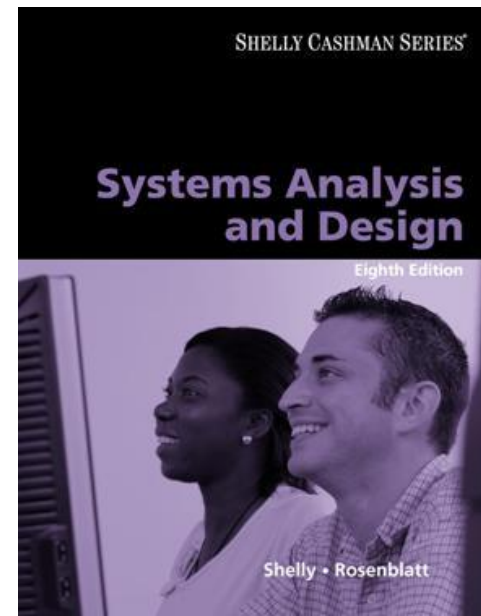


Systems Analysis and Design

8th Edition

Chapter 8

Output and User Interface Design



Phase Description

- Systems Design is the third of five phases in the systems development life cycle
- Now you will work on a physical design that will meet the specifications described in the system requirements document
- Tasks will include output and user interface design, data design, and system architecture

Chapter Objectives

- Discuss output design issues and various types of output
- Design various types of reports, and suggest output controls and security
- Explain the concept of user interface design and human-computer interaction, including the basic principles of user-centered design
- List specific guidelines for user interface design

Chapter Objectives

- Describe user interface techniques, including screen elements and controls
- Explain input design concepts, techniques, and methods
- Describe guidelines for data entry screen design
- Use validation checks for reducing input errors
- Design effective source documents and input controls

Introduction

- Output and user interface design is the first task in the systems design phase of the SDLC
- Output design focuses on user needs for screen and printed forms of output, while user interface design stresses user interaction with the computer, including input design and procedures

Output Design

- Before designing output, ask yourself several questions:
 - What is the purpose of the output?
 - Who wants the information, why is it needed, and how will it be used?
 - What specific information will be included?
 - Will the output be printed, viewed on-screen, or both? What type of device will the output go to?

Output Design

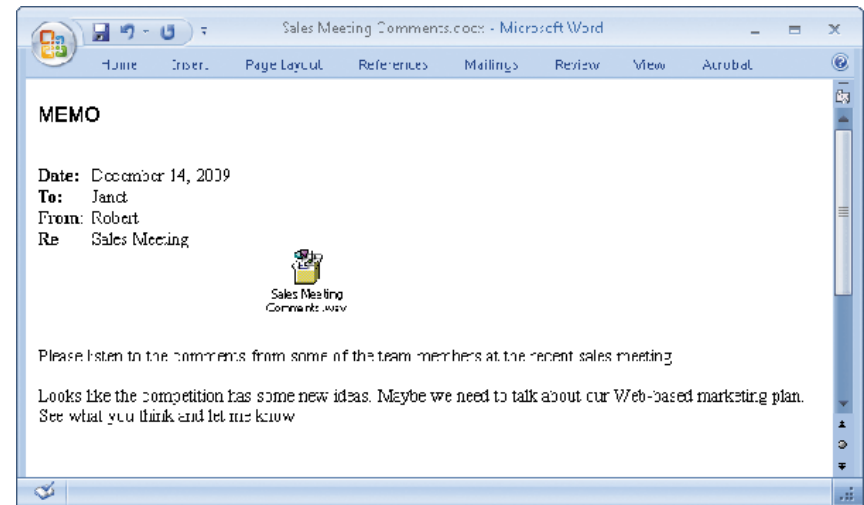
- Before designing output, ask yourself several questions:
 - When will the information be provided, and how often must it be updated?
 - Do security or confidentiality issues exist?
- Your answers will affect your output design strategies

Output Design

- Types of Output
 - Internet-based information delivery
 - Webcast
 - E-mail
 - Blogs
 - Instant Messaging
 - Wireless Devices

Output Design

- Types of Output
 - Digital audio, images, and video
 - Podcasts
 - Automated facsimile systems
 - Faxback systems
 - Computer output microfilm (COM)
 - Computer output to digital media



Output Design

- Types of Output
 - Specialized Forms of Output
 - An incredibly diverse marketplace requires a variety of specialized output
 - Output from one system often becomes input into another system
 - Although digital technology has opened new horizons in business communications, printed output still is a common type of output, and specific considerations apply to it

Printed and Screen Output

- Few firms have been able to eliminate printed output totally
- Turnaround documents
- Overview of Report Design
 - Reports must be easy to read and well organized
 - Database programs include a variety of report design tools
 - Character-based reports

Printed and Screen Output

- Types of Reports
 - Detail reports
 - Exception reports
 - Summary reports

EMPLOYEE HOURS
WEEK ENDING DATE: 6/26/09
PAGE 1

| STORE NUMBER | EMPLOYEE NAME | POSITION | REGULAR HOURS | OVERTIME HOURS | TOTAL HOURS |
|------------------|----------------------|----------|---------------|----------------|-------------|
| 8 | Andres, Marguerite | Clerk | 20.0 | 0.0 | 20.0 |
| 8 | Bogema, Michele | Clerk | 12.5 | 0.0 | 12.5 |
| 8 | Davenport, Kim | Asst Mgr | 40.0 | 5.0 | 45.0 |
| 8 | Lamka, Susan | Clerk | 32.7 | 0.0 | 32.7 |
| 8 | Ramirez, Rudy | Manager | 40.0 | 8.5 | 48.5 |
| 8 | Ullery, Ruth | Clerk | 20.0 | 0.0 | 20.0 |
| STORE 8 TOTALS: | | | 165.2 | 13.5 | 178.7 |
| 17 | De Martini, Jennifer | Clerk | 40.0 | 8.4 | 48.4 |
| 17 | Haff, Lisa | Manager | 40.0 | 0.0 | 40.0 |
| 17 | Rittenbery, Sandra | Clerk | 40.0 | 11.0 | 51.0 |
| 17 | Wyer, Elizabeth | Clerk | 20.0 | 0.0 | 20.0 |
| 17 | Zeigler, Cecille | Clerk | 32.0 | 0.0 | 32.0 |
| STORE 17 TOTALS: | | | 172.0 | 19.4 | 191.4 |
| GRAND TOTALS: | | | 337.2 | 32.9 | 370.1 |

Printed and Screen Output

- User Involvement in Report Design
 - Printed reports are an important way of delivering information to users, so recipients should approve all report designs in advance
 - To avoid problems submit each design for approval as you complete it, rather than waiting until you finish all report designs
 - Mock-up
 - Report analysis form

Printed and Screen Output

- Report Design Principles
 - Printed reports must be attractive, professional, and easy to read
 - Report headers and footers
 - Page headers and footers
 - Column heading alignment
 - Column spacing

The diagram shows an employee hours report with several design annotations:

- identifying fields:** Points to the STORE NUMBER and EMPLOYEE NAME columns.
- hours fields:** Points to the REGULAR HOURS, OVERTIME HOURS, and TOTAL HOURS columns.
- report header:** Points to the title 'EMPLOYEE HOURS' and subtitle 'WEEK ENDING DATE: 6/26/09'.
- page header:** Points to the column headers.
- control break on STORE NUMBER field:** Points to the change in the STORE NUMBER column from 8 to 17.
- group footer:** Points to the 'STORE 8 TOTALS' and 'STORE 17 TOTALS' rows.
- report footer:** Points to the 'GRAND TOTALS' row.
- page footer:** Points to the 'PAGE 1' text.

| STORE NUMBER | EMPLOYEE NAME | POSITION | REGULAR HOURS | OVERTIME HOURS | TOTAL HOURS |
|------------------|----------------------|----------|---------------|----------------|-------------|
| 8 | Andres, Marguerite | Clerk | 20.0 | 0.0 | 20.0 |
| 8 | Bogema, Michelle | Clerk | 12.5 | 0.0 | 12.5 |
| 8 | Davenport, Kim | Asst Mgr | 40.0 | 5.0 | 45.0 |
| 8 | Lemka, Susan | Clerk | 32.7 | 0.0 | 32.7 |
| 8 | Ramirez, Rudy | Manager | 40.0 | 8.5 | 48.5 |
| 8 | Ulery, Ruth | Clerk | 20.0 | 0.0 | 20.0 |
| STORE 8 TOTALS: | | | 165.2 | 13.5 | 178.7 |
| 17 | De Martini, Jennifer | Clerk | 40.0 | 8.4 | 48.4 |
| 17 | Haff, Lisa | Manager | 40.0 | 0.0 | 40.0 |
| 17 | Rillenbery, Sandra | Clerk | 40.0 | 11.0 | 51.0 |
| 17 | Wyer, Elizabeth | Clerk | 20.0 | 0.0 | 20.0 |
| 17 | Zeigler, Cecille | Clerk | 32.0 | 0.0 | 32.0 |
| STORE 17 TOTALS: | | | 172.0 | 19.4 | 191.4 |
| GRAND TOTALS: | | | 337.2 | 32.9 | 370.1 |

Printed and Screen Output

- Report Design Principles
 - Field order
 - Fields should be displayed and grouped in a logical order
 - Grouping detail lines
 - It is meaningful to arrange detail lines in groups
 - Group header
 - Group footer
 - Consistent design

Printed and Screen Output

- Report Design Example

| EMPLOYEE HOURS | | | | | | PAGE 1 |
|---------------------------|------------------|----------------------|---------------|----------------|-------------|-----------------|
| WEEK ENDING DATE: 6/26/09 | | | | | | |
| STORE NUMBER | POSITION | EMPLOYEE NAME | REGULAR HOURS | OVERTIME HOURS | TOTAL HOURS | |
| 8 | | Andres, Marguerite | 20.0 | | 20.0 | |
| | | Bogema, Michelle | 12.5 | | 12.5 | 0.0 not printed |
| | Asst Mgr | Davenport, Kim | 40.0 | 5.0 | 45.0 | |
| | | Lemka, Susan | 32.7 | | 32.7 | |
| | | Ramirez, Rudy | 40.0 | | 48.5 | |
| | Manager | Ulery, Ruth | <u>20.0</u> | <u>8.5</u> | <u>20.0</u> | |
| | STORE 8 TOTALS: | | | 165.2 | 13.5 | 178.7 |
| 17 | | De Martini, Jennifer | 40.0 | | 48.4 | |
| | | Haff, Lisa | 40.0 | 8.4 | 40.0 | |
| | Manager | Rittenbery, Sandra | 40.0 | | 51.0 | |
| | | Wyer, Elizabeth | 20.0 | 11.0 | 20.0 | |
| | | Zeigler, Cecille | <u>32.0</u> | <u>—</u> | <u>32.0</u> | |
| | STORE 17 TOTALS: | | | 172.0 | 19.4 | 191.4 |
| GRAND TOTALS: | | | 337.2 | 32.9 | 370.1 | |

Printed and Screen Output



- Output Control and Security
 - Output must be accurate, complete, current, and secure
 - The IT department is responsible for output control and security measures

User Interface Design

- Evolution of the User Interface
 - Process-control
 - As information management evolved from centralized data processing to dynamic, enterprise-wide systems, the primary focus also shifted — from the IT department to the users themselves
 - User-centered system
 - Requires an understanding of human-computer interaction and user-centered design principles

User Interface Design

- Human-Computer Interaction
 - Human-computer interaction (HCI) describes the relationship between computers and people who use them to perform business-related tasks
 - Graphical user interface (GUI)
 - Main objective is to create a user-friendly design that is easy to learn and use

User Interface Design

- Human-Computer Interaction

User Rights

1. **Perspective:** The user always is right. If there is a problem with the use of the system, the system is the problem, not the user.
2. **Installation:** The user has the right to install and uninstall software and hardware systems easily without negative consequences.
3. **Compliance:** The user has the right to a system that performs exactly as promised.
4. **Instruction:** The user has the right to easy-to-use instructions (user guides, online or contextual help, and error messages) for understanding and utilizing a system to achieve desired goals and recover efficiently and gracefully from problem situations.
5. **Control:** The user has the right to be in control of the system and to be able to get the system to respond to a request for attention.
6. **Feedback:** The user has the right to a system that provides clear, understandable, and accurate information regarding the task it is performing and the progress toward completion.
7. **Dependencies:** The user has the right to be informed clearly about all systems requirements for successfully using software or hardware.
8. **Scope:** The user has the right to know the limits of the system's capabilities.
9. **Assistance:** The user has the right to communicate with the technology provider and receive a thoughtful and helpful response when raising concerns.
10. **Usability:** The user should be the master of software and hardware technology, not vice versa. Products should be natural and intuitive to use.

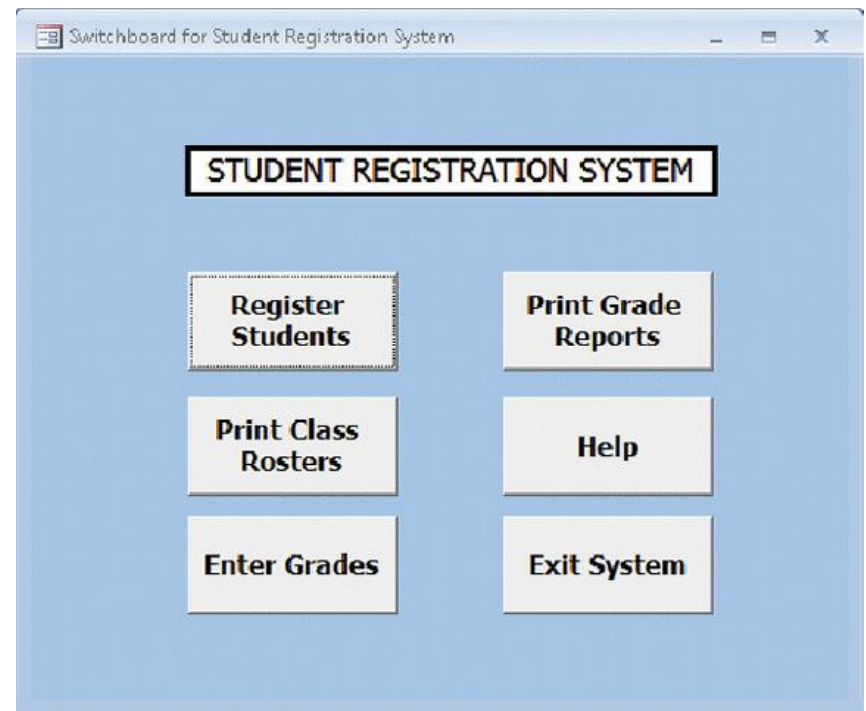
Source: <http://www-306.ibm.com/software/ucd/designconcepts/userrights.html>

User Interface Design

- Basic Principles of User-Centered Design
 - Good design depends on eight basic principles
 - Understand the underlying business functions
 - Maximize graphical effectiveness
 - Profile the system's users
 - Think like a user

User Interface Design

- Basic Principles of User-Centered Design
 - Use prototyping
 - Storyboard
 - Usability metrics
 - Design a comprehensive interface
 - Continue the feedback process
 - Document the interface design



User Interface Design

- Guidelines for User Interface Design
 - Follow eight basic guidelines
 1. Focus on basic objectives
 2. Build an interface that is easy to learn and use
 3. Provide features that promote efficiency
 4. Make it easy for users to obtain help or correct errors
 5. Minimize input data problems

User Interface Design

- Guidelines for User Interface Design
 - Follow eight basic guidelines
 6. Provide feedback to users
 7. Create an attractive layout and design
 8. Use familiar terms and images
 - Good user interface design is based on a combination of ergonomics, aesthetics, and interface technology

User Interface Design

- User Interface Controls
 - Menu bar
 - Toolbar
 - Command button
 - Dialog box
 - Text box
 - Toggle button

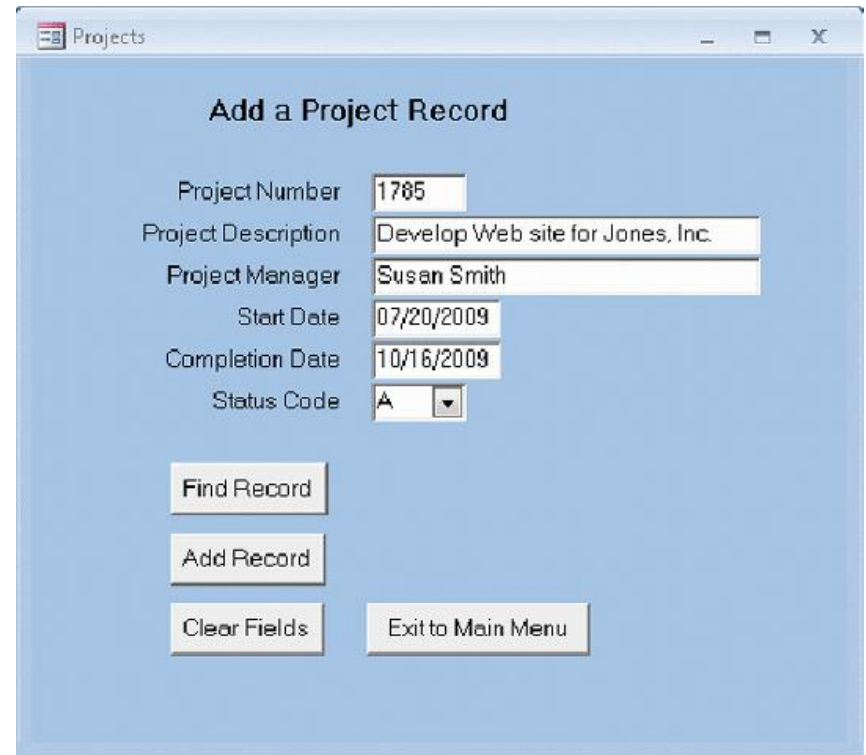
The screenshot displays a window titled "Students" for a "STUDENT REGISTRATION SYSTEM". The interface includes several user interface controls:

- Form Fields:** Text boxes for SSN (111-11-1111), City (New Hope), Last Name (Hamilton), ST (PA), First Name (Rose), Zip (12345), MI (M), Home Phone ((555) 999-9999), Street (607 West Spring Street), and Work Phone ((555) 555-9999).
- Dropdowns:** Semester (F) and Academic Year (2009-2010).
- Calendar:** A calendar for August 2009.
- Buttons:** "On-line data entry", "Find Student", "Print Record", and "HELP".
- Checkboxes:** "Advisor Assigned", "Transcript OK", "Full Time", and "Part Time".
- Table:** A table titled "Courses" with columns for Prefix, Number, Section, and Grade. The data is as follows:

| Prefix | Number | Section | Grade |
|--------|--------|---------|-------|
| MAT | 111 | 2 | |
| CIS | 110 | 3 | |
| BUS | 285 | 1 | |
- Dialog Box:** A small dialog box with the text "Remind students that tuition and fees are due by the first day of class."

User Interface Design

- User Interface Controls
 - List box – scroll bar
 - Drop-down list box
 - Option button, or radio button
 - Check box
 - Calendar control
 - Switchboard



The screenshot shows a window titled "Projects" with a subtitle "Add a Project Record". The form contains the following fields and controls:

| | |
|---------------------|---|
| Project Number | <input type="text" value="1785"/> |
| Project Description | <input type="text" value="Develop Web site for Jones, Inc."/> |
| Project Manager | <input type="text" value="Susan Smith"/> |
| Start Date | <input type="text" value="07/20/2009"/> |
| Completion Date | <input type="text" value="10/16/2009"/> |
| Status Code | <input type="text" value="A"/> ▾ |

Below the form are four buttons: "Find Record", "Add Record", "Clear Fields", and "Exit to Main Menu".

Input Design

- Input technology has changed dramatically in recent years
- The quality of the output is only as good as the quality of the input
 - Garbage in, garbage out (GIGO)
 - Data capture
 - Data entry

Input Design

- Input and Data Entry Methods
 - Batch input
 - Batch
 - Online input
 - Online data entry
 - Source data automation
 - RFID tags or Magnetic data strips

Input Design

- Input and Data Entry Methods
 - Tradeoffs
 - Unless source data automation is used, manual data entry is slower and more expensive than batch input because it is performed at the time the transaction occurs and often done when computer demand is at its highest
 - The decision to use batch or online input depends on business requirements

Input Design

- Input Volume
 - Guidelines will help reduce input volume
 1. Input necessary data only
 2. Do not input data that the user can retrieve from system files or calculate from other data
 3. Do not input constant data
 4. Use codes

Input Design

- Designing Data Entry Screens
 - Most effective method of online data entry is form filling
 - Guidelines will help you design data entry screens
 1. Restrict user access to screen locations where data is entered
 2. Provide a descriptive caption for every field, and show the user where to enter the data and the required or maximum field size

Input Design

- Designing Data Entry Screens
 - Guidelines will help you design data entry screens
 3. Display a sample format if a user must enter values in a field in a specific format - separator
 4. Require an ending keystroke for every field
 5. Do not require users to type leading zeroes for numeric fields
 6. Do not require users to type trailing zeroes for numbers that include decimals

Input Design

- Designing Data Entry Screens
 - Guidelines will help you design data entry screens
 7. Display default values so operators can press the ENTER key to accept the suggested value
 8. Use a default value when a field value will be constant for successive records or throughout the data entry session
 9. Display a list of acceptable values for fields, and provide meaningful error messages

Input Design

- Designing Data Entry Screens
 - Guidelines will help you design data entry screens
 10. Provide a way to leave the data entry screen at any time without entering the current record
 11. Provide users with an opportunity to confirm the accuracy of input data before entering it
 12. Provide a means for users to move among fields on the form

Input Design

- Designing Data Entry Screens
 - Guidelines will help you design data entry screens
 13. Design the screen form layout to match the layout of the source document
 14. Allow users to add, change, delete, and view records
 15. Provide a method to allow users to search for specific information

Input Design

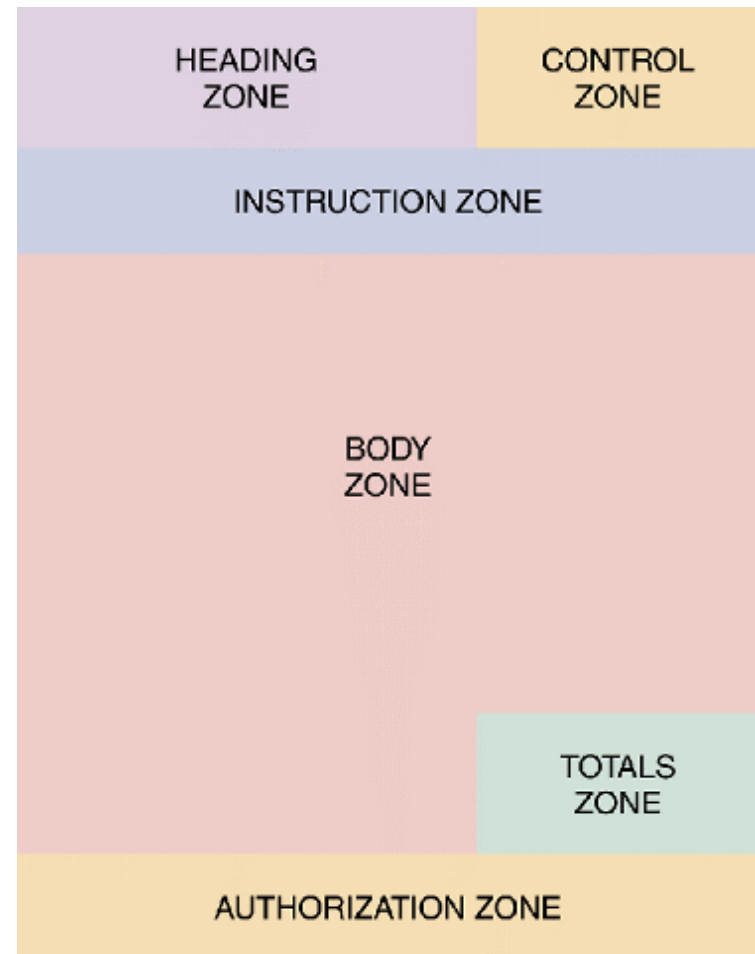
- Input Errors
 - At least eight types of data validation checks
 1. Sequence check
 2. Existence check
 3. Data type check
 4. Range check – limit check

Input Design

- Input Errors
 - At least eight types of data validation checks
 5. Reasonableness check
 6. Validity check – referential integrity
 7. Combination check
 8. Batch controls – hash totals

Input Design

- Source Documents
 - Form layout
 - Heading zone
 - Control zone
 - Instruction zone
 - Body zone
 - Totals zone
 - Authorization zone




Input Design

- Source Documents
 - Information should flow on a form from left to right and top to bottom to match the way users read documents naturally
 - A major challenge of Web-based form design is that most people read and interact differently with on-screen information compared to paper forms

Input Design

- Source Documents



The screenshot shows a Windows Internet Explorer browser window. The title bar reads "Reading on the Web (Alertbox) - Windows Internet Explorer". The address bar contains the URL "http://www.useit.com/alertbox/9710a.html". The page content is as follows:

How Users Read on the Web

They don't.

People rarely read Web pages word by word; instead, they **scan** the page, picking out individual words and sentences. In [research on how people read websites](#) we found that 79 percent of our test users always scanned any new page they came across; only 16 percent read word-by-word. (Update: a newer study found that [users read email newsletters](#) even more abruptly than they read websites.)

As a result, Web pages have to employ **scannable text**, using

- highlighted **keywords** (hypertext links serve as one form of highlighting; typeface variations and color are others)
- meaningful **sub-headings** (not "clever" ones)
- bulleted **lists**
- **one idea** per paragraph (users will skip over any additional ideas if they are not caught by the first few words in the paragraph)
- the **inverted pyramid** style, starting with the conclusion
- **half the word count** (or less) than conventional writing

We found that **credibility is important** for Web users, since it is unclear who is behind information on the Web and whether a page can be trusted. [Credibility can be increased](#) by high-quality graphics, good writing, and use of **outbound hypertext links**. Links to other sites show that the authors have done their homework and are not afraid to let readers visit other sites.

Input Design

- Input Control
 - Every piece of information should be traceable back to the input data
 - Audit trail
 - Data security
 - Records retention policy
 - Encrypted – encryption

Chapter Summary

- The chapter began with a discussion of output design issues and a description of various types of output
- User-centered design principles require an analyst to understand the business functions, maximize graphical effectiveness, profile the system's users, think like a user, use prototyping, design a comprehensive interface, continue the feedback process, and document the interface design

Chapter Summary

- An effective way to reduce input errors is to reduce input volume
- You can also reduce errors by using well-designed data entry screens and by using data validation checks
- Chapter 8 complete