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Barbara S. Chaparro, Editor

Examining Tolerance for Online Delays

By Paula Selvidge[1]

The World Wide Web (WWW) has become an increasingly important medium for communication, commerce, and entertainment. The WWW user population is estimated to grow to 320 million by the year 2002 (Bouch et al., 2000). The 10th WWW User Survey reported that speed, or taking too long to download pages, was the third major problem with the Internet reported by users (GVU, 1998). This problem translates into lost profits for e-commerce websites due to effects on users' perceptions and performance. ZDNet (2002) reported a study of 12,000 online customers that revealed 48% of them gave up trying to purchase products because the web pages took too long to download. Brynijolfsson and Smith (2000) pointed out that trust is probably the single most important factor in e-commerce and the effects of time delay can significantly reduce consumer trust towards an e-commerce retailer. Unfortunately, addressing the factors that affect download time is not as simple as making hardware improvements. Since problems with delays are expected to persist, the effects of delays on aspects of website usability remain an important concern and are the focus of this study.

In this study, user tolerance for delays for three common WWW tasks, including information retrieval, purchasing, and downloading a text file was examined. These tasks were selected since the file sizes differ significantly among the three tasks, so it was expected that tolerance may be higher for those tasks with smaller file sizes. For example, tolerance for delays would be higher for downloading a text file than purchasing or information retrieval, since users may have an expectation that the task should take longer so they may be more willing to wait. End-users may be more tolerant of delays while purchasing online, since information must be exchanged to process the transaction, whereas information retrieval does not require information exchange.

The general purpose of this study was to examine how long participants would wait for web pages to load before abandoning a website. Previous research has primarily examined the effect of delays on preference and subjective evaluations of websites, but has failed to focus on the most important aspect, which is end-user behavior. The important question for e-commerce organizations is when will the potential customer leave the website because the wait is too long. The effects of different demographic characteristics, such as age (young adults/older adults), Internet experience level (novice/experienced), and type of Internet connection frequently used on tolerance for delays relating to three types of common Internet tasks (information retrieval, purchasing, downloading a text file) were investigated. It was hypothesized that (i) older adults would be more tolerant of delays than younger adults, (ii) participants with more Internet experience would be less tolerant of delays than novice users, (iii) participants would be more tolerant of delays for tasks involving downloading text files than purchasing or information retrieval tasks, and (iv) participants that frequently use high-speed connections to the Internet, e.g. cable or DSL modems, would be less tolerant of delays.

METHOD

Participants

A total of 101 participants in two different age groups with varying levels of Internet experience were recruited to participate in the experiment. The group of 61 young adults ranged in age from 18 to 30 (M = 20.13, SD = 2.63) and included 18 men and 43 women. The 40 older adults ranged in age from 60 to 88 (M = 70.65, SD = 7.60) and included 15 men and 25 women. Internet experience level (novice/experienced) was determined by the amount of WWW experience and frequency of WWW use. Participants with less than one-year experience with the WWW and frequency of WWW use less than a few times a month were classified as novice users, whereas participants with over 4 years experience and frequency of use at least a few times per month were classified as experienced users. Participants consisted of 24 novice and 37 experienced users in the young adult group and 15 novice and 25 experienced users in the older adult group. A Pentium-class computer with a 17" VGA monitor and 800 x 600 resolution was used in the experiment. The 800 x 600 resolution was selected due to potential visual limitations of the older adult participants. Two websites were created that enabled users to complete one of three common Internet tasks (information retrieval, purchasing, or downloading a text file).

The websites were similar in design, layout, and content in order to reduce possible effects of site design. The content of both sites was related to electronics, more specifically computers, cameras, and software. Two different design templates were selected that varied in color and title header graphics. The font size and style were consistent across sites (12 point Verdana), and all site backgrounds were white with black text. The websites were accessed from the hard drive during the experiment in order to control delays in page loading time. Each web page loaded after a 45-second delay. The 45-second delay level was selected based on prior studies that indicated significant differences in frustration between 20 and 30-seconds, so a delay level was selected beyond 30-seconds to include a majority of participants' tolerance levels for download delays (Selvidge et al., 2001).

Procedure

All participants were tested on an individual basis in a 45-minute session. The experimenter typed in the two URL's for the websites and minimized the websites on the task bar, so participants just selected a website from the task bar. After completing the survey, the experimenter read the task aloud and participants were instructed to complete one task (information retrieval, purchasing, or downloading a text file) on one of two websites. The participants were informed that they could leave the website they initially started on at any time or any reason, they could stay on the same site, or they could go back and forth between the sites, since the task information could be found on either website. Each page on both websites loaded after a fixed 45-second delay throughout the task. The delay started with the users' action of selecting a hyperlink, Back, or Forward command button. During the delay period, the page where the user initiated the action remained on the screen while a message window (2.5 mm x .75 cm) with the text "Working..." was presented in the center of the screen to provide feedback that the page was loading. After the delay, the page selected was presented immediately with all text and graphics fully loaded. The correct answer for each task was located on the third level of each website. The browser program recorded the web page selected, elapsed time when participants left the website, and number of times each site was selected. After completing the task, the experimenter asked the participants why they did/did not leave the first website, the type of Internet connection they used most frequently, and they were also asked to rank the speed for task completion based on their experience for information retrieval, purchasing, and downloading a file.

RESULTS

Delay Time

The mean delay times were 86 s (SD = 57 s) for young adults and 151 s (SD = 60 s) for older adults (see Figure 1). A 2 (age) x 2 (experience level) x 4 (task) between-subjects ANOVA with delay time as the dependent variable revealed a significant main effect of age, $F(1, 84) = 18.64$, $p < .01$, but no effect of experience, age by task, age by experience, experience by task, or age by experience by task, $p > .05$. A one-way ANOVA was conducted to determine the effects of internet connection on delay time and revealed a significant main effect $F(2.97) = 3.80$, $p < .05$. Post-hoc analysis showed a significant difference between the Cable/DSL users and the dial-up users (Figure 2).

Site Changes

The means for site changes for young adults were 3.95 site changes (SD = 6.74) and 0.26 site changes (SD = .72) for older adults (see Figure 3). The actual number of site changes ranged from 0 to 4 for the older adults (N = 8) and 0 to 35 for the young adults (N = 30). A 2 (age) x 2 (experience) x 4 (task) between-subjects ANOVA with number of site changes as the dependent variable revealed a significant main effect of age, $F(1, 84) = 8.65$, $p = .004$; $h2 = .09$; $1 - b = .82$, but no effect of experience or any interactions, $p > .05$.

Task Type and Experience

No effect of task type (information retrieval, purchasing, downloading a text file) or Internet experience level was found for either delay time or number of site changes.

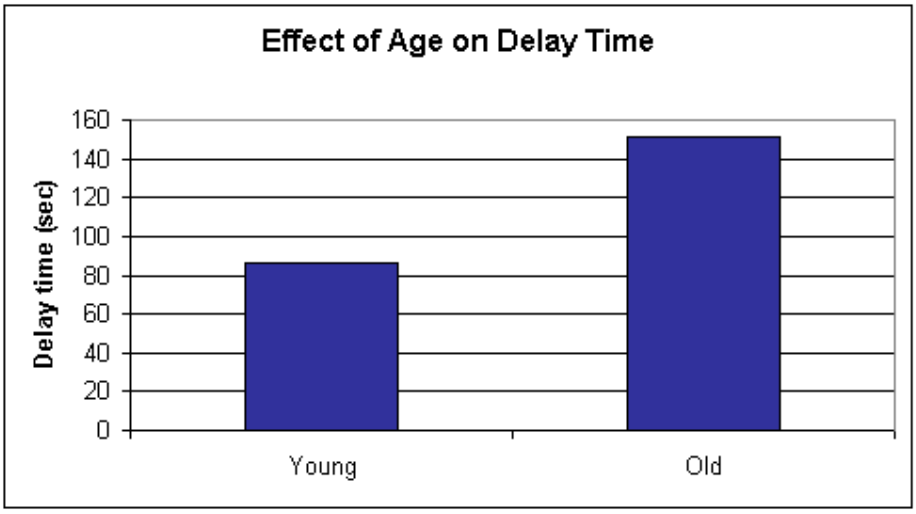


Figure 1. Older adults waited longer than younger adults.

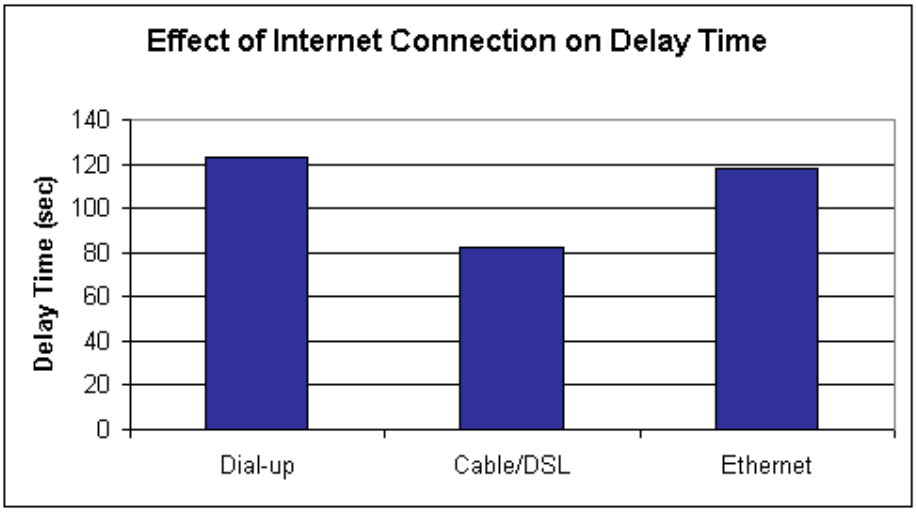
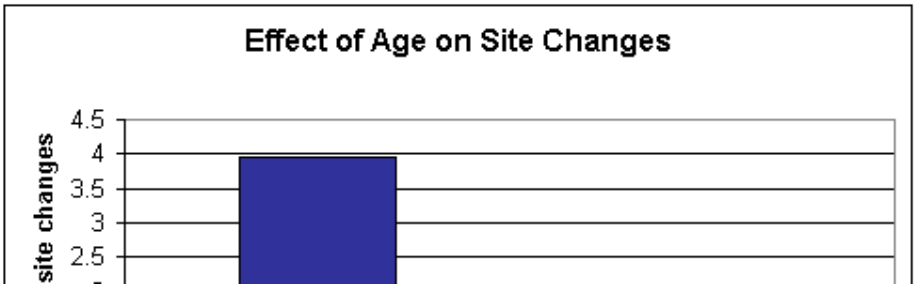


Figure 2. Dial-up users waited longer than Cable / DSL users.



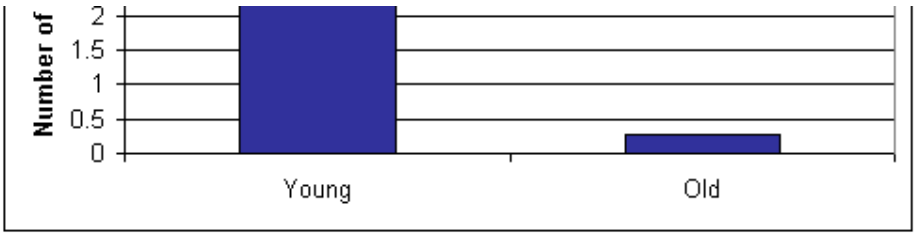


Figure 3. Older adults switched sites less frequently.

DISCUSSION

Results of this study showed that:
Older adults were more tolerant of delays than younger adults in that they waited longer before leaving a site and switched sites less often.

Participants that frequently use high speed connection are less tolerant of delays than those used to a dial-up connection.

Internet experience level or task had no impact on delay tolerance.

Older adults not only waited longer, but a majority did not leave the site at all. Only 20% of older adults left, while 49% of young adults left to go to the other site. In addition, 70% of the young adults abandoned the site before the home page even loaded. It was interesting to note that the older participants were frustrated by the delays as evidenced by their comments, but they did not elect to leave the site to escape the wait. When asked why they left or stayed on one website, only 29% of older participants commented that the website was slow. Others commented that they were curious, unsure if the site was working, or stayed because they were satisfied with aspects of the site.
The findings from this study have direct implications for website design. Older adults will wait longer for downloads and are less likely to leave a site, so web designers could incorporate meaningful graphics or other media in the place of text to enhance the usability of the site for this population. If web designers are targeting users with high-speed connections, page size should be limited, since high-speed users leave websites faster and switch sites more frequently. If web designers are targeting young adults, home page size should be small and download quickly, since young adults frequently abandon sites on the home page. In general, use techniques to minimize page sizes because sites with short delays will be revisited more frequently. In summary, the findings stress the importance of designing for the targeted end-user to maximize performance and end-user satisfaction.

[1]**Note:** This research is part of a larger dissertation study that examined the effects of end-user attributes on tolerance.

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