Abstract
This paper describes a study in which Web style guides were characterized, compared to traditional human-computer interface (HCI) style guides, and evaluated against findings from HCI reviews of web pages and applications. Findings showed little consistency among the 21 Web style guides assessed, with 75% of recommendations appearing in only one style guide. While there was some overlap, only 20% of Web-relevant recommendations from traditional style guides were found in Web style guides. Web style guides emphasized common look and feel, information display, and navigation issues, with little mention of many issues prominent in traditional style guides such as help, message boxes, and data entry. This difference is reinforced by other results showing that Web style guides address Web information-only pages with much greater success than web-based control enabling features, like buttons and entry fields. It is concluded that while the WWW represents a unique graphical user interface (GUI) environment, development of Web style guides has been less rigorous, with issues associated with web-based control enabling features neglected.

Keywords: HTML, World Wide Web, Style Guides, Human-Computer Interface

Introduction
The prolific expansion of the World Wide Web (WWW) has fueled an unprecedented growth in the number of developers creating computer-based materials for public access[2]. In the brief existence of the WWW, there has not been an opportunity for style guides and conventions comparable to other HCI domains to be developed and gain acceptance from the development community, concerns with the effectiveness of style guides aside [1,3,4]. This predicament is worsened by Web developers with limited knowledge of traditional graphical interface concerns and unfamiliarity with problems raised by cross-platform and browser compatibility requirements of Web-based interfaces. To fill these voids, numerous HCI style guides have appeared for Web development.

This paper examines Web style guides in three ways: 1) It compares the development environment of Web style guides with their traditional GUI counterparts. 2) It compares the content of Web and traditional style guides to see where they differ. In particular, it examines the extent to which Web style recommendations include the most essential of the traditional recommendations, as judged by a group of human factors practitioners. 3) It examines how useful Web style recommendations are in actual practice by comparing them against human factors reviews of Web pages generated for use in a large R&D company.

Method
Phase 1. A Comparison of Style Guide Development
The comparison of HTML and established HCI style guides began with a consideration of the development process. Ten authors of style guides, five Web and five traditional, responded to a survey asking them about their educational and professional backgrounds. Authors were asked to describe why they created their style guide, who would use it, and who sponsored it. Also, questions were asked about the time it took to create the style guide, the resources used, and how often it was updated.

Phase 2. A Comparison of Style Guide Content
This phase of the research sought to compare the content and emphases of Web and traditional style guides.

Style guides were sampled in the following manner. First, twenty-one WWW sites offering Web interface recommendations were identified in the fall of 1995. From these sources, a set of 357 unique recommendations were obtained. Second, recommendations from traditional style guides were collected from five printed sources. Style guides not applicable to the WWW, or which were specific to a particular platform or operating system, were discarded. This process resulted in a collection of 270 unique interface recommendations. For each domain, Web and traditional, style guides were combined to form a comprehensive set of interface recommendations. Web and traditional style recommendations were compared qualitatively to examine their similarities and differences.

To assess the representation of the most essential traditional style recommendations within the Web style recommendations, it was first necessary to determine which recommendations were most important. Eleven practicing human factors professionals responded to a survey asking them to review the 270 recommendations obtained from the traditional style guides. For each recommendation, participants gave their opinion as to how essential they thought the recommendation was to the usability of a system. Answers were indicated by assigning an integer to each item using a scale from 0 (non-essential) to 4 (absolutely essential). Descriptive statistics were used to identify those items which the participants generally agreed were essential to usability.
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These “essential” recommendations from traditional sources were compared to the Web recommendations to determine how well they were accounted for in the Web domain.

Phase 3. A Comparison of Web Recommendations and Actual Human Factors Evaluations
As a further assessment of their practical effectiveness, web style recommendations were compared to actual human factors reviews of the web-based, corporate information infrastructure at Sandia National Laboratories. (The reviewers were knowledgeable of the traditional GUI style guides, but all reviews occurred prior to exposure to any of the Web style guides.)

There are generally two different kinds of Web pages. First are those which derive information for the user by performing routines, such as accessing databases; this paper refers to these pages as applications. Examples of such applications are an electronic phone book, or a conference room scheduler. The second kind of page contains information only, examples of which are a corporate newsletter, engineering procedures, or departmental home pages.

Findings from these two types of pages were compared to Web style guides to assess how well the guides would have accounted for deficiencies identified by the human factors experts.

Results
Phase 1. A Comparison of Style Guide Development
Survey results from Web and traditional style guide authors revealed distinct differences. All Web style guide authors were from educational environments and described the development process as informal with an average of 3.26 weeks spent writing the style guide, with revisions prompted by feedback from users or impending conference submissions. In contrast, the traditional style guide authors were from military, government or corporate organizations. Three of five specified that a formal process was employed to develop the style guide, with an average of 54.2 weeks for the initial version, with subsequent versions following annual reviews and structured working groups.

Web style guide authors explained that resources to write the guide drew from the fields of human factors, marketing, graphic arts, and public relations. Traditional guidelines were primarily based on human factors, cognitive psychology, and military sources. The audience for traditional style guides is programmers, interface designers, and technical experts. The audience for Web style guides seems less clear: in only one instance did an author identify a specific audience for the document, and that was the staff at his university.

Phase 2. A Comparison of Style Guide Content
Style recommendations from both Web and traditional style guides were assigned to one of 20 categories and compared. Figure 1 shows the distribution of recommendations across categories. Four categories accounted for 63% of the Web recommendations: Common Look and Feel (CL&F), Information Display, Navigation, and Labels. Table 1 lists the most frequently cited recommendations from the Web style guides.

<table>
<thead>
<tr>
<th>Recommendation</th>
<th># Style Guides</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Signature should be included at bottom of Web page</td>
<td>12</td>
</tr>
<tr>
<td>2. “Here” or similar words should not be used to designate a link</td>
<td>12</td>
</tr>
<tr>
<td>3. Pages should be timestamped/dated</td>
<td>11</td>
</tr>
<tr>
<td>4. Every page should have a title</td>
<td>11</td>
</tr>
<tr>
<td>5. Design for all platforms and browsers</td>
<td>10</td>
</tr>
<tr>
<td>6. Menu bar or buttons should be provided for navigation</td>
<td>8</td>
</tr>
<tr>
<td>7. Text used for links should be descriptive and meaningful</td>
<td>7</td>
</tr>
<tr>
<td>8. Pages should have common look and feel</td>
<td>7</td>
</tr>
</tbody>
</table>

Table 1. Eight Highest Ranked Recommendations from Web Style Guides

As shown in Figure 1, the categorization of recommendations reveals some overlap, but also considerable differences between Web and traditional style guides. A Chi Square test of independence showed a significant difference in the distributions of recommendations across categories ($X^2=245.5, p<0.05; df=19$). The biggest differences arise from the greater emphasis on information display and consideration of help, data entry, and message boxes within traditional style guides.

![Figure 1. Distribution of Style Guide Recommendations Across Categories](Image)
The next comparison assessed the degree to which traditional style recommendations were addressed within Web style guides. Of the 270 Web-relevant recommendations found in traditional style guides, only 53 (20%) also appeared within Web style guides, with another 20 partially addressed within the Web style guides. The greatest overlap occurred for recommendations categorized as common look and feel (15 of 16), menu design (11 of 17) and labels (15 of 25).

With regard to the surveys used to identify the most essential guidelines from traditional style guides, a plot of this data revealed 26 guidelines whose mean score was greater than three and standard deviation less than 0.75. These items received consistently high ratings from the experts. Table 2 shows the eight highest ranked recommendations from traditional style guides.

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>mean</th>
<th>s.d.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. If a user can’t log-on, a prompt should be provided explaining why</td>
<td>3.9</td>
<td>0.32</td>
</tr>
<tr>
<td>2. Text should be readable from normal viewing distances</td>
<td>3.8</td>
<td>0.42</td>
</tr>
<tr>
<td>3. Where precise readings are required, precise values should be displayed</td>
<td>3.7</td>
<td>0.67</td>
</tr>
<tr>
<td>4. Displayed information should be readable to the degree of accuracy required by the task</td>
<td>3.7</td>
<td>0.67</td>
</tr>
<tr>
<td>5. A positive indication of function actuation should be provided</td>
<td>3.7</td>
<td>0.67</td>
</tr>
<tr>
<td>6. The system should provide positive feedback regarding the acceptance or rejection of input</td>
<td>3.7</td>
<td>0.48</td>
</tr>
<tr>
<td>7. Data entry formats should match source document formats</td>
<td>3.6</td>
<td>0.52</td>
</tr>
<tr>
<td>8. An easy mechanism should be provided for correcting erroneous entries</td>
<td>3.6</td>
<td>0.70</td>
</tr>
</tbody>
</table>

Table 2. Eight Highest Ranked Recommendations from Traditional Style Guides

**CONCLUSION**

These findings reveal distinct differences in the development and content of Web and traditional GUI style guides. There are several explanations for this result.

First, it may be argued that while there are overlaps, the WWW introduces unique human-computer interface concerns. This explanation is supported by the emphasis placed on common look and feel within the Web style guides. It is reasonable to suppose that in the hypertext environment of the Web, where users may readily move between unrelated sites, common look and feel is of greater importance than with stand-alone software applications where differences are less apparent.

The second explanation for the apparent differences between Web and traditional style guides would assert that Web style guide development has occurred with less rigor and little reference to traditional style guides and principles. That there was poor agreement between the Web style recommendations and the actual findings of human factors reviews of control-enabling applications supports this explanation. This was not true, however, for those Web pages that contained information only. For these pages the Web style guides accounted for 64% of findings, which is as good as might be expected [3,5]. One explanation for this result might be due to the greater representation of information only pages on the Web than application pages. Inexperience with Web applications may explain the scarcity of application-specific recommendations in Web style guides.

It does appear that Web authors tended not to reference traditional style guides when creating their own. The explosive growth of the Web should leave no surprise that some authors, from diverse backgrounds, would not think to look beyond the Web for answers to its interface problems. But the appearance of these Web style guides would not be possible without the
Web itself; the ability to publish one’s own document and disseminate it widely is a new phenomenon [2].

To be fair, many of the style guides were written for specific audiences (to assist authors within a particular company, for example.) Contrast this with the traditional style guides which were formally sponsored to address specific, but more comprehensive, concerns. There is also the fact that the Web is still new. Its use to conduct work and business is still being explored; as it matures it may undergo the same pressures to standardize as did the early graphical environments.

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REFERENCES


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