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Barbara S. Chaparro, Editor

Where Should You Put the Links? Comparing Embedded and Framed / Non-Framed Links

By Michael Bernard & Spring Hull

In the last issue of Usability News, we discussed our findings from a study that examined performance and preference of link placements located at the top-left, bottom, corresponding with the text, and embedded within the text (Bernard, Hull, & Drake, 2001). The comparisons revealed no significant differences in terms of search time or efficiency between the four link placements. However, participants did significantly prefer links that were embedded within the text to the other link placements. This study sought to expand the last study by further examining embedded link placements, as well as links within framed and non-framed documents.

There are several possible reasons why the embedded arrangement was most preferred. First, embedded links require the least division of attention because the links and the passage are in the same visual area. In addition, it provides for a greater context, since the embedded links are part of passage. However, embedding links within a document can make it more difficult to find and refer back to specific links because of their embedded nature. It is possible, then, that embedded links are superior for the initial information search, whereas corresponding links that are located to the left of a passage could be superior for searches after the information associated with the links is known. Therefore, combining the embedded and corresponding links may prove to be a better arrangement than either type alone.

The use of information redundancy is often used in the design of complex documents and may, in turn, be beneficial for web documents. On the other hand, the additional information may produce longer search times and lower perceptions of search performance because of additional display “clutter.” Thus, in order to determine if this type of redundancy actually leads to greater performance and/or preference, we conducted the present study.

In addition to the redundant links, we also examined performance with links within frames versus non-framed pages by comparing a vertical inline frame layout (i.e., frames dedicated to displaying the main navigational links within a site and which are subordinate to the main page) to a non-framed layout. Much has been written about the use of frames within websites. In fact, it has been a considerable source of discussion for the past six or so years. During that time most of the dialogue had focused on the ill effects of frames. For example, it has been noted that frames have the potential to confuse users by breaking the model of a website’s structure, which consists of interconnected, but distinct nodes of information (i.e., web pages). Yet for documents, the use of frames may actually assist the reader by reducing the problem of the disappearing menu when users scroll down a non-framed page. To address this issue, we examined links placed within a vertical frame and a non-framed page with links placed in the same location.

METHOD

A Pentium II based PC computer, with a 60 Hz, 96dpi 17” monitor with a resolution setting of 1024 x

768 pixels was used. The participants' performance was tracked using Ergobrowser™ software. In one condition the links were embedded (Embedded) within a document, as would be found with many online documents (see Figure 1). This was accomplished by using an original online article with embedded links. A second condition embedded the links as well as placing them to the left (Left- Embedded) at the same height the link corresponded with the associative article (see Figure 2). Another condition placed links at the top-left (Top-Left) of the document (see Figure 3) and a fourth condition placed the links within a vertical frame (Frame) at the left of the document (see Figure 4). All of the passages came from Scientific American™ online articles.

Figure 1. Links embedded in document

Figure 2. Links left and embedded in the document

Figure 3. Links at top-left

Figure 4. Links within a vertical frame

Participants

Twenty participants (9 males, 11 females) volunteered for this study. They ranged in ages from 18 to 58 with a mean age of 30.75 (S.D. = 12.6 years), with an average of 3.25 years in college. The median Web use for the participants was 7-14 hours per week (90% reported using it a few time per month or more).

Procedure

Participants were presented with four documents, each with a different link arrangement. For each arrangement they were asked to find answers to 10 questions (such as, *"Who found evidence linking tribes from Siberia to the Americas?"*). Each question had to be properly answered within five minutes to be considered correct. Approximately 40 percent of the questions pertained to information located on the initial page, while the other 60 percent was located within a passage at a second level. This forced participants to read and integrate the content at both levels. Participants could search until they found the correct information by using the Back button, or until the time expired. The link arrangements,

passages, and their associated questions were counterbalanced by means of a Latin square design.

After finishing all the questions for each condition, participants answered a satisfaction questionnaire. The questionnaire consisted of a 6-point Likert scale, with 1 = “Disagree” and 6 = “Agree” as anchors. The questionnaire items were: *This site is easy to navigate, The information I need is easy to find, The arrangement of links promotes comprehension.* After participants answered the respective questionnaires for each condition they ranked the link arrangements for general preference.

Results and Discussion

A within-subject ANOVA design was used to investigate search time and perceived search efficiency for four types of link conditions.

Search Time

Assessing the time needed to complete the search tasks for each link arrangement produced results approaching significance [F (3, 54) = 2.42, p = .08]. As shown in Table 1, the Left-Embedded condition had the fastest search time and the Top-Left condition had the slowest.

Table 1. Mean search time – Mean (Standard Deviation).

	Embedded	Left-Embedded	Frame	Top-left
Search time (sec.)	592.0 (222.3)	529.7 (195.9)	601.8 (258.1)	711.9 (189.8)

Perceptions of Search Efficiency

Mean perceptions of search efficiency are shown in Table 2. Significant differences were revealed for ease of navigation [F (3, 57) = 2.99, p<. 05]. Post hoc analysis indicated that Left-Embedded and Frame conditions had significantly greater perceptions of ease of navigation compared to the Top-Left condition. Participants also indicated that information in the Left-Embedded and Frame conditions were significantly easier to find when compared to the Top-Left condition [F (3, 57) = 4.67, p<. 05]. Examining the perception that the arrangement of links promoted comprehension revealed significant differences in that the Left-Embedded condition had significantly higher perceptions of comprehension than the Top-Left condition [F (3, 57) = 3.60, p<. 05]. Thus, in all three measures, the Top-Left condition was perceived as having the lowest levels of search efficiency.

Table 2. Perceptions of search efficiency – Mean (Standard Deviation).

	Embedded	Left-Embedded	Frame	Top-left
Easy to navigate	4.20 (1.32)	4.30 (1.22)	4.45 (1.36)	3.50 (1.32)
Easy to find info.	3.40 (1.39)	3.95 (1.19)	3.95 (1.47)	2.80 (1.20)
Easy to comprehend	3.50 (1.43)	4.30 (1.08)	3.80 (1.58)	2.95 (1.28)

Embedded link preferences

Using the Wilcoxon Signed Ranks Test to examine difference in preference between the Embedded and Left-Embedded conditions revealed a significant difference between the two conditions [z = -2.68, p < .01] in that the Left-Embedded was preferred to the Embedded condition (1.1 and 1.8, respectively). Examining the number of participants’ ranking either the Embedded or Left-Embedded conditions as their first choice further illustrates the preference for the Left-Embedded condition (see Figure 5).

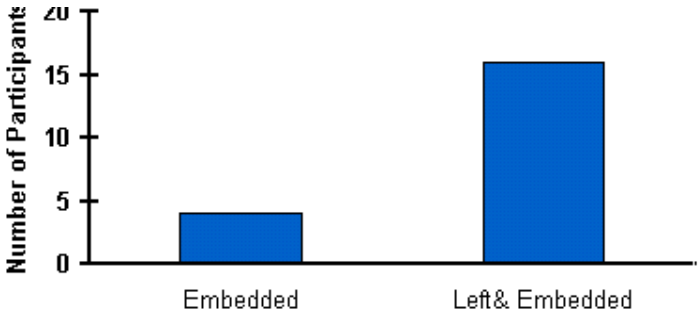

Figure 5. Number of participants' ranking either the Embedded or Left- Embedded conditions as their first choice.

Framed and non-framed preferences

Using the Wilcoxon Signed Ranks Test to examine the differences in preference between the Frame and Top-Left conditions revealed a significant difference among them [$z = -3.58$, $p < .001$] in that the Frame condition was preferred to the Top-Left condition (1.2 and 1.9, respectively). Examining the number of participants' ranking either the Frame or Top-Left (no frame) conditions as their first choice further illustrates the preference for the Frame condition (see Figure 6).

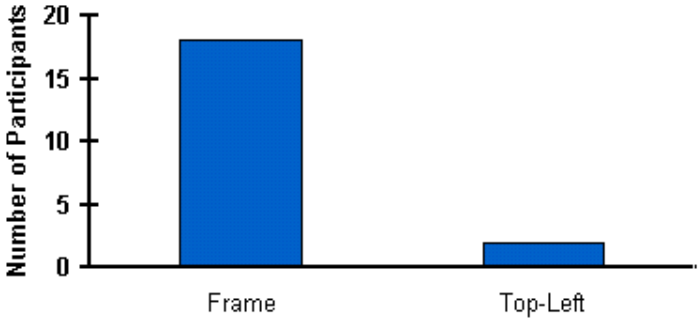

Figure 6. Number of participants' ranking either the Frame or Top-Left (no frame) conditions as their first choice.

Preference for all link placements

Analysis of the participants' rankings for each link arrangement revealed a significant difference in preference [c^2 (3, N= 20) = 17.4, $p < .05$]. The Left-Embedded condition was most preferred followed by the Frame condition. The Top-Left condition was least preferred. Assessing the number of participants' first choice again shows the preference differences between the conditions (Figure 7).

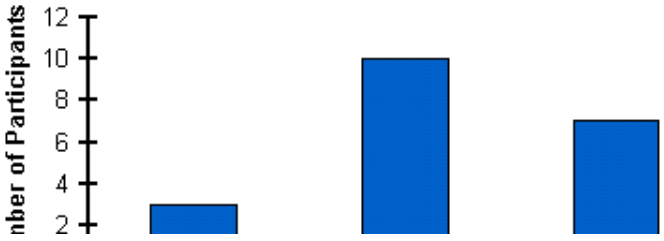

Figure 7. Number of participants' first choice rankings for all link conditions. No participant ranked the Top-Left condition as their first choice.

CONCLUSION

Several observations can be made from this study. Overall, the Left-Embedded condition was searched faster (though not significantly), was perceived as being easier to navigate and to find information than the other link conditions. It was also generally preferred to the other link conditions. Therefore, it is suggested that providing redundant links that are both embedded and corresponding to the document is generally superior to just embedding them within the document or listing them on the left.

The Frame condition was perceived as promoting easier comprehension of the passages, and ranked second in preference. This is interesting in light of the fact than a commonly-used argument against the use of frames is that users supposedly dislike them. This was understandable several years ago when web designers commonly used multi-frame layouts, which can create a navigational nightmare. However, it is suggested that for this specific type of layout, the use of a frame layout is superior to a non-frame layout.

Note: A paper based on this research was presented at *Proceedings of the CybErg'2002 Conference*

REFERENCE

Bernard, M., Hull, S., & Drake, D. (2001). Where Should You Put the Links? A Comparison of Four Locations. *Usability News 3.2* [Online] http://psychology.wichita.edu//surl/usabilitynews/32/links.htm

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