Quick but not so dirty web design: Applying empirical conceptual clustering techniques to organise hypertext content.

Charles M. Hymes

Customer Data & Design Lab
Hewlett Packard Company
19483 Pruneridge Ave
Cupertino CA 95014 USA
+1 408 447-2340
charles_hymes@hp.com

Gary M. Olson

Collaboratory for Research on Electronic Work
University of Michigan
701 Tappan room c2420
Ann Arbor MI USA
+1 48109-1234
gmo@crew.umich.edu

ABSTRACT

When the purpose of a web site is to communicate a body of information, the most common and significant problem for the user is understanding how content is organised within the site. The Rapid Empirical Clustering Approach (RECAp) was developed from cognitive science work on concept structure to help the designer represent the "modal mental model" of the users' conception of web site content. RECAp has been performed under tight time and resource constraints. None the less RECAp has been observed to substantially improve web site structure, while helping design teams maintain focus on users and usability.

KEYWORDS

Fast, WWW Design, Hypertext Structure, Conceptual Structure.

INTRODUCTION

Problem

There are several recurring difficulties in organizing the content of web pages. When the purpose of a web site is to communicate a body of information, the pages must be useful, navigable and understandable. Most pages are produced and put online before any clear and direct assessment of the users' needs are made. Consequently, these needs become more difficult to fulfill. In contrast, navigability seems to be the most recognized usability issue about the web. However, navigation tools represent only one component of web site interaction. The most significant problem for the user is understanding how content is organized within the site. Without this understanding, navigation is effortful and exploratory, and even the utility of the site is obscured.

Approach

The techniques used for web design at the Hewlett-Packard Customer Data & Design Lab (CDDL) focus on need fulfillment and content organization. These techniques help the designer represent the "modal mental model" of the users' conception of the content. Essentially, our procedure is to:

- Rapidly model the users' concepts and intra- conceptual structure;
- Prototype that model with paper representations
- Test the model for fit and usability,
- Use the information gained through testing to refine the model.

We have found that letting the users' conceptual structure drive the structure of the web site leads to easy navigation and resolves other web usability issues, such as depth versus breadth, the amount of content per page, and the organization of hyperlinks.

Theory

This approach is an extension of dissertation work [[4]. That work addresses the applications of traditional cognitive science research focused on conceptual structure, and builds on the idea of concepts as combinations of attributes, theory, and the utilitarian goals of the reasoner. [2, 7, 8] Sometimes, a categorization methodology is applied to a set of items, and the results are preserved as a tool or document. I refer to this type of categorization methodology as "deliberate categorization" where- the designer creates the category to satisfy some goal set, classifies found entities under the same constraints, and/or actually creates new objects to be members of the category.

Setting

CDDL is the main supplier of human factors support for the Hewlett Packard Company's (HP) System Technology Group's (STG's) divisions. In addition, we supply usability

training for Boise printer divisions and consult on various projects for the departments of Test and Measurement, Scientific Instruments and sales support.

We are primarily an internal consulting group, hired into development teams for various products. It is important to our internal customers that we demonstrate our knowledge of the HP environment, and deliver our services in a manner that is consistent with the HP culture.

Constraints

One aspect of HP's culture is that groups within HP are very independent and value their autonomy. Similarly, within groups in HP, individual contributors are given significant latitude in choosing their design and implementation strategies. This means that CDDL's clients are free to hire us, someone else, or no one for usability engineering. Accordingly, we must provide our services in a manner that clearly maximizes the benefits to our clients, while minimizing costs. In almost all situations, those of our clients who are working on web sites express an urgent need to get easily implimentable results as rapidly as possible. On several occasions our team has been brought in after a substantial investment has already been made both in the current design and content, and with very few working days remaining until the release deadline.

Another interesting constraint is the strong desire of web designers to utilize as much new "flash - whiz - bang" technology as possible. The implicit and sometimes explicit design goals are to demonstrate the implementation of the technology, attract attention, be distinct from other web sites and to entertain. With some web technologies, (that is, animation, frames, search engines) it is far easier to annoy the user than it is to satisfy the user's needs.

Nonetheless, flashiness is as legitimate a design goal as any other. When the user is only a click away from abandoning the site altogether, flashiness is an excellent way to encourage the user to invest the time and effort to discover what the site has to offer.

METHOD

The Rapid Empirical Clustering Approach (RECAp) has three "procedures":

get_user_goals

assess_content

make_links

The results of each procedure are used as data for the next procedure. However, to a significant degree, any procedure can be independently applied at any stage in the development of a web site, and incremental improvement can be gained. Additionally, in a pinch, procedures may be overlapped. For example, getting goals may be combined

with assessing content if the content already exists. Furthermore, when time or other resource constraints prevent the execution of a particular procedure, a reasonable approximation (or educated guess) may be substituted for actual data, and again, some incremental progress may be made.

Get_User_Goals

Purpose: Identify goals & needs of users, obtain key phrases & headings.

Input: Current Design, Design goals

Results: key phrases, subject headings

Set-up:

Prepare a design goals document and an outline of the proposed design.

Procedure:

Present users with design goals and the design outline. Explain and answer questions.

Next, have the users brainstorm for at least ten minutes about what they would want out of such a site, and what would encourage them to visit it. Be sure users use the entire ten minute period. Have the users record their ideas on a single color of index cards.

Repeat the brainstorming exercise, but have the users brainstorm about what they will do with the information on the site, and why they would visit it. These ideas should be recorded on another color of index cards.

Finally, have the users brainstorm on how they would recognize a site that is meeting those needs by "just by looking at it". These features should be included wherever appropriate in the content.

Analysis:

When all users have been run, have a judge (preferably yet another user) identify the key terms and concepts. [6] [10] Do this by combining the cards for each topic, and sort the cards into stacks of similar ideas. Generally, no stack should have more than five, non-identical ideas, depending on the complexity of the concepts. Similarly, if there are more than seven distinct stacks, cluster similar or related stacks next to each other, and note their relationship. The most important stacks are the tallest ones, where users are agreeing on key terms. Increasing the number of judges will improve intra-page consistency.

Development:

Edit content so that, where appropriate, the key terms and concepts are natural headings. Users' goals should generally appear as headings in the content [11]. Users' needs should generally appear as sub headings in the content. Generally, everything in a single stack should be on a single page. Then, users will not have to page around or scroll unnecessarily because the material that belongs together should, and will be together.

Assess_Content
> Purpose: Organize intra-page design, headings, and hyperlinks
> Input: key terms and phrases, representative web content
> Results: utility and appeal measures of content; hyperlink headings.

Set-up:
Generate your content on paper, in color, if possible. Try to include all the identifying visual attributes mentioned by the users.

Procedure:
Give users a randomized stack of the content pages, packs of different colored small postit notes, and a pack of large postit notes.

For each page, instruct users to rate each page on a scale of 1-5 on its utility, how interesting its content is, and how visually appealing it is. A shortcut is to give users one pad of small postits and ask them to tag only those pages they thought were a good source of valuable content.

Also, have users write a one sentence description of each page on the post it and attach it to the page.

Finally, encourage users to write on any page that merits comment.

Analysis:
The ratings on each page can be used to identify both problem pages as well as pages to be emulated. Additionally, an average score for each measure can be calculated to estimate overall acceptance of the site. The "shortcut" method of simply tagging good pages can also be used as a rough guide to site acceptance. The more pages tagged as "good" in a site, the better. The large postits should be used to determine the text in hyperlinks. All the large postits should be examined to identify the most common sentence.

Development:
Edit the content to reflect the identified hyperlink headings. Ideally, the most common sentences provided for each page should be the title of that page. Whenever that sentence occurs in the text of other pages, there should be a hyperlink. If there is little consensus between users on the descriptive sentences for a particular page, the page should be redesigned.

Make_Links
> Purpose: Architect overall navigation strategy
> Input: organized web content pages
> Results: Interpage Hyperlinks

Set-up:
Generate the content on paper. From the goals identified in get_goals, develop a goal-based scenario.

Procedure:
Begin by orienting the user by presenting and explaining the scenario.

Next, have the user sort the content pages into several piles of "things-that-go-together" [5, 9] given the orienting scenario. For each pile, have users explain why these pages go together, and have them name the pile. Have the users paperclip the pages in each pile together, and include the name and explanation with each pile.

To obtain the superordinate structure, repeat the process, with the users treating each pile the same way they just treated the individual pages. Iterate until there is only one pile.

Analysis:
The piles and sub-piles of pages should be treated similarly to the judged stacks of cards and large postits in get_goals and assess_content. The users' piles should be compared to identify themes and commonalties. Here, there is greater latitude in the size of the piles and sub-piles, because the headings will eventually be presented in lists and tables rather than being imbedded in the content.

Development
Each pile represents a navigation page, frame, or map for the website. The title of each pile should be the title of the navigation page. Each navigation page should have a link to each page in the pile, and the explanations the users gave should drive the appearance and functionality of the navigation technique.

LESSONS
Because of the intense time pressures we have encountered, we at the CDDL have not yet had the opportunity to use a complete suite of the RECAp procedures on a web project from start to finish. However, we have been able to use different procedures in combination on different projects. This has allowed us to invent several important aspects of RECAp in real development environments:

RECAp degrades gracefully.
When the situation does not allow for an ideal laboratory methodology ,well-defined populations of users, or large samples of subjects, useful results can still be obtained. To the degree that the users agree on labels and grouping for the site [3], RECAp seems robust at helping us approximate a coherent conceptual framework.

Walking through the RECAp procedures clarify the web design process and focuses the design team on the user population
RECAp is a simple way to introduce user's goals, user's conceptual structures, and user centered design to web development teams. RECAp gives concrete examples for important but abstract usability issues. After these

examples are understood, design teams are much more aware and concerned about the users point of view.

RECAp is compatible with other design approaches

Even in its most formal implementation, RECAp is an "Open" approach, and can be mixed and matched with other usability methods. Like other "hard" methodologies [8] given sufficient time and resources, RECAp can provide solid metrics (in multi-dimentional scales) on the conceptual proximity of the concepts on each web page. Like other "soft" approaches [1] , RECAp captures qualitative information within the context of the users. Additionally, RECAp provides useful information even before all the statistical analyses are complete.

Users report greater satisfaction, less confusion.

On web projects where RECAp has been used, users take less time to find desired content, and report greater satisfaction. These are the most important factors in Recap's value. Unfortunately, these measures are always confounded by other improvements and changes in web content. Accordingly, we can not yet claim a direct causal link between RECAp and navigation speed and overall satisfaction.

We at the CDDL are looking forward to the opportunity to evaluate RECAp under appropriately controlled conditions, both to establish this link, and to refine some aspects of the approach that are difficult to develop under typical production pressures.

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