Handling Errors, Help & Documentation

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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%

Kraut et al, CHI '83

- 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

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

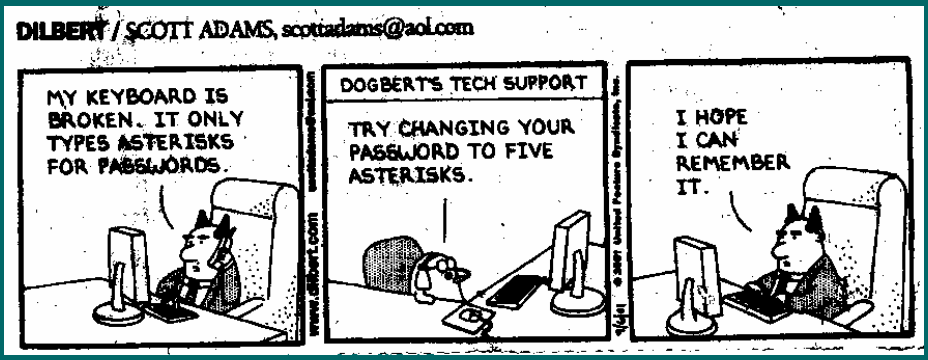
- Illegal command
- Illegal command!
- ILLEGAL COMMAND !@#&
- **ILLEGAL COMMAND!**

- Which may suggest to some users …

Help & Documentation

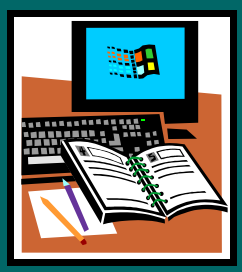
- It's in the manual…

Customer Support



User Support

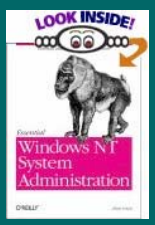
- Help
  - Problem-oriented and specific
- Documentation
  - System-oriented and general



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)

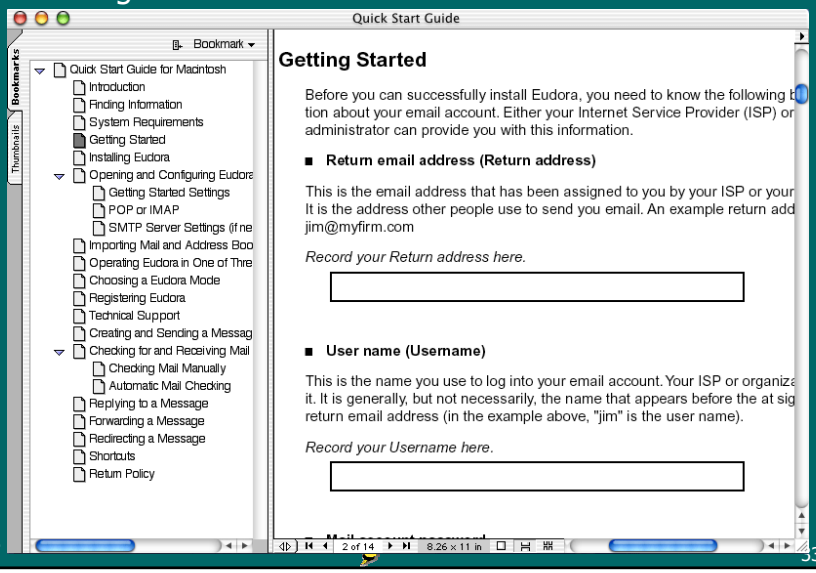
- Flexibility
  - Appropriate for novices through experts, maybe by having expandable sections of details
- Unobtrusiveness
  - Shouldn't distract from or interfere with normal work flow

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

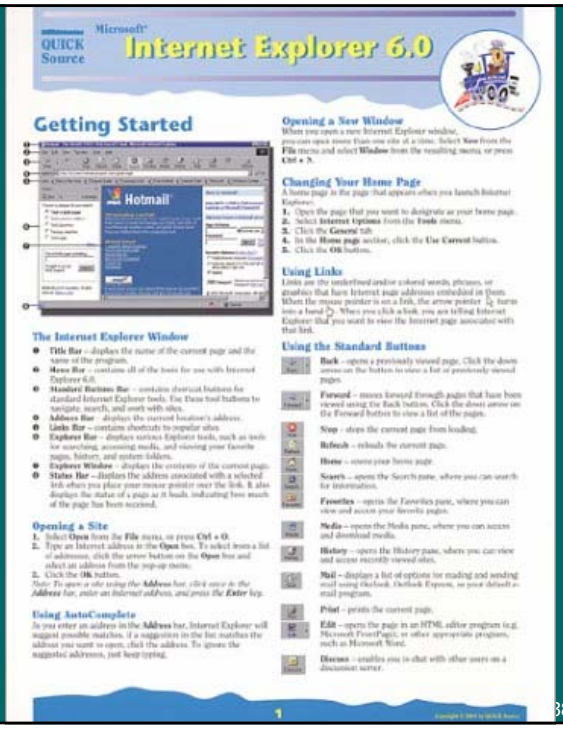
On-line Tutorial

- 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

The Internet Explorer Window

Opening a Site

Using AutoComplete

Opening a New Window

Changing Your Home Page

Using Links

Using the Standard Buttons

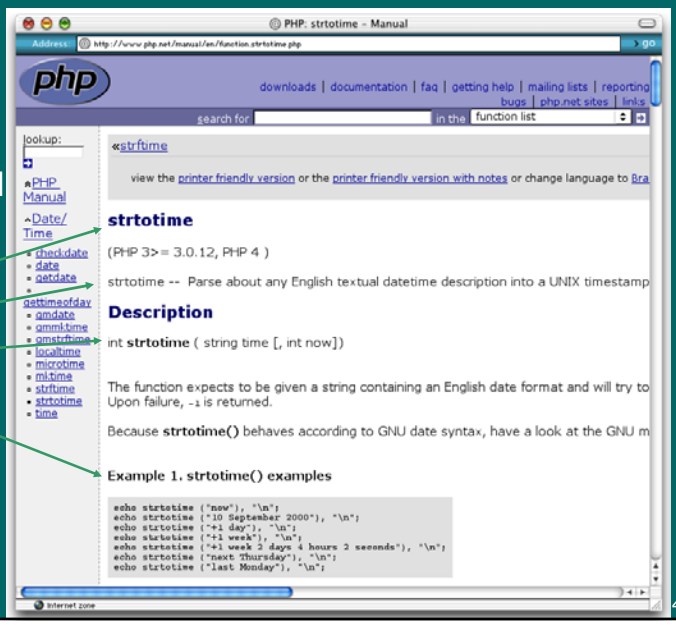
Types of Doc/Help

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

Types of Doc/Help

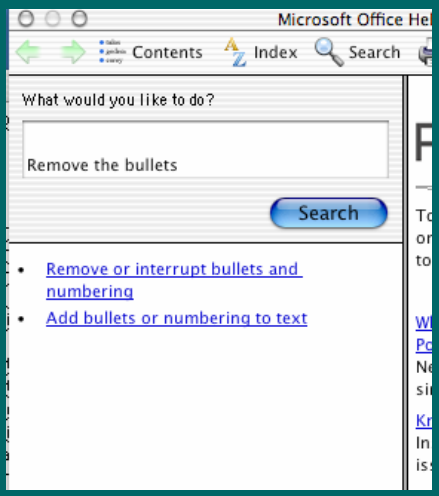
Combined Quick Reference and full Reference Manual

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



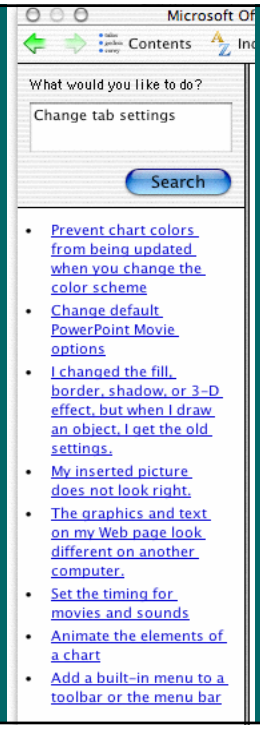
Types of Doc/Help

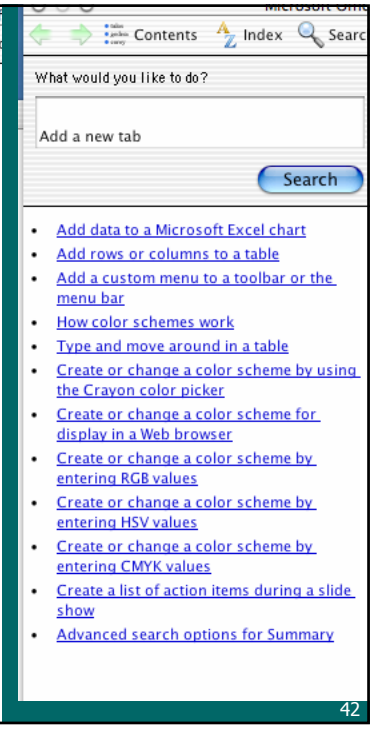
- 4. Searchable Sometimes it works….



Searchable

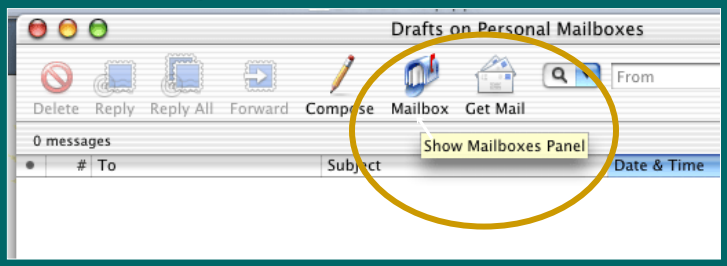
- And sometimes, it doesn't….





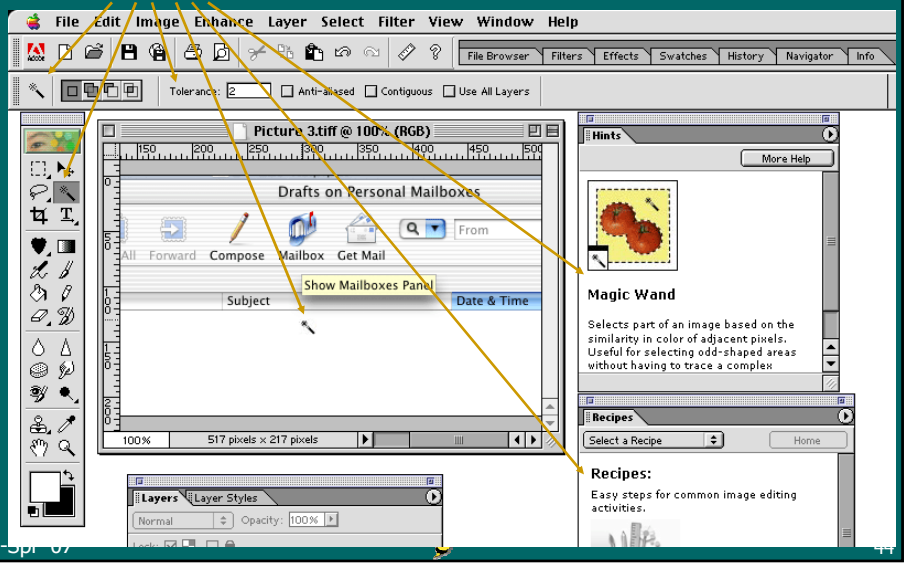
Types of Doc/Help

- 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

- OK
  - All details of each command
  - BNF or formal notation
  - Terse, technical prose
- Better
  - Subsets of concepts
  - Lots of examples
  - Readable explanations with a minimum of technical terms

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

- Avoid
  - know, think, understand, have memory
  - ask, tell, speak to, communicate with
- Better
  - process, print, compute, sort, store, search, retrieve
  - use, direct, operate, program, control

Upcoming

- Prototyping and UI Software
- Exam
- Poster session