

Effects of Structure and Label Ambiguity on Information Navigation

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ABSTRACT

We present experimental results showing that search for target items in a three-tiered categorization structure (approximately 8 links per page) is faster than a comparable two-tiered structure provided that the category labels are clear and unambiguous. For items in ambiguous categories, search is faster in the two-tiered structure.

Keywords

Information architecture, category structures

INTRODUCTION

Given the expense and importance of successfully structuring a Web site's content, identifying and understanding any patterns that relate a site's structure to its usability would be helpful in producing more usable sites. Here we explore the tradeoff between the site's depth and the number of links per page.

Empirical results by Larson and Czerwinski [1] suggest that people are able to find items faster in two-tiered structures (i.e. 16x32 and 32x16) than in a comparable three-tiered structure (8x8x8). Our theoretical results [2] support these results, at least when the link labels are not completely clear. However, our simulations showed a slight usability advantage to the three-tiered structure when link labels are unambiguous.

Here we report results from an ongoing study that addresses these two claims. One of the study's goals is to verify our theoretical claim while also evaluating the generality of the Larson and Czerwinski results. Like Larson and Czerwinski, we recorded the time taken by participants to find selected items in Web sites with varying structures. Unlike Larson and Czerwinski, we identified a range of targets, some of which were clearly categorized and others that were ambiguously categorized. The theoretical claim predicts faster search times for the three-tiered structure when category labels are unambiguous, but faster search times for the two-tiered structure when labels

are ambiguous.

METHOD

Participants

45 participants were recruited from class announcements and student email lists at DePaul University. They were all experienced users of the Web (more than 10 hours of personal usage) and at least 18 years of age.

Materials

The Web sites were constructed using items and categories found in a discount department store.¹ Of the categories, there were 6 high-level categories and 37 low-level categories. Examples of items are a tripod grill, a butane lighter and a hand mixer. Examples of the 6 high-level categories are sporting goods and hardware. Examples of the 37 low-level categories are camping accessories and kitchen gadgets. A Web server dynamically constructed a site hierarchy from these categories and items. The three-tiered structure was created from categories at both levels, where the top-level page had 6 links, the pages at the second level had an average of 6.17 links and the bottom level an average of 13 links leading to the items. Two-tiered structures were created by either omitting the top-level categories or the bottom-level categories, thus respectively producing 37x13 and 6x80.8 structures.

Procedure

Using a between-groups design, each participant was randomly assigned to search in one of the three structures. Regardless of structure, each participant was asked to look for the same 8 items. Three judges predetermined that 2 of these are clearly categorized at both levels and that 2 of these items are ambiguously categorized at both levels.

The Web server randomized the order of search targets for each participant and created a new Web site for each search by randomizing the order of the links on all of its pages. Every time a participant requested a new page by selecting a link, the Web server automatically recorded the name of the selected link and the time the link was selected. If the

¹ We are grateful to Gillian Jetson who gathered the initial set of items and categories from a local department store.

participant took longer than four minutes, the server asked the participant to look for the next targeted item.

RESULTS

Here we focus on results that address the previously discussed findings. In particular, we look at search times in the three-tiered structure (its 6x6.17x13 structure approximates an 8x8x8 structure) and the two-tiered structure with bottom-level categories (its 37x13 structure approximates a 32x16 structure). We also focus on the two targets (i.e. garage remote and tripod grill) that were previously judged ambiguous at both categorical levels and the two targets (i.e. birdbath and handlebar bag) judged unambiguous at both levels. For cases when the target was not found, the search time was recoded as 4 minutes.

Average times in seconds are shown in Table 1. The times across all three structures were fastest for the birdbath and the handlebar bag and slowest for the tripod grill and the garage remote. For pairwise comparisons between the structures, the birdbath was found faster in the three-tiered structure than in the two-tiered structure (T-Test p value = .0345) whereas the tripod grill was found faster in the two-tiered structure (p = .0300). The differences for the handlebar bag (p = .9041) and the garage remote (p = .1070) were less reliable.

Table 1 Average time in seconds

	Birdbath	Handlebar bag	Garage remote	Tripod grill
All structures	24.7	27.2	87.4	137.2
3-tiered	10.3	27.6	96.0	147.8
2-tiered (37x13)	45.1	26.2	63.5	92.4

Although the birdbath and the handlebar bag were prejudged to be unambiguously categorized targets, not all participants took the shortest route. For example, many participants first looked for the handlebar bag under hardware before choosing the correct category, sporting goods. For these participants, the handlebar bag lies behind ambiguous labels and thus is not a good example of an unambiguously categorized target. To get a clearer indication of the effects of unambiguous labels, we excluded results that took more than the minimal number of link selections for both the birdbath and handlebar bag targets. Following the same logic, so that garage remote and tripod grill better serve as ambiguously categorized targets, we excluded the results that took the minimal number of selections to find them.

Table 2 presents the averages for the reduced results. This time, the three-tiered structure produced faster times than the two-tiered structure for both the birdbath (p = .0207) and handlebar bag (p = .2002). As before, the three-tiered structure produced slower times than the two-tiered structure for the garage remote (p = .0629) and the tripod grill (p = .0102).

Table 2 Average time in seconds for filtered results

	Birdbath	Handlebar bag	Garage remote	Tripod grill
3-tiered	9.0	11.1	102.1	157.1
2-tiered (37x13)	20.1	14.7	63.5	92.4

DISCUSSION

The pairwise comparisons for which there was either a significant or marginally significant difference (i.e. $p < .1$) were all consistent with the theoretical prediction, namely that items whose link labels are unambiguous are generally found faster in a three-tiered structure (approximately 8 links per page) than in a two-tiered structure (approximately 32 links per page at the top level and 16 links per page at the bottom level) and that items whose link labels are ambiguous are generally found more slowly in the three-tiered structure than in the two-tiered structure. In regard to the results by Larson and Czerwinski, their finding that 32x16 structures produce faster times than 8x8x8 structures seem to generalize to similarly sized structures provided that the targeted items are not clearly classified from the perspective of their users.

A plausible explanation for these results is that, in the ideal case, the three-tiered site minimizes the number of links that the user has to evaluate in order to find the targeted item. However, in the less than ideal situation, some backtracking is required, at which point the user has to evaluate and select more links for the three-tiered structure than the two-tiered structure. We plan to flesh out and corroborate this explanation with further analysis.

As for practical advice, these results suggest that content structured with significantly more than 8 links per page generally produces faster search times unless the link labels are clear and unambiguous to its users. This advice should be further qualified to the properties of the structures presented here:

- The links are not grouped or ordered in any way.
- The links at the bottom level clearly identify the items.

These properties do not hold for many Web sites and any variation from these properties might produce different patterns. Additional experiments and theoretical work is needed to find patterns for these kinds of structures.

REFERENCES

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