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Breadcrumb Navigation: An Exploratory Study of Usage

By Bonnie Lida, Spring Hull, & Katie Pilcher

Just as Hansel and Gretel created a breadcrumb trail to find their path back home, today's internet user often finds a need to get back to a website's previously visited locations; hence, the cyber "breadcrumb trail" was created. This textual representation of where and how information is located within the website allows the user to link to major categories of information along a continuum of sequential order. For example, the breadcrumb path for a leather chair on the Office Max website would be: **Home > Furniture > Chairs > Leather Chairs**. The location of the navigational path is often prominently placed in the upper left quarter of the website page.

In general, breadcrumbs serve two purposes: 1) they provide information to the user as to where they are located within the site, and 2) they offer shortcut links for users to "jump" to previous categories in the sequence without using the Back key, other navigation bars, or the search engine. Breadcrumb paths give location information and links in a backward linear manner. Navigation methods, such as search fields or horizontal/vertical navigation bars, serve to retrieve information for the user in a forward-seeking approach. As suggested by Marchionini (1995), systems that support navigation by both browsing and analytical strategies are most beneficial to users since various patterns, strategies, tactics, and moves associated with both types of strategies are normally used.

Breadcrumb trails, according to Bowler, Ng, and Schwartz (2001), help users browse and search for information, as well as provide paths back up the web hierarchy. Toms (2000) found that the search tool was most useful in focused searching; while menus were considered essential for browsing. She also suggests that users need both a stable orienting device, such as a menu, to facilitate pathways through the site, as well as a system that supports scanning to smooth the progress of the search (Toms, 2000). However, research on breadcrumbs as a navigation tool has been limited. Studies researching breadcrumb navigation have used simple site structures in a controlled experimental setting. These studies found that the availability of breadcrumb navigation bars resulted in more efficient site navigation and satisfaction (Bowler, et al. 2001; Maldaonado & Resnick, 2002).

In an attempt to better understand how, when, or even if, users use breadcrumb navigation in a real-time online environment, we conducted an exploratory study to determine if participants use breadcrumbs when given a list of items to find on a website. In addition, we were interested in monitoring what other navigational methods they use to access information or e-commerce items (i.e., Back button, navigation bars, search).

In this study, we evaluated participants' navigational strategies, user satisfaction, and general preference for two sites that utilize "breadcrumbs" - Google Directory directory.google.com, a web information search site, and Office Max www.officemax.com, an e-commerce office supply site. In addition to breadcrumb navigation, the Google directory (Figure 1) is organized in main and sub-categories and offers search capability.

Figure 1. Google Directory with breadcrumb Games > Board Games > Economy and Trading

Participants using Office Max (Figure 2) also had access to a breadcrumb navigation, search, a hierarchical left side vertical navigational structure, and a top of page horizontal navigational bar.

Figure 2. Office Max site with breadcrumb Home > Supplies > Post-It,Flags, & Markers > Post-It Notes

Participant performance was measured by the number of clicks, Back button selections, searches, and time to complete the ten tasks. This data was gathered by the tracking program Ergobrowser^{TM}. Data to collect breadcrumb usage was via Mousetrack 1.0 from LGSoft. Pentium 4-based personal computers, with a 60 Hz, 96dpi 17" monitor with a resolution setting of 1024 x 768 pixels on a campus network were used to access the sites.

After completing the tasks on each site, participants answered the End-User Computing Satisfaction (EUCS) instrument (Doll, Xia, & Torkzadeh, 1994), which was adapted for web usage and consisted of 12 satisfaction questions using a 1-5 Likert scale.

METHOD

Seventy-two participants (13 male, 59 female) with an average age of 23.8 volunteered for the usability study. All participants were familiar with the web - 83% reported searching for information at least weekly, while 64% had purchased a product online. Participants were asked to find ten items on the Office Max site and place them in their shopping cart. In addition, they were asked to find and record answers to ten information search questions on Google. The order of the sites was counterbalanced across participants. Participants had approximately 20 minutes per site to search for the information. The tasks were organized such that items from similar categories were grouped together so that use of the breadcrumb would enhance efficiency (i.e., the 1st five items in the OfficeMax task list were all from the category Furniture). After tasks for both sites had been completed, users answered additional questions related to their knowledge of breadcrumbs, recall of whether a breadcrumb was present on the sites, and recall of the path to a specific item.

Information Search Tasks (Google Directory):

1. *What is the height of Luke Skywalker from the movie Star Wars?*
2. *What character did DeForest Kelley play in Star Trek V - The Final Frontier?*
3. *Name two actors in the cast of Toy Story 2 animated movie.*
4. *What is Michelangelo's last name?*
5. *How old was Claude Monet (artist) when he died?*
6. *What company developed the Elite Force action video game?*
7. *Did the Star Trek video game, Generations, get a "good" or "bad" review from the Game Zone website?*
8. *Who developed the Monopoly board game?*
9. *In the area of psychology, what did Al Gore's handwriting analysis reveal about his personality?*
10. *What do the letters, D, I, S, C, stand for in the DISC personality test?*

E-Commerce Tasks (Office Max):

Items that you need:

1. *1 high back office chair*
2. *2 file cabinets (lateral, 2 drawer)*
3. *1 file cabinet (vertical, 2 drawer, letter)*
4. *1 home/office safe*
5. *1 leather guest chair*
6. *1 scientific calculator*
7. *1 cordless phone with caller ID*
8. *1 8-outlet surge protector*
9. *2 boxes of hanging file folders*
10. *4 packages of post it notes*

RESULTS

Results from a paired samples t-tests between sites revealed significant differences across the sites in terms of satisfaction, number of breadcrumbs used, searches, Back clicks, time, total clicks and

recollection of seeing a breadcrumb path.

Participants were queried as to the biggest problem they encountered with each site. The results found that "Not being able to find the information I am looking for" was the most cited problem by 60.8% of the participants in the Google directory search; in the OfficeMax site, 41.9% of the participants found their biggest problem was "It takes too long to view/download pages." The overall satisfaction totals for both sites revealed participants were significantly more satisfied with the OfficeMax site ($M = 57.52$, $SD = 8.17$) than the Google directory site ($M = 44.18$, $SD = 13.32$), $t(70) = -7.33$, $p < .01$, for the search tasks.

We calculated the optimal number of clicks necessary to find the items for Office Max to be 67 (including 8 breadcrumb links) and 2 Back button clicks; for Google the optimal path was 68 clicks (including 7 breadcrumb links) and 8 Back button clicks. Figures 3 through 7 show the average number of breadcrumbs used, Back button clicks, total clicks, searches, and completion time for the two sites. As can be seen, the average breadcrumb usage is fairly low for each site ($M = 2.11$, $SD = 2.46$ for Google; $M = 3.25$, $SD = 3.75$ for Office Max), $t(62) = -2.06$, $p < .05$. The Back button was used significantly more in the Google directory ($M = 59.25$, $SD = 30.23$) than for OfficeMax ($M = 16$, $SD = 18.21$), $t(62) = 10.31$, $p < .01$. The total number of clicks was high ($M = 152.54$, $SD = 64.75$ for Google; $M = 94.07$, $SD = 29.09$ for Office Max), $t(62) = 6.71$, $p < .01$. Although participants were instructed not to use the search to access information or products, 61% used this method in Google ($M = 5.89$, $SD = 7.09$) and 47% in Office Max ($M = 3.00$, SD 4.23), $t(70) = 3.57$, $p < .01$. Significant differences were also found for the task completion times between the two sites. The questions for the Google directory site took longer to find ($M = 1652.98$, $SD = 482.91$) than the products to purchase on the OfficeMax site ($M = 917.02$, $SD = 256.58$), $t(62) = 10.73$, $p < .01$.

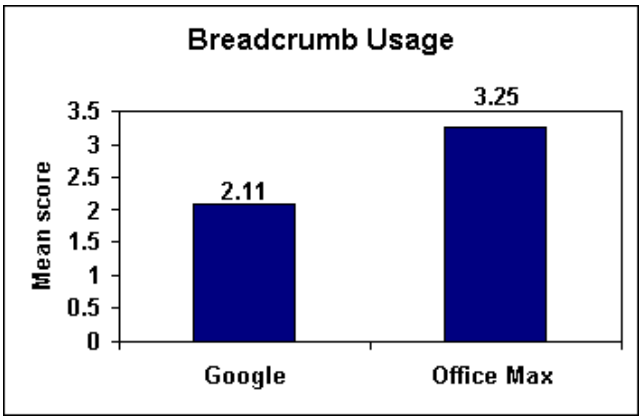

Figure 3. Average number of times Breadcrumb navigation bar was used.

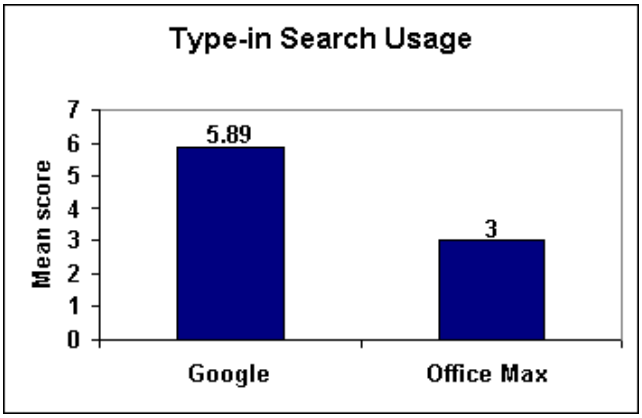

Figure 4. Average number of times Search was used.

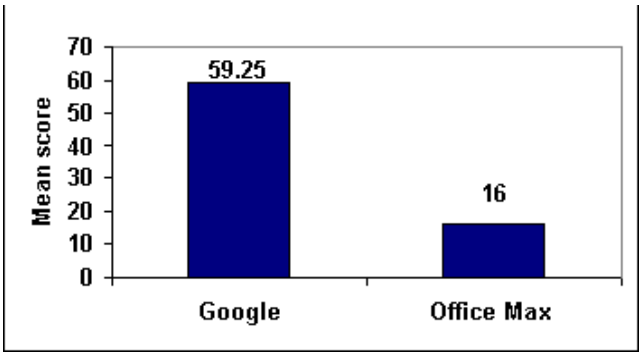

Figure 5. Average number of times the Back button was used.

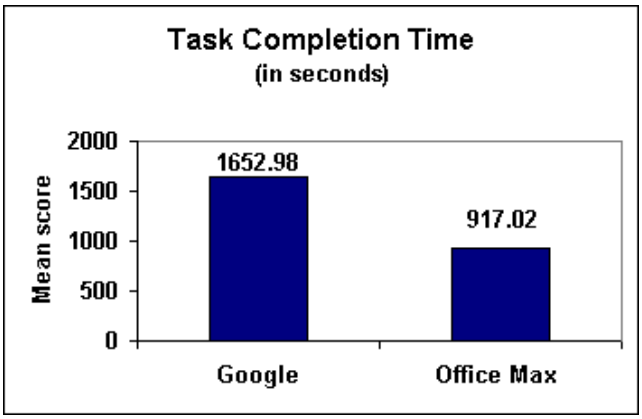

Figure 6. Average time to complete ten tasks for each site.

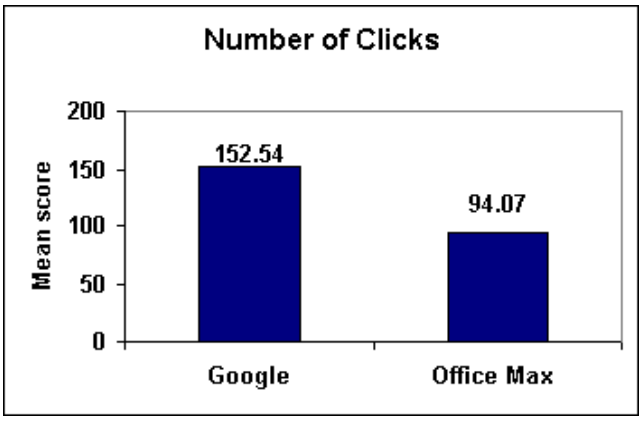

Figure 7. Average number of clicks used to complete ten tasks for each site.

The median split of breadcrumb usage was found to be 4.0, within a range of 0 to 21, 28 (48%) of the participants were categorized into non-breadcrumb user (<4) and 31 (52%) as a breadcrumb user (=4). No significant differences were revealed when the two groups of breadcrumb users were compared with their efficiency data--total clicks, Back button clicks, searches, and time.

When participants were asked if they recalled seeing a breadcrumb path (with an example provided) seventy-nine percent of participants recalled seeing one on Google ($M = 1.61$, $SD = .49$) and 40% recalled seeing one on OfficeMax ($M = 1.20$, $SD = .40$), $t(70) = 5.33$, $p < .01$. (Figure 8).

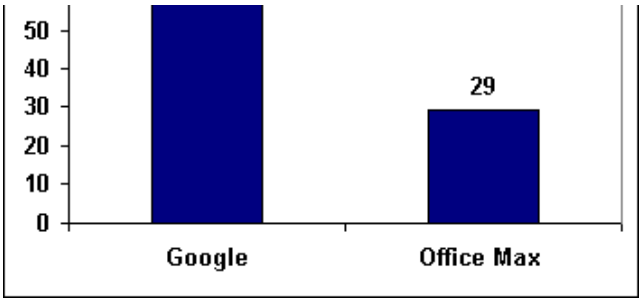

Figure 8. Number of users who reported recalling a breadcrumb path on each site.

DISCUSSION

This exploratory study was conducted to determine whether participants used the breadcrumb trail as a navigational tool within a site. We found the overall usage of the breadcrumb in site navigation to be low. Breadcrumb users were not found to be more efficient than users who did not use the breadcrumb. Participants used a variety of navigational means, such as the Back button, left and top navigation bars, and searching to find the information instead of or in addition to the breadcrumb tool.

Eighty-nine percent of the participants reported seeing a breadcrumb path on the sites; however, it is not known if the participants understood the function of the breadcrumb path. Although we designed the tasks to aid the users' learning by choosing items that repeated the same main and subcategories, participants did not utilize the breadcrumb tool. Future studies should investigate whether users understand the purpose of the breadcrumb path, and if training to use this navigational tool aids their search efficiency and mental model of the site.

The tasks in this study were designed to allow participants to efficiently use breadcrumbs to find the answers to questions in the Google directory search, or find the products to purchase on the Office Max task list. However, there were significant differences between sites in terms of satisfaction and all dependent measures. These differences were not entirely surprising given the site size and opportunities for new browser windows to open in the Google directory search for which using the Back button was necessary. However, the optimal path clicks for both sites was relatively similar (67 total clicks, 2 Back button clicks, 8 breadcrumbs for OfficeMax and 68 total clicks, 8 Back button clicks, and 7 breadcrumbs for Google). Yet the average number of clicks in comparison was extremely different (94 total clicks, 16 Back button clicks, and 3 breadcrumbs for OfficeMax and 153 total clicks, 59 Back button clicks, and 2 breadcrumbs for Google). The results suggest there is reason to further investigate the differences between navigational strategies for an e-commerce task versus an information search task.

Participants in this study also reported seeing a breadcrumb path more often in the Google directory search, yet they used this navigational tool less on that site. This finding is even more interesting considering that participants reported their biggest problem on Google was not being able to find the information. Although it would appear from past research that the breadcrumb path aids the user in navigation efficiency and their place within the site, our results did not find that to be the case. The results of this study put forward many new questions regarding the use of breadcrumb and efficiencies in navigation for future research.

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