

Lecture 8: Design Principles

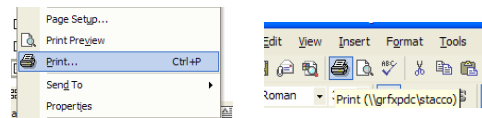
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UI Hall of Fame or Shame?

- Three ways to print in Microsoft Office
 - File/Print menu item
 - Print toolbar button
 - Ctrl-P keyboard shortcut



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Hall of Fame or Shame?



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Usability Guidelines (“Heuristics”)

- Plenty to choose from
 - Nielsen’s 10 principles
 - One version in his book
 - A more recent version on his website
 - Tognazzini’s 16 principles
 - Norman’s rules from Design of Everyday Things
 - Mac, Windows, Gnome, KDE guidelines
- Help designers choose design alternatives
- Help evaluators find problems in interfaces (“heuristic evaluation”)

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Guidelines From Earlier Lectures

- User-centered design
 - Know your users
 - Understand their tasks
- Fitts's Law
 - Size and proximity of controls should relate to their importance
 - Tiny controls are hard to hit
 - Screen edges are precious
- Memory
 - Use chunking to simplify information presentation
 - Minimize working memory
- Color guidelines
 - Don't depend solely on color distinctions (color blindness)
 - Avoid red on blue text (chromatic aberration)
 - Avoid small blue details
- Norman's principles of direct manipulation
 - Affordances
 - Natural mapping
 - Visibility
 - Feedback

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1. Match the Real World

- Use common words, not techie jargon
 - But use domain-specific terms where appropriate
- Don't put limits on user-defined names
- Allow aliases/synonyms in command languages
- Metaphors are useful but may mislead



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2. Consistency and Standards

- Principle of Least Surprise
 - Similar things should look and act similar
 - Different things should look different
- Other properties
 - Size, location, color, wording, ordering, ...
- Command/argument order
 - Prefix vs. postfix
- Follow platform standards

Source: Interface Hall of Shame

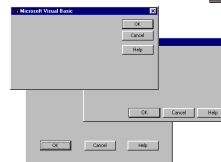
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Kinds of Consistency

- Internal
- External
- Metaphorical



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Case Against Consistency (Grudin)

- Inconsistency is appropriate when context and task demand it
 - Arrow keys
- But if all else is equal, consistency wins
 - QWERTY vs. Dvorak

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3. Help and Documentation

- Users don't read manuals
 - Prefer to spend time working toward their task goals, not learning about your system
- But manuals and online help are vital
 - Usually when user is frustrated or in crisis
- Help should be:
 - Searchable
 - Context-sensitive
 - Task-oriented
 - Concrete
 - Short

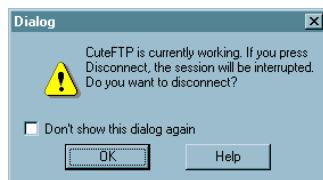
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4. User Control and Freedom

- Provide undo
- Long operations should be cancelable
- All dialogs should have a cancel button



Source: Interface Hall of Shame

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5. Visibility of System Status

- Keep user informed of system state
 - Cursor change
 - Selection highlight
 - Status bar
 - Don't overdo it...
- Response time
 - < 0.1 s: seems instantaneous
 - 0.1-1 s: user notices, but no feedback needed
 - 1-5 s: display busy cursor
 - > 1-5 s: display progress bar



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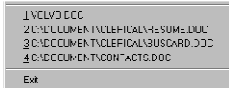
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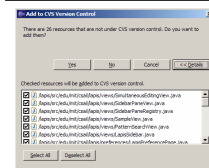
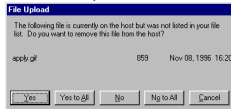
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6. Flexibility and Efficiency

- Provide easily-learned shortcuts for frequent operations
 - Keyboard accelerators
 - Command abbreviations
 - Styles
 - Bookmarks
 - History



Source: Interface Hall of Shame



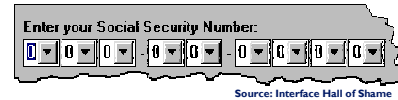
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7. Error Prevention

- Selection is less error-prone than typing
 - But don't go overboard...



- Disable illegal commands

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Description Error

- Intended action is replaced by another action with many features in common
 - Pouring orange juice into your cereal
 - Putting the wrong lid on a bowl
 - Throwing shirt into toilet instead of hamper
 - Going to Kendall Square instead of Kenmore Square
- Avoid actions with very similar descriptions
 - Long rows of identical switches
 - Adjacent menu items that look similar

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Capture Error

- A sequence of actions is replaced by another sequence that starts the same way
 - Leave your house and find yourself walking to school instead of where you meant to go
 - Vi :wq command
- Avoid habitual action sequences with common prefixes

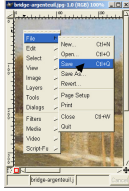
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Mode Error

- Modes: states in which actions have different meanings
 - Vi's insert mode vs. command mode
 - Caps Lock
 - Drawing palette
- Avoiding mode errors
 - Eliminate modes
 - Visibility of mode
 - Spring-loaded or temporary modes
 - Disjoint action sets in different modes



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8. Recognition, Not Recall

- Use menus, not command languages
- Use combo boxes, not textboxes
- Use generic commands where possible (Open, Save, Copy Paste)
- All needed information should be visible



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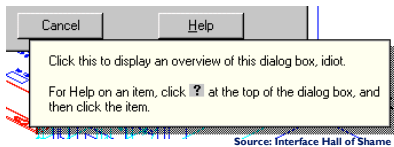
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9. Error Reporting, Diagnosis, Recovery

- Be precise; restate user's input
 - Not "Cannot open file", but "Cannot open file named paper.doc"
- Give constructive help
 - why error occurred and how to fix it
- Be polite and nonblaming
 - Not "fatal error", not "illegal"
- Hide technical details (stack trace) until requested



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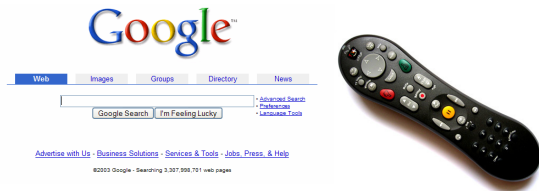
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10. Aesthetic and Minimalist Design

- "Less is More"
 - Omit extraneous info, graphics, features



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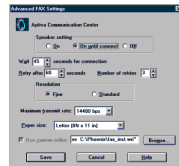
10. Aesthetic and Minimalist Design

- Good graphic design
 - Few, well-chosen colors and fonts



- Group with whitespace
- Align controls sensibly

- Use concise language
 - Choose labels carefully



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Chunking the Heuristics Further

- **Meet expectations**
 1. Match the real world
 2. Consistency & standards
 3. Help & documentation
- **User is the boss**
 4. User control & freedom
 5. Visibility of system status
 6. Flexibility & efficiency
- **Handle errors**
 7. Error prevention
 8. Recognition, not recall
 9. Error reporting, diagnosis, and recovery
- **Keep it simple**
 10. Aesthetic & minimalist design

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Tog's 16 Principles

- **Anticipation**
- Autonomy
- Color blindness
- Consistency
- **Defaults**
- Efficiency
- **Explorable interfaces**
- Fitts's Law
- Human interface objects
- Latency reduction
- **Learnability**
- Metaphors
- **Protect users' work**
- **Readability**
- **Track state**
- **Visible navigation**

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Shneiderman's 8 Golden Rules

- Consistency
- Shortcuts
- Feedback
- **Dialog closure**
- Simple error handling
- Reversible actions
- Put user in control
- Reduce short-term memory load

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