

Web Usability

A Review of the Research

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As with the information technologies that have preceded it, Web technology is faced with many of the same issues of accessibility and usability. Paraphrasing the definition supplied by the ISO [1], Web usability is the efficient, effective and satisfying completion of a specified task by any given Web user. Support of essential user tasks made possible by Web technology serves as the benchmark of its usability. With this definition in mind, a brief review of available empirical research on Web usability was carried out to determine what is known about the factors that might affect Web usability. This review is not intended to be exhaustive nor is it intended as a review of the many design alternatives and suggestions that have been proposed for improving Web use. The primary purpose of this review is to identify Web-specific usability research and to provide some suggestions for future research.

Tasks

Any description of the usability of a system must begin with the essential tasks that the system is intended to support. Essential user tasks for Web technology include 1) finding desired information by direct search or discovering new information by browsing 2) comprehending the information presented, which includes subtasks such as reading and image processing and 3) a wide variety of specialized tasks specific to certain Web sites, such as the ordering and downloading of products, or other tasks which may require users to execute specific procedures.

System Variables

System variables will affect the usability of any system design and the Web is no exception. System variables include factors such as Internet transmission speed, visual display device capabilities such as spatial resolution and color, and capabilities and limitations of user input devices.

User Characteristics

With Web technology now accessible to millions of users, the characteristics of Web user population runs the gamut of age, skills and knowledge, and physical and mental capabilities. The candidate user characteristics which might affect Web usability are likely to be 1) the extent of user computer and Web experience and knowledge, 2) age and disability-related limitations in memory and vision 3) reading ability level and 4) motivational factors.

Searching the Web

The most immediate task Web users frequently face is finding desired information in a veritable ocean of unwanted information. Indexing sites (e.g., Yahoo) and search engines remain the primary starting points for most information searches. While novices may favor indexed sites over search engines [2], search engines are likely to remain a staple of information search due to their wider accessibility to the rapidly growing number of Web sites. Unfortunately, the keyword search interface is notorious for its lack of usability. Early studies of search interface usability found that user queries generally missed more than half of the information available on the topic [3]. A more recent study of popular

search engines found zero-hit rates of some 30% in Web searches [4]. The essential usability problem with the keyword search interface is in the formulation of the query. Incorrect query constructions were found to be a common occurrence in a recent study of one of the more popular search engines [5]. Studies of novice Web users have found that the construction of even simple text search strings was beyond the user's ability [2]. The ineffectiveness and general dissatisfaction expressed by user in these studies should make it evident that current search engine interfaces are a major obstacle to effective use of Web technology.

Web Site Navigation

The challenge of finding information does not end with a successful Web search. The design of the Web site also needs to support the user in the task of finding desired information. While very large Web sites may present the user with yet another search engine interface, most Web sites will rely on site navigation controls and browser interface controls to provide support for user search.

Factors affecting user navigation within the Web site have been the subject of some recent studies. Some of these studies have examined the organization of Web sites while others have examined the use of the Web browser interface. Larson and Czerwinski [6] found the effect of Web organization, specifically the effect of breadth and depth of hyperlink distribution, markedly affected Web site usability. In this study of experienced Web users, a shallow organization which allowed the user rapid access to content from a single hyperlink appeared to provide the most effective solution. This emphasis on breadth over depth does have its limits, however. Very large numbers of main hyperlinks (32 in this study) were found to slow user search times and induce user disorientation. The authors of this study also pointed to the importance of distinctness in hyperlink labeling in site pages and to the need to minimize the number of category judgments users must make.

Navigation of Web sites is also affected by the design of the browser interface. Studies of browser-use by experienced Web users suggest that certain browser controls are favored more than others [7, 8]. The Back button control, which allows step-wise retracing to previously visited pages, has been found to be used in some 30-40% of all navigation actions. The Forward and Home button, in contrast, were found to be used only 1-2% of the time. The browser history list, which provides a list of previously visited sites, was only used some 3% of the time [8] despite the finding of page re-visit frequencies ranging from 58-61% [7, 8].

Navigation controls placed within the Web site itself have also been investigated [9]. Local navigation controls, such as Previous and Next, were generally found to confuse, rather than aid, both novice and experienced users alike. Content-specific navigation aids (e.g., Index) were found to reduce search time provided they were placed in a fixed position near the top of the site page.

Reading

Reading on-line information is what will occupy the majority of user time when Web sites are visited. A large number of studies of many years have investigated factors which affect reading of electronic text [10], the details of these studies are beyond the scope of this report. However, designers should be aware of some of the key factors affecting the readability of on-line information including the height of displayed characters, the relative contrast between text characters and page background, the use of color, the quality of the user's display device as well the actual composition of the Web site content.

Some factors which dominant the design of Web documents are candidates for more detailed consideration by researchers. For example, a recent study by Piolat, Roussey, and Thunin [11] showed that an organization of on-line documents which emphasizes page-by-page presentation results in better user comprehension and improved search performance than a document organization that requires page scrolling to acquire the same information.

Internet Delays

Among the key system variables that affect Web technology use is the speed with which information can be transmitted across the Internet. While users may be sensitive to delays in Internet responsiveness of only few seconds, the effects can be significantly altered by the context of Web use and by user experience and expectations. Sears, Jacko, and Borello [12] found that, though users viewed documents delayed in transmission less favorably than others, the effect depended on the document's contents. Users viewing documents with text and graphics were much less tolerant to Internet delays than when viewing documents with text only. Motivation of users may also play a role in mitigating the effects of Internet delays. Surveys of users browsing Web sites selected for evaluation by the researcher found that Internet delays markedly affected usability [13]. However, if users were allowed to evaluate sites they selected themselves, even substantial Internet delays did not affect site usability ratings [14].

Future Research

Considering the potential social and economic impact of the Web, this brief overview of Web research revealed only a small amount of empirical research on factors affecting usability. What is evident from the research that is available is that key Web tasks are often poorly supported by the current design of the technology. This is particularly evident in the case of Web search engines which appear to be frequently ineffective and dissatisfying to users. Research and development of Web search engine interfaces should be a priority.

Given the enormous potential for design variability in Web site, research efforts should maintain a focus on support for generic tasks which might apply to most or all Web site designs. More usability research on the effects of Web site organization is needed as is research on the design of browser controls and their relationship to local navigation

controls within a Web site. Browser research should also address the personalization of Web space. Some of this research has, in fact, already begun [15].

The effects of varying degrees of Internet delay on web usability are not as straightforward as some might believe. Faster is not always better. The effect delays on usability have depend on user expectations, user motivation for visiting the site, the specific tasks involved in using the site, user experience with Web technology, and perhaps other factors.

Certain user characteristics, such as age-related memory loss, will affect the usability of a Web technology. Older adults have been found to require more steps to successfully complete Web site navigation tasks and are generally less efficient in their Web searches than younger adults [16]. More research on the effects of visual and cognitive disabilities on Web use is needed to assure broader Web accessibility.

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