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Involving Seniors in Designing Information Architecture for the Web

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Abstract

The present study utilized the card sorting technique and cluster analysis to define the best information architecture of Web health information for seniors. Sixteen seniors participated in the card sorting, twenty in the category identification and thirteen in category labeling experiments. Seniors participated in the study tend to group the tested items conceptually at the higher level but tend to group the items based on common words found in the titles at the lower level of the hierarchy. The study also found that user grouping produced more heterogeneous structure than the Dmoz set-up information architecture. Category labels suggested by seniors were observed to be less formal than the Dmoz category labels.

1 Introduction

1.1 Health Information and Aging

U.S. Census Bureau (2000) projected that by the year 2030 people aged 65 and above will represent 20% of US population. Although older adults are still underrepresented as computer users, more and more are beginning to incorporate the Web as part of their lives, currently representing 13% of the online users (Cury, 2001). One of the main uses of computers for seniors is to look for health information (White et al., 1999; Cochrane, 1999).

This significant increase in the older computer user population has led to various studies investigating the age effect in utilizing the Web. Some findings suggested that older adults have some disadvantages in fully utilizing the Internet as an information source. That is, older people have more trouble finding information in a Web site than younger people (Mead et al., 1997). However, little effort has been placed to ensure that health information on the Internet is structured to help older computer users to find the desired information easily and efficiently.

In addition to age-related problems of searching for information on the Internet, seniors often face various problems when searching specifically for health information. Research reviewing medical and health related web sites listed the following problems: although those sites are attractive, they only function as "yellow pages" (Cochrane, 1999); it is difficult to find specific information and it contains content of varying quality (Hersh, 1999); there is a potential for serious abuse and conflict of interest because of the profit acquired from selling an advertiser's products (Bloom & Iannacone, 1999). For most topics, inability to find the proper information (or to find the information in a timely manner) might not bring severe consequences. However, the case is different in health and medical areas. Hence, it is crucial to make certain that online health and medical information is structured in a way that would enable users to find the information easily and efficiently.

This study investigated ways to better structure and information architecture of Web health resources and to be more intuitive to seniors. Previous studies showed that unintuitive web link labels might lead users to a wrong path or caused disorientation, which render users unable to find the information (Oliver & Oliver, 1996).

1.2 Card Sorting Technique

An important step in organizing the content of a web site is to place the information on the web site according to how individuals typically view information (Bernard, 2000b). A well-constructed taxonomy will help end users to locate the desired information quickly and accurately and a badly constructed taxonomy might contribute to a waste of time and effort without obtaining the desired information (Karneva et al., 1997).

The organizational structure of a Web site can have a profound effect on its ease of use. An ideal structure would allow users to navigate efficiently through the site, while a less-than-ideal structure might make users unable to achieve their goals in information search. For example, many corporate Internet sites design their web site's structure based on the internal structure of their companies, no matter how conceptually unintuitive the structure is.

Unfortunately, most visitors are unfamiliar with the actual structure of the company, and are unlikely to find this kind of site easy to navigate as these sites do not match the user's mental model of the structure of the company.

To make certain that the information architecture design matches the way users view information, usability testing needs to be conducted. Usability testing should follow the philosophy that the successful design of a web interface is very dependent on the typical user's mental model of the structure of a web site (Bernard, 2000a). Thus, in web site design it is essential to ensure the design of a meaningful structure of information organization, as a meaningful information organization will promote efficient navigation (Shneiderman, 1992). The optimal information structure should fit the user's mental model (Lisle, Dong & Isensee, 1998).

One of the ways to understand user's perceived relationship of various components of the web sites using a formative design support technique is by utilizing the card sorting technique. In the card sorting exercise, participants are presented with randomly ordered cards representing pages of a Web site, and they are asked to group the cards based on their perceived fit (Martin, 1999).

Card sorting is considered as one of the best usability methods for investigating users' mental model of an information space (ZDNet Developer, 1999). The resulting tree structures can be used as a base for organizing the site and for identifying meaningful patterns in the resulting hierarchy which are indicative of general underlying cognitive processes or user mental models. These patterns can then be generalized to form principles and guidelines for organizing Web content (Karneva et al., 1997).

There are two ways to analyze collected data from card sorting experiments: by "eyeballing" the card's grouping trend (Martin, 1999), which is tedious for large number of users; or by utilizing the cluster analysis technique. Cluster analysis of card-sorting data is a promising method for understanding and summarizing multiple participants' input to the organization of Web site pages. Cluster analysis quantifies card-sorting data by calculating the strengths of the perceived relationships between pairs of cards, based on how often the members of each possible pair appear in a common group (Martin, 1999). The degree of the relationship between any two cards is represented by their similarity score. The output can be displayed in the form of tree diagrams in which the relationship between any two groups of cards is represented graphically by the distance between the origin and the branching of the lines leading to the two groups.

2 METHODOLOGY

2.1 Participants

The experiment was designed specifically to include a representative pool of the prospective users of the tested health information web sites. Sixteen seniors aged 55 and above (mean age = 68.69, SD = 5.97 years) participated in the card sorting experiment (experiment 1). A different pool of twenty seniors (mean age = 70.41, SD = 13.41 years) participated in the category identification follow-up experiment (experiment 2). Another new pool of thirteen seniors (mean age = 70.69, SD = 8.18 years) participated in the category labeling experiment (experiment 3).

All participants live independently in the community (non-institutionalized) and have no visual and cognitive impairment and functional illiteracy. All participants have at least 13 years of formal education.

2.2 Stimulus Material

The pages used for the whole card sorting experiments were sixty four (64) leaf items taken from the "Health: Aging" hierarchy of Dmoz (**http://www.dmoz.org**) web site from four main categories: Geriatrics, Diabetes and Alzheimer, Life Cycle and Life Expectancy. The example of the original web site structure is pictured in Appendix A-1. Items were carefully selected to be of interest to our participant's age population and of similar title complexity.

2.3 Apparatus

3'x5' Index Cards with the Web link names and short descriptions of the content of Web pages were used in the Card Sorting test. USort and EZCalc software by IBM™ were used for the cluster analysis of the card sorting data. Paper and pencil questionnaires were used for category identification and category labeling experiments.

2.4 Procedure

2.4.1 Experiment 1: The card sorting

The link title and a short description of the web page of each of the 64 items was printed on a separate index card. An example of those index cards is depicted in Figure 1.

Alzheimer's Outreach
Information for caregivers of Alzheimer's patients and caregivers. Includes message board, poetry and numerous places to relax.

Figure 1: An example of Index Card used in this experiment

Each participant was given one set of sixteen (16) randomly ordered index cards from one of the four Dmoz main categories. The participant was tested in an individual session to make sure that the grouping was based on individual observation rather than group observation. The participants were asked to sort the cards into logical groupings based on the following instructions (ZDNet Developer, 1999):

- Please sort these cards into piles such that things that you think go together are in the same pile.
- You can have as many or as few piles as you like.
- The piles do not need to contain the same number of cards: some piles may be very big and others may have one or two cards if you don't think they are sufficiently similar to anything else.
- You can change your mind and move cards around and merge or split piles as you go.

When they were comfortable with their final sorting arrangement, they were asked to record their card groupings on paper. To aid in understanding the underlying concept of how they group the information, participants were also asked to write down group names and descriptions of why they grouped the items that way. Each participant was then asked to repeat the experiment by using a different grouping strategy.

Because it was predicted that seniors might be confused and worried when finding an item that they couldn't group with any of their groups, two options were given: to place the item to any of the existing categories or to list the item as a separate group with the item's name as the group name (some help was provided by asking the participants to use the "thinking out loud" method while creating the categories). In cases where the participants felt that some items could fit into more than one group, they were allowed to list that item in one or more categories.

Next, a cluster analysis was conducted using EZCalc across all participants' card groupings to produce final hierarchical structures. The final hierarchical information architecture can be found in the Figures 2-5 of http://agrino.org/pzaphiri/Papers/HCII2001.

2.4.2 Experiment 2: The category identification

In this follow-up experiment, participants were given pages containing items from the same main category of Dmoz. Each of the pages contained items that were suggested to belong to the same group by the participants of Experiment 1. Each participants in Experiment 2 was then asked to write down a suggested label for each of the groups. In general, across the twenty participants, 3-5 names were proposed for each group.

2.4.3 Experiment 3: The category labeling

The last experiment, the category labeling, involves presenting users with the category labels suggested by the participants of Experiment 2 and the items that belong to that category. Each participant was asked to rank the suggested labels based on their fit to the group (lower number means higher fit). The number was then added up and the label with the smaller sum was the chosen label for the group.

3 RESULTS AND DISCUSSION

The new hierarchical structure (see Appendix A-2) revealed that, through the use of user feedback, the information structure has transformed from a homogeneous (four items per branch) design of Dmoz to a heterogeneous hierarchy (ranging from two to six items per branch). The users' mental model is more in agreement with a heterogeneous information architecture than a homogeneous one.

Another interesting observation is that seniors participated in our experiment tended to group items conceptually at the higher level of the information structure (e.g. by putting items related to Organizations or Diabetes in one group) but tended to be influenced by common words found in link name titles (e.g. "Longevity" or "Anti-aging") when grouping items at lower level of the hierarchy. In contrary to the commercial grouping of Dmoz where the information was often grouped based on geographic location (e.g. Research Institutions in USA versus Research Institutions abroad), our senior participants tend to group items based on their functionality or service provided (e.g. Institutions about Aging, research centers about diabetes).

From the category labeling experiment, new names for the proposed categories where obtained. Category labels suggested by seniors were observed to be less formal than the category labels designed by web site experts. Our hypothesis is that these category labels match the user perception better than the information architecture proposed by Dmoz designers. The validity of this hypothesis needs to be tested by a formal usability experiment.

4 CONCLUSIONS

This study applied a series of user-centered design exercises to build a senior-oriented information architecture for health-related information on the Web. The results of the study showed that involving prospective users in the design can capture users' underlying perceptions of different components of the information architecture, including the structure and the labels of the hierarchy. The resulting information architecture is expected to be more user-friendly as we believe it is a closer fit to the user's mental model. The study suggests that web designers should accommodate the needs of users to ensure that their products would appeal to the end-users. More generally, with the Internet being more integrated in various aspects of life, it is necessary to accommodate users with different characteristics (e.g. people with disabilities or older users) when designing the online information architecture.

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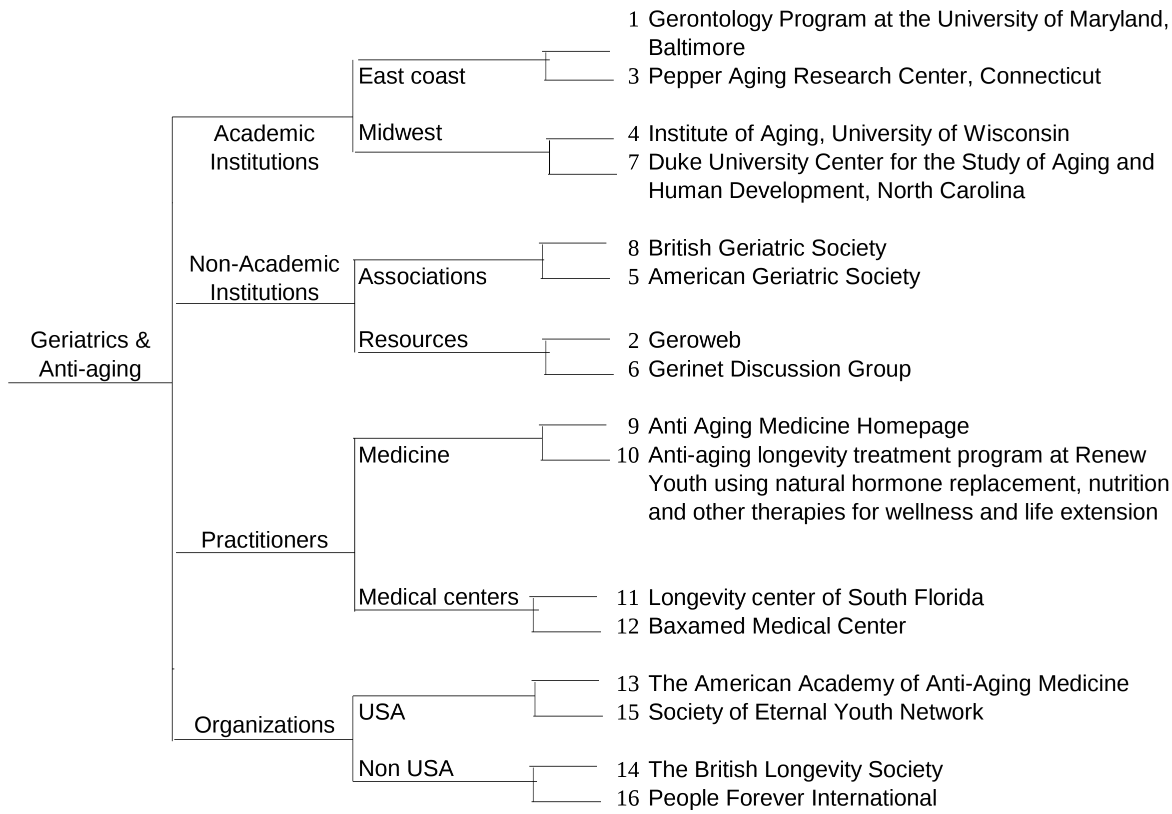
Appendix A-1: An example of web site structure from Dmoz of the main category: Geriatrics & Anti-aging



Appendix A-2: An example of the result from the card sorting experiment from Geriatric & Anti-aging