In:
"Hypertext State of the Art"
edited by Ray McAleese and Catherine Green
Intellect ISBN 1-871516-08-0
Ablex ISBN 0-89391-692-2

Chapter 28

User-centred hypertext design: the application of HCI design principles and guidelines

Lynda Hardman
Brian S Sharratt
Scottish HCI Centre
Heriot-Watt University

Abstract

Current HCI principles and guidelines do not specifically address the design of hypertexts. This chapter presents a set of design principles and guidelines tailored to the hypertext design process. The guidelines are divided into four functional areas: user action; information display; dialogue design; and online assistance. The application of these guidelines to static (layout/presentation) or dynamic (navigation) design issues is noted. An example is used to illustrate these principles and guidelines.

Introduction

Designing a hypertext places a number of demands on the author in terms of the presentation of material used and the ways in which the reader should interact with this material. These demands can be divided into two general categories - static and dynamic. Static design issues cover the layout and presentation of both the material delivered by the hypertext and the links on a particular screen to other parts of the hypertext. Dynamic design issues address navigation through the hypertext and the ways users are able to combine or compare information in different parts of the hypertext. The handling of these two groups of design issues can be aided by the application of appropriate design principles and guidelines, with the design principles representing the general concepts which underlie the hypertext design process and the guidelines indicating specific features which have to be considered. However, the sets of current HCI principles and guidelines are very general purpose sets and do not specifically address the design of hypertexts.

The aims of this paper are to present a set of design principles and guidelines tailored to the hypertext design process and show how they can lead to more "reader-friendly" hypertexts. These principles and guidelines have been specifically chosen to be independent of the hypertext system being used. They apply to a hypertext that is to remain unchanged rather than one which is to be continuously updated (see Hardman, 1988 for a discussion of the process of developing a hypertext). An example is included and used to illustrate how the guidelines affect the use of particular hypertext features.

Abstraction of design principles and guidelines

The design principles and guidelines used in this paper were taken from Smith and Mosier (1986) and Brown (1988). These two sources provide comprehensive collections of interface design guidelines and between them they contain over 900 individual guidelines. The general organization of these two collections is similar with small sets of general principles being followed by guidelines divided into groups covering specific functional areas of user interaction (such as data entry and data display). These common organizational features formed the basis for a four-stage reduction process that resulted in a small subset of principles and guidelines applicable to the design of hypertexts. Firstly, the redundancy across the two sets of design principles was examined and a group of general design principles was derived. Secondly, the functional areas from Smith and Mosier and from Brown were compared and a common set of functional areas produced. Thirdly, the functional areas not applicable to the hypertext itself were eliminated (such as display devices and data protection). Finally, the guidelines in the remaining functional areas were considered and a subset of those relevant to hypertext authoring were abstracted.

Use of principles

The design principles directly applicable to hypertext authoring are:

> **Consistency**: the hypertext should be structured so that a consistent presentation is used and consistent sequences of actions are required in similar situations;
>
> **Mental processing**: the hypertext should not complicate the reader's information gathering tasks and impose excessive mental-processing requirements. The author should be trying to: (i) minimize the overall mental load by reducing the requirement for readers to remember the objects, actions, codes and abbreviations they are working with; (ii) minimize the task-specific mental processing by arranging for efficient completion of a typical reader task;
>
> **Ease of leaning and use**: the aim is to reach a suitable balance between ease of learning and ease of use. Ease of learning focuses

on enabling the reader to become proficient with the hypertext with minimal training and practice. Ease of use is achieved by minimising the steps or actions taken by knowledgeable readers;

Flexibility: the hypertext should be capable of adaptation to the needs of the user. This principle covers the need to: (i) design the hypertext for different types of users and levels of experience; and (ii) provide multiple paths that allow readers to by-pass certain parts of the hypertext;

Task compatibility: this embodies a number of related concepts with the author having to ensure that: (i) there is stimulus-response compatibility - where the hypertext information is presented in a form that is suitable for the reader's tasks; (ii) the author takes advantage of any physical analogies that aid the presentation of, and navigation between, information; and (iii) the layout and coding applied to information conforms to reader's expectations.

Use of guidelines

The guidelines have been grouped into four functional areas; user action (which corresponds to data entry guidelines), information display, dialogue design and online assistance.

The application of these guidelines to static, dynamic or static and dynamic design issues are indicated by letters following the guideline title (S, D or S-D). Static design issues can be assessed by considering the current screen display only. Dynamic design issues can be assessed only by considering a number of related screen displays. Guidelines marked as (S-D) can generally be applied by considering only the current screen display, but related screens need to be consistent with the current screen.

USER ACTION GUIDELINES

Display of links (S) - when reading a hypertext, the data input from the reader is restricted to selecting and actioning a link. To help the reader with choosing a link the positions of the links on the screen should be obvious. Highlighting the links in some way would satisfy this but, with a large number of links, the screen may look cluttered.

containing links, can be adopted for
xpert users. This guideline should be
lentify link types" and "Assignment of
ned in rounded boxes; (ii) items in the
et of initials, addresses and numbers;
further lists.

- where there are small linked items in
larger than the visual representation.

Figure 1 shows an example of letters and circles as the visual representation on the screen with the extent of the active area indicated by dotted lines.

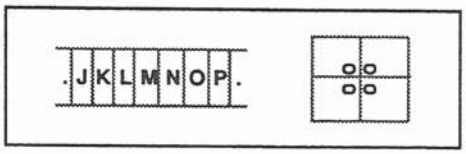

Figure 1 Small items can have larger active areas

INFORMATION DISPLAY GUIDELINES

Identify link types (S-D) - links within a hypertext can be of different types. For example a link might bring up a small note, or it might take the reader to the middle of a completely different section of the hypertext. Differences in link type should be apparent before the reader actions the link. In Figure 2, clicking on a surname displays the corresponding address information in the same screen, whereas clicking on one of the tabbed letters takes the reader to another section of the hypertext.

Highlighting critical information (S-D) - certain parts of the information contained in the hypertext may be particularly important. This information should be highlighted in order to draw readers' attention to it. Highlighting should only be used for a small proportion of the information on the screen.

Assignment of visual codes (S-D) - after choosing which types of links need to be distinguished, and which pieces of information are important, a visual code needs to be assigned to the different types of information. Care needs to be taken to keep the number of codes small so the reader is not overloaded. Forms of visual coding that can be used are text style, graphical style, colour, brightness, flashing or some combination of these features. Flashing should be used with great care since it can be effective the first time round but become irritating with frequent use. Colour should be used as a redundant feature (ie colour is paired with another form of coding), and preferably with options to allow readers to select the colour they want for each code. When using graphical representations extra care is required to produce clear codings of link types and critical information. Figure 2 shows rounded boxing, rectangles and small tabs to denote link types.

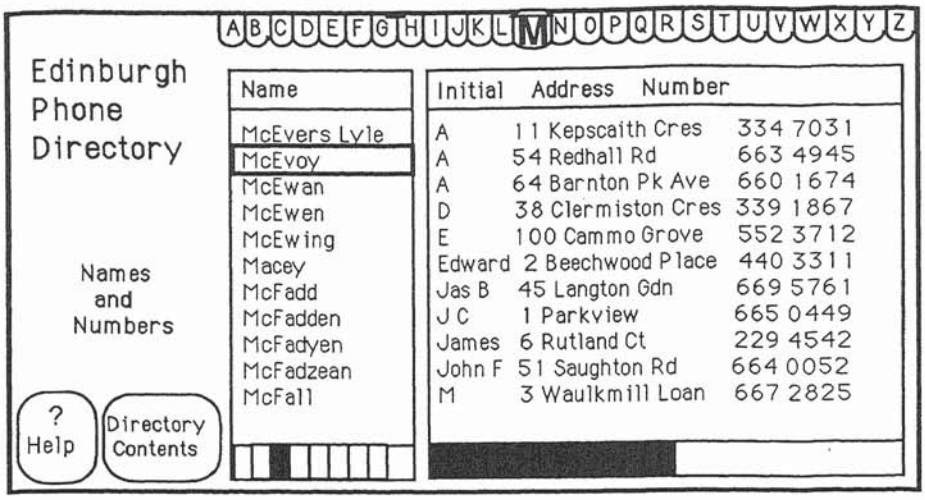

Figure 2 Example hypertext of a telephone directory

Display necessary information (S) - the items a reader requires on a screen are: (i) a clear title (in Figure 2 this is "Edinburgh Phone Directory" with a further subheading "Names and Numbers"); (ii) the information the reader is interested in (in this case, the phone number of one of the McEvoy's); (iii) indications of where the links are within this material (here the letters along the top and all the surnames are buttons); (iv) other links to known places in the hypertext (for example the "Help" and "Directory Contents" buttons); (v) sufficient context information to inform readers where they currently are (see the following section for the context information that should be provided).

Grouping information (S) - information should be arranged to make relationships clear. This is particularly important for graphical information. Where possible, different windows (or areas of the screen) should be used for different types of information.

Ordering information (S) - ordering of lists should be designed to assist readers' tasks and in a hypertext this can be enhanced by having multiple orderings of the same information. As well as this, what would traditionally be a linear list can be broken down into a hierarchical structure containing shorter sublists. Figure 2 illustrates a hierarchical, alphabetical ordering first by initial letter of the surname ("M") and then by surname (currently "McEvoy").

DIALOGUE DESIGN GUIDELINES

Context for displayed information (S-D) - readers should not be required to remember where they are so when they arrive at a new screen after actioning a link there should be sufficient information to re-orient themselves. Information on what the current section is, and where in the current section the reader is, should be either immediately available on the screen, or directly accessible by a mechanism made known to the reader. In hypertext systems which allow scrolling, extra care is needed to ensure sufficient context information is available. In Figure 2 the title and subtitle provide some information, the position bars at the bottom of each list, the enlarged letter "M" and highlighted "McEvoy" provide the rest.

Reading extended information (D) - where immediately relevant information takes up more than one screen the reader should be able to move easily between the relevant displays. For example, the A-Z tabs in Figure 2 allow the reader to go to adjacent letters in the alphabet or to any other letter.

Minimize cursor movement (D) - this guideline applies to hypertexts where there is a high proportion of link following compared with reading the information. Items should be arranged to minimize the distance the cursor has to move in order to reach the buttons. For example in Figure 2 it would have been less convenient for the reader if the inactive titles came between the directory entries and the alphabetical tabs at the top of the screen.

Terminology and wording (S) - any wording the author uses to guide the reader should follow standard guidelines: (i) terminology should be familiar (or there should be easy access to definitions) and consistent; (ii) abbreviations should be explained; (iii) sentence structure should be simple; (iv) instructions should be affirmative and in the active voice.

Effective use of graphics (S-D) - graphics can be used in a number of ways, as well as for illustrating the material the reader is interested in. Icons can be used for frequently occurring links, diagrams of nodes and links can be used to help orient the reader (this type of map need not contain every link, but main links between sections). Icons should be clear and legible and standardized throughout the hypertext.

Consistent formats (D) - the layout of material across different screens should remain as consistent as possible. For example, always keep the contents and help section buttons in the same place, arrange similar types of information in similar ways. Fonts and styles should be used consistently throughout the hypertext. The hypertext illustrated in Figure 2 would change very little when moving from one section to

another - only the highlighted letter at the top and the information in the two boxes would change.

ONLINE ASSISTANCE

Help in using links (S-D) - the hypertext author has only to deal with a small part of aiding the reader since the hypertext system itself should take care of many of the reader's requirements. The "errors" a reader is likely to make are clicking on an item which is not linked, or actioning the wrong link. In the first case some hypertext systems allow the author to display a message such as "Click on a surname to see the numbers". In the second case some hypertext systems allow readers to backtrack to where they just came from, otherwise the author can include links to take the reader back.

Help always available (S) - help at a general level and help specific to the reader's current position should always be available and obtained through a standard procedure, eg, a help icon is always displayed on the screen.

Conclusion

The guidelines presented above reflect a careful reduction of the large sets of very specific guidelines found in Smith and Mosier (1986) and Brown (1988) to a manageable subset relevant to the hypertext authoring process. In this authoring process the design principles and guidelines have a dual function. At the outset, the principles and guidelines alert the author to the features that need be designed into the hypertext. At a later stage when a prototype hypertext is available, the guidelines can be used as a check list to review the structure, presentation and potential readability of the hypertext.

Acknowledgements

The research reported in this paper was supported by Alvey Grant GR/D 42412. Our thanks go to our colleagues at the Scottish HCI Centre for their help with the production of this paper. The Scottish HCI Centre is a joint venture of Heriot-Watt and Strathclyde Universities.

References

Brown C M (1988) *Human-Computer Interface Design Guidelines*. New York, Ablex Publishing.

Hardman L (1988) Hypertext tips: experiences in developing a hypertext tutorial. In: *People and Computers IV*. Edited by Jones D M and Winder R. Cambridge, Cambridge University Press. pp 437-451.

Smith S L and Mosier J N (1986) *Guidelines for designing user interface software.* Technical Report ESD-TR-86-278. Massachusetts, Mitre Corporation.