Learning Objectives

◆ Describe the difference between user interfaces and system interfaces

◆ Explain why the user interface is the system to the users

◆ Discuss the importance of the three principles of user-centered design

◆ Describe the historical development of the field of human-computer interaction (HCI)
Learning Objectives (continued)

- Describe the three metaphors of human-computer interaction
- Discuss how visibility and affordance affect usability
- Apply the eight golden rules of dialog design when designing the user interface
- Define the overall system structure as a menu hierarchy
Learning Objectives (continued)

- Write user-computer interaction scenarios as dialogs
- Create storyboards to show the sequence of forms used in a dialog
- Use UML class diagrams and sequence diagrams to document dialog designs
- Design windows forms and browser forms that are used to implement a dialog
- List the key principles used in Web design
Overview

- User interfaces handle input and output that involve a user directly
- Focus on interaction between user and computer called human-computer interaction (HCI)
- Metaphors to describe the user interface
- Usability and Web-based development guidelines
- Approaches to documenting dialog designs, including UML diagrams from OO approach
Identifying and Classifying Inputs and Outputs

- Identified by analyst when defining system scope
- Requirements model produced during analysis
  - Event table includes trigger to each external event
  - Triggers represent inputs
  - Outputs are shown as responses to events
Traditional and OO Approaches to Inputs and Outputs

- **Traditional approach to inputs and outputs**
  - Shown as data flows on context diagram, data flow diagram (DFD) fragments, and detailed DFDs

- **OO approach to inputs and outputs**
  - Defined by message entering or leaving system
  - Documented in system sequence diagram (SSD)
  - Actors provide inputs for many use cases
  - Use cases provide outputs to actors
User versus System Interface

- **System interfaces** – I/O requiring minimal human interaction

- **User interfaces**
  - I/O requiring human interaction
  - User interface is everything end user comes into contact with while using the system
  - To the user, the interface *is* the system

- Analyst designs system interfaces separate from user interfaces

- Requires different expertise and technology
Understanding the User Interface

- Physical aspects of the user interface
  - Devices touched by user, manuals, documentation, and forms

- Perceptual aspects of the user interface
  - Everything else user sees, hears, or touches such as screen objects, menus, and buttons

- Conceptual aspects of the user interface
  - What user knows about system and logical function of system
Aspects of the User Interface

Figure 13-1
Physical, perceptual, and conceptual aspects of the user interface

Desk, chair, light, keyboard, mouse, touch screen, keypad, manuals, printed documents, paper forms.

Windows, menus, dialog boxes, buttons, lines, shapes, textures, colors, fonts, sounds, speech.

Customers, products, orders, catalogs, adding, deleting, updating, printing, select-click-drag-dropp, double-click-escape-click-click.
User-Centered Design

- Focus early on the users and their work by focusing on requirements
- **Usability** - system is easy to learn and use
- Iterative development keeps focus on user
  - Continually return to user requirements and evaluate system after each iteration
- **Human-computer interaction (HCI)**
  - Study of end users and interaction with computers
- **Human factors engineering (ergonomics)**
Fields Contributing to the Study of HCI

Figure 13-2
The fields contributing to the study of HCI

- Sociology
- Cognitive psychology
- Social psychology
- Linguistics
- Media
- Human-computer interaction (HCI)
- Anthropology
- Graphic art
- Physiology
- Engineering
- Computer science
Metaphors for Human-Computer Interaction

- **Direct manipulation metaphor**
  - User interacts with objects on display screen

- **Document metaphor**
  - Computer is involved with browsing and entering data in electronic documents
  - WWW, hypertext, and hypermedia

- **Dialog metaphor**
  - Much like carrying on a conversation
Desktop Metaphor Based on Direct Manipulation Shown on Display Screen

Figure 13-3
The desktop metaphor based on direct manipulation, shown on a double-wide display screen.
Document Metaphor Shown as Hypermedia in Web Browsers
Dialog Metaphor Expresses the Messaging Concept

Figure 13-5
The dialog metaphor expresses the concept that the user and computer interact by sending messages.

- I am ready to work now.
- Okay, which task do you want to complete?
- I want to check for messages.
- It looks like you have these three messages...
Guidelines for Designing User Interfaces

- **Visibility**
  - All controls should be visible
  - Provide immediate feedback to indicate control is responding

- **Affordance**
  - Appearance of control should suggest its functionality – purpose for which it is used

- System developers should use published interface design standards and guidelines
Eight Golden Rules for Interactive Interface Design

1. Strive for Consistency
2. Enable Frequent Users to Use Shortcuts
3. Offer Informative Feedback
4. Design Dialogs to Yield Closure
5. Offer Simple Error Handling
6. Permit Easy Reversal of Actions
7. Support Internal Locus of Control
8. Reduce Short-Term Memory Load
Documenting Dialog Designs

- Done simultaneously with other system activities

- Based on inputs and outputs requiring user interaction

- Used to define menu hierarchy
  - Allows user to navigate to each dialog
  - Provides overall system structure

- Storyboards, prototypes, and UML diagrams
Overall Menu Hierarchy Design:

Each Use Case Is Listed Under a Menu

Utilities, Preferences, and Help Are Added
Dialogs and Storyboards

- Many methods exist for documenting dialogs
  - Written descriptions following flow of activities like in use case description
  - Narratives
  - Sketches of screens
  - **Storyboarding** – showing sequence of sketches of display screen during a dialog
Storyboard for the Downtown Videos Rent Videos Dialog

(Figure 13-9)
Dialog Documentation with UML Diagrams

- **OO approach provides UML diagrams**
- **Use case descriptions**
  - List of steps followed as system and user interact
- **Activity diagrams**
  - Document dialog between user and computer for a use case
- **System sequence diagrams (SSD)**
  - Actor (a user) sends messages to system
  - System returns information in form of messages
Sequence Diagram for the RMO

Look Up Item Availability dialog (Figure 13-10)
Class Diagram Showing Interface Classes Making up ProductQueryForm
Sequence Diagram Showing Specific Interface Objects (Figure 13-12)
Guidelines for Designing Windows and Browser Forms

- Each dialog might require several windows forms
- Standard forms are widely available
  - Windows: Visual Basic, C++, C#, Java
  - Browser: HTML, VBScript, JavaScript, ASP, Java servlets

- Implementation
  - Identify objectives of form and associated data fields
  - Construct form with prototyping tools
Form Design Issues

- Form layout and formatting consistency
  - Headings, labels, logos
  - Font sizes, highlighting, colors
  - Order of data-entry fields and buttons

- Data keying and data entry (use standard control)
  - Text boxes, list boxes, combo boxes, and so on

- Navigation and support controls

- Help support – tutorials, indexes, context-sensitive
Guidelines for Designing Web Sites

- Draw from guidelines and rules for designing windows forms and browser forms

- Web site uses
  - Corporate communication
  - Customer information and service
  - Sales, distribution, and marketing

- Must work seamlessly with customers 24/7
Ten Good Deeds in Web Design

◆ Place organization’s name and logo on every page and link to the homepage
◆ Provide a search function
◆ Use straightforward headlines and page titles so it is clear what page contains
◆ Structure page to help readers scan it
◆ Use hypertext to organize information into separate pages
Ten Good Deeds in Web Design (Continued)

- Use product photos (preferably thumbnails), but avoid cluttered and bloated pages that load slowly
- Use relevance-enhanced image reduction; zoom in on needed detail
- Use link titles to provide users with a preview of where link will take them
- Ensure that pages are accessible by users with disabilities
- Do the same thing as everybody else because users come to expect certain features
Design for RMO Phone-Order Dialog

- Steps in dialog models
  1. Record customer information
  2. Create new order
  3. Record transaction details
  4. Produce order confirmation

- Traditional approach – use structure charts
- OO approach – expand SSD to include forms
Required Forms for RMO

- Main menu
- Customer
- Item search
- Product detail
- Order summary
- Shipping and payment options
- Order confirmation
Design Concept for Sequential Approach to *Create New Order* Dialog

**Figure 13-15**
A design concept for the sequential approach to the *Create new order* dialog
Design Concept for Order-Centered Approach to *Create New Order* Dialog

**Figure 13-16**
A design concept for an order-centered approach to the *Create new order* dialog.
Prototype Main Menu Form for Order-Centered Approach to Dialog (Figure 13-17a)
Order Summary and Product Detail Forms (Figures 13-17b and 13-17c)
Completed Order Summary and Shipping Payment Forms (Figures 13-17d and 13-17e)

Figure 13-17 cont.
(d) The Order Summary form after the user adds the product

(e) The Shipping and Payment Option form for the completed order
Dialog Design for RMO Web Site

- Basic dialog between user and customer similar to phone-order representative
- Web site will provide more information for user, be more flexible, and be easier to use
- More product pictures are needed
- Information needs are different for customer than for phone-order employees
- Guidelines for visibility and affordance are used to convey positive company image
Figure 13-18

Rocky Mountain Outfitters’ home page

RMO’s Home Page
Figure 13-19
The Product Detail page from the Rocky Mountain Outfitters' Web site
Figure 13-20
The shopping cart page from Rocky Mountain Outfitters’ Web site
Summary

◆ User interface is everything user comes into contact with while using the system
  ● Physically, perceptually, and conceptually

◆ To some users, user interface is the system

◆ User-centered design means
  ● Focusing early on users and their work
  ● Evaluating designs to ensure usability
  ● Applying iterative development
User interface is described with metaphors (desktop, document, dialog)

Interface design guidelines and standards are available from many sources

Dialog design starts with use cases and adds dialogs for integrity controls, user preferences, help

OO approach provides UML models to document dialog designs, including sequence diagrams, activity diagrams, and class diagrams