results as a list or as actual web sites?

- A List
- Actual web sites

3.3. If you answered "A List" to Question 3:

- Did you feel that displaying four results at a time was:
 - Too many
 - Just right
 - Not enough
- How did you feel about being able to view a picture preview of the listed result?
 - I liked it, it was helpful.
 - I liked it, it might be helpful.
- How did you feel about being able to view a text description of the listed result?
 - I liked it, it was helpful.
 - I liked it, it might be helpful.

3.4. If you answered “Actual web sites” to Question 3, please check all that apply and feel free to comment:

I liked the Search Box. Please check all the following that apply:

- It was obvious what the Search Box was, and how to use it to refine my search.
- It was a good color

I did not like the Search Box. Please check all the following that apply:

- The color was bad, I would prefer _____.
- There was too much information in the Search Box, and it was cluttered and/or confusing.

Comments: _____

4. Was the layout of the Avalon web site clear and legible?

- At some points, but some parts need work.
 - If you recall specific points, what were they?

- For the most part it was all clear, I cannot think of any specific points that were of issue to me.
 - I knew how to proceed at every step to get the information I desired.

5. Did you like the small preview that appeared of the previous page when your mouse scrolled over the “Back” arrow in the Search Box?

- Yes, it would be helpful.
- No:
 - It made the screen too cluttered – it was too much information to comprehend at once.
 - I do not feel it would be useful.

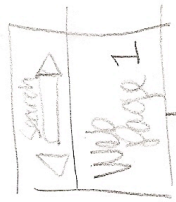
Comments: _____

APPENDIX K

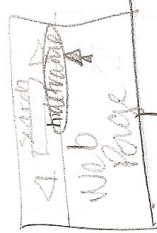
Prototype Storyboard

<p>1. Alex wants to search for side-effects of Aspirin.</p> 	<p>5. He views the text tutorial of how to view results.</p> 
<p>2. Alex opens the I.E. Web Browser</p> 	<p>6. He doesn't understand the steps outlined in the text, so he clicks on "video" of two steps.</p> 
<p>3. Alex goes to Avalon.org</p> 	<p>7. He goes back to Avalon search page.</p> 
<p>4. He's Used it before, but forgotten the steps, so he needs to view a tutorial.</p> 	<p>8. He types "Aspirin side-effects" into search bar</p> 

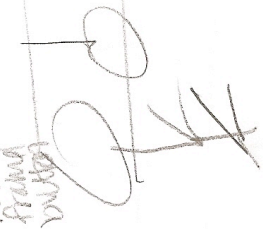
9. He wants to view the search results as actual web pages.



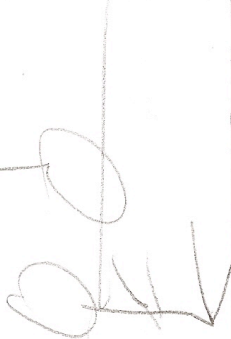
10. Views the first results but wants to see more of those, he hides the frame



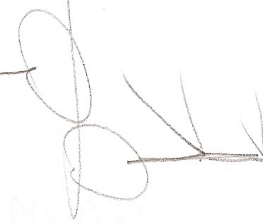
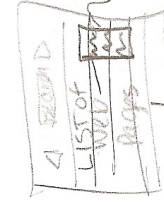
11. He views website, but if doesn't answer his questions, so he wants to return the frame



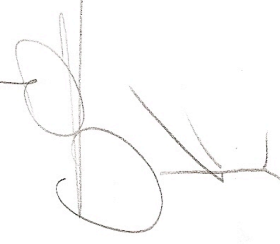
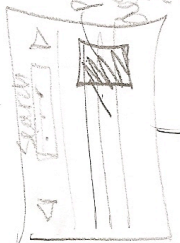
12. He wants to view the results in a list format (list-index)



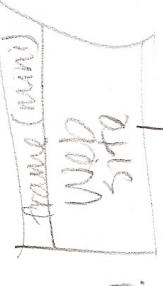
13. He wants to see a text description of the second result



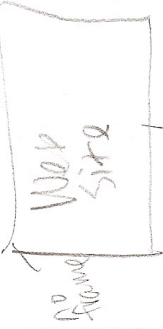
14. He wants to view a picture description



15. He wants to choose this result and go to the actual website.



16. He wants to remove the Aol icon frame and just view the website.



APPENDIX L

Team Member Cognitive Walkthroughs Notes

I. Vivian:

Cognitive Walkthrough

Persona:

Bob is an 88 year old retired English Professor. He and his wife Trudy have 3 children and 2 grandchildren. One of their grandchildren is a sophomore at CU in Boulder, CO, and the other is a junior at Fairview High School. His grandchildren constantly talk about the Internet and to connect to his grandkids he has been trying to learn some of the lingo that they use.

Bob uses his computer to play games every day, but really only uses the Internet to check his email. Every now and then he uses Yahoo! to search for information about his prescriptions or about symptoms that he or his wife are experiencing, but is frustrated by the information that comes up.

Relevant Tasks:

1. Bob needs to find information on a new type of drug that his doctor proscribed him, specifically he would like to know what, if any, possible side-effects are related to it because he does not remember specifically what his Doctor told him.

2. Bob wants to be able to quickly navigate the search results for the health related topics he has searched for.

Interface Actions Required:

1. Go to Avalon homepage
2. Click 'Tutorial' button to view tutorial
3. View Tutorial as 'Text with Pictures'
4. Scroll down to read through Tutorial
5. Click to view related video (next to each "How to...")
6. Go back to search homepage by clicking "Back to Previous Page"
7. Type in the item searching for "Aspirin side effects" into search bar
8. Click 'Search' button
9. Choose to view results in picture format by clicking "Pictures" button
10. Try to get rid of frame at top of page to view more of site
11. Click "What is frame?" to learn how to do this
12. Click hide frame
13. After scrolling through the page to view the Web site, close the hidden frame.

Cognitive Walkthrough – Questions at each step:

1.
 - a) **Match to Intent:** We assume the users have the required knowledge to do this. Although we interviewed participants who did not, we have proceeded with designs under the assumption that they were not our target user group.
 - b) **Visibility:** There is not specific button or menu that users will use to get to this page, but again, we assume they have enough of a technical background to be able to navigate to this search page.
 - c) **Labeling:** Once users get to the homepage they will recognize that this is what they wanted because the page is clean and it is obviously labeled “Avalon,” and is obviously a Web site for searching.
 - d) **Indication of Progress:** The only feedback users will have at this point is that they are indeed at a searching Web site, which would have been their intent for coming to the Avalon homepage.
2.
 - a) **Match to Intent:** Tutorial is a very self-explanatory word, so I do not foresee any reason a user would click it except to view the tutorial, at which point by clicking it, the effect will be what the user intended. Users are assumed to have the knowledge to get to a Web site, so clicking this button is also assumed to be task they can perform without issue.
 - b) **Visibility:** Users will see this button because it is large and red; it therefore grabs the user’s attention. Another reason I don’t see an issue with visibility is that the page is relatively clear of cluttered information – there are very few options for the user, so Tutorial would be quite obvious without having to search all over the page for it.
 - c) **Labeling:** I don’t see an issue with the labeling – again, “Tutorial” is a very self-explanatory word, and we assume our target audience will recognize it.
 - d) **Indication of Progress:** After the action is taken users will be taken to a page that asks them how they would like to view the tutorial (what format) – by prominently displaying the word “Tutorial” in the question, users will know that they are still on the right track for their originally intended action (to view the tutorial).
3.
 - a) **Match to Intent:** Users will have gotten to this page by clicking “Tutorial” and they can see in the wording of the page “I would like to view the *Tutorial* as:” that they are still on the right track to view the tutorial, which was their original intention. Users will have the required knowledge to proceed by either clicking the “Text with Pictures” button or “Video” button (for our list of tasks, the user will click “Text with Pictures”)

b) Visibility: The page is clean and clear of too many options, so the options to proceed with “Text with Pictures” button will be prominent and obvious to the users.

c) Labeling: The wording of the buttons appears clear to be, a small issue might be that after our Iteration 2 prototypes, we now have an option for users to view the video related to each particular “How to...” so “Text with Pictures” will actually take them somewhere they can view the Tutorial as text with pictures *and* related videos.

d) Indication of Progress: When the user clicks “Text with Pictures” they are taken to the text tutorial, which prominently displays “Tutorial” in red at the top of the page – I believe this will clearly indicate to the user that they are at their desired location (where they originally intended to go).

4. **a) Match to Intent:** When users scroll down to view the tutorial, more of the tutorial will be visible, therefore it matches the users original intent or viewing more of the particular page. We assume that the users have the required knowledge to scroll down the Web page.

b) Visibility: We can’t control how visible the scroll bar is, but we assume the user will know how to do this particular step (will know where the scroll bar is) because scrolling down a Web page requires no more technical background than getting to a Web page in the first place, which we assume our target user group will know how to do.

c) Labeling: None of the labeling for this step is within the context of our design, but I do feel that the labeling of the Tutorial page will be clearly labeled (each section) – the “How to...” sections will clearly have the video displayed next to them.

d) Indication of Progress: The user will know that they are viewing the right video (related to the right “How to...” section) because the frame of the video will remain stationary next to that particular “How to...” section.

5. **a) Match to Intent:** Clicking the video will have the desired effect because it will start to show the video of that particular “How to...” section. I believe the users will have the knowledge to know how to make the video play because it is quite obvious and standard.

b) Visibility: Viewing a related video will be an obvious option because they will be located next to a specific “How to...” section, and users will therefore know that the video corresponds to a particular section.

c) Labeling: This design for the video does not have any difficult aspects to understanding how to work it, the common symbol for “Play” (the arrow) will be displayed on the screen of the frame of the video (just like youtube.com)

d) Indication of Progress: Users can navigate back to the search page by clicking the “Back to Previous Page” button. They will know they are back at the homepage because it will be the same as they originally saw when they went to the Avalon Web site in the first place.

6. **a) Match to Intent:** Clicking “Back to Previous Page” will have the desired outcome for users by taking them back to whatever page led them to the Tutorial in the first place (in this case, the Avalon homepage...)

b) Visibility: I believe this button is quite obvious, but users would probably have to search around the page quite a bit (scroll up) to find it, so I think we could make it bigger. As far as the color goes though, I believe that purple does provide a nice contrast to the rest of the page, helping to make the button that much more obvious.

c) Labeling: I do not see an issue with the wording of the button, I feel that it allows user to know that they will be going back to whatever page they came to the Tutorial from as opposed to “Back to Homepage,” which they might not have come from. The wording does not seem confusing or misleading.

d) Indication of Progress: By clicking this button the user for this particular set of tasks will return to the Avalon Homepage, which would have been his intention by clicking “Back to Previous Page.” The feedback provided to the user at this point is that they are back to the original search page with the wording “I’m searching for:” above the search box – clearly indicating that they user is where they intended to be and how they should proceed.

7. **a) Match to Intent:** Typing “Aspirin side effects” into the search bar will not, by itself, have any effects, but users will know they are typing it in the right place because the search bar is clearly labeled (more clearly labeled than Google’s search bar at least...)

b) Visibility: The search bar will be clearly visible on the screen to the user because it looks like a standard search bar and is on a clean (information-clutter-free) page.

c) Labeling: The wording above the search bar “I’m looking for:” is the current design for labeling the search bar, but I feel it would be more clear than other wording such as “Search Bar:” or “Search for:”

d) Indication of Progress: Users will have to click search before they can actually view results, but it is obvious that just typing something into the

search bar is not enough because nothing will happen when they just type something in, they will have to click “Search” and I think that nothing happening will indicate to the users that they must do something else besides just typing something in and that this will lead them to search the page for what to next, at which point the “Search” button will be right next to the search bar.

8. **a) Match to Intent:** Clicking the search button will take them to a page asking them *how* they would like to view their results, and just as was the case with the Tutorials, I believe this will indicate to the user that they are on the right path to generating the desired effect (viewing results). Users will also have the knowledge to click “Search” because of how self-explanatory the wording is.

b) Visibility: The search button will be located right next to the search bar, which optimizes its visibility to the users; I don’t see a visibility issue with the ‘Search’ button for the users.

c) Labeling: The word “Search” is not only self-explanatory, it is indicative of the user’s original intention for using Avalon in the first place. There is not labeling issue with the “Search” button.

d) Indication of Progress: When users click the ‘Search’ button they will be taken to a page asking them how they would like to view their results, and I believe that users will know they are on the right track because the word “results” is what they were searching for in the first place, so this implicit feedback will indicate they are on the right tack and therefore help them proceed.

9. **a) Match to Intent:** By clicking the “Pictures” button, the user will be taken to the results displayed as the actual Web pages embedded into a frame, but the user will be shown the results in a graphical form instead of just a list, so they will have produced the desired effect.

b) Visibility: There are only 3 buttons that they user can click on the page at this point, and Pictures is prominently displayed under the descriptive statement. This allows users to not only see the button, but to understand what it will do.

c) Labeling: The intent of the user at this point is to view results in a pictorial format, so the “Pictures” button under the statement “I would like my results displayed in the form of:” is obviously going to produce results in the form of pictures.

d) Indication of Progress: Clicking the “Pictures” button will take users to the Web site embedded within the Avalon frame, but by seeing the Web site

(hopefully a relevant one...) the user will know they are seeing the result of their search and that the frame is separate from it – at which point they will hopefully know how to proceed.

10. a) Match to Intent: There are many different ways to proceed at this point for this particular step, but either the “Hide Frame” or “Close Frame” option will result in the desired effect of this step (to view more of the page and less of the frame.) Assuming for this persona (and for this set of tasks) that they user does not know how to proceed with removing the frame because they don’t know exactly what it is, they will click the “What is a Frame?” button, which will explain to them what a frame is – producing the desired effect.

b) Visibility: The multiple options to try to view less of the frame are in an obvious location at the bottom of the frame. The color contrast also adds to the visibility of the buttons.

c) Labeling: The wording of the three options relating to the frame provide an obvious means to proceed with either reducing the visibility of the frame, removing the frame or finding out what a frame is.

d) Indication of Progress: This particular step does not have any explicit effects, but the user will know that these three buttons relate to the frame and can make an informed decision from that point.

11. a) Match to Intent: Clicking the “What is a Frame?” button will result in the user arriving at a page describing what a frame is and how removing it or hiding it will affect how the page looks – we will provide screen shot pictures within the description, so users will know that they are learning about the frame (even if they do not know exactly what that is). Users will have the required knowledge to click the button.

b) Visibility: The “What is a Frame?” Button is just as visible as the two other buttons: “Close Frame” and “Hide Frame.” This particular button however has a different color than the other two, to indicate to the user that it is more of a tutorial-type option than an “action” option.

c) Labeling: The wording is pretty clear – they might not know what a frame is... but by clicking it they will find out.

d) Indication of Progress: Clicking this button will take them to a page describing what a frame is, but I discovered a major design flaw at this point in the design – there is no way for the user to return to the previous page, so they’re kind of stuck in limbo at this page. We need to design it so that it has a button to return back to the picture-format results.

12. a) Match to Intent: By clicking the hide frame button, the user will see the picture-result (the actual Web page) with the limited frame (as can be seen in

the Iteration 2 prototypes). This will allow the user to view more of the Web page that was the result, which was the original intent of the user. The user will have the knowledge to do this because he will have read the “What is a Frame?” section if he did not previously have it.

b) Visibility: The “Hide Frame” button is prominently displayed at the bottom of the frame, just as the “Close Frame” and “What is a Frame?” button are, with appropriately large font size and color contrast – I do not foresee the user having an issue with visibility of this button.

c) Labeling: The wording may not be clear to a user who has just come upon the picture-results embedded within the frame, but they will be clear to a user who has read the “What is a Frame?” section, which we assume our user has (and we also assume a user would if they did not know how to proceed).

d) Indication of Progress: The user will know they have succeeded in hiding the frame because a reduced version of the frame will result (see prototypes). This reduced frame will remain prominently displayed for the user while they view more of the Web page with perhaps less interference from the full frame, and because it is starkly different than the full frame, it will allow the user to see that this is in fact a different type of (smaller) frame than the full-frame – indicating to them that they have succeeded in their endeavor.

13. a) Match to Intent: When the user clicks “Close Frame” from the reduced frame, the entire frame will disappear which matches the user’s original intent. The user will have the knowledge to do this because the word “close” in the “Close Frame” button is self-explanatory and one of only two options from this point.

b) Visibility: Because of the stark contrast of the color of the text in the button to the dark green background of the reduced frame, the user will be able to see the buttons clearly, whether they choose to return to the frame or close it completely, they will have an obvious means to proceed with their choice.

c) Labeling: The word “close” in “Close Frame” makes the labeling of this button apparent and obvious to the user, so there is no labeling issue with this button or step.

d) Indication of Progress: The previous visibility of the reduced frame will disappear, indicating to the user that the frame has been completely removed. Whether or not the user will know how to proceed from this point is not an aspect of our design project, but they will know they have succeeded in completely removing the frame.

Determined Problem Points:

Our team apparently managed to address a lot of issues with our second iteration of prototypes, because I did not find that many issues with this cognitive walkthrough. That is not to say that there are not that many issues with our design at this point, but rather that I will have to collaborate with my group to see what they came up with. Listed below are two issues that I did find with this cognitive walkthrough that will have to be addressed.

1 – Minor Issue

“Back to Previous Page” button is not obvious on either the Text with Pictures Tutorial or Video Tutorial page.

Design Idea – We will have to make the button more obvious, and we can potentially accomplish this by making both the button itself and the text within the button bigger.

2 – Major Issue

There is no way to return from the “What is a Frame?” page.

Design Idea – By putting a button on the top right of the screen that says something to the effect of “Return to Picture Results” we will provide an obvious means for users to return to the previous page or results.

II. Leo:

Cognitive Walkthrough

Persona:

Bob is an 88 year old retired English Professor. He and his wife Trudy have 3 children and 2 grandchildren. One of their grandchildren is a sophomore at CU in Boulder, CO, and the other is a junior at Fairview High School. His grandchildren constantly talk about the Internet and to connect to his grandkids he has been trying to learn some of the lingo that they use.

Bob uses his computer to play games every day, but really only uses the Internet to check his email. Every now and then he uses Yahoo! to search for information about his prescriptions or about symptoms that he or his wife are experiencing, but is frustrated by the information that comes up.

Task:

Bob needs to find information on a new type of drug that his doctor prescribed him, specifically he would like to know what, if any, possible side-effects are related to it because he does not remember specifically what his Doctor told him.

List of interface actions:

1. Bob goes to Avalon.org
2. Bob clicks on the tutorial button to refresh his memory about this website

3. Bob scrolls down to find relevant information
4. Bob finds “how to search for something” on the page
5. Reads through shown information
6. He decides to watch a tutorial video so he clicks on the box with the play button.
7. He goes back to the tutorial page by clicking “back to previous page”
8. Bob goes back to the homepage by clicking on the back to previous page button
9. Bob clicks the search box
10. Types in the name of the drug and the words side effects after the name
11. Clicks enter or presses the search button
12. Bob chooses to see the results as pictures
13. Bob reads through the first result
14. Bob buttons with the word frame so he decides to find out more about the frame by clicking the “what is a “frame”?” button
15. Bob reads through the description
16. Bob goes back by clicking the back button on the browser he is using.
17. Clicks next result to see the next page
18. Bob decides to see a list of results so he clicks the “list” button
19. Bob sees one of the results mention death and clicks “see text description”
20. Bob wants to see a picture of the website so he clicks the “see picture preview button.
21. Bob decides that the description is too vague and the picture is too small so he clicks on the link to the actual website.
22. Bob doesn’t want the frame covering so much space so he clicks hide frame.
23. Bob has decided to stay on the page and not search anymore so he clicks “close frame”

Summary: The cognitive walkthrough did not find any problems with the second prototype that cause the website not to work correctly. Some parts of our website do not match to standard and labeling could be better. Other than that the website seems to be quick and easy to learn. Unknown parts are pretty self explanatory to most users. The users that still don’t understand something can easily look through the well designed tutorial to learn about any unknown parts.

Major problems:

- Some users may not understand that choosing to see the search results as “pictures”, shows them the actual websites, one at a time starting from the first search result.
- The list button is very small and may easily be missed by many of our users.
- There is no way to get back from the description of the frame.
- The “see picture preview” button on the list page will likely be interpreted as going to the actual webpage by anyone who has viewed what our website calls the “pictures” view.

Minor Problems:

- Some users may not know what a video looks like so they may not be able to figure out how to play videos in our tutorial page.

- User may want to return to the home page without clicking the “back to previous page” button several times.
- A part of the description of the frame is outside the tutorial, this may cause some confusion.
- Many users are used to seeing the text description without having to click anything and may choose not to simply because going to the actual website is just as fast and shows more information.
- The preview picture that can be shown from the list page will likely be too small for our target users.

Possible Fixes:

- We could change the “picture” view to be “one page at a time” view.
- We could place the list button in a more visible location and/or making bigger.
- We could add a back button to the page with the description of the frame.
- If the first suggestion is followed then this will not be a problem or we could simply call it preview of page.
- We could add a button that says ”video of this tutorial” in addition to what we have now.
- We could add a button called home that always takes us to the home page.
- We could have the button “What is a “frame”?” link to a part of the tutorial page.
- We could display the Google results exactly like Google show them for our list view.
- We could remove this option.

III. Steve:

Cognitive Walkthrough

The problems that I encountered when I had done the cognitive walkthrough were not very numerous they were mainly only labeling problems as we had designed the revised prototype to reflect an easy and intuitive interface that would allow older adults to get access to the web via search engines. I had felt that a couple of the buttons could have been labeled differently or I felt that what was intuitive for me might not be intuitive for someone who is a bit overwhelmed by the use of a computer. One such case was I felt that the tutorial button on the homepage of the website could be a bit more descriptive and say something to the effect of “Need help click here” instead of just saying help or tutorial the button has a description of its function.

1. Click tutorial box
2. Click text tutorial
3. Click back
4. Click video tutorial
5. Click back to search page
6. Click search box
7. Type aspirin side effects

8. click search
9. click list
10. click see text description for first result
11. click see picture preview for third result
12. click not what I want for first result
13. click not what I want for fourth result
14. click picture
15. click previous
16. click next
17. click hide frame

APPENDIX M

Team Member Think Aloud Notes

I. Vivian:

Think Aloud Assignment – HW #4

Participant – My participant was a 20 year old female Chemical Engineering major friend of mine whom I recruited, by asking her to help me out, after my previous plan of interviewing my Grandmother fell through.

Session – The session took place on Monday, March 17th in the afternoon (starting around 4PM) and took approximately 25-30 minutes to complete.

Task Script –

- You are attempting to find information about the side-effect of Aspirin, using the Avalon search engine.
 - You should attempt to find out some information about how to use or navigate around the Avalon Search engine.
 - From Avalon's homepage, conduct a search in which you view any results in the form of the actual Web sites.
 - Next you should attempt to make more of the Web site visible without having to scroll down, to do this you might try to minimize the Avalon frame.
 - Next you should restore the full Avalon frame, and attempt to switch the display of the results to a list format.
 - You should now try to find out more about the first result in the list.
 - Go to the actual Web site for the first result listed and completely remove the Avalon frame.

Session Notes –

- Participant had trouble navigating back to the Avalon homepage from the “Rapid Tutorial” page – the button wasn't obvious.
- When directed to try to minimize the “frame,” the participant wasn't clear about what this meant – they expressed confusion of the word “frame” itself and what that entailed. They also described how they couldn't tell because of the large black spot where there is supposedly a screen-shot of the actual Website (Issue with the prototype itself...)

- Participant felt that the drawing of the “mouse” was confusing – didn’t understand why it was there or whether you were supposed to click it.
- When trying to return the minimized frame, participant didn’t like the term “Return Frame” and expressed a less confusing suggestion to be “Un-hide Frame”
- When prompted to find more information about the first result of the listed results, participant couldn’t immediately understand what “Text Description” entailed – they felt the “text description” of the result was the title of the result itself, and that the supposed “text description” should actually be called simply a “Description.”

Suggested Design Solutions –

1. Tutorials should have back buttons (previous page in addition to Avalon homepage).
2. If clicking Web site from list result, have “Back” button return to list, not Avalon Home page.
3. Make actual screen-shots visible for all results in the prototypes.
4. Get rid of the “mouse” from low-fidelity prototypes.
5. Call the “frame” a “Search Box”
6. Re-word “Return Frame” to “Un-Hide Frame” to make more clear.
7. Re-word “Text Description” to “Read Description.”

Lessons Learned –

In terms of the actual presentation of the prototype, I found that we definitely need to address the functionality of the Semi-High-Fidelity Prototypes in Powerpoint, because a lot of the buttons that should be able to go multiple places only go back to a specific screen.

Taking notes is definitely hard – we might consider audio-recording any sessions that we conduct to be able to refer back to, that way we can concentrate more on the session at hand and interact better with the participants in the sense that we can ask them prodding-questions to prompt more “thinking aloud.”

We might want to provide users with a mouse that doesn’t have the scrolling knob while conducting user-studies with our Powerpoint implementation because an accidental movement can cause the screen to change abruptly and that would be very confusing for users.

II. Leo:

Think Aloud Assignment

Description of Participant:

Max is a 60 year old man. He has a doctorate of science which is equivalent to a PhD. He has lived in this country for 11 years. He uses the web a lot because he trades on the Forex and Stock markets. He is a friend of my parents. He lives here in Boulder so I called him and asked if I could come over and have him test my prototype. He agreed and we met Tuesday. The entire meeting took about 40 minutes.

Task 1

This is your first time on this website, find out information on how to use it.

Task 2

Go back to our home page.

Ok, first of all it is a little confusing that there are two tutorials on the main page.

Which one do I use?

The word "rapid" means fast right?

Ok well I do want to learn this fast so I will click on rapid tutorial.

Hmm, well there is some information, but there aren't any picture representations.

I guess I will go to the other tutorial.

Hey wait how do I go there from this page?

Do I go back? There is no back button.

Clicks on the back button on browser.

Goes to comprehensive tutorial.

Well there is some info and even movies so I guess that is good.

Wait there is no way to go back from this page either.

Clicks around at random and finds that the Avalon logo is the link back to the homepage.

Oh so that's how it works. Still it isn't very easy to figure out.

Task 3

Search for aspirin.

Task 4

Choose a view.

Task 5

Choose a different view

Task 6

Go between the views and find out any useful information that you can get

Ok so I can't actually type anything in but after I did so I would press the search button.

Hmm, why does this page have me choose the views?

Now I would go to the tutorial pages but they still wouldn't have a link back to this page so I guess I will just click one of them.

Clicks actual websites link.

Well this looks a lot better, there are back buttons and a search box.

The top buttons talk about frame, hmm it would have been nice if there was an actual explanation of it in your current tutorial.

Clicks on what is a frame.

Hey you mean I can't go back to where I was from here either?

So what is a frame anyway?

Oh I see.

Goes back to homepage, clicks search chooses list view.

Hmm I wish I could just choose a default and not need to choose a view every time.

Clicks the description and picture preview buttons.

Well this is a nice feature.

But how do I go to the actual website.

Oh there is a link above that takes me to actual websites view.

This is useful but how do I go to a specific link in the list?

Do I just click next until I get there?

Goes back to list view.

Hmm maybe if I (clicks the name of the website) oh this does work.

Well this is rather nice.

Task 7

Hide the frame

Task 8

Close the frame

Hide the frame? Well how do I do that?

Searches for a minute, oh they are up here.

I am used to the windows hide and close symbols. (- and x)

Ok so now I click on the hide frame button.

Hey why did it take me out of the list view and into the actual website view?

If your list is run by your frame then maybe you shouldn't have the hide and close frame choices there.

Ok so now I close the frame?

Wait this Avalon logo is also a link back to your home page right? (yes)

I wouldn't have thought that if I hadn't found out about it on your tutorial page.

Clicks close frame.

Ok so now my website and your frame went away.

Oh so the website I was looking at would actually be here in the final version.

Well that is alright but how do I get back to your website.

I would have to type the URL or click the browser back button?

Maybe you shouldn't let people completely close your frame or at least put an "add me to favorites" button on your home page.

This was interesting feel free to ask me to test your prototypes again.

Bye.

Lessons learned.

Always tell the tester that we need them to find the problems in understanding our interface.

Continually explain to the tester that this is just a prototype which doesn't have some things implemented correctly which is why we need them to help us fix and/or complete it.

Always tell the tester that if they are having problems then there is probably something wrong with the interface.

If the tester finds something silly that you did or forgot to do on your interface than do not defend the interface, it is probably better to say wow that was silly of me or us.

Be prepared to explain things that would have been explained in the tutorial. EX: What exactly is a frame?

Solutions to problems found:

We can have a back button in the tutorials as well as a link between the tutorials.

The tutorials can have pictures in addition to text and movies.

We can have just one tutorial.

We can have an option on the homepage that lets users choose a default view as well as have one selected if they don't choose one.

We can add a Home page button everywhere.

We can add the standard – and x representations to the hide and close frame buttons.

We can remove the Hide and Close frame buttons from the list view

III. Steve:

Think aloud with test participant

The participant that agreed to be the metaphorical guinea pig for this test was a male in his early 20's this is far from our subject audience however he has a unique lack of common sense. So even though he was outside our audience range he proved to be a useful participant by pointing out obvious flaws in the testing design. I recruited him by asking him if he wouldn't mind doing this for me in one of the mutual classes that we have together. The test was conducted at my apartment. I had run the test on Sunday night at around 6 pm the test took 45 minutes to 50 minutes.

1. Find information on how to conduct a search.
 - a. Presented with opening screen
 - b. Saw two tutorials one comprehensive one quick
 - c. Clicked comprehensive tutorial

2. Do a search for aspirin find useful website
 - a. Couldn't figure out how to get back to search page
 - b. Had to be told to click on the Avalon logo
 - c. Clicked Avalon logo to return to home page
 - d. Typed aspirin into search box
 - e. Clicked search
 - f. Said I would like to see a list of websites first
 - g. Clicked list of websites
 - h. Presented with short list of possible websites
 - i. Liked the layout and the ability to do a picture preview or get a text description
 - j. Clicked text description
 - k. Couldn't figure out if useful or not so decided to click picture preview.
 - l. Got some useful info but wanted more.
 - m. Click next website text description
 - n. Said not what I want so clicked not what I want.
 - o. Clicked the picture description for the fourth website
 - p. Liked that had a lot of information
3. Find the tutorial from this page
 - a. Saw that the top of the screen had links to both the comprehensive tutorial and the rapid tutorial.
 - b. Clicked rapid tutorial
 - c. When done clicked back to go back to list of websites
4. Switch back to an actual website view and hide the frame at the top
 - a. Clicked the take me to actual websites button
 - b. Found out it took him to the beginning of the list of websites didn't like that wanted to go to specific website.
 - c. Saw that you can get previews of the next website and the previous website just by hovering the mouse over the representative button.
 - d. Clicked next until got to fourth website.
 - e. Now told to hide the frame
 - f. Found the hide frame button at the top of the screen
 - g. Clicked it.
5. Revise your search
 - a. Found the return frame at the top of screen remembered the revise search option
 - b. Found the revise search button at the top of the frame
 - c. Clicked revise search
 - d. Taken back to opening screen
 - e. Typed in aspirin side effects
 - f. Clicked search
 - g. Tried actual websites this time
6. Close the frame when you get to a website of your liking
 - a. Liked this first website so found the close frame at the top of the screen
 - b. Accidentally clicked hide frame
 - c. Clicked close frame from to of screen

APPENDIX N

User Study Notes

Homepage } (Summary) Condensed User Study Notes

- 2: Point of Avalon? Suggested explicitly stating what Avalon is / what it does.
- 3: Was no difference between "Rapid Tutorial" and "Comprehensive Tutorial"

Choose Form of Results Screen

- No problem with the wording of "Actual websites" or "A List of websites" (2 & 3)

Rapid Tutorial Page & Comprehensive Tutorial

- 3: Saw no difference between this tutorial & the comprehensive tutorial → suggested combining them.

Actual Website with Frame:

- 2: Had issue with wording of "frame" → we asked if he had other suggestion, he said no.
- 3: Problem differentiating between where the frame ended and website began.

Actual Website with Reduced Frame

- 2 & 3: Neither user went to this screen, so no issue or comment.
⇒ Is this option even necessary?

List of Results

- 2: Mentioned he didn't like "frame" again
- 3: Didn't think "frame" was different from Actual website

Home page

- participant confused by what Aulan meant I.e. does it stand for anything (2)
- participant wanted to know reason for 2 tutorials (1)
- Choose form for results

- participant expressed dislike with being presented with two options (1)

Rapid tutorial

- didn't like 2 tutorials couldn't distinguish what to use for what reason. (1)

Actual website with frame

- participant had problem with "what is a frame" option (1) could not offer any suggestions (2)

Actual website with reduced frame

- participant had no problem with frame thought it was self explanatory (1)

List of results

- participant still didn't like frame (2)