Systems Analysis and Design 11th Edition

Chapter 8
User Interface Design

Chapter Objectives

- Explain the concept of user interface design and human-computer interaction, including basic principles of user-centered design
- Explain how experienced interface designers perform their tasks
- Describe rules for successful interface design
- Discuss input and output technology issues

Chapter Objectives (Cont.)

- Design effective source documents and forms
- Explain printed output guidelines
- Describe output and input controls and security
- Explain modular design and prototyping techniques

Systems Design Phase Overview

- Goal of **systems design** – To build a system that is effective, reliable, and maintainable
  - A system is:
    - Effective if it supports business requirements and meets user needs
    - Reliable if it handles input errors, processing errors, hardware failures, or human mistakes
    - Maintainable if it is flexible, scalable, and easily modified

Systems Design Phase Overview (Cont.)

- **Will It Succeed?**
  - Suggestions for successful design
    - Think like a user
      - Carefully examine any point where users provide input or receive output
    - Anticipate future needs and provide flexibility
      - Anticipate possible expansion
      - Offer several alternatives
    - Manage data effectively
      - System should enter and verify data as soon as possible
      - Input data must be close to its source
      - A secure system must include **audit trails**

Chapter Overview

- Users can design their own output
  - System designers are more aware of user needs and desires
- Centralized IT departments no longer produce reams of printed reports
  - Customer-designed output is the current trend
- The user interface has evolved
  - Most user information needs can be met with screen-generated data
  - Continues to evolve with the use of mobile and wearable devices

What Is a User Interface?

- Describes how users interact with a computer system
  - Comprises features that affect two-way communications between the user and the computer
- Central to **usability**
  - In a **user-centered** system, the distinction blurs between input, output, and the interface itself

FIGURE 8-2 Apple has long been a leader in creating elegant user interfaces for its products.
Source: Apple

What Is a User Interface? (Cont.)

- **Human-Computer Interaction (HCI)**
  - Describes the relationship between computers and people who use them to perform their jobs
  - Early user interfaces – Complex commands and **graphical user interface (GUI)**
  - **Transparent user interface**: Does not distract the user
  - Objective – To create a user-friendly design that is easy to learn and use

Figure 8-3 HCI is essential to employee productivity, whether the work is done in a traditional office setting or on a construction site like the one shown in this figure.
Goodluz/Shutterstock.com

Seven Habits of Successful Interface Designers

- **Understand the Business**
  - The interface designer must understand:
    - The underlying business functions
    - How the system supports individual, departmental, and enterprise goals
- **Maximize Graphical Effectiveness**
  - A well-designed interface enables rapid learning
- **Think Like a User**
  - The designer must see the system from a user's perspective

Seven Habits of Successful Interface Designers (Cont. 1)

- **Use Models and Prototypes**
  - Designers can present initial screen designs to users in the form of a **storyboard**
    - Users should test the design and provide feedback
- **Focus on Usability**
  - Include main options in the opening screen
  - Offer a reasonable number of choices that a user easily can comprehend

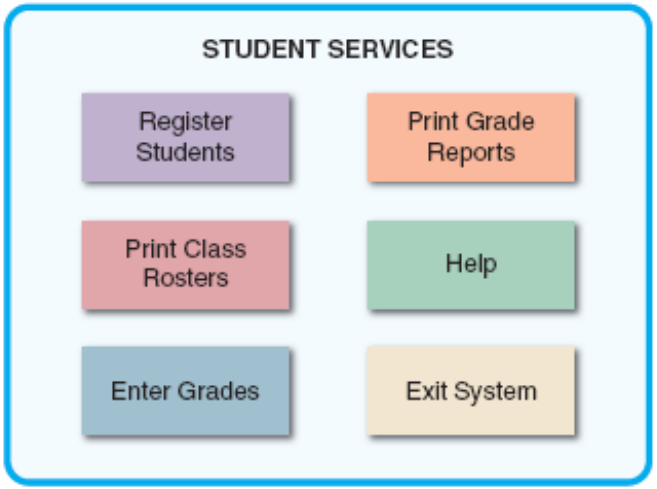


FIGURE 8-5 The opening screen displays the main options for a student registration system. A user can click an option to see lower-level actions and menu choices.

Seven Habits of Successful Interface Designers (Cont. 2)

- **Invite Feedback**
  - Monitor system usage and solicit user suggestions
  - Determine if system features are being used as intended by observing and surveying users
- **Document Everything**
  - Document all screen designs for later use by programmers
  - User-approved sketches and storyboards can be used to document the user interface

Guidelines for User Interface Design

- **Create an Interface That Is Easy to Learn and Use**
  - Focus on system design objectives
  - Create a design that is easy to understand and remember
  - Provide commands, actions, and system responses that are consistent and predictable
  - Allow users to correct errors easily
  - Clearly label all controls, buttons, and icons

Guidelines for User Interface Design (Cont. 1)

- **Create an Interface That Is Easy to Learn and Use (Cont.)**
  - Select familiar images that users can understand
    - Provide on-screen instructions that are logical, concise, and clear
  - Show all commands in a list of menu items
    - Dim any commands that are not available to the user
  - Make it easy to navigate or return to any level in the menu structure

Guidelines for User Interface Design (Cont. 2)

- **Enhance User Productivity**
  - Organize tasks, commands, and functions in groups that resemble actual business operations
  - Create alphabetical menu lists or place the selections used frequently at the top of the menu list
  - Provide shortcuts for experienced users
  - Use default values if the majority of values in a field are the same
  - Use a duplicate value function, but allow users to turn this feature on or off as they prefer

Guidelines for User Interface Design (Cont. 3)

- **Enhance User Productivity** (Cont.)
  - Provide a fast-find feature
  - If available, consider a **natural language** feature that allows users to type commands or requests in normal text phrases
- **Provide Users with Help and Feedback**
  - Ensure that help is always available on demand
  - Provide user-selected help and context-sensitive help
  - Provide a direct route for users to return to the point from where help was requested
  - Include contact information

Guidelines for User Interface Design (Cont. 4)

- **Provide Users with Help and Feedback (Cont.)**
  - Require user confirmation before data deletion
  - Provide an "Undo" key
  - When a user-entered command contains an error, highlight the erroneous part
  - Use hypertext links to assist users
  - Display messages at a logical place on the screen
  - Alert users to lengthy processing times or delays
  - Allow messages to remain on the screen long enough for users to read them
  - Let the user know whether the task or operation was successful or not

Guidelines for User Interface Design (Cont. 5)

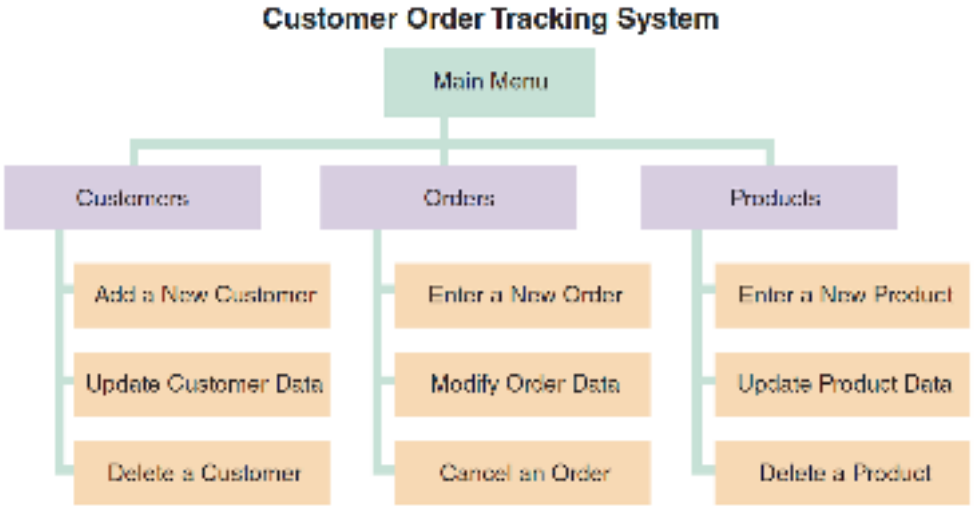


Figure 8-7 This menu hierarchy shows tasks, commands, and functions organized into logical groups and sequences. The structure resembles a functional decomposition diagram (FDD), which is a model of business functions and processes.

Figure 8-8 The main Help screen for a student registration system.

Guidelines for User Interface Design (Cont. 6)

- **Provide Users with Help and Feedback (Cont.)**
  - Provide a text explanation for an icon or image on a control button
  - Use messages that are specific, understandable, and professional
- **Create an Attractive Layout and Design**
  - Use appropriate colors to highlight different areas of the screen
  - Use special effects sparingly
  - Use hyperlinks that allow users to navigate to related topics
  - Group related objects and information

Guidelines for User Interface Design (Cont. 7)

- **Create an Attractive Layout and Design (Cont.)**
  - Display titles, messages, and instructions in a consistent manner
  - Ensure that commands and similar mouse actions will have the same effect
  - Require the user to confirm the entry by pressing Enter or Tab
  - Remember that users are accustomed to a pattern of red = stop, yellow = caution, and green = go
  - Provide a keystroke alternative for each menu command
  - Avoid complex terms and technical jargon

Guidelines for User Interface Design (Cont. 8)

- **Enhance the Interface**
  - Opening screen is important as it introduces the application
    - The starting point can be a **switchboard** with well-placed command buttons for navigation
  - Use a **command button** to initiate an action
  - Try to create customized **menu bars** and toolbars
  - Add a shortcut feature that lets a user select a **menu command**
  - If variable input data is needed, provide a **dialog box** that explains what is required

Guidelines for User Interface Design (Cont. 9)

- **Enhance the Interface** (Cont.)
  - A **toggle button** makes it easy to show on or off status
  - Use **list boxes** that display the available choices
  - Use an **option button**, or a **radio button**, to control user choices
  - If **check boxes** are used to select one or more choices from a group, show the choices with a checkmark or an X
  - When dates must be entered, use a **calendar control**

Guidelines for User Interface Design (Cont. 10)

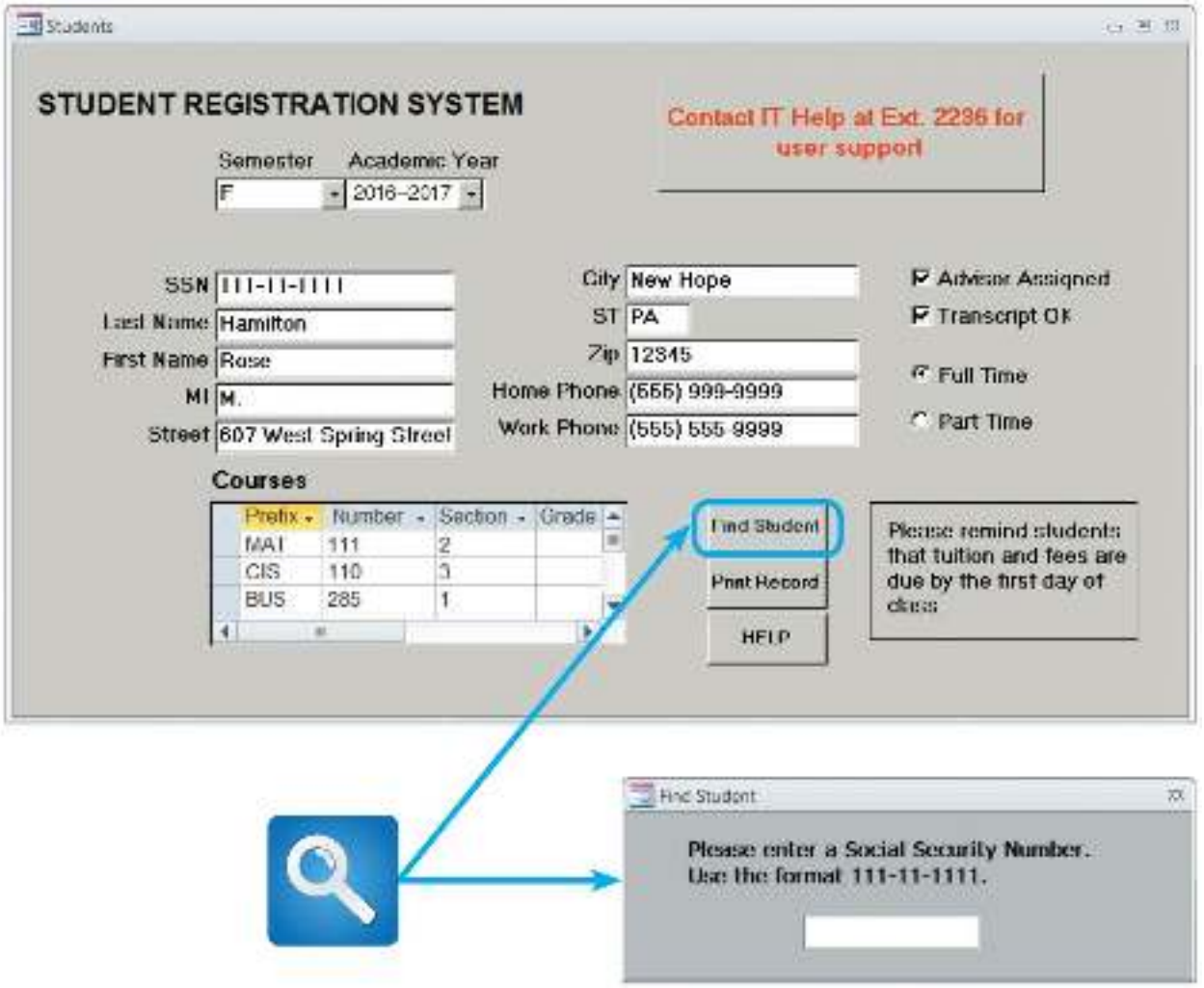


FIGURE 8-10 A data entry screen for the student registration system. This screen uses several design features that are described in the text. When a user clicks the Find Student command button, a dialog box is displayed with instructions.

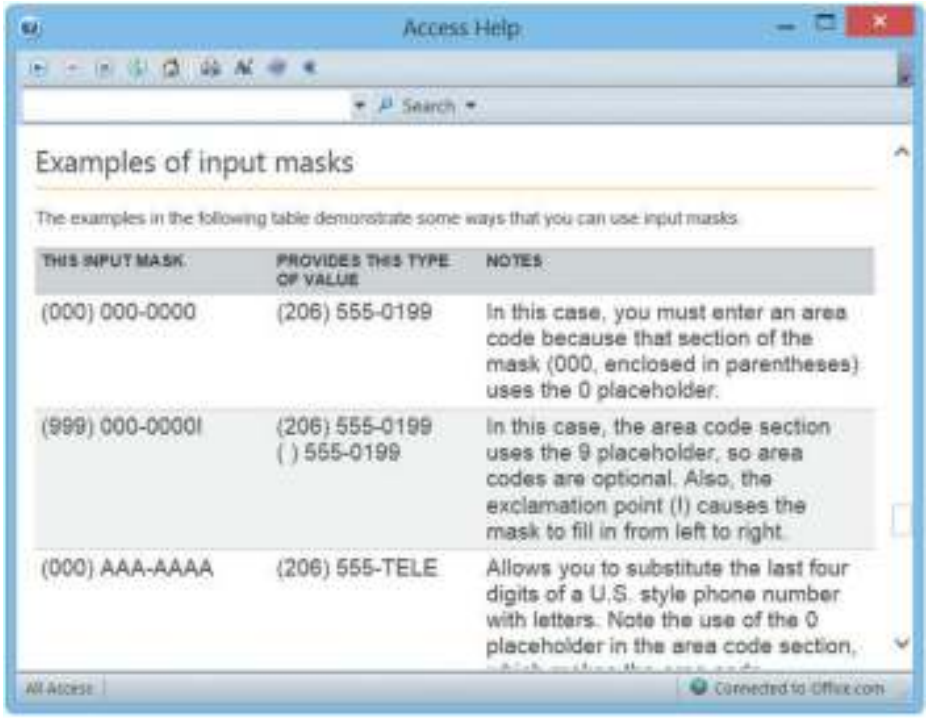
Guidelines for User Interface Design (Cont. 11)

- **Focus on Data Entry Screens**
  - Use the **form filling** method whenever possible
  - Restrict user access to screen locations where data is entered
  - Provide a way to leave the data entry screen at any time without entering the current record
  - Provide a descriptive caption for every field
  - Provide a means for users to move among fields on the form in a standard order or in any order they choose
  - Allow users to add, change, delete, and view records

Guidelines for User Interface Design (Cont. 12)

- **Focus on Data Entry Screens (Cont.)**
  - Design the screen form layout to match the layout of the source document
  - Display a sample format like MMDDYY and use an **input mask**
  - Require an ending stroke for every field
  - Do not require users to type leading zeros for numeric fields or trailing zeros for decimals
  - Display default values
  - Provide users with an opportunity to confirm the accuracy of input data before displaying it

Guidelines for User Interface Design (Cont. 13)



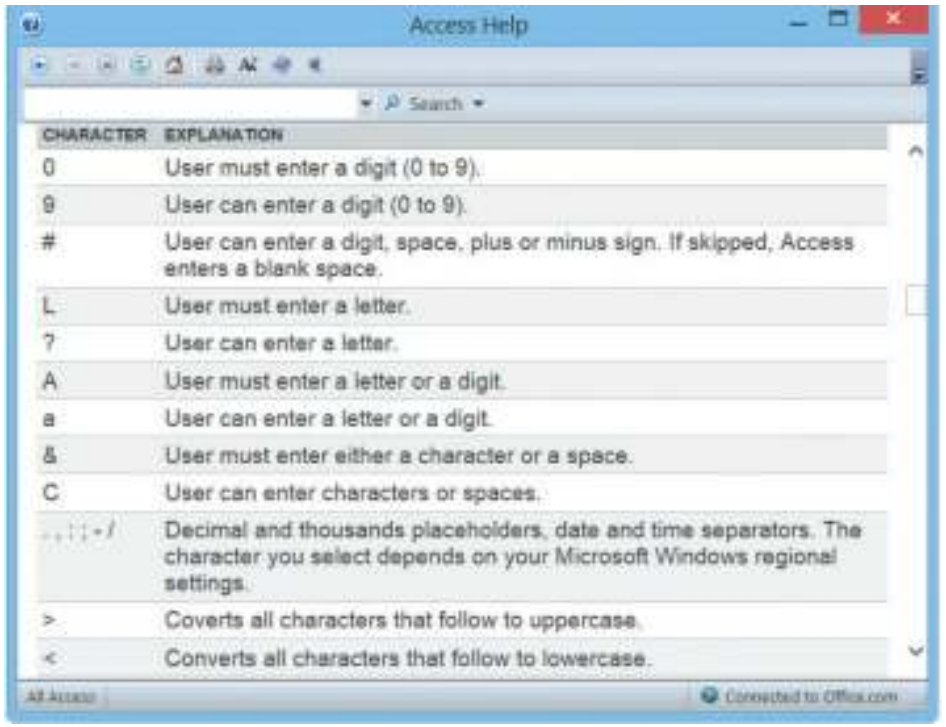


FIGURE 8-12 Microsoft Access provides various input masks for dates, phone numbers, and postal codes, among others. In addition, it is easy to create a custom mask using the characters shown here.

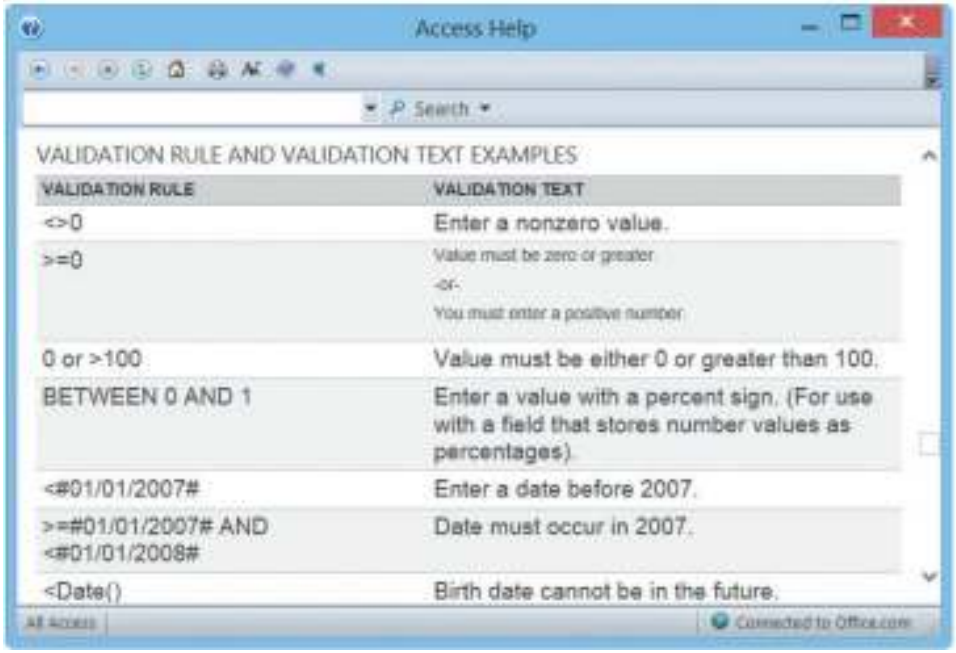
Guidelines for User Interface Design (Cont. 14)

- **Focus on Data Entry Screens (Cont.)**
  - Use a default value when a field value will be constant for successive records or throughout the data entry session
- **Use Validation Rules**
  - **Sequence check**: Used when the data must be in some predetermined sequence
  - **Existence check**: Applies to mandatory data items
  - **Data type check**: Tests to ensure that a data item fits the required data type
  - **Range check**: Used to verify that data items fall between a specified minimum and maximum value

Guidelines for User Interface Design (Cont. 15)

- **Use Validation Rules** (Cont.)
  - **Reasonableness check**: Identifies values that are questionable, but not necessarily wrong
  - **Validity check**: Used for data items that must have certain values
  - **Combination check**: Performed on two or more fields to ensure that they are consistent or reasonable when considered together
  - **Batch controls**: Totals used to verify batch input

Guidelines for User Interface Design (Cont. 16)



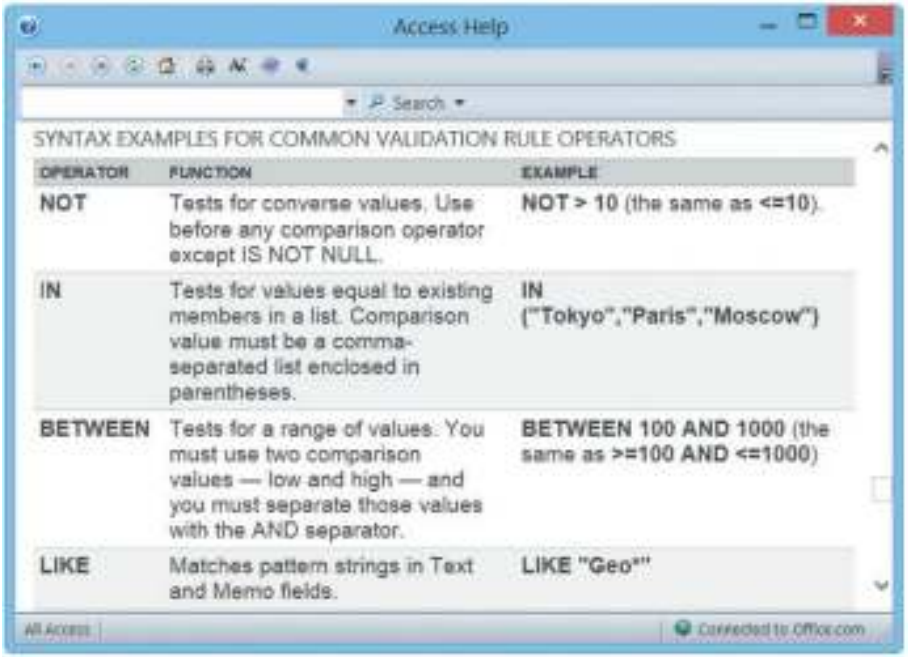


FIGURE 8-13 Microsoft Access provides **v**alidation rules can improve data quality by requiring the input to meet specific requirements or conditions.

Guidelines for User Interface Design (Cont. 17)

- **Reduce Input Volume**
  - Input necessary data only
  - Do not input data that the user can retrieve from system files or calculate from other data
  - Do not input constant data
  - Use codes as they are shorter than the data they represent

Where Do We Go From Here?

- **Modular Design**
  - Individual components, called **modules**, connect to a higher-level program or process
    - Designed to perform a single function
  - In a structured design, each module represents a specific process
    - Shown on a data flow diagram (DFD) and documented in a process description
- **Prototyping**
  - Involves a repetitive sequence of analysis, design, modeling, and testing

Where Do We Go From Here (Cont. 1)

- **Prototyping** (Cont.)
  - **System prototyping**
    - Produces a full-featured, working model of the information system
  - **Design** or **throwaway prototyping**
    - Used to verify user requirements and is discarded

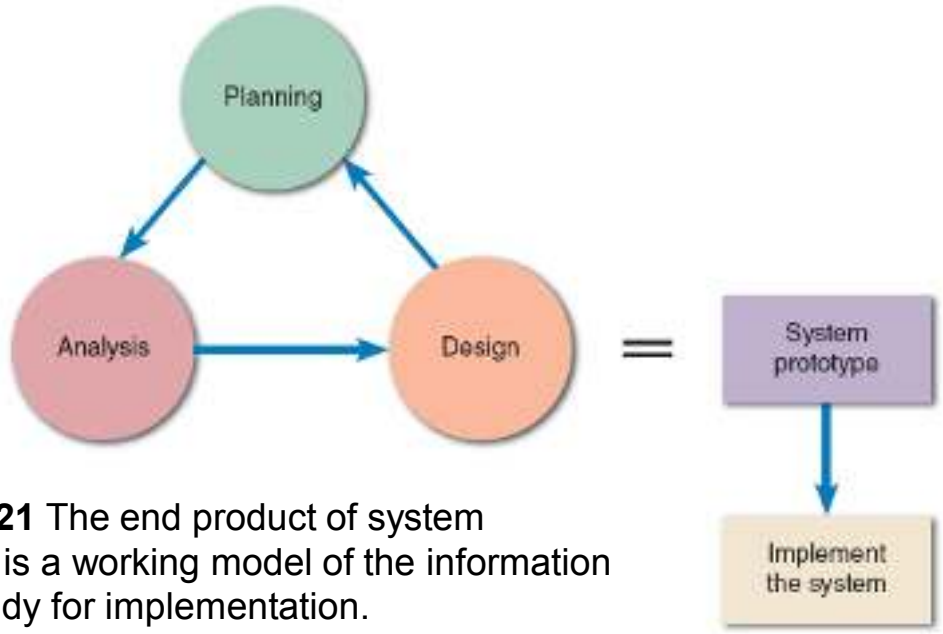


FIGURE 8-21 The end product of system prototyping is a working model of the information system, ready for implementation.

Where Do We Go From Here (Cont. 2)

- **Prototyping** (Cont.)
  - Benefits
    - Users and systems developers can avoid misunderstandings
    - System developers can create accurate specifications for the finished system based on the prototype
    - Managers can evaluate a working model more effectively than a paper specification
    - Helps in developing testing and training procedures
    - Reduces the risk and potential financial exposure that occur when a finished system fails to support business needs

Where Do We Go From Here (Cont. 3)

- **Prototyping** (Cont.)
  - Potential problems
    - Rapid pace of development can create quality problems which may not be discovered until the finished system is operational
    - System requirements, such as reliability and maintainability, cannot be tested adequately using a prototype
    - In complex systems, the prototype can become unwieldy and difficult to manage
    - Clients may want to adopt the prototype with few to no changes, leading to increased maintenance costs later in the SDLC

Chapter Summary

- Purpose of systems design
  - To create a physical model of the system that satisfies the design requirements that were defined during the systems analysis phase
- User interface design must be based on the perspective of the user
- Types of printed reports
  - Detail, exception, and summary reports

Chapter Summary (Cont.)

- Various zones in a document
  - Heading zone, control zone, instruction zone, body zone, totals zone, and authorization zone
- Input methods include data capture and data entry
- Security and control plays an important role in designing