Designing Hypertext and the Web

Yin-Leng Theng
Nanyang Technological University, Singapore

INTRODUCTION

Hypertext and Web technology still continue to excite many, ever since it became popular in the late 1980s. Early visionary thinkers such as Bush (1945), Engelbart (1963), and Nelson (1987) in their own ways believed that hypertext and its underlying philosophy would enable man to locate, retrieve, and easily use the store of human knowledge that lies in books, journals, and associated materials in libraries all over the world.

In hypertext, end users not only benefit from the information they read, but also from the richness of associations supported by the network of nodes and links. Hypertext has affected us directly or indirectly in almost every facet of our lives, ranging from scientific work to business and education needs, to our general way of life. For example, the most widely used hypertext system since 1994 is the World Wide Web (or simply the Web) on the Internet.

Though hypertext systems promise a whole new paradigm and freedom of reading and information retrieval, they are not without problems. Ironically, it is precisely this freedom and power with which hypertext systems equip end users that give rise to many of these problems.

BACKGROUND: BRIEF HISTORY OF HYPERTEXT AND THE WEB

When Vannevar Bush (1945) envisioned his hypertext "memex," he dreamed of a personal microfiche-based system that would help him tackle the problem of information overload at that time. His vision of the "memex" heralded the beginning of a search for a system that mimics the human mind to access information quickly and intuitively by reference. In 1965, Nelson (1987) coined the term "hypertext" and presented it as a radical new way of structuring textual information into non-sequential format, a computer-based incarnation of Bush's dream "memex" (Berk & Devlin, 1991). Even though the technology in the "early" years of the hypertext history (for example, Conklin, 1987; Nielsen, 1995) was not sophisticated enough for many of the ideas to be realized, hypertext pioneers staunchly believed that hypertext technology had something special to offer.

Not surprisingly, as the years roll by, hypertext systems grow more sophisticated and computer is the technology that has enabled the concept of hypertext to be seen and not just heard. The growing popularity of the Internet and advancements in networking saw the birth of networked hypertext systems such as the Web. The Web project initiated in 1990 was originally created as an online information tool for high-energy physics research at CERN (the European Center for Nuclear Physics Research in Geneva, Switzerland). Berners-Lee and colleagues, the originators of the Web, built it based on the hypertext paradigm. Based on its likeness to a spider's web, this world of hypertext links is also called the Web.

Although the Web was first made available in 1991, it was only after the release of Mosaic by the National Center for Supercomputing Applications (NCSA) in January 1993 that it really gained prominence. Mosaic, NCSA's Web client, made the Web accessible to a wide and diverse user community because of its easy-to-use, graphical interface. Mosaic and the Web succeeded in establishing a universal hypertext. With the release of Netscape Navigator in 1994 by a commercial company co-founded by the original author of Mosaic, the number of end users on the Internet escalated to a phenomenal figure. Today, the Web is used by millions across the world. It has changed the Internet to the extent that it has become almost synonymous with the modern use of the Internet.

Since the same usability issues arise in hypertext, hypermedia, multimedia, and the World Wide Web, we will call them all "Web" for conciseness.

CONTINUING DESIGN AND USABILITY PROBLEMS

Since Halasz's seminal paper at the Hypertext'87 Conference, seven design issues in hypertext systems were identified; these issues formed the nucleus of multiple research agendas in: (a) search and query; (b) composites; (c) virtual structures; (d) computation in/over hypertext network; (e) versioning; (f) collaborative work; (g) extensibility; and (h) tailorability.

Although these issues were revisited several times over the intervening 15 years, and many research systems

have attempted to address the original seven issues (Whitehead et al, 2002), we are still *not* producing better, usable hypertext applications.

With the exponential growth of the Web in 1994 and 1995, these issues became particularly acute. Nielsen (1996) listed 10 top mistakes in Web design, including: (1) use of frames; (2) bleeding edge technology; (3) scrolling text, marquees, constantly running animations; (4) complex URLs (Uniform Resource Locators); (5) orphan pages; (6) long scrolling pages; (7) lack of navigation support; (8) non-standard link colors; (9) outdated information; and (10) overly long download times. When Nielsen (1999) revisited these mistakes three years later, he concluded that all 10 mistakes were still mistakes. Apart from scrolling long pages, which is causing fewer navigation problems, the other nine mistakes still cause significant usability problems and should be avoided in modern Web sites.

A survey of current work (e.g., Wu, Meng, Yu & Li, 2001) seems to suggest one or more of the following problems still persist in hypertext/Web applications: (a) structured search for documents is not sufficiently supported; (b) proving properties of Web sites is difficult or impossible; (c) maintenance is not supported by formal mechanisms; and (d) personalizing of information, or adaptation to user groups, is difficult or impossible.

The question we want to ask is: Could it be possible that these well-intentioned efforts are not achieving their aims because wrong or inappropriate solutions are being sought based on incorrect or incomplete assumptions?

If it is a *psychological* problem, then it may be entirely due to end users' inability to exploit computer screens, complex information structures, and that nothing in the design is going to ameliorate this. Thus, as a psychological problem, it can be alleviated but not solved by better design (Theng, 1997).

If it is an *engineering* problem, it can be attributable to bad system design, and poor design causes psychological problems. The "blame," therefore, should not rest on end users alone!

NEW DESIGN AND USABILITY PROBLEMS

The world is becoming a global marketplace with end users from across the world. However, according to Galdo and Nielsen (1996), this heightened interest in internationalization and localization has not yet been translated into increased usability for international end users.

Globalization brings with it new issues relating to culture and ethics. With respect to design, standard human-computer interaction (HCI) guidelines may not be adequate. They may need to be modified, extended, or restricted.

Culture and Design

Culture is defined as "learned behavior consisting of thoughts and feelings" (Galdo & Nielsen, 1996). There is little provision in hypertext/Web applications to cater to end users' browsing and inter-cultural needs (Theng, Duncker, Mohd-Nasir, Buchanan & Thimbleby, 1999). One reason for the neglect of cultural aspects may be that usability failure is rather commonplace, and cultural usability issues are hard to recognize as such, more so since designers cannot help but see the world from their particular cultural point of view and may be defensive about their work. Thus, cultural usability issues for system designers may come disguised as illiteracy problems or simply as "user faults," rather than as cultural differences.

Apart from colors (Duncker, Theng & Mohd-Nasir, 2000), cultural factors that can influence the design of interactive interfaces for international end users include the following: spoken and written languages; the reading/writing direction; meanings and preferences of colors; and interpretations of signs, pictures, symbols used (Galdo & Nielsen, 1996).

In order to produce usable and useful interactive systems, designers need to ensure that good design features are incorporated into the systems, taking into consideration end users' cultural preferences.

Ethics and Design

According to the Oxford Dictionary, ethics is the "study of right and wrong in human behavior." The notion of the code of ethics and professional conduct is not new. The general moral imperatives in the ACM (Association for Computing Machinery) code of Ethics and Professional Conduct (adopted by the ACM Council, October 16, 1992) include one's contribution to society and human well-being, avoidance of harm to others, honesty and trustworthiness, fairness and non-discriminate actions, respect for property rights, privacy, and confidentiality. A specific professional responsibility in the ACM Code of Ethics is to "give comprehensive and thorough evaluations of computer systems and their impacts, including analysis of possible risks." "Ensuring that users have their needs clearly articulated during assessment and design of requirements" is one of the organizational leadership moral imperatives.

Apart from ensuring that the technical aspects of the Internet are taken care of, designers need also to consider the ethical and legal issues that may arise, owing to the increase in the use of computer-mediated communication devices (Gringras, 1997).

In recent years, Cyberethics, a growing area of research, explores the application of classical ethics to the latest information communication technologies, includ-