Breaking down the predicted and observed times for the tasks by the type of tasks performed showed that while there was a significant difference between predicted and observed learning times for semantic generalization tasks, ($t = 3.01$, $p < .05$) there was not a significant difference for the control, deletion, and addition tasks. This suggests that the model accurately predicts the training time for all the tasks except for semantic generalization tasks, in which it under-predicts the amount of time to perform the tasks. There was a significant difference between the predicted and observed times for the two forgetting control groups ($t = 2.87$, $p < .05$), with the model over-predicting the amount of time to learn the tasks. The predicted and observed learning times for the different tasks and the forgetting control groups are displayed in Figure 3.

Figure 3. Predicted and observed mean times to perform the 4 different task and forgetting controls.

Discussion

As predicted by the positive transfer model, our results indicated that when users encountered menu paths with additional steps, the cost of performing those steps was equal to the amount of time required to learn the rules associated with the new steps. Removing steps from a menu path had no detrimental effect on user performance. The model's under-prediction of the learning time for the semantic generalization tasks indicates that users had difficulty making semantic generalizations between similar menu command names. Thus, users were not able to perfectly generalize between the similar command names and instead, may have treated the two related tasks as independent.

The model's over-predicting of the learning times for the forgetting control groups indicates that the model is still not able to account for all of the performance data. This over-prediction may be due to the control groups not encountering any of the paraphrased menu information seen by the experimental groups, and, therefore having fewer problems of generalizing rules on the second day. In order to account for this difference, a more sophisticated model of transfer will have to be created.

Based on these results, we conclude that when redesigning an existing menu system, changes to the dialogue structure are not detrimental, but changes in the semantic content of the menu commands may force users to engage in problem solving behavior in order to learn the new system.

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A USER NEEDS APPROACH TO CONTEXT-SENSITIVE HELP

SIGRID GRIMM, JOLANTA MALICKI, AND SUSAN OBERMEYER

Help facilities can only alleviate the problems experienced by new or casual users by providing the desired information when and where it is needed. Context-sensitive help focuses on providing information relevant to the user's current context. This ensures that information is timely, but if the type and scope of this help is not tuned to the user's needs, it will not be helpful.

An approach based on user needs has been used to develop context-sensitive online help services for

Meridian¹ SL Information Services. Information Services are a set of integrated voice and text communication tools such as voice messaging, integrated voice and text messaging, and telephone directories. The system provides a forms-oriented windowing environment with hardkeys, softkeys and typed-in command input mechanisms, and menu selection for object designation.

Analysis of user needs and observation of users as they interacted with the system (using co-discovery learning techniques {1 }) indicated a requirement to offer the following types of context-sensitive information:

- "Where you are": A description of the current context and important concepts.
- "What you can do": Both goal-oriented (To do "X"...) and command-oriented (The "Y" command does...)
- Field options: Values that can be applied to the current field.
- Help on the current condition, if one exists.

In addition, the scope of the information required varied from field-level, detailed help to context-level information and system-wide concepts.

Based on these requirements, various forms of assistance are available to users of Information Services:

- a context-sensitive help service which appears in a pop-up window and is accessed by pressing the HELP key;
- pop-up menus of values appropriate to the current field e.g., when filling in the name of a person to call. The values are accessed by pressing the OPTION key;
- on-line user guides which are a complete set of files explaining all aspects of the system, accessed from the main menu. These can be browsed or printed by the user.

The context-sensitive help service is described in detail below.

THE CONTEXT-SENSITIVE HELP SERVICE

When the user presses the HELP key, different kinds of help are available:

1. Overview Help: Describe the object in the current window ("Where you are") along with a goal-oriented list of all the functions which may be performed in the context ("What you can do" e.g., "To make a phone call: select an entry, then use Call").
2. Problem Help: Available when a problem (system or user-induced) has occurred and a message is currently displayed on the screen. Problem help expands on the cause of the problem and offers possible solutions.
3. Command Help: Lists all of the currently valid commands (function-oriented "What you can do" e.g., "The Call command places a phone call to the selected directory entry"). More detailed command help is available for each command listed.

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¹Meridian is a trademark of Northern Telecom Ltd.

4. Field Help: Describes the field which the cursor is currently on, if one exists.

5. Help about help: Describes how to use the help service itself.

ACCESS METHOD

Pressing the HELP hardkey immediately provides relevant information in a pop-up: problem help is displayed if there is a current error condition; overview help is displayed otherwise. A number of softkeys can then be used to select the different kinds of help mentioned above. These softkeys are available regardless of the type of help displayed so that the user can skip between the various types of help without leaving the help service.

INITIAL USABILITY RESULTS

Some usability testing of the help service has been done. Initial results include the following:

- The kind of help used most often appears to be the overview help displayed initially. Command help is the second most often used type of help.
- Format of help text is very important: users are more willing to scan lists than read blocks of text.
- The ability to change from one type of help to another without exiting the help system is considered important.
- The OPTION feature is used by experienced users rather than new users. It is most useful in situations where recall is difficult, e.g. when a particular file name must be specified.

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THE EFFECTS OF FREQUENCY AND LENGTH OF COMMANDS AND TRAINING TRANSFER ON TEXT EDITING PERFORMANCE

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The nature of the command terms used by computer systems is an important issue affecting human computer interaction. As such, this area has received considerable attention recently (e.g., Ehrenreich, 1982, 1985; Grudin & Barnard, 1984; Landauer, Galotti, & Hartwell, 1983; Landauer & Galotti, 1984; Ledgard, Whiteside, Singer, & Seymour, 1980; Scapin, 1981, 1982). The issues addressed by these researchers are particularly important in light of the larger number of computer users who have little or no knowledge of the underlying logic of either the hardware or the software that they are using. As a group, these users often believe that the system should be "fast and easy to use". One area in which this expectation is especially widespread is that of wordprocessing packages. Although wordprocessing packages generally share the same basic functional purposes, the specific command terms that each uses for a particular function are generally not the same or even similar. There are even instances where different versions of the same wordprocessing package have different commands and/or functions than previous versions. Therefore, not only is the issue of the ease of learning and use of commands important, but also the issue of how these commands might be changed (either across different levels of user expertise or different versions of the software) so that there is maximum transfer of training from old commands to new commands.

Previous research in this area has been concerned with transfer of training between different wordprocessing packages (e.g., Karat, Boyes, Weisgerber, & Schafer, 1986). Since there are inherent differences between wordprocessing packages that include more than just command name changes it was felt that examining transfer of training within the same

wordprocessing environment would isolate the issue of transfer of training for command terms. Therefore, the present study was concerned with addressing transfer of training issues related to command length changes within the same wordprocessing package.

Method

Subjects, Design, and Procedure. Forty students enrolled in an introductory psychology course participated in four sessions spread over two consecutive days. In each session subjects were given hardcopy versions of eight paragraphs each containing eight errors noted by standard copyediting marks. Subjects were instructed to use the text editor to correct the errors in each paragraph, store that paragraph, and then retrieve the next paragraph. Different paragraphs were used for each session but the paragraphs were the same across subjects for each session. The length of the commands used to accomplish the text editing was manipulated within-subjects. On Day 1 subjects used either whole word commands or single letter commands and on Day 2 they were switched to the other command type (i.e., words on Day 1 with letters on Day 2 or vice versa). In all cases the single letter was the first letter of the whole word. Half the subjects used words that were high frequency and the other half used low frequency commands. Subjects were not informed that they would be switching command lengths. Therefore, the design was a 2 (Length of Command: words vs. letters) x 2 (Frequency: high vs. low) x 4 (Session: 1-4) mixed-factor design.

Results

A variety of performance measures related to speed and accuracy were obtained from each session. In addition, data regarding subjects' experience with computers, word processors, and typing was also collected. Due to space limitations we will only discuss the variables of the total time to complete each session and total errors for a session. Not surprisingly, for each of the four between subjects conditions the total time required to complete each session decreased across the four sessions. Furthermore, this task completion time was greater for low frequency commands than for high frequency commands. Subjects in the letter-to-word condition showed an increase in task completion time on the third session, regardless of the relative frequency of