Chapter 11
Designing Interfaces and Dialogues
Learning Objectives

✓ Explain the process of designing interfaces and dialogues and the deliverables for their creation.
✓ Contrast and apply several methods for interacting with a system.
✓ List and describe various input devices and discuss usability issues for each in relation to performing different tasks.
✓ Describe and apply the general guidelines for designing interfaces and specific guidelines for layout design, structuring data entry fields, providing feedback, and system help.
Learning Objectives (Cont.)

✓ Design human-computer dialogues and understand how dialogue diagramming can be used to design dialogues.
✓ Design graphical user interfaces.
✓ Discuss guidelines for the design of interfaces and dialogues for Internet-based electronic commerce systems.
Designing Interfaces and Dialogues

- User-focused activity

- Prototyping methodology of iteratively:
  - Collecting information
  - Constructing a prototype
  - Assessing usability
  - Making refinements

- Must answer the who, what, where, and how questions
Designing Interfaces and Dialogues (Cont.)

FIGURE 11-1
Systems development life cycle (SDLC)
Deliverables and Outcomes

Creation of a design specification

- A typical interface/dialogue design specification is similar to form design, but includes multiple forms and dialogue sequence specifications.
Deliverables and Outcomes (Cont.)

- The specification includes:
  - Narrative overview
  - Sample design
  - Testing and usability assessment
  - Dialogue sequence

- *Dialogue sequence*—the ways a user can move from one display to another
### Design Specification

1. **Narrative Overview**  
   a. Interface/Dialogue Name  
   b. User Characteristics  
   c. Task Characteristics  
   d. System Characteristics  
   e. Environmental Characteristics

2. **Interface/Dialogue Designs**  
   a. Form/Report Designs  
   b. Dialogue Sequence Diagram(s) and Narrative Description

3. **Testing and Usability Assessment**  
   a. Testing Objectives  
   b. Testing Procedures  
   c. Testing Results  
      i) Time to Learn  
      ii) Speed of Performance  
      iii) Rate of Errors  
      iv) Retention over Time  
      v) User Satisfaction and Other Perceptions

**Figure 11-2**  
Specification outline for the design of interfaces and dialogues
Interaction Methods and Devices

- **Interface**: a method by which users interact with an information system

- All human-computer interfaces must:
  - have an interaction style, and
  - use some hardware device(s) for supporting this interaction.
Methods of Interacting

- Command line
  - Includes keyboard shortcuts and function keys
- Menu
- Form
- Object-based
- Natural language
Command Language Interaction

- **Command language interaction**: a human-computer interaction method whereby users enter explicit statements into a system to invoke operations.

- Example from MS DOS:
  - COPY C:PAPER.DOC A:PAPER.DOC
  - Command copies a file from C: drive to A: drive
Menu Interaction

- **Menu interaction**: a human-computer interaction method in which a list of system options is provided and a specific command is invoked by user selection of a menu option.

- **Pop-up menu**: a menu-positioning method that places a menu near the current cursor position.
Menu Interaction (Cont.)

- **Drop-down menu** is a menu-positioning method that places the access point of the menu near the top line of the display.
  - When accessed, menus open by dropping down onto the display.
  - Visual editing tools help designers construct menus.
Figure 11-5
Various types of menu configurations
(Source: Based on Shneiderman et al., 2009.)
Menu Interaction (Cont.)

Guidelines for Menu Design

- **Wording** — meaningful titles, clear command verbs, mixed upper/lower case
- **Organization** — consistent organizing principle
- **Length** — all choices fit within screen length
- **Selection** — consistent, clear and easy selection methods
- **Highlighting** — only for selected options or unavailable options
Menu Interaction (Cont.)

FIGURE 11-8
Menu building with Microsoft Visual Basic .NET
Form Interaction

Form interaction: a highly intuitive human-computer interaction method whereby data fields are formatted in a manner similar to paper-based forms.

- Allows users to fill in the blanks when working with a system.
Form Interaction (Cont.)

FIGURE 11-9
Example of form interaction from the Google Advanced Search Engine (Source: Google.)
Object-Based Interaction

- **Object-based interaction**: a human-computer interaction method in which symbols are used to represent commands or functions

- **Icons**: graphical pictures that represent specific functions within a system
  - Use little screen space and are easily understood by users
Object-Based Interaction (Cont.)

Figure 11-10
Object-based (icon) interface from the Option menu in the Firefox Web browser
Natural Language Interaction

- **Natural language interaction**: a human-computer interaction method whereby inputs to and outputs from a computer-based application are in a conventional spoken language such as English.

- Based on research in artificial intelligence.

- Current implementations are tedious and difficult to work with, not as viable as other interaction methods.
Hardware Options for System Interaction

- Keyboard
- Mouse
- Joystick
- Trackball
- Touch screen
- Light Pen
- Graphics Tablet
- Voice
Usability Problems with Hardware Devices

- **Visual Blocking**
  - Extent to which device blocks display when using

- **User Fatigue**
  - Potential for fatigue over long use

- **Movement Scaling**
  - Extent to which device movement translates to equivalent screen movement

- **Durability**
  - Lack of durability or need for maintenance (e.g., cleaning) over extended use
Usability Problems with Hardware Devices (Cont.)

- Adequate Feedback
  - Extent to which device provides adequate feedback for each operation

- Speed
  - Cursor movement speed

- Pointing Accuracy
  - Ability to precisely direct cursor

(Source: Based on Blattner and Schultz, 1988.)
Usability Problems with Hardware Devices (Cont.)

### TABLE 11-3 Summary of Interaction Device Usability Problems

<table>
<thead>
<tr>
<th>Device</th>
<th>Visual Blocking</th>
<th>User Fatigue</th>
<th>Movement Scaling</th>
<th>Durability</th>
<th>Adequate Feedback</th>
<th>Speed</th>
<th>Pointing Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keyboard</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
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<tr>
<td>Mouse</td>
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<td>□</td>
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<td>□</td>
<td>□</td>
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<tr>
<td>Joystick</td>
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<td>□</td>
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<td>□</td>
<td>□</td>
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<tr>
<td>Trackball</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Touch Screen</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Light Pen</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Graphics Tablet</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Voice</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>

**Key:**

- □ = little or no usability problems
- ■ = potentially high usability problems for some applications
## Usability Problems with Hardware Devices (Cont.)

### TABLE 11-4 Summary of General Conclusions from Experimental Comparisons of Input Devices in Relation to Specific Task Activities

<table>
<thead>
<tr>
<th>Task</th>
<th>Most Accurate</th>
<th>Shortest Positioning</th>
<th>Most Preferred</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target Selection</td>
<td>trackball, graphics tablet, mouse, joystick</td>
<td>touch screen, light pen, mouse, graphics tablet, trackball</td>
<td>touch screen, light pen</td>
</tr>
<tr>
<td>Text Selection</td>
<td>mouse</td>
<td>mouse</td>
<td>—</td>
</tr>
<tr>
<td>Data Entry</td>
<td>light pen</td>
<td>light pen</td>
<td>—</td>
</tr>
<tr>
<td>Cursor Positioning</td>
<td>—</td>
<td>light pen</td>
<td>—</td>
</tr>
<tr>
<td>Text Correction</td>
<td>light pen, cursor keys</td>
<td>light pen</td>
<td>light pen</td>
</tr>
<tr>
<td>Menu Selection</td>
<td>touch screen</td>
<td>—</td>
<td>keyboard, touch screen</td>
</tr>
</tbody>
</table>

Key:
- Target Selection = moving the cursor to select a figure or item
- Text Selection = moving the cursor to select a block of text
- Data Entry = entering information of any type into a system
- Cursor Positioning = moving the cursor to a specific position
- Text Correction = moving the cursor to a location to make a text correction
- Menu Selection = activating a menu item
- — = no clear conclusion from the research

(Source: Based on Blattner and Schultz, 1988.)
Designing Interfaces

Forms have several general areas in common:

- Header information
- Sequence and time-related information
- Instruction or formatting information
- Body or data details
- Totals or data summary
- Authorization or signatures
- Comments
Figure 11-11
Paper-based form for reporting customer sales activity (Pine Valley Furniture)
Designing Interfaces (Cont.)

- Use standard formats similar to paper-based forms and reports.
- Use left-to-right, top-to-bottom navigation.
Designing Interfaces (Cont.)

- Flexibility and consistency:
  - Free movement between fields
  - No permanent data storage until the user requests
  - Each key and command assigned to one function
# Structuring Data Entry

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry</td>
<td>Never require data that are already online or that can be computed</td>
</tr>
<tr>
<td>Defaults</td>
<td>Always provide default values when appropriate</td>
</tr>
<tr>
<td>Units</td>
<td>Make clear the type of data units requested for entry</td>
</tr>
<tr>
<td>Replacement</td>
<td>Use character replacement when appropriate</td>
</tr>
<tr>
<td>Captioning</td>
<td>Always place a caption adjacent to fields</td>
</tr>
<tr>
<td>Format</td>
<td>Provide formatting examples</td>
</tr>
<tr>
<td>Justify</td>
<td>Automatically justify data entries</td>
</tr>
<tr>
<td>Help</td>
<td>Provide context-sensitive help when appropriate</td>
</tr>
</tbody>
</table>
Controlling Data Input

Objective: Reduce data entry errors

Common sources of data entry errors in a field:

-Appending: adding additional characters
-Trimming: losing characters
-Transcribing: entering invalid data
-Transposing: reversing sequence of characters
<table>
<thead>
<tr>
<th>Validation Test</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class or Composition</td>
<td>Test to ensure that data are of proper type (e.g., all numeric, all alphabetic, all alphanumerical)</td>
</tr>
<tr>
<td>Combinations</td>
<td>Test to see if the value combinations of two or more data fields are appropriate or make sense (e.g., does the quantity sold make sense given the type of product?)</td>
</tr>
<tr>
<td>Expected Values</td>
<td>Test to see if data are what is expected (e.g., match with existing customer names, payment amount, etc.)</td>
</tr>
<tr>
<td>Missing Data</td>
<td>Test for existence of data items in all fields of a record (e.g., is there a quantity field on each line item of a customer order?)</td>
</tr>
<tr>
<td>Pictures/Templates</td>
<td>Test to ensure that data conform to a standard format (e.g., are hyphens in the right places for a student ID number?)</td>
</tr>
<tr>
<td>Range</td>
<td>Test to ensure data are within proper range of values (e.g., is a student’s grade point average between 0 and 4.0?)</td>
</tr>
<tr>
<td>Reasonableness</td>
<td>Test to ensure data are reasonable for situation (e.g., pay rate for a specific type of employee)</td>
</tr>
<tr>
<td>Self-Checking Digits</td>
<td>Test where an extra digit is added to a numeric field in which its value is derived using a standard formula (see Figure 11-14)</td>
</tr>
<tr>
<td>Size</td>
<td>Test for too few or too many characters (e.g., is social security number exactly nine digits?)</td>
</tr>
<tr>
<td>Values</td>
<td>Test to make sure values come from set of standard values (e.g., two-letter state codes)</td>
</tr>
</tbody>
</table>
Providing Feedback

Three types of system feedback:

- **Status information**: keep user informed of what’s going on, helpful when user has to wait for response
- **Prompting cues**: tell user when input is needed, and how to provide the input
- **Error or warning messages**: inform user that something is wrong, either with data entry or system operation
Providing Help

- Place yourself in user’s place when designing help.

Guidelines for designing usable help:

- **Simplicity** — Help messages should be short and to the point.

- **Organize** — Information in help messages should be easily absorbed by users.

- **Show** — It is useful to explicitly show users how to perform an operation.
# Types of Help

<table>
<thead>
<tr>
<th>Type of Help</th>
<th>Example of Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>Help on Help</td>
<td>How do I get help?</td>
</tr>
<tr>
<td>Help on Concepts</td>
<td>What is a customer record?</td>
</tr>
<tr>
<td>Help on Procedures</td>
<td>How do I update a record?</td>
</tr>
<tr>
<td>Help on Messages</td>
<td>What does “Invalid File Name” mean?</td>
</tr>
<tr>
<td>Help on Menus</td>
<td>What does “Graphics” mean?</td>
</tr>
<tr>
<td>Help on Function Keys</td>
<td>What does each Function key do?</td>
</tr>
<tr>
<td>Help on Commands</td>
<td>How do I use the “Cut” and “Paste” commands?</td>
</tr>
<tr>
<td>Help on Words</td>
<td>What do “Merge” and “Sort” mean?</td>
</tr>
</tbody>
</table>

Designing Dialogues

- **Dialogue**: the sequence of interaction between a user and a system

- Dialogue design involves:
  - Designing a dialogue sequence.
  - Building a prototype.
  - Assessing usability.
Designing the Dialogue Sequence

- Typical dialogue between user and Customer Information System:
  - Request to view individual customer information.
  - Specify the customer of interest.
  - Select the year-to-date transaction summary display.
  - Review the customer information.
  - Leave system.
Guidelines for Designing Human-Computer Dialogues

- Consistency
- Shortcuts and Sequence
- Feedback
- Closure

- Error Handling
- Reversal
- Control
- Ease
Designing the Dialogue Sequence (Cont.)

Dialogue diagramming: a formal method for designing and representing human-computer dialogues using box and line diagrams
Designing the Dialogue Sequence (Cont.)

- Three sections of the box:
  - *Top*—contains a unique display reference number used by other displays for referencing it
  - *Middle*—contains the name or description of the display
  - *Bottom*—contains display reference numbers that can be accessed from the current display
Designing the Dialogue Sequence (Cont.)

FIGURE 11-17
Sections of a dialogue diagramming box
Designing the Dialogue Sequence (Cont.)

- Dialogue diagrams depict the sequence, conditional branching, and repetition of dialogues.
Designing the Dialogue Sequence (Cont.)

FIGURE 11-18
Dialogue diagram illustrating sequence, selection, and iteration
Building Prototypes and Assessing Usability

- Optional activities

- Building prototype displays using a graphical development environment
  - Example: Microsoft’s Visual Studio .NET
  - Easy-to-use input and output (form, report, or window) design utilities
Graphical Interface Design

Issues

- Become an expert user of the GUI environment.
  - Understand how other applications have been designed.
  - Understand standards.

- Understand the available resources and how they can be used.
  - Become familiar with standards for menus and forms.
Graphical Interface Design Issues (Cont.)

Figure 11-20
Highlighting GUI design standards
(Source: University of Arizona.)

- File menu item is always first item (if present)
- Edit menu item is always second item (if present)
- Help menu item is always last item (if present)

Solid circle shows that an item is selected or mode is turned on
Ellipses (…) show that a pop-up menu will appear if selected
Right arrow ( ) shows that an item leads to a submenu
No checkmarks indicate that a command will be executed if selected
Central and critical design activity
Where customer interacts with the company
  Care must be put in design!
Prototyping design process is most appropriate to design the human interface.
Several general design guidelines have emerged.
General Guidelines

- Web’s single “click-to-act” method of loading static hypertext documents (i.e. most buttons on the Web do not provide click feedback)
- Limited capabilities of most Web browsers to support finely grained user interactivity
General Guidelines

- Limited agreed-upon standards for encoding Web content and control mechanisms
- Lack of maturity of Web scripting and programming languages as well as limitations in commonly used Web GUI component libraries
Designing Interfaces and Dialogues for Pine Valley Furniture

Key feature PVF wants for their WebStore:

- Incorporate “menu-driven navigation with cookie crumbs” into design of interface
Menu-Driven Navigation with Cookie Crumbs

- **Cookie crumbs**: the technique of placing “tabs” on a Web page that show a user where he or she is on a site and where he or she has been
  - Allow users to navigate to a point previously visited and will assure they are not lost
  - Clearly show users where they have been and how far they have gone from home
Common Errors in Web site Design

- Opening new browser window
- Breaking or slowing down the Back button
- Complex URLs
- Orphan Pages
- Scrolling navigation pages
- Lack of navigation support
- Hidden links
- Links that don’t provide enough information
- Buttons that provide no click feedback
Summary

In this chapter you learned how to:

✓ Explain the process of designing interfaces and dialogues and the deliverables for their creation.
✓ Contrast and apply several methods for interacting with a system.
✓ List and describe various input devices and discuss usability issues for each in relation to performing different tasks.
✓ Describe and apply the general guidelines for designing interfaces and specific guidelines for layout design, structuring data entry fields, providing feedback, and system help.
Summary (Cont.)

- Design human-computer dialogues and understand how dialogue diagramming can be used to design dialogues.
- Design graphical user interfaces.
- Discuss guidelines for the design of interfaces and dialogues for Internet-based electronic commerce systems.
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