

# Handling Errors, Help & Documentation

John Stasko

Spring 2007

This material has been developed by Georgia Tech HCI faculty, and continues to evolve. Contributors include Gregory Abowd, Al Badre, Jim Foley, Elizabeth Mynatt, Jeff Pierce, Colin Potts, Chris Shaw, John Stasko, and Bruce Walker. Permission is granted to use with acknowledgement for non-profit purposes. Last revision: January 2007.

## Agenda

- Handling errors
  - Error types
  - Slip types
  - Error prevention guidelines
  - Error recovery guidelines
- Help & documentation
  - Guidelines
  - Types of doc/help
  - Presentation issues
  - Doc organization



## Errors

- Three considerations:
  - Avoiding and preventing
  - Identifying and understanding
  - Handling and recovering



## Why errors are important

### Errors are unavoidable

To err is human

Making mistakes is part of learning

### Designer's responsibility

Understand why errors occur

Minimize likelihood

Allow for recognition of error and graceful recovery  
(forward or backward)



## User-Computer Dialog

- Three phases
  - Read-scan phase -- Perceptual errors
  - Think phase -- Cognitive errors
  - Respond phase -- Motor errors



## Perceptual Errors

- Result from insufficient or poor perceptual cues
  - Examples
    - Display of objects that are visually similar
    - Invisible or poorly expressed states
    - Failure to capture user's attention
    - Lack of perceivable feedback



## Cognitive Errors

- Caused by taxing the memory and problem solving capabilities
  - Examples
    - Tax recall memory
    - Lack of or poor mnemonic aids
    - Inconsistency
    - Lack of context or status info
      - e.g., where came from in a menu
    - Mental calculations and translations



## Motor Errors

- Taxing the eye-hand coordination and motor skills
  - Examples
    - Awkward motor movements
    - Highly similar motor sequences
      - e.g., double click, click
    - Pressure for speed
    - Require a high degree of hand-eye coordination
    - Requiring special types of motor skills (type)



## Example Studies

- 170 experienced UNIX users over 9 days
  - Individual commands had error rates of 3-50%
- 300 security system users over 20 months
  - 12,117 error messages
  - Most common 11 errors -> 65%
  - 2517 involved repeated errors (with no non-errors in between) within 10 minutes
    - → Bad error recovery/help

Kraut et al, CHI '83

Mosteller & Ballas, *Human Factors* '89



## Slips

- Automatic (subconscious) error that occurs without deliberation
- Examples?



## Types of Slips

- 1. Capture error - Continue frequently done activity instead of intended one (similar starts)
  - Type "animation" instead of animate
  - Confirm deletion of file instead of cancel
- 2. Description error - Intended action has much in common with others possible (usually when distracted, close proximity)
  - ctrl key & caps lock key / Sun & Mac



## Types of Slips

- 3. Data driven error - Triggered by arrival of sensory info which intrudes into normal action
  - Call to give someone a number, dial that number instead
- 4. Associative activation - Internal thoughts and associations trigger action
  - Phone rings, yell "come in"



## Types of Slips

- 5. Loss of activation - Forgetting goal in middle of sequence of actions
  - Start going into room, then forget why you're going there
- 6. Mode errors - Do action in one mode thinking you're in another
  - Delete file, but you're in wrong directory



## Error Prevention Guidelines (1)

- Eliminate modes or provide visible cues for modes
- Use good coding techniques (color, style)
- Maximize recognition, minimize recall
- Design non-similar motor sequences or commands
- Minimize need for typing



## Error Prevention Guidelines (2)

- Test and monitor for errors and engineer them out
- Allow reconsideration of action by user (e.g., removing file from trash)



## Error Recovery Guidelines (1)

- Provide appropriate type of response
  - Gag - Prevent user from continuing
    - Erroneous login
  - Warn - Warn user an unusual situation is occurring
    - Bell or alert box
  - Nothing - Just don't do anything (Careful, user must determine problem)
    - Mac: move file to bad place





## Error Recovery Guidelines (2)

- Responses (continued)
  - Self-correct - Guess correct action & do it
    - Spell-check correction
  - Dialog - System opens dialog with user
    - Go into debugger on run-time crash
- Query - Ask user what should've been done, then allow error action as legal one
  - Command language naming error



## Error Recovery Guidelines (3)

- Provide undo function
- Provide cancel function from operations in progress
- Require confirmation for drastic, destructive commands
- Provide reasonableness checks on input data
  - Did you really mean to order 5000?



## Error Recovery Guidelines (4)

- Return cursor to error field, allow fix
- Provide some intelligence
  - Guess what they wanted to do
- Provide quick access to context-sensitive help



## Error Message - What to Say

- |                         |                                                                      |
|-------------------------|----------------------------------------------------------------------|
| • Error:                | Error code -37                                                       |
| • Description:          | Disk full                                                            |
| • Prescription:         | Disk full; recover disk space                                        |
| • Prescription + aid:   | Disk full; recover space by deleting files or defragmenting          |
| • Prescription + offer: | Disk full; proceed with disk defragmentation? Otherwise delete files |



## Error Message Wording - Vocabulary

- Problem with previous example - some users will not know what defragmentation means!!
- Vocabulary
  - User-oriented
  - Defined in advance for commonality throughout all messages (in style guide)
- Alternatives to “defragmentation” ?



## Error Message Wording - Tone

- Sorry, command not recognized
- Command not recognized :-(
- Command not recognized
- Command not recognized!!



## Or Even Worse

- Illegal command
- Illegal command!
- ILLEGAL COMMAND !@#&
- **ILLEGAL COMMAND!**
- Which may suggest to some users ...



## Help & Documentation

- It's in the manual...



## Customer Support

DILBERT / SCOTT ADAMS, scottadams@aol.com



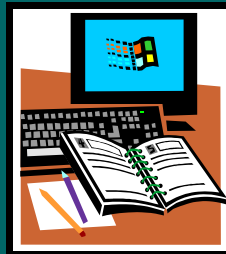
6750-Spr '07



25

## User Support

- Help
  - Problem-oriented and specific
- Documentation
  - System-oriented and general



6750-Spr '07



26

## Help & Documentation

- Never a replacement for bad design, but essential
- Simple systems may not use/require any
  - User walks up and uses it
  - Name some
- Most other systems with rich features require help



## Documentation

- Many users don't read manuals
  - Boring, no goal
  - Just dive in and start working
- Often used in panic mode, when user needs immediate help
  - Manuals probably locked away somewhere
  - Points to need for on-line help with search
- Sometimes want quick ref - emacs card



## User Support Requirements (1)

- Availability
  - Should be available any time the user is operating the system
- Accuracy & Completeness
  - Should be accurate (tricky with changing versions) and should cover all aspects of application



## User Support Requirements (2)

- Consistency
  - Across different sections, between on-line and paper documentation, in terminology, content and style
- Robustness
  - Should be predictable and free of errors



## User Support Requirements (3)

- Flexibility
  - Appropriate for novices through experts, maybe by having expandable sections of details
- Unobtrusiveness
  - Shouldn't distract from or interfere with normal work flow



## Types of Doc/Help

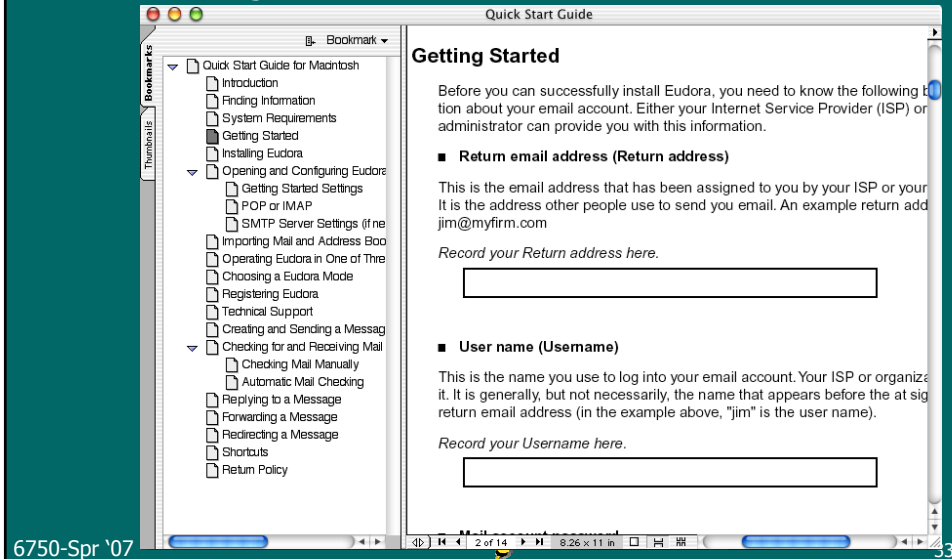
- 1. Tutorial
  - For start-up
  - Gets user going
  - Convey conceptual model
  - Communicate essential items
  - Sometimes see on-line tour or demo





# Types of Doc/Help

## Quick start guide as a tutorial



## Tutorial Manual - Outline

### 1. Introduction

- Assumed background of reader
  - Ref on where to get it
- General capabilities
- Key concepts - model, metaphor

### 2. Starter kit of tasks and how to accomplish

- For each task - examples, screen shots
- Introduce additional elements of conceptual model only as needed
- How to deal with *common* errors / exceptions
- Have plenty of examples, complete sample sessions



## Tutorial Manual - Outline

### 3. More tasks

- Introduce more commands as needed by tasks
- More sophisticated uses of earlier commands
- Changing defaults
- Etc
- Etc

### N. Index

- § Organized by terms, concepts, tasks, commands



## On-line Tutorial

- Work through simple examples, provide a feel for application



## Types of Doc/Help

- 2. Quick reference/review
  - Reminder or short reference
  - Often for syntax
  - Can be recall aid for expert
  - Can allow novice to see what's available



## Example

Microsoft QUICK Source **Internet Explorer 6.0**

### Getting Started

**Opening a New Window**  
When you open a new Internet Explorer window, you can open more than one site at a time. Select **New** from the **File** menu and select **Window** from the resulting menu, or press **Ctrl + N**.

**Changing Your Home Page**  
A home page is the page that appears when you launch Internet Explorer.  
1. Open the page that you want to designate as your home page.  
2. Select **Internet Options** from the **Tools** menu.  
3. Click the **Content** tab.  
4. In the **Home page** section, click the **Use Current** button.  
5. Click the **OK** button.

**Using Links**  
Links are the underlined and/or colored words, phrases, or graphics that have Internet page addresses embedded in them. When the mouse pointer is on a link, the arrow pointer turns into a hand . When you click a link, you are telling Internet Explorer that you want to view the Internet page associated with that link.

**Using the Standard Buttons**

- Back** - opens a previously viewed page. Click the down arrow on the button to view a list of previously viewed pages.
- Forward** - moves forward through pages that have been viewed using the Back button. Click the down arrow on the Forward button to view a list of the pages.
- Stop** - stops the current page from loading.
- Refresh** - reloads the current page.
- Home** - returns your home page.
- Search** - opens the Search pane, where you can search for information.
- Favorites** - opens the Favorites pane, where you can view and access your favorite pages.
- Media** - opens the Media pane, where you can access and download media.
- History** - opens the History pane, where you can view and access recently viewed sites.
- Mail** - displays a list of options for reading and sending mail using the built-in Outlook Express, or your default e-mail program.
- Print** - prints the current page.
- Edit** - opens the page in an HTML editor program (e.g., Microsoft FrontPage), or other appropriate program, such as Microsoft Word.
- Discuss** - enables you to chat with other users on a discussion server.

**The Internet Explorer Window**

- Title Bar** - displays the name of the current page and the name of the program.
- Menu Bar** - contains all of the menus for use with Internet Explorer 6.0.
- Standard Buttons Bar** - contains shortcut buttons for standard Internet Explorer tools. Use these tool buttons to navigate, search, and work with sites.
- Address Bar** - displays the current location's address.
- Links Bar** - contains shortcuts to popular sites.
- Explorer Bar** - displays various Explorer tools, such as tools for searching, accessing media, and viewing your favorite pages, history, and recent folders.
- Explorer Window** - displays the contents of the current page.
- Status Bar** - displays the address associated with a selected link when you place your mouse pointer over the link. It also displays the status of a page as it loads, indicating how much of the page has been received.

**Opening a Site**

- Select **Open** from the **File** menu, or press **Ctrl + O**.
- Type an Internet address in the **Open** box. To select from a list of addresses, click the arrow button on the **Open** box and select an address from the pop-up menu.
- Click the **OK** button.

**Note:** To open a site using the **Address bar**, click once in the **Address bar**, enter an Internet address, and press the **Enter** key.

**Using AutoComplete**

If you enter an address in the **Address bar**, Internet Explorer will suggest possible matches. If a suggestion in the list matches the address you want to open, click the address. To ignore the suggested addresses, just keep typing.

6750-Spr '07

38

## Types of Doc/Help

- 3. Reference Manual (Full explanation)
  - Detailed command descriptions
  - Usually for experts
  - Unix on-line manual pages, for example



## Types of Doc/Help

Combined  
Quick Reference  
and full  
Reference Manual

- command
- purpose
- syntax
- example
- links to details

lookup:

view the [printer friendly version](#) or the [printer friendly version with notes](#) or change language to [Bra](#)

### strtotime

(PHP 3 >= 3.0.12, PHP 4)

strtotime -- Parse about any English textual datetime description into a UNIX timestamp

#### Description

int **strtotime** ( string time [, int now])

The function expects to be given a string containing an English date format and will try to Upon failure, -1 is returned.

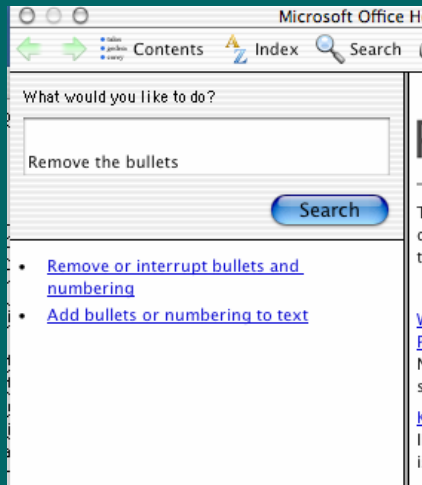
Because **strtotime()** behaves according to GNU date syntax, have a look at the GNU m

#### Example 1. strtotime() examples

```
echo strtotime ('now'), "\n";
echo strtotime ("10 September 2000"), "\n";
echo strtotime ("+1 day"), "\n";
echo strtotime ("+2 week"), "\n";
echo strtotime ("+1 week 2 days 4 hours 2 seconds"), "\n";
echo strtotime ("next Thursday"), "\n";
echo strtotime ("last Monday"), "\n";
```

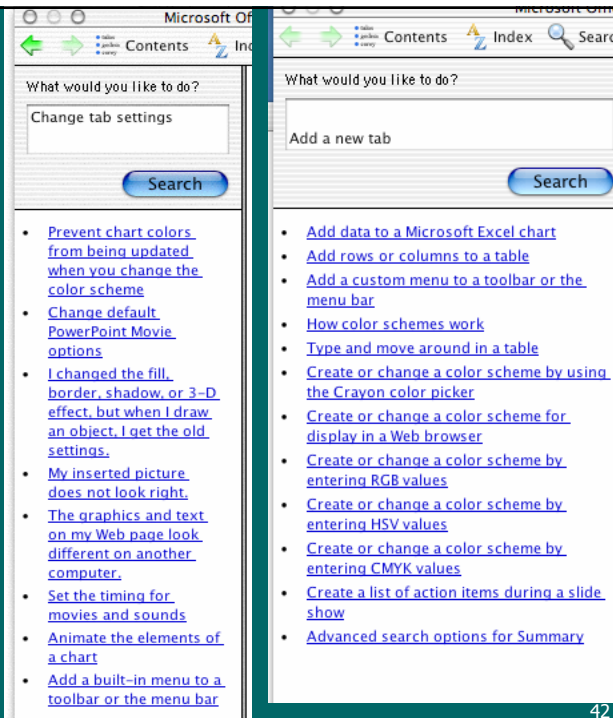
## Types of Doc/Help

- 4. Searchable  
Sometimes it works....



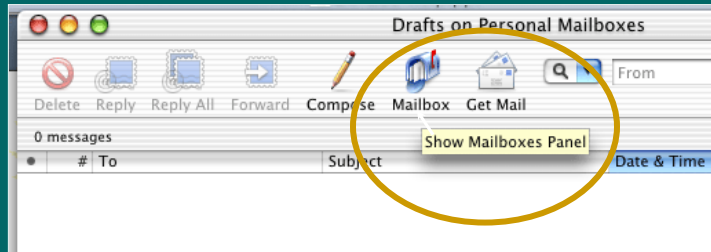
## Searchable

- And sometimes, it doesn't....



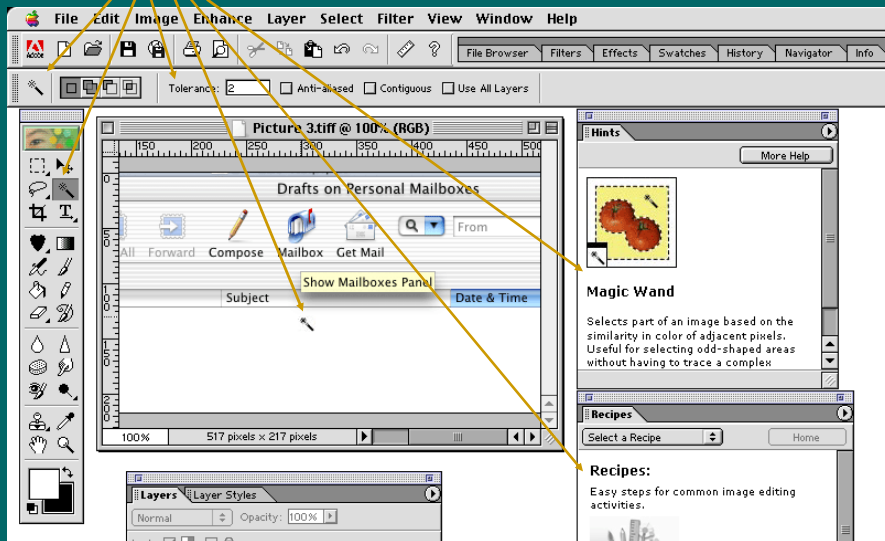
## Types of Doc/Help

- 5. Context-sensitive (task-specific) help
  - System provides help on current situation
  - Macintosh balloon help (old), ToolTips, for example
  - Other examples?



## Types of Doc/Help

Context Sensitive Help e.g. Photoshop



## Medium

- Paper versus monitor
- Studies show that people are 15-30% slower reading and comprehending text from a display as compared to paper



## Monitor

- Causes for slow-down
  - Poor fonts (*monospace*, bad kerning “VA”, bad spacing, ...)
  - Low contrast of letters & background
  - Emitted vs. reflected light (curved tube)
  - Small display -> page turning
  - Distance, placement of monitor
  - Layout and formatting problems
  - Reduced hand and body motion



## Presentation Issues

- Integrate with system, don't "add on"
- 1. How is help requested?
  - Command, button, function, separate application
  - Advantages, disadvantages?
- 2. How is help displayed?
  - Separate window, whole screen, part of screen, on top of application, pop-up box, command line, highlighted button, light bulb..
  - Largely depends on what type of help it is



## Presentation Issues

- 3. Effective presentation of help
  - Design it like any other part of UI: language, terminology, jargon, etc.
  - Use active voice
    - "To close a window, place the mouse cursor in the box at the upper right corner (with the X) and click the mouse button."
- 4. Implementation issues
  - Fast response time is important
  - How is help stored? File, database, ...?





## Adaptive Help

- Tailor help level and style to the particular user
- Usually requires a system to maintain a *user model*



## Help Levels

- 1. Designer model
  - System designer has model of typical user and builds interface with this in mind
- 2. Adaptable help
  - User can edit their own model, for example, .profile on UNIX
- 3. Adaptive help
  - System maintains a user model and can change it on the fly



## User Model

- How is user model constructed and maintained?
  - 1. Quantification - Numeric levels of use
  - 2. Stereotype
    - Novice, intermediate, expert
    - Utilize command use and errors to categorize
  - 3. Overlay model
    - Build expert user profile with optimal behavior
    - Compare to what user is currently doing



## Adaptive Help Issues

- Initiative & control
  - Does user feel that control was taken away by system?
  - “You’re not performing efficiently in this task”
- Use
  - Is all this work actually useful?
- Scope
  - To what aspect of system or of help does it apply?



## Documentation – Worth It?

- Studies have taken documentation and improved it
  - People did perform better with the improved documentation
- -> Effort here is worthwhile



## Recommendations

- |                                                                                                                                                                                                     |                                                                                                                                                                                                                            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"><li>• OK<ul style="list-style-type: none"><li>– All details of each command</li><li>– BNF or formal notation</li><li>– Terse, technical prose</li></ul></li></ul> | <ul style="list-style-type: none"><li>• Better<ul style="list-style-type: none"><li>– Subsets of concepts</li><li>– Lots of examples</li><li>– Readable explanations with a minimum of technical terms</li></ul></li></ul> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



## Doc Organization

- State educational objectives
- Present concepts in logical sequence, increasing order of difficulty
- Avoid forward references
- Make sections have roughly equal amounts of material
- Have plenty of examples, complete sample sessions



## Doc Organization

- Each concept section:
  - Explain reason for concept
  - Describe concept in task-domain semantic terms
  - Show computer-related semantic concepts
  - Offer syntax
- Table of contents and index are important
- Keep reading level simple



## Reading Level

- Study on doc at 5th, 10th, 15th grade reading levels among low, mid, high reading level people
- Reading level of person affected performance, but not reading level of text
- People liked 5th grade text best

Roemer & Chapanis, CHI '82



## Improving Doc

- Run through think-aloud sessions
- Use on-line example tutorials
- Try to predict common states and problems
- Anticipate errors
- Develop manuals early and pilot test
- Iteratively refine



## Human Characteristics

- Don't anthropomorphize
  - “The computer will calculate an answer after you respond”
    - Gives user inaccurate impression
  - “You can get the solution by pressing F1”
    - Better to put user in control



## Terminology

- |                                                                                                                                                                                               |                                                                                                                                                                                                                   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"><li>• Avoid<ul style="list-style-type: none"><li>– know, think, understand, have memory</li><li>– ask, tell, speak to, communicate with</li></ul></li></ul> | <ul style="list-style-type: none"><li>• Better<ul style="list-style-type: none"><li>– process, print, compute, sort, store, search, retrieve</li><li>– use, direct, operate, program, control</li></ul></li></ul> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



## Upcoming

- Prototyping and UI Software
- Exam
- Poster session

