

# 17

## User Interface Design

### Overview

Chapter 17 teaches students the important skill of user interface design and prototyping. Students learn how to design a system user interface that will provide a friendly means by which the user can interact with the application to process inputs and obtain outputs. The chapter introduces them to the role of operating systems, Web browsers, and other technologies that impact user interface design. These factors and a number of human interface considerations and guidelines are presented. The students are presented with several strategy styles for designing the user interface for a system.

### Chapter to Course Sequencing

Students are encouraged to read Chapters 15 and 16 to learn how to design inputs and outputs before completing this chapter. That recommendation is important because user interface design addresses the overall presentation of the application, including how the user is to interact with the system in order to process the inputs and generate the desired outputs.

### What's Different Here and Why?

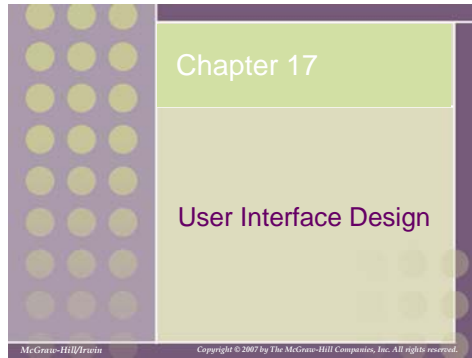
This chapter did not necessitate many changes from the sixth edition.

1. As with all chapters, we have streamlined the SoundStage episode into a quick narrative introduction to the concepts presented the chapter.
2. We updated all technology references throughout the chapter.

## Lesson Planning Notes for Slides

The following instructor notes, keyed to slide images from the PowerPoint repository, are intended to help instructors integrate the slides into their individual lesson plans for this chapter.

Slide 1



slide appearance after initial mouse click in slide show mode

This repository of slides is intended to support the named chapter. The slide repository should be used as follows:

Copy the file to a unique name for your course and unit.

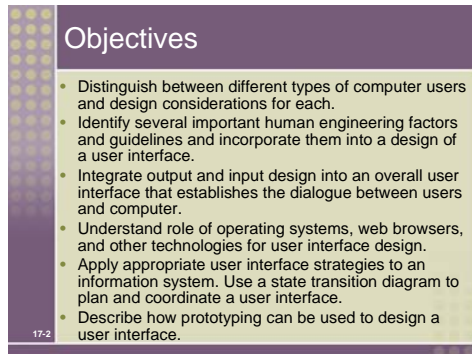
Edit the file by deleting those slides you don't want to cover, editing other slides as appropriate to your course, and adding slides as desired.

Print the slides to produce transparency masters or print directly to film or present the slides using a computer image projector.

Each slide includes instructor notes. To view those notes in PowerPoint, click-left on the View Menu; then click left on Notes View sub-menu. You may need to scroll down to see the instructor notes.

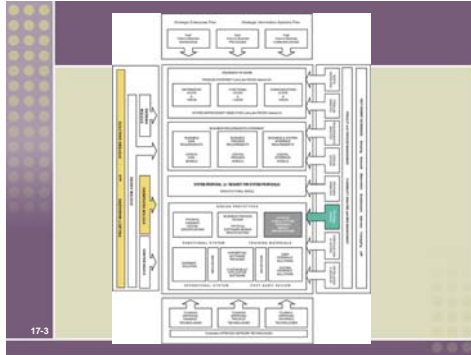
The instructor notes are also available in hard-copy as the Instructor Guide to Accompany Systems Analysis and Design Methods, 6/ed.

Slide 2



No additional notes.

Slide 3



**Teaching Notes**

This slide shows the how this chapter's content fits with the building blocks framework used throughout the textbook. The emphasis of this chapter is with the physical design phase, focusing on the communication building blocks. It involves system designers and systems analysts.

Slide 4

### System User Classifications

**Expert User** – an experienced computer user

- Spends considerable time using specific application programs.
- Use of a computer is usually considered non-discretionary.
- In the mainframe computing era, this was called a *dedicated user*.

**Novice User** – a less experienced computer user

- Uses computer on a less frequent, or even occasional, basis.
- Use of a computer may be viewed as discretionary (although this is becoming less and less true).
- Sometimes called a *casual user*.

**Teaching Notes**

Emphasize that expert and novice users are actually extremes in the continuum of all users. The totally novice user who hasn't used a computer is becoming less common. Mention some people that the students might know (perhaps a department secretary, yourself, another colleague, etc.) and ask the students to characterize them as an expert or novice user. Be sure to acknowledge, once again, that some individuals may fit in between the two extremes. A given user might be an expert at PowerPoint, a novice at PhotoShop, and something in between at Excel.

Slide 5

### Interface Problems

According to Galitz, the following problems result in confusion, panic, frustration, boredom, misuse, abandonment, and other undesirable consequences.

- Excessive use of computer jargon and acronyms
- Nonobvious or less-than-intuitive design
- Inability to distinguish between alternative actions ("what do I do next?")
- Inconsistent problem-solving approaches
- Design inconsistency

**Teaching Notes**

The above points can be driven home by providing the students with some sample screen designs that exhibit the various problems.

Slide 6

### Commandments of User Interface Design

- Understand your users and their tasks.
- Involve the user in interface design.
- Test the system on actual users.
- Practice iterative design.

17-6

**Teaching Notes**

These also come from Galitz.

Slide 7

### Human Engineering Guidelines

- The user should always be aware of what to do next
  - Tell user what the system expects right now.
  - Tell user that data has been entered correctly.
  - Tell user that data has not been entered correctly.
  - Explain reason for a delay in processing.
  - Tell user a task was completed or not completed.
- Format screen so instructions and messages always appear in same general display area.
- Display messages and instructions long enough so user can read them.

17-7

**Teaching Tips**

The above points can be driven home by providing the students with some sample screen designs that exhibit a failure to take into consideration the above guidelines.

Alternatively, obtain some screen shots of a sample application from a local company and have the students assess the screens relative to the above guidelines.

Slide 8

### Human Engineering Guidelines (continued)

- Use display attributes sparingly.
- Default values should be specified.
- Anticipate errors users might make.
- Users should not be allowed to proceed without correcting an error.
- If user does something that could be catastrophic, the keyboard should be locked to prevent any further input, and an instruction to call the analyst or technical support should be displayed.

17-8

**Teaching Notes**

Entire books have been written on the subject of user interface design. Feel free to add additional user interface design considerations you want to bring to the students attention (such as the user of color, consideration of handicapped individuals, etc.). We provided several references to books on the subject of user interface design.

## Slide 9

### Guidelines for dialogue Tone and Terminology

**Dialogue** – the overall flow of screens and messages for an application

- **Tone:**
  - Use simple, grammatically correct sentences.
  - Don't be funny or cute!
  - Don't be condescending.
- **Terminology**
  - Don't use computer jargon.
  - Avoid most abbreviations.
  - Use simple terms.
  - Be consistent in your use of terminology.
  - Carefully phrase instructions—use appropriate action verbs.

17-9

**Teaching Notes**

The above points can be driven home by providing the students with some sample screen designs that exhibit the and incorrect use of tone and terminology.

Have the students give examples of instructions that might appear on a screen. Is the tone and terminology acceptable?

## Slide 10

### User Interface Technology

- **Operating Systems and Web Browsers**
  - GUI
  - Windows, Macintosh, UNIX, Linux, Palm OS, Windows CE
  - Growing importance of platform independence
- **Display Monitor**
  - Regular PC monitors
  - Non-GUI terminals
  - Growing importance of devices such as handhelds
- **Paging** – Display complete screen of characters at a time.
- **Scrolling** – Display information up or down a screen one line at a time.
- **Keyboards and Pointers**
  - Mouse
  - Pens

17-10

**Teaching Notes**

The manner in which the display area is shown to the user is controlled by both the technical capabilities of the display and the operating system capabilities. Paging and scrolling are the two most common approaches to showing the display area to the user.

Scrolling is often used in web sites where a web page can be infinitely long. However users can get lost if they have to scroll too much to enter their inputs. In those cases, paging gives more control both to the user and the programmer.

## Slide 11

### Graphical User Interfaces Styles and Considerations

- **Windows and frames**
- **Menu-driven interfaces**
  - Pull-down and cascading menus
  - Tear-off and pop-up menus
  - Toolbar and iconic menus
  - Hypertext and hyperlink menus
- **Instruction-driven interfaces**
  - Language-based syntax
  - Mnemonic syntax
  - Natural language syntax
- **Question-answer dialogue**

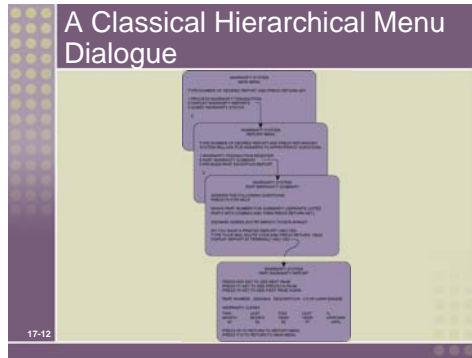
17-11

**Teaching Notes**

These will be illustrated in the following slides. Consider using a laptop and projection capability to demonstrate a software product(s) or application and its use of the different types of GUI menus.

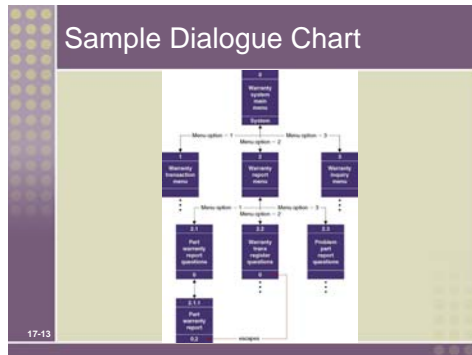
Emphasize to the students that the above styles/strategies should not be viewed as alternatives.

Slide 12



No additional notes.

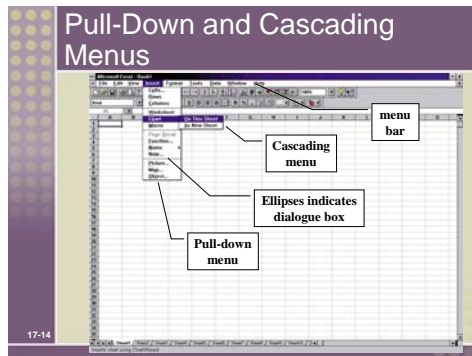
Slide 13



**Teaching Notes**

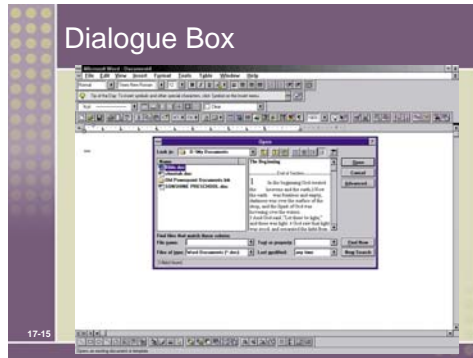
This screen dialogue chart was taken from the First Edition of our textbook. This tool was created by the authors as a tool for designing dialogues for on-line mainframe-based computing solutions. Subsequently, the tool has been adopted and adapted by numerous authors of systems development textbooks. The authors emphasize that this tool has become ineffective in design GUI screens because today's GUI design solutions are not naturally hierarchical.

Slide 14



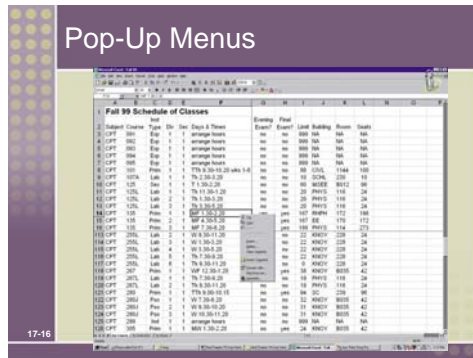
No additional notes.

Slide 15



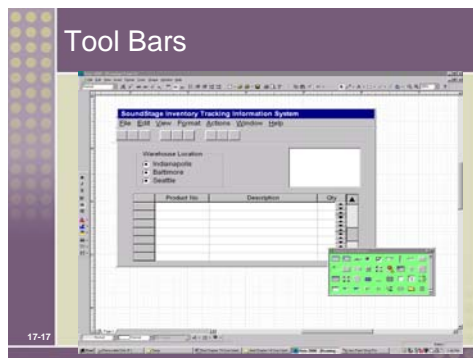
No additional notes.

Slide 16



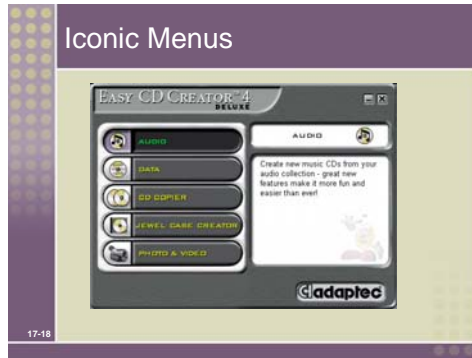
**Teaching Notes:**  
Be sure to emphasize that such menus are not as appropriate for the novice user because they are less likely to even know the menu exists (since there is no visual hint of its existence).

Slide 17



No additional notes.

Slide 18



No additional notes.

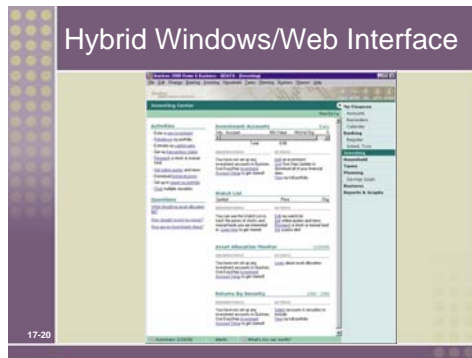
Slide 19



**Teaching Notes**

Consumer-style interfaces are somewhat more artistic  
 The primary look and feel is more web-like  
 The interface consists of clickable icons and buttons that replace more traditional Windows menu approaches

Slide 20



No additional notes.



Slide 21

### Instruction-Driven Interfaces

- **Language-based syntax** is built around a widely accepted command language that can be used to invoke actions
  - SQL
- **Mnemonic syntax** is built around commands defined for custom information systems.
  - Commands unique to that system and meaningful to user
- **Natural language syntax** allows users to enter questions and command in their native language

17-21

No additional notes.

Slide 22

### Instruction-Driven Interface

17-22

No additional notes.

Slide 23

### Special Considerations for User Interface Design

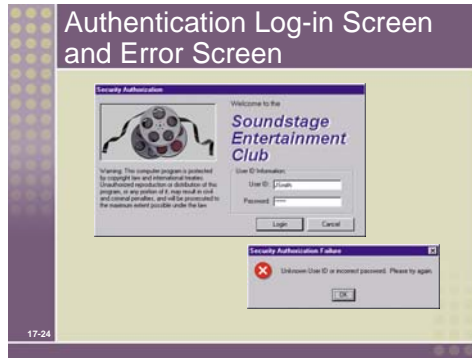
- **Internal Controls – Authentication and Authorization**
  - User ID and Password
  - Privileges assigned to roles
  - Web certificates
- **Online Help**
  - Growing use of HTML for help systems
  - Help authoring packages
  - Tool tips
  - Help wizards
- **Agents – reusable software object that can operate across different applications and networks.**

17-23

**Teaching Notes**

Screens to illustrate these concepts are on the following slides

Slide 24



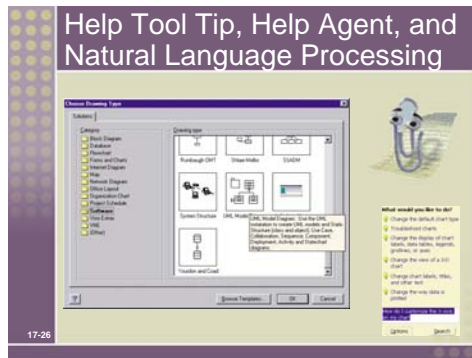
No additional notes.

Slide 25



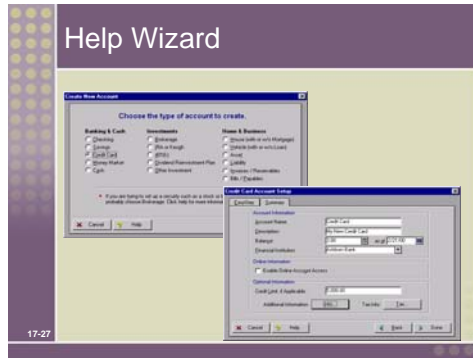
No additional notes.

Slide 26



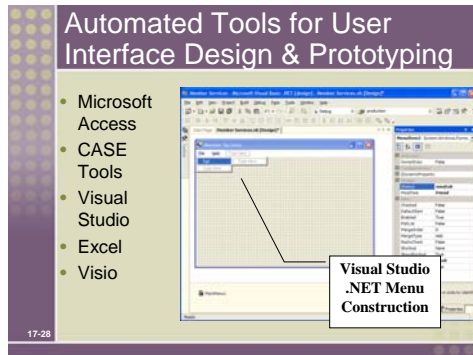
No additional notes.

Slide 27



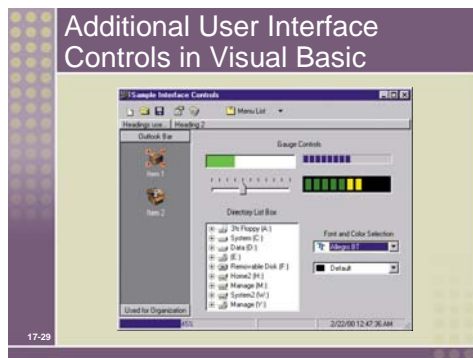
No additional notes.

Slide 28



No additional notes.

Slide 29



**Teaching Notes:**  
Feel free to provide additional screen shots of other user interface controls not presented in the textbook. These are only a few of the many controls that continue to evolve.

Slide 30

**The User Interface Design Process**

1. Chart the user interface dialogue.
 

**State Transition Diagram**—a tool used to depict the sequence and variation of screens that can occur during a user session.
2. Prototype the dialogue and user interface.
3. Obtain user feedback.
  - Exercising (or testing) the user interface
4. If necessary return to step 1 or 2

17-30

**Teaching Notes**

In practice these steps are not strictly sequential.

Slide 31

**SoundStage Partial State Transition Diagram**

17-31

No additional notes.

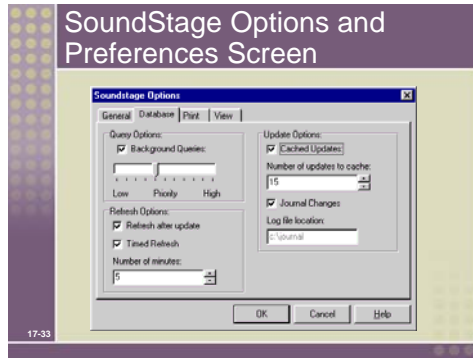
Slide 32

**SoundStage Main Menu**

17-32

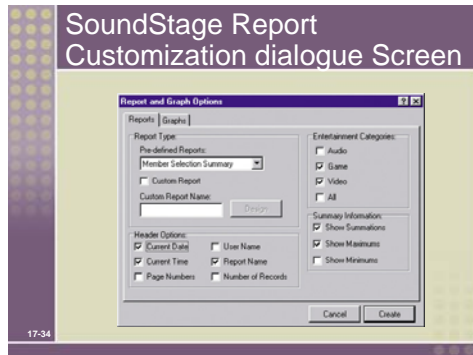
No additional notes.

Slide 33



No additional notes.

Slide 34



No additional notes.

## Answers to End of Chapter Questions and Exercises

### Review Questions

1. User interfaces are the dialogue between the users and the systems. The dialogue basically determines everything from logging into the system, to setting options and preferences, to getting help. Since users can interact with the system using different paths through menu, hyperlinks, dialog box, etc, it is important to accommodate the different behaviors of the users. Therefore, in order for both the users and the system to communicate well in this dialogue, it is important to involve the system users in the design process.
2. Expert users have extensive experience in terms of using technology or computers. They are referred to as expert because they are comfortable with using many different kinds of applications. They are also familiar with the operations needed to accomplish what they want using the computers without the need to seek instructions.
3. It is generally because of poor user interface design, including:
  - The overuse of computer jargon and acronyms on the interface
  - Ambiguous or non-intuitive design of the interface
  - Inadequate instructions as to what actions are to go next
  - Inconsistent design of the interface
4. After the system is implemented, it is very natural and tempting to “force” the users to learn to use the systems. However, such an approach will not help find the problems facing the users when they are using the systems. As a result, it will be very difficult to improve the system. Therefore, we should observe the users actions and mistakes. Also, we should also listen to the users’ comments and questions so that we can understand more about their experience with the interface. The key of testing the system on actual users is to observe and listen.
5. We have to make sure the system will inform the user what the system is expecting the users to do. Also, we have to let the user know whether the input data is correct or not. In addition to that, if the system is experiencing delay, the system should explain to the users why there is such a delay. Lastly, the users should be notified as to whether a particular task has been completed or not.
6. When there are errors, the users should never be allowed to continue, unless the errors are corrected. The interfaces also need to show how the

users should correct the errors. The errors can be highlighted with sound or color and then explained in a pop-up window or dialogue box.

7. Computer jargon and abbreviations should be avoided in the computer dialogues; instead we should keep the terms used in the interface very simple. Also, being consistent is essential. We should keep all the terms used consistent. Instructions should be phrased carefully as well.
8. Web browsers are becoming more important because they can be run in different kinds of platforms and environments. Doing so, the interfaces can be written for one or two browsers rather than constructing the interfaces for all the possible platforms or environments. Such a strategy is called platform independence.
9. Paging is to display a complete screen of characters at a time.

Scrolling is to display information up or down a screen, one line at a time.

10. Function keys are keys to perform common or repeat functions in a user interface. We should make sure that function keys are used consistently. Since function keys are predefined in an operating system, we should use the same function keys that are similar to the conventional ones in our interface.
11. Pens are used because handheld devices such as PalmPilots are becoming very common. Thus, when we design our application, we should make sure if such a media will be supported or not. This is an area that most people will overlook because keyboards and mice are still involved in the majority of the applications.
12. Windows are rectangular and bordered area where a title is displayed on the top. Windows can be divided into zones called frames. Each frame can act independently of the other frames in the window (refer p. 658).
13. It is often shown when the users right-click on the mouse. A menu will then pop up immediately. It is context-sensitive because the content of the pop-up menu will depend on the location of the cursor. The locations may be a blank area, a field, a cell, a word, or an object.
14. Firstly, designers should document the dialogue of the user interface, since many screens may be involved in the interface. Secondly, designers need to make additional prototypes of the new dialogues that may come up in the interface. After prototypes are made, feedback should be obtained from the users. Based on the feedback of the users, more dialogues or prototypes may be needed. Thus, the process is iterative.

15. A state transition diagram (STD) is used to portray both the sequence and variation of the screens that may take place. Display screens are represented by rectangles. The flow of control and the triggering event are both represented by arrows.

### Problems and Exercises

1. 1. Meets guidelines; message is clear and concise.  
 2. Fails; message would be okay except for using ENTER instead of the preferred TYPE.  
 3. Fails; message is sarcastic, which tends to be more annoying than funny or cute ones.  
 4. Fails; message uses cryptic jargon and abbreviations.  
 5. Fails; message is condescending and patronizing.
2. With a menu-driven interface, users choose action they want from a selection menu. The main difference is that menu-driven interfaces are hierarchical; GUI interfaces are not. Menu-driven interfaces are easy to design and easy to model in comparison to GUI interfaces, as well as being easy to use. The major disadvantage is their hierarchal nature; users frequently must go up and down several levels to get to where they want to go.
3. It is rare to find an application that fully meets all the human engineering guidelines described in the textbook for user interface screens. This exercise is intended to help you appreciate the complexities involved in incorporating human interface factors into the user interface design.
4. This exercise is intended to provide you with the opportunity to apply specific human engineering guidelines to real-life applications. It also gives you the opportunity to see how different perspectives may identify different problems, and how designing user interface screens is truly an iterative process.
5. 1. False; consistent and appropriate action verbs promote user understanding and reduce errors and confusion.  
 2. False; managers need expertise in problem solving, as well as planning, organizing and directing work to its successful conclusion through the effort of others. Computer expertise is not needed to successful in these factors.  
 3. True; interface designs are expected to go through a series of iterations and refinement.  
 4. True; Windows screen design is increasingly influenced by web interface designs.  
 5. False; applications should have multiple help menus and dialogues geared toward users' different levels of expertise.  
 6. False; funny the first time (maybe); annoying and grating thereafter.



7. True; there are only four basic steps.
6. Guidelines and considerations to take into account in building internal controls into the user interface design include:
  - Passwords should never be displayed on screen; asterisks are the preferred convention.
  - A standard security authorization screen should be displayed for log-in failures.
  - User interface screens may need to be customized for different categories of users, depending upon their access and security privileges. Certain menu options and dialogue boxes may be disabled or “ghosted out.”
  - For web applications, a website certification icon should be displayed and users should be able to view the authentication certificate at any point in their transaction.
7.
  1. Some instruction-driven interfaces use a natural-language syntax that allows users to ask questions in their native language.
  2. The last step in user interface design is to return to the first or second steps as part of the iterative process until users are satisfied with the design.
  3. SQL uses a language-based syntax which allows end users to query the database.
  4. Good human engineering guidelines include anticipating possible user errors and warning the user of an action’s dangers before the action is executed.
  5. One guideline for establishing users’ access and service privileges is to base their privileges upon roles, not individuals.
8. A6, B9, C12, D10, E11, F2, G13, H1, I4, J3, K7, L8, M5,
9. Common interface problems include:
  - Jargon and acronyms are overused or not explained
  - The screen design is not intuitive
  - The screen design doesn’t make it clear what the different alternative actions are
  - Design of the different screens in the application is not consistent
  - Problem-solving methods are not consistent throughout the application

Your boss is likely to ask you:

- What steps did you take to understand your users and the work they do?
- Did you involve the users to find out what they like and don’t like?
- Did you test the screens on customers and employees who will actually be using the system?
- Did you go through an iterative process of screen redesign and refine-

ment?

10. • Design the help system based upon anticipating the errors users will make.
  - When an error message is displayed, the design should also provide the user with a help option.
  - When the help session is finished, users should be returned to the same place in the application they were before the help session began.
  - Use standard conventions for help menu bar options, tool tips, help wizards and help agents.
  - Consider using a help authoring package to simplify building a comprehensive help system.
11. Your diagram should use the same components as the one shown in Figure 17-16. Each display screen, window and dialogue box used in the part of the application that you selected should be represented by a rectangle. The control flow and the event which activates the screen, window or dialogue box should be represented by a labeled arrow, with the sequence of screens being indicated by the direction of the arrow. Also, because the flow of control to a screen is caused by a different action than flow of control from a screen, different labeled arrows should be used.
12. This exercise is intended to give you experience in developing design standards. Your list should include issues such as standard colors to be used for screens, messages and dialog boxes, naming conventions for buttons and menu options, and related issues discussed in this and the two prior chapters..
13. Yes and no. The programming and design of these interfaces is inherently complicated. However, using contemporary tools, such as Visual Basic, can relieve system developers of much of the burden.

## **Projects and Research**

1. Tufte's viewpoints are well-known and readily available, both on his and other websites. Tufte coined the term "chartjunk" to refer to charts that appear to say a great deal through their artistic presentation, but really say little or nothing. His viewpoint on contemporary project management charts and PowerPoint is critically illuminating. Although the particular items which "resonate" the most with students will vary, they should have no problem finding several concepts, guidelines and/or viewpoints that they consider important to apply.

2. The intent of this question is to help expose students to the foundational underpinnings of human interface design and human engineering guidelines. As such, responses are open-ended, but should indicate that a range of exploratory research was conducted and that thoughtful consideration was given to these issues.
3. The purpose of this question is to get students to “think outside the box” in terms of who are the experts in the field, and to consider a wide range of sources. Their responses may or may not indicate any additional items of relevance, but should show conscientious effort and an understanding of how complex this discipline really is.
4. The intent of this question is to expose students to the different automated screen design tools that are commercially available. Students should be able to find detailed information on a multitude of screen design tools without any problem. They should be able to compare and contrast their relevant features, and to recognize any downside these tools might have in terms of functionality and creativity.
5. The intent of this question is to have students think about the differences and similarities between public and private sector agencies relative to systems design and human interface design. Responses will vary widely, but in general, the expected response would be that technical issues have more similarities between the public and private sector than the “business-side” issues of design. Causes for this may reflect that on an overall basis, the stakeholder base for public sector information systems tends to be significantly wider than for private sector companies. The same set of guidelines would apply, but the execution of these guidelines will probably vary because their audiences (stakeholders) are so different.
6. The intent of this question is to have students look at the underlying foundation or business objectives for different types of web interfaces, and to see how that might impact design guidelines. As such, responses can be open-ended in terms of viewpoints, but should indicate an understanding of the essential differences and their potential impact.

### **Minicases**

1. This minicase should garner some really interesting responses and observations. If you have time, use it for a roundtable discussion. Clearly, there are no set answers to this!
2. While answers will differ, make sure that the interface prototype matches the personality and needs (as the student has described) of the person who

will be using the system. The design should be supported and documented in detail.

3. Students should expect that the user will want and need changes. This is not a reflection of a poor job on their part. No; the reflection of a job well-done will be the ability of the students to really hear the criticism of the user (and not take it personally) so that they can make all of the needed changes.
4. There is no set answer. Make sure students have addressed ALL of the user's issues.

### **Team and Individual Exercises**

There are no answers to this section.