



Chapter 2

Guidelines, Principles, and Theories

Introduction

- Guidance for designers is available in the form of:
 - Specific and practical guidelines
 - Prescribe cures for design problems, caution against dangers, and provide helpful reminders based on accumulated wisdom
 - Middle-level principles
 - Help in analyzing and comparing design alternatives
 - High-level theories and models
 - Try to describe objects and actions with consistent terminology so that communication and teaching can be facilitated.

Guidelines

- Guidelines are based on experience
 - Record best practices derived from practical experience or empirical studies with appropriate examples and counterexamples
- Promote consistency among multiple designers in terminology, appearance, and action sequences
 - Apple and Microsoft guidelines for desktop applications
 - Guidelines for the web and mobile devices
- Critics
 - Too specific, incomplete, hard to apply, and sometimes wrong
- Proponents
 - Building on experience contributes to steady improvements

Navigating the interface

- Sample of the National Cancer Institutes guidelines:
 - Standardize task sequences
 - Ensure that embedded links are descriptive
 - Use unique and descriptive headings
 - Use check boxes for binary choices
 - Develop pages that will print properly
 - Use thumbnail images to preview larger images

Detailed guidelines on www.usability.gov

Accessibility guidelines

- Access Board (www.access-board.gov/508.htm), a US agency, adapted guidelines about accessibility for people with disabilities. The guidelines are organized into three priority levels.
- A few of Priority 1 Accessibility Guidelines are:
 - Provide a text equivalent for every non-text element
 - For any time-based multimedia presentation synchronize equivalent alternatives
 - Information conveyed with color should also be conveyed without it
 - Title each frame to facilitate frame identification and navigation

Detailed guidelines on www.w3.org/TR/WCAG20/

Organizing the display

- Smith and Mosier (1986) offer five high-level goals for data display:
 - Consistency of data display
 - Terminology, abbreviations, formats, colors, etc.
 - Efficient information assimilation by the user
 - L/R justification, spacing, labeling, etc.
 - Minimal memory load on the user
 - No memory requirement from one screen to another
 - Tasks of few actions only
 - Labels & common formats, etc.
 - Compatibility of data display with data entry
 - Output fields as editable input fields
 - Flexibility for user control of data display
 - Order of columns, sorting of rows, etc.

Getting the user's attention

- Intensity:
 - two levels only, high intensity to draw attention
 - Marking:
 - underlining, box, arrow, asterisk, bullet, dash, plus sign, or X
 - Size:
 - up to four sizes only, with larger sizes attracting more attention
 - Choice of fonts:
 - up to three fonts only
 - Inverse video (inverse coloring)
 - Blinking:
 - use with great care and in limited areas
 - Color:
 - up to four
 - Audio:
 - soft tones for regular positive feedback, harsh for rare emergency conditions
- ☞ *Overusing these techniques may result in cluttered displays*

Facilitating data entry

- Smith and Mosier (1986) offer five high-level objectives as part of their guidelines for data entry:
 - Consistency of data-entry transactions
 - Similar sequences of actions under all conditions
 - Similar abbreviations, delimiters, and so on.
 - Minimal input actions by user (increases productivity)
 - Few clicks, list choice selection
 - Avoid frequent movement between keyboard & mouse
 - Avoid redundant data-entry
 - Minimal memory load on users
 - Lengthy list of codes, complex commands
 - Compatibility of data entry with data display
 - Flexibility for user control of data entry
 - e.g., sequence control
 - Should be used cautiously; flexibility goes against consistency

Principles

- More fundamental, widely applicable, and enduring than guidelines
- Need more clarification
- Fundamental principles
 - Determine user's skill levels
 - Identify the tasks
 - Five primary interaction styles
 - Eight golden rules of interface design
 - Prevent errors

Determine user's skill levels

- “Know thy user” Hansen (1971)
- All designs should begin with an understanding of the intended users
 - Age, gender, physical and cognitive abilities, education, cultural or ethnic background, training, motivation, goals and personality
 - Other variables: location (e.g. urban vs. rural), economic profile, disabilities, and attitude towards using technology
- An understanding of users' skills with interfaces and with the application domain is also important

▶ Determine user's skill levels

- Separation of users into various groups might lead to different design goals. e.g.
 - Novice or first-time users
 - Knowledgeable intermittent users
 - Expert frequent users
- Multi-layer (or level-structured) designs
 - Not only in the software but also in user manuals, help screens, error messages and tutorials
 - The most promising approach to promoting universal usability
- Other ways of accommodating different usage classes
 - User control of the density of informative feedback
 - Dense vs. sparse display of information
 - Slow vs. fast pace of interaction

Identify the tasks

- The set of tasks must be determined before design can proceed
- Task analysis usually involve long hours observing and interviewing users
- Decomposition of high level tasks
- Relative task frequencies: frequent vs. infrequent

	TASK				
Job title	Query by Patient	Update Data	Query across Patients	Add Relations	Evaluate System
Nurse	0.14	0.11			
Physician	0.06	0.04			
Supervisor	0.01	0.01	0.04		
Appointment personnel	0.26				
Medical-record maintainer	0.07	0.04	0.04	0.01	
Clinical researcher			0.08		
Database programmer			0.02	0.02	0.05

Choose an interaction style

- Direct Manipulation
- Menu selection
- Form fillin
- Command language
- Natural language

Advantages

Direct manipulation

Visually presents task concepts
Allows easy learning

Allows easy retention
Allows errors to be avoided
Encourages exploration
Affords high subjective satisfaction

Menu selection

Shortens learning
Reduces keystrokes
Structures decision making
Permits use of dialog-management tools
Allows easy support of error handling

Form fillin

Simplifies data entry
Requires modest training
Gives convenient assistance
Permits use of form-management tools

Command language

Is flexible
Appeals to "power" users

Supports user initiative
Allows convenient creation of user-defined macros

Natural language

Relieves burden of learning syntax

Disadvantages

May be hard to program
May require graphics display and pointing devices

Presents danger of many menus
May slow frequent users
Consumes screen space
Requires rapid display rate

Consumes screen space

Has poor error handling
Requires substantial training and memorization

Requires clarification dialog
May not show context
May require more keystrokes
Is unpredictable

The eight golden rules of interface design

1. Strive for consistency
2. Cater to universal usability
3. Offer informative feedback
4. Design dialogs to yield closure
5. Prevent errors
6. Permit easy reversal of actions
7. Support internal locus of control
8. Reduce short term memory

Prevent errors

- Prevent errors in the first place. If a user makes an error, present a good error message
 - Make error messages specific, positive in tone, and constructive
- Techniques to reduce errors:
 - Correct actions
 - Make it difficult or impossible to take an incorrect action
 - Gray out inappropriate actions
 - Selection rather than freestyle typing
 - Automatic completion
 - Complete sequences
 - Single abstract commands combining multiple steps
 - Style formats in word processors
 - Macros and subroutines

Skipped Sections

The following sections have been skipped:

- 2.3.6: Integrating automation while preserving human control

- 2.4 Theories
- 2.5 Object-Action Interface Model

