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Evaluation Criteria for the Design of Commercial Web Sites

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1. Introduction

The term Web site has been loosely used to refer to a set of "Web pages" that together create an hyperspace entity representing an organization or a person on the Internet. The degree of complexity of Web sites varies. A Web site could contain a single HTML page or could be a full scale application that integrates with an organization's internal resources and provide sophisticated user interfaces. The package delivery tracking Web site of FedEx is a well known example. Developing such commercial Web sites (applications) is not a simple task. It requires technical expertise drawing from research in hypermedia and computer human interface as well as business expertise in marketing and sales.

There have been several studies on the design issues of Web sites. Tim Berners-Lee, the inventor of WWW, wrote a Style Guide for Online Hypertext [Berners-Lee 95] that discussed issues in effectively communicating through a Web site. Patrick Lynch and his colleague at Yale Center for Advanced Instructional Media published a Web Style Manual [Lynch 97]. The manual covered design issues related to user interface, site, pages, graphs and multimedia. Rick Levine at Sun Microsystems published The Sun Guide to Web Style [Levine 95]. This design guide is a cookbook providing detailed design advice. Other researchers have also published style guide for Web design such as Christine Quinn at Stanford University [Quinn 95], and Gareth Rees at Cambridge University [Rees 96].

As companies rush to publish their Web sites, unfortunately, many design issues have been largely ignored. This paper reports an on-going project that evaluates the technical design issues of commercial Web sites. It attempts to accomplish the following tasks:

- Identifying a set of technical design issues
- Defining evaluation criteria for the design issues
- Evaluating selected commercial Web sites based on the criteria
- Reporting the finding and attempting to identify research issues in improving the design of Web sites.

Limited by space, this paper presents only the evaluation criteria used to survey selected commercial Web sites. The survey findings are discussed in a separate report [Hong 97].

2. Web Design Evaluation Criteria

The central theme of this study is designing a comprehensive Web site. The framework of the study is based on what proposed by Thüring, et. al. [Thüring 95]. Their research in cognition and human information processing suggests that design for comprehension is an effective way to reduce viewer's mental efforts to understand the contents of a document. In WWW, it is generally believed that if a Web site cannot catch the attention of a visitor's in 30 seconds, the visitor may simply skip the rest of the site and jump to other sites. Thus, comprehension of a Web site becomes a key to the success of the site.

Evaluation criteria to be developed focus on three areas that directly contribute to the comprehension of a Web site. These three areas include Web site structure and layout, navigation, and orientation. Evaluation issues related to the contents of a Web site are excluded. There are two main reasons for not evaluating the contents of a site. First, the contents of a Web site are dependent on the business domain of the site. The
evaluation of the contents would require the understanding of the business, marketing, and sales, which is beyond the expertise of information professionals. On the other hand, there should be a set of technical design issues that are independent of any business domains, which are what this study attempts to identify.

The second reason is that one of our goals in this study is develop a set of "hard" evaluation criteria that are independent of specific business domains. Although complete objectivity would be impossible to achieve, effort has been made to minimize human biases and domain dependent factors.

2.1 Web Structure and Layout

Comprehension is defined as "the construction of a mental model that represents the objects and semantic relations described in a text." [Thüring 95] In a Web site, objects are the components of the site such as paragraphs, images, and pages. Semantic relations are represented by the ways in which the Web site is constructed from the objects. The following three groups of criteria are developed based on this principle.

(A) Web site structure deals with the organization of information objects in a Web site. It includes:

- **Balance of Web site structure.** A Web site is not balanced if it is either too shallow or too deep. In a shallow structure, the viewer would have to search through a very long index of hyperlinks to locate useful links. In a deep structure, the viewer would deal with a few hyperlinks, but the viewer would have to dive into the hyperlink network to find desired information. In either case, the semantic relations among the Web documents are not poorly presented, which increases the cognitive overhead for the viewer to construct a mental model of the Web site.

- **Support of multiple views.** A view represents one way in which a Web site can be explored. For example, almost all libraries provide several "views" for searching books in the libraries: by subject, by author, or by key words. As viewers visiting a Web site may have totally different agendas, the design of a Web site should provide customized views for its visitors. This design would speed up the process of constructing a mental model about the Web site.

- **Organization metaphors.** The organization style of a Web site refers to the way information is presented to the viewers. Commonly used metaphors include book, room, store front, ticket counter, etc. Appropriate metaphors help viewers switch to a correct mental setting and set correct expectation. Consequently, the degree of comprehension of the Web site is increased.

(B) Readability addresses the presentation design issues of the contents of a Web site and includes:

- **Document size.** It is defined as the number of screen scrolling required to browse a document from the beginning to the end of a Web page. It is known that the mental effort to process a large chunk of information is larger than that to process a small chunk of information. Dividing Web pages into appropriate size would increase the readability of the pages.

- **Visual setting.** It looks at typographical features of Web pages, such as background images, text color, fonts, and inline images. In a poorly designed Web page, every component of the page would demanding the attention of a viewer, which would be distract the viewer from the contents page. It would result in a low degree of comprehension of the Web site.

- **Predictability.** It studies the labeling and annotations of hyperlinks. If viewers could predict the contents linked by a hyperlink, it would help the viewer construct a correct mental model and speed up the process of information. Otherwise, the viewer has to guess what the link leads, which could result in disappointment and frustration.

(C) Essential Information refers to information about the author, contact information, date the document is last updated, copyright, and disclaimer. Those data provide additional information that helps the understanding of a Web site.

2.2 Navigation
Navigation is defined as the means by which visitors travel in the hyperspace created by a Web site. Without well-designed navigational guide, visitors would be handicapped by lacking effective paths leading to desired Web pages. The design goal is to reduce the mental effort required for visitors to move from one Web page to another. Three major criteria are identified as follows.

(A) **Navigation Richness** indicates the type of navigational guide that enables a visitor traverses the hyperlinks in a Web site. It includes:

- **Search Services.** Web search capability is an important mean to reduce the distance from a Web page to arrive at desired Web pages. It also reduces the choices a viewer may have to select.
- **Hyper Links.** It looks at the average number of hyperlinks per Web document. Hyperlinks that branch to other Web sites are not included. This criterion provides an indicator on the extensiveness of hyperlinks.
- **Table of Contents.** Table of contents receives a special treatment because it provides a menu structure to organize Web documents, while other hyperlinks may be embedded in paragraphs.
- **Navigation Types.** It surveys other structured navigational guide, such as guided tour, indexing, and navigation bar.

(B) **Reachability** investigates the connectivity among Web pages in the hyperspace of a Web site. It looks at the following two aspects:

- **Dead-End Documents.** A Web page is a dead-end if it provides no hyperlink branching to other Web pages in the same site. In such a situation, the viewer may have to memorize the URL of desired Web pages or rely on the Web browser to find other Web pages. As a dead-end Web page may be arrived following different paths, the Web browser may not be capable of providing such navigational help.
- **Return Hyperlinks.** Return hyperlinks are different from other type of hyperlinks in that they maintain a logic sequence of Web pages. The "Back" command available in a Web browser provides only the most recent travel history. Maintaining logic sequence of Web pages is essential for the design of a Web site. For example, a return hyperlink should move back to Chapter 2 from Chapter 3, regardless how and from where the viewer arrived at Chapter 3.

(C) **Navigation Quality** concerns usability issues of navigational guide. It attempts to identify the following two criteria:

- **Consistency.** It looks at whether a Web site provides consistent location, presentation, and usage of navigational guide. An inconsistent navigation example would be that the hyperlink leading back to the home page of a Web site is displayed at the top of some Web pages. However, in other pages, the hyperlink could appear at the bottom of the pages. Another example could be that a same image served as a hyperlink in one Web page, but it is just a plain image (picture) in other pages. Consistency is a key to help visitors establish patterns of recognition. Thus, mental effort that is required to comprehend the contents of Web pages would be reduced.
- **Presentation.** It judges the representation of various navigational guides. For example, it would judge whether an image used to indicate the home page in Web pages matches well with the meaning of the hyperlink. Another bad example is that a hyperlink text is shown in the same color as non-hyperlink texts, or a normal text is displayed in a color that is commonly regarded as a hyperlink.

2.3 Orientation

Orientation is defined as information indicating where visitors are, how they got there or where they should go next. [Thüring 95]. It includes the following three criteria:
(A) **Context** provides information about the "location" where a visitor arrived. The information helps the visitor construct a mental model of a Web site and map the current position to the position in the mental model. It judges on two issues: the extensiveness of context information and the presentation (textual or graphical) of the context information. A context information is extensive if it provide complete location description. For instance, if a Web page were for an academic department of a university, a complete context information would include the university, college, and department names.

The presentation of context information attempts to rate the usage of images or text for indicating the context information.

(B) **Navigation History** evaluates the extensiveness of history information built into Web documents. The data would give a visitor an easy and logical way to return to one of the previous page in the navigation history. For example, if a visitor arrives at faculty home page, the history information would include the university, the college, and the department. Such history information would allow a visitor easily accessing other pages in the same hyperlink hierarchy. It also removes the dependency of a Web browser to construct navigation history.

Navigation history is closely related to Navigation context discussed earlier. The latter does not have to be non-hyperlink text. However, if the context information is turned into hyperlinks, the context information also provides navigation history.

(C) **Where to Go Next.** It investigates how a Web site provides adequate information that helps viewers decide where to travel next. It looks at three different dimensions:

- *Move to a lower level.* An example is to move from Chapter 2 to Section 2.2.
- *Move to an upper level.* An example is to move from Section 2.2 back to Chapter 3.
- *Move to a page at the same level.* An example is to move forward from Chapter 2 to Chapter 3 or backward to Chapter 1

Combining all these criteria, a good design of orientation would provide visitor a true 3-D hyperspace.

### 3. Conclusion

This paper presented a set of criteria for evaluating the technical design of Web sites. At the writing of this paper, we have surveyed about 100 randomly selected commercial Web sites. We are in the process of analyzing the data.

The ultimate goal is to develop an automated aid that would be used to analyze the design of a Web sites based on the evaluation criteria. The tool would then provide improvement advice to Web site developers.

### 4. References

[References available upon request from first author.]