Session 7 User Interface Design

Based on System Analysis & Design 2nd Edition
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Objectives

- Understand several fundamental user interface design principles.
- Understand the process of user interface design.
- Understand how to design the user interface structure.
- Understand how to design the user interface standards.
- Be able to design a user interface.
Key Definitions

- The **user interface** defines how the system will interact with external entities.
- The **system interfaces** define how systems exchange information with other systems.
Key Definitions

- The **navigation mechanism** provides the way for users to tell the system what to do.
- The **input mechanism** defines the way the system captures information.
- The **output mechanism** defines the way the system provides information to users or other systems.
Key Definitions

The graphical user interface (GUI) is the most common type of interfaces most students are likely to use personally and for developing systems.
PRINCIPLES FOR
USER INTERFACE DESIGN
Principles for User Interface Design

- Layout
- Content awareness
- Aesthetics
- User experience
- Consistency
- Minimal user effort
Layout Concepts

- The screen is often divided into three boxes
  - Navigation area (top)
  - Status area (bottom)
  - Work area (middle)
- Information can be presented in multiple areas
- Like areas should be grouped together
More Layout Concepts

- Areas and information should minimize user movement from one to another
- Ideally, areas will remain consistent in
  - Size
  - Shape
  - Placement for entering data
  - Reports presenting retrieved data
Layout Example 1
### Layout Example 3

#### Patient Information

<table>
<thead>
<tr>
<th>Patient Name</th>
<th>Address</th>
<th>Referring Doctor</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Name:</td>
<td>Street:</td>
<td>First Name:</td>
</tr>
<tr>
<td>Last Name:</td>
<td>City:</td>
<td>Last Name:</td>
</tr>
<tr>
<td></td>
<td>State/Province:</td>
<td>Street:</td>
</tr>
<tr>
<td></td>
<td>Zip Code/Postal Code:</td>
<td>City:</td>
</tr>
<tr>
<td></td>
<td>Home Phone:</td>
<td>State/Province:</td>
</tr>
<tr>
<td></td>
<td>Office Phone:</td>
<td>Zip Code/Postal Code:</td>
</tr>
<tr>
<td></td>
<td>Cell Phone:</td>
<td>Office Phone:</td>
</tr>
</tbody>
</table>

(a) Vertical flow

<table>
<thead>
<tr>
<th>Patient Name</th>
<th>Address</th>
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</thead>
<tbody>
<tr>
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<td>Last Name:</td>
</tr>
<tr>
<td></td>
<td>State/Province:</td>
<td>Street:</td>
</tr>
<tr>
<td></td>
<td>Zip Code/Postal Code:</td>
<td>City:</td>
</tr>
<tr>
<td></td>
<td>Home Phone:</td>
<td>State/Province:</td>
</tr>
<tr>
<td></td>
<td>Office Phone:</td>
<td>Zip Code/Postal Code:</td>
</tr>
<tr>
<td></td>
<td>Cell Phone:</td>
<td>Office Phone:</td>
</tr>
</tbody>
</table>

(b) Horizontal Flow
Content Awareness

- All interfaces should have titles
- Menus should show
  - where you are
  - where you came from to get there
- It should be clear what information is within each area
- Fields and field labels should be selected carefully
- Use dates and version numbers to aid system users
Aesthetics

- Interfaces need to be functional and inviting to use
- Avoid squeezing in too much, particularly for novice users
- Design text carefully
  - Be aware of font and size
  - Avoid using all capital letters
More Aesthetics

Colors and patterns should be used carefully

- Test quality of colors by trying the interface on a black/white monitor
- Use colors to separate or categorize items
User Experience

- How easy is the program to learn?
- How easy is the program to use for the expert?
- Consider adding shortcuts for the expert
- Where there is low employee turnover, some training can lessen the impact of less precise interfaces
Consistency

- Enables users to predict what will happen.
- Reduces learning curve.
- Considers items within an application and across applications.
- Pertains to many different levels
  - Navigation controls
  - Terminology
  - Report and form design
Minimize Effort

Three clicks rule

Users should be able to go from the start or main menu of a system to the information or action they want in no more than three mouse clicks or three keystrokes.
USER INTERFACE DESIGN
PROCESS
Five Step Process
User Scenario Development

- An outline of steps to perform work.
- Presented in a simple narrative tied to the related DFD.
- Document the most common paths through the use case so interface designs will be easy to use for those situations.
Your Turn

- Visit the Web site for your university and navigate through several of its Web pages.
- Develop two use scenarios for it.
Interface Structure Design

- A diagram showing how all screens, forms, and reports are related.
- Shows how user moves from one to another.
- Similar to DFD in using boxes and lines.
- Boxes denote screens.
- Lines show movement from one to another.
- Different from DFD in having no standard rules or format.
Interface Structure Diagram Example
Interface Standards Design

- The basic elements that are common across individual screens, forms, and reports within the application
- Interface metaphor
  - Desktop, checkbook, shopping cart
- Interface objects
- Interface actions
- Interface icons
- Interface templates
Interface Design Prototyping

- A mock-up or simulation of screen, form, or report

- Common methods include
  - Paper
  - Storyboarding
  - HTML prototype
  - Language prototype
Storyboard Example

Client Menu
- Add Client
- Find Clients
- List Clients

Add a Client
First Name: __________ Last Name: __________
Address: __________________________________________
City: __________________ State: ______ Zip Code: ______

Find a Client
(Type in information to search on)
First Name: __________ Last Name: __________
Address: __________________________________________
City: __________________ State: ______ Zip Code: ______

Client List
- (Click on a client for more information)
  - Adams, Clare
  - Ace, John
  - Baker, Robin

Client Information
First Name: Pat Last Name: Smith
Address: 1234 Anywhere St., Apt 56
City: Somethingsville State: CA Zip code: 90211
Interface Evaluation Methods

- Heuristic evaluation
  - Compare design to checklist
- Walkthrough evaluation
  - Team simulates movement through components
- Interactive evaluation
  - Users try out the system
- Formal usability testing
  - Expensive
  - Detailed use of special lab testing
NAVIGATION DESIGN
Basic Principles of Navigation Design

- Assume users
  - Have not read the manual
  - Have not attended training
  - Do not have external help readily at hand

- All controls should be clear and understandable and placed in an intuitive location on the screen.
Basic Principles of Navigation Design

- Prevent mistakes
  - Limit choices
  - Never display commands that can’t be used (or “gray them out”)
  - Confirm actions that are difficult or impossible to undo
- Simplify recovery from mistakes
- Use consistent grammar order
Types of Navigation Control

Languages
- Command language
- Natural language

Menus
- Generally aim at broad shallow menu
- Consider using “hot keys”

Direct Manipulation
- Used with icons to start programs
- Used to shape and size objects
- May not be intuitive for all commands
A Traditional Menu in a UNIX System

Copyright 1989-1997. PINE is a trademark of the University of Washington.
Common Types of Menus

- **Menu Bar**
- **Grayed Out Commands**
- **Drop-Down Menu**
- **Tool Bar with Buttons**
- **Line Dividing Menu Group**
- **A pop-up menu that is also a tab menu**

Never display a command that cannot be used. For example, many Windows applications "gray out" commands that cannot be used; they are displayed on pull-down menus in a very light-colored font, but they cannot be used. This shows that they are available (and keeps all menu items in the same place), but that they cannot be used at that time.
## Types of Menus

<table>
<thead>
<tr>
<th>Types of Menus</th>
<th>When Would You Use Each of These Menu Types?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Menu bar</td>
<td></td>
</tr>
<tr>
<td>Drop-down menu</td>
<td></td>
</tr>
<tr>
<td>Pop-up menu</td>
<td></td>
</tr>
<tr>
<td>Tab menu</td>
<td></td>
</tr>
<tr>
<td>Toolbar</td>
<td></td>
</tr>
<tr>
<td>Image map</td>
<td></td>
</tr>
</tbody>
</table>
Message Tips

- Should be clear, concise, and complete
- Should be grammatically correct and free of jargon and abbreviations (unless they are the users)
- Avoid negatives and humor
## Types of Messages

<table>
<thead>
<tr>
<th>Types of Messages</th>
<th>When Would You Use Each of These Message Types?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Error message</td>
<td></td>
</tr>
<tr>
<td>Confirmation message</td>
<td></td>
</tr>
<tr>
<td>Acknowledgment message</td>
<td></td>
</tr>
<tr>
<td>Delay message</td>
<td></td>
</tr>
<tr>
<td>Help message</td>
<td></td>
</tr>
</tbody>
</table>

When Would You Use Each of These Message Types?
Your Turn

- Pretend that you are designing the new interface to a career services system at your university.
- How would you incorporate the basic principles of input design into your interface design?
INPUT DESIGN
Basic Principles of Input Design

- The goal is to simply and easily capture accurate information for the system
- Reflect the nature of the inputs
- Find ways to simplify their collection
Online versus Batch Processing

- **Online processing** immediately records the transaction in the appropriate database.
- **Batch processing** collects inputs over time and enters them into the system at one time in a batch.
- **Batch processing** simplifies data communications and other processes, master files are not updated real-time.
Capture Data at the Source

- Reduces duplicate work.
- Reduces processing time.
- Decreases cost.
- Decreases probability of error.
Source Data Automation

Can be obtained by using the following technologies:
- bar code readers
- optical character recognition
- magnetic stripe readers
- smart cards

*How can internet be used for source data automation?*
Minimize Keystrokes

- Never ask for information that can be obtained other ways
  - Lookups
  - Dropdown lists
  - Default values
Types of Inputs

- Data items linked to fields
- Text
- Numbers
- Selection boxes
Types of Input Forms

Sample Input Form

Name:

What is your major:
(Check one only)
- MIS
- Accounting
- Marketing
- Computer Science
- Management

What software do you feel comfortable using:
(Check all that apply)
- Word
- WordPerfect
- Excel
- Lotus 1-2-3
- Access

Select where you were born:

Hair Color:
- Brown
- Blonde
- Black
- Red

Interest Score

0 50 100
## Types of Selection Boxes

<table>
<thead>
<tr>
<th>Types of Boxes</th>
<th>When Would You Use Each of These Box Types?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check box</td>
<td></td>
</tr>
<tr>
<td>Radio button</td>
<td></td>
</tr>
<tr>
<td>On-screen list box</td>
<td></td>
</tr>
<tr>
<td>Drop-down list box</td>
<td></td>
</tr>
<tr>
<td>Combo box</td>
<td></td>
</tr>
<tr>
<td>Slider</td>
<td></td>
</tr>
</tbody>
</table>
# Types of Input Validation

<table>
<thead>
<tr>
<th>Types of Validation</th>
<th>When Would You Use Each of These Validation Methods?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completeness check</td>
<td></td>
</tr>
<tr>
<td>Format check</td>
<td></td>
</tr>
<tr>
<td>Range check</td>
<td></td>
</tr>
<tr>
<td>Check digit check</td>
<td></td>
</tr>
<tr>
<td>Consistency check</td>
<td></td>
</tr>
<tr>
<td>Database checks</td>
<td></td>
</tr>
</tbody>
</table>
OUTPUT DESIGN
Basic Principles

- Understand report usage
  - Reference or cover-to-cover?
  - Frequency?
  - Real-time or batch reports?
- Manage information load
  - All needed information, no more
- Minimize bias
Bias in Graphs

(a) Unbiased Graph with scale starting at 0

(b) Biased Graph with scale starting at 90
## Types of Reports

<table>
<thead>
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<tbody>
<tr>
<td>Detail reports</td>
<td></td>
</tr>
<tr>
<td>Summary report</td>
<td></td>
</tr>
<tr>
<td>Turnaround document</td>
<td></td>
</tr>
<tr>
<td>Graphs</td>
<td></td>
</tr>
</tbody>
</table>
Report Media

Electronic

Versus Paper
Summary

- The fundamental goal of navigation design is to make the system as simple to use as possible.
- The goal of input mechanism is to simply and easily capture accurate information.
- The goal of the output mechanism is to provide accurate information to users that minimize information overload and bias.