Output Design and Prototyping

Overview

Chapter 15 is a technique chapter. It teaches students the important skill of output design and prototyping. Students learn the underlying system concepts that apply to output design, and then they learn how to design and prototype computer outputs. The chapter focuses most heavily on the design of screen-based outputs—the fastest growing medium for computer outputs. The chapter distinguishes between the most common types of charts used in graphic outputs.

Chapter to Course Sequencing

The sequencing of output and input design is a classic “chicken or egg” problem. We have designed Chapters 15 (output design) and 16 (input design) to be interchangeable. We elected to present output design first because that is the classical approach as follows:

1. Database design (Chapter 14) precedes output design to ensure that the source data will be available to produce desired outputs.

2. Output design (Chapter 15) validates the database design. In other words, output design seeks to ensure that all the data needed for the outputs is available in the database.

3. Input design (this chapter) validates both the output and database design. In other words, input design seeks to ensure that all the data needed to produce the outputs has been input to the database.

4. User interface design (Chapter 17) ties the inputs and outputs together (regardless of the order in which you designed those outputs and inputs).

It should be noted that, in practice, most systems analysts integrate the design of outputs and inputs.

Regardless of how you sequence Chapters 15 and 16, students should first read Chapter 10 to provide perspective for where output design fits into total systems design. It is also recommended that this chapter follow Chapters 13 and 14. Chapter 13 determines the application framework or general system design that serves as an outline for detailed design, inclusive of outputs. Chapter 14 covers database design. Input design and prototyping loads the database. If you are taking an object-oriented approach, you could cover Chapter 18 either before or after Chapters 15-17.
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

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.
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 COMMUNICATION. It involves system designers and systems analysts.

Teaching Notes
This slide (and the next) is positioned after the definitions in the belief that students often learn better in lecture situations by first learning details and then seeing how those details fit together. If you prefer to teach structure first and then fill in the details, then move these two slides to just after the Chapter Map.

If this slide is difficult to read, refer students to Figure 15-1 in the text.

Note that these categories are not necessarily mutually exclusive.
Internal Outputs

**Internal output** — an output intended for system owners and system users within an organization.

- **Detailed report** — an internal output that presents information with little or no filtering
  - Example: A listing of all customers
- **Summary report** — an internal output that categorizes information for managers
  - Do not have to wade through details.
  - Increasingly presented in graphical formats using charts
  - Example: A count of customers by region
- **Exception report** — An internal output that filters data to report exceptions to some condition or standard.
  - Example: A listing of customers with past due accounts

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**Detailed Report**

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**Summary Report**

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No additional notes.
Slide 9

Exception Report

No additional notes.

Slide 10

External Outputs

External outputs – an output that leaves the organization organization.

• Intended for customers, suppliers, partners, or regulatory agencies.

Turnaround documents – an external output that may re-enter the system as an input.

• Most “bills” and invoices include a stub to be returned by the customer with payment.

No additional notes.

Slide 11

External Document

No additional notes.
Slide 12

Turnaround Document

No additional notes.

Slide 13

Implementation Methods for Outputs

- Printed output
  - Tabular output presents information in columns.
  - Zoned output places text and numbers into designated areas
- Screen output
- Graphic output is the use of pictorial charts to convey information and demonstrate trends and relationships that cannot be easily seen in tabular formats.
- Point-of-sale terminals
- Multimedia
- E-mail
- Hyperlinks
- Microfilm or microfiche

No additional notes.

Slide 14

Chart Types

- **Line charts** show one or more series of data over a period of time. They are useful for summarizing and showing data at regular intervals. Each line represents one series or category of data.

- **Area charts** are similar to line charts except that the focus is on the area under the line. That area is useful for summarizing and showing the change in data over time. Each line represents one series or category of data.

- **Bar charts** are useful for comparing series or categories of data. Each bar represents one series or category of data.

- **Column charts** are similar to bar charts except that the bars are vertical. Also, a series of column charts may be used to compare the same categories at different times or time intervals. Each bar represents one series or category of data.

**Teaching Notes**

This is material from Figure 15-5. It has been pulled out of the figure so that the text can be larger and more readable.
Chart Types (concluded)

Pie charts show the relationship of parts to a whole. They are useful for summarizing percentages of a whole within a single series of data. Each slice represents one item in that series of data.

Donut charts are similar to pie charts except that they can show multiple series or categories of data, each as its own concentric ring. Within each ring, a slice of that ring represents one item in that series of data.

Radar charts are useful for comparing different aspects of more than one series or category of data. Each data series is represented as a geometric shape around a central point. Multiple series are overlaid so they can be compared.

Scatter charts are useful for showing the relationship between two or more series or categories of data measured at uneven intervals of time. Each series is represented by data points using either different colors or bullets.

Teaching Notes
This is material from Figure 15-5. It has been pulled out of the figure so that the text can be larger and more readable.

Output Design with an Old Style Printer Spacing Chart

Teaching Notes
When all printouts were done on dot matrix and line printers with mono-spaced fonts (meaning that every character took the same horizontal amount of space), these charts were very useful in laying out charts.

Students can see that these charts can be considered "models" or even prototypes of reports. Today GUIs have changed the focus from character spacing to pixels, making these charts irrelevant.

Output Design with a Modern CASE Tool

Teaching Notes
As shown here with System Architect, many CASE tools include facilities for report and screen layout.

Another approach used today is to develop working prototypes with PC-database applications.

Tools such as Visio or even spreadsheets can be used to quickly develop non-working output prototypes.
Output Design with a Report Writer Tool

Teaching Notes
A final way to design output with a GUI report writer tool, such as Seagate Crystal Reports (shown here). Tools such as this create the actual “code” to be integrated in the operational information system.

Output Design with a Report Writer Tool (continued)

No additional notes:

Output Design Guidelines

Teaching Notes
If the designer does not understand the purpose of the report or the information in it well enough to do all of these things, then he or she is not yet ready to design the report!

Design guidelines are continued on the next slide.

1. Outputs should be simple to read and interpret.
   - Include a title.
   - Date and time stamp.
   - Include sections and headings to segment information.
   - Clearly label all fields and columns.
   - Include legends for all abbreviations.
   - Include only required information. Online provide methods to expand and contract information.
   - Report information in format that does not have to be manually added.
   - Information should be balanced across the page or screen.
   - Provide for easy navigation.
   - Avoid computer jargon and error messages.
Output Design Guidelines (cont.)

1. The timing of outputs is important.
   • This can affect how the output is designed and implemented.
2. The distribution of (or access to) outputs must be sufficient to assist all relevant users.
   • The choice of implementation method affects distribution.
3. Outputs must be acceptable to the system users who will receive them.
   • Systems analyst must understand how the recipient plans to use the output.

Output Design Process

1. Identify system outputs and review logical requirements.
2. Specify physical output requirements.
3. As necessary, design any preprinted forms.
4. Design, validate and test outputs using some combination of:
   1. Layout tools (e.g., hand sketches, spacing charts, or CASE tools).
   2. Prototyping tools (e.g., spreadsheet, PC DBMS, 4GL).
   3. Code generating tools (e.g., report writer).

Teaching Notes
The next slide shows a logical data structure for output requirements (related to step 1). Following slides present other output design principles.

A Logical Data Structure for Output Requirements

Teaching Notes
It may be useful to walk through this technique for specifying “logical” output requirements. The red and blue symbols are relational operators, that is, they specify the relationship between attributes to be included on the output in terms of:

- Sequence: +
- Selection: [ data attributes]
- Iteration: min ( data attributes ) max
- Optionality: ( data attributes)

Many CASE tools support this logical notation.
Tabular Report Design Principles

<table>
<thead>
<tr>
<th>Design Issue</th>
<th>Design Guideline</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Page Size</td>
<td>portrait or landscape</td>
<td>See applicable</td>
</tr>
<tr>
<td>Page Orientation</td>
<td>portrait orientation is often preferred because it is oriented the way we read most books and reports. Landscape orientation is sometimes preferred for tabular reports because more columns can be printed.</td>
<td></td>
</tr>
<tr>
<td>Page Headings</td>
<td>At a minimum, page headings should include a recognizable report title, date and time, and page numbers.</td>
<td></td>
</tr>
<tr>
<td>Report Legends</td>
<td>A legend is an explanation of abbreviations, colors, or codes used in a report. In a printed report, a legend can be printed on only the first or last page. On a display screen, a legend can be made available as a pop-up dialogue box.</td>
<td></td>
</tr>
<tr>
<td>Portrait Orientation</td>
<td>Portrait orientation is often preferred because it is oriented the way we orient most books and reports; however, landscape orientation is often necessitated for tabular reports because more columns can be printed.</td>
<td></td>
</tr>
<tr>
<td>Page Size</td>
<td>Today the page sizes of choice are standard (8½” x 11”) and legal (8½” x 14”).</td>
<td></td>
</tr>
<tr>
<td>Column Headings</td>
<td>Column headings should be short and descriptive. Avoid abbreviations or include a Report Legend.</td>
<td></td>
</tr>
<tr>
<td>Column Spacing</td>
<td>Alignment should be tested with users for preferences with a special emphasis on the risk of misinterpretation of the information.</td>
<td></td>
</tr>
<tr>
<td>Column Spacing</td>
<td>If columns are too close, users may not properly differentiate between the columns. If they are too far apart, the user may have difficulty following a single row. Rule of thumb: X 5 spaces between each.</td>
<td></td>
</tr>
<tr>
<td>Row Headings</td>
<td>The first one or two columns should identify data that differentiates each row. Rows should be sequenced in a fashion that supports their use. Frequently rows are sorted on a numerical key or alphabetically.</td>
<td></td>
</tr>
<tr>
<td>Formatting</td>
<td>Data is often reoriented without formatting. Character or space designations should include formatting.</td>
<td></td>
</tr>
<tr>
<td>Control Results</td>
<td>Groups of rows should be logically grouped in the report. The transition from one group to the next is called a control break and is frequently followed by a subtotal for the group.</td>
<td></td>
</tr>
<tr>
<td>End of Report</td>
<td>The end of a report should be clearly indicated to ensure that users have the entire report.</td>
<td></td>
</tr>
</tbody>
</table>

No additional notes.

No additional notes.

Teaching Notes
Refer to Figure 15-9 in the text for a more readable version.
Screen Output Design Principles

<table>
<thead>
<tr>
<th>Screen Design Considerations</th>
<th>Design Guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site</td>
<td>The designer should consider the lowest common denominator. The default screen size should be less than or equal to the smallest resolution display in the user community.</td>
</tr>
<tr>
<td>Scrolling</td>
<td>On-line applications have the advantage of not being limited by the physical page. This can also be a disadvantage if important information such as column headings scroll off the screen. If possible, freeze important headings at the top of the screen.</td>
</tr>
<tr>
<td>Navigation</td>
<td>Users should always have a sense of where they are in a network of on-line screens. Users also require the ability to navigate between screens.</td>
</tr>
<tr>
<td>Partitioning</td>
<td>In Windows, zones are forms within forms. On the Internet, frames are pages within pages.</td>
</tr>
<tr>
<td>Information Hiding</td>
<td>On-line applications often require the ability to hide information until it is either needed or becomes important. Techniques include drill-down and pop-up dialogue boxes.</td>
</tr>
<tr>
<td>Highlighting</td>
<td>Highlighting can call users' attention to erroneous data, exception data, or specific problems. Highlighting can also be a distraction if exposed.</td>
</tr>
<tr>
<td>Printing</td>
<td>Always provide users the option to print a permanent copy of the report.</td>
</tr>
</tbody>
</table>

Teaching Notes
Refer to Figure 15-10 in the text for a more readable version.

Report Customization

Teaching Notes
Adding a user dialogue to a report is a powerful way to give users the ability to customize a report for various kinds of detail, exceptions, and summarization (see Slide 4). These screens must be prototyped and approved by users as well as the reports. Ask students what types of things would be asked of users as they review this output customization dialogue prototype.

Tabular Report Prototype

Teaching Notes
Ask students what types of things would be asked of users as they review this output prototype.
Graphical Report Prototype

No additional notes.

Record-at-a-Time Output Prototype

Teaching Notes
This kind of output is useful for on-screen browsing and can eliminate a lot of printing costs.

Web Database Output Prototype

Teaching Notes
Ask students how they would verify this prototype. Who would they ask? What would they ask them? How are web outputs different than other outputs?
Windows/Web Media Player
Output Prototype
Answers to End of Chapter Questions and Exercises

Review Questions

1. Prototypes are not fully functional; rather, they are simple mock-ups of the information systems. These prototypes contain dummy data from databases such as Microsoft Access. In addition to that, they do not have any security features or optimized data access, which is always required in the final version of the information systems.

2. Outputs can be classified based on two characteristics:
   a. The outputs’ distribution and audience, which is about how the outputs are distributed—inside or outside of the organization and the people who read and use them
   b. Implementation methods

3. The summary report is used to aggregate data and to filter out information that may not be of interest of managers. It is often used to indicate trends or potential problems based on the data.

   The exception report also filters out information before the report reaches the manager. However, the exception report only includes exceptions to some condition or standard. For example, it may be used to identify customers who have overdue payments, which can be understood as a condition.

4. Invoices, account statements, paychecks, course schedules, airline tickets, boarding pass, travel itineraries, telephone bills, purchase orders, and mailing labels.

   All of the reports will leave the organization.

5. Tabular output is the most common format for printed output. It is an output that presents information as columns of text and numbers.

   Zoned output is an output that places text and numbers into designated areas of boxes of a form.

6. It is because screen outputs only provide information temporarily. If a user leaves the screen, the information cannot be retrieved again easily. This is also why many e-commerce websites will ask the user to print out the order confirmation shown on the screen. Perhaps most important, many users are more comfortable with printed reports than they are with screen reports.
7. • Line chart
   • Area chart
   • Bar chart
   • Column chart
   • Pie chart
   • Donut chart
   • Radar chart
   • Scatter chart

8. Graphic output can present data relationships, associations, and trends in a manner that tabular reports can not

9. • Computer outputs should be clear, easy to read and to interpret
   • Output should be timely.
   • Distribution of reports must reach the system users who need and use the information. Computer outputs must meet the expectations and needs of their audience.

   The guidelines’ main focus is on the system users who will ultimately be using the reports. Thus, it is very important for the system analysts to find out what exactly the users need and/or want in the reports.

10. • Identify system outputs and review logical requirements
   • Specify physical output requirements
   • Design preprinted external forms as necessary
   • Design, validate, and test outputs

11. Type and purpose of the output: this is an important criterion because reports are used to convey information for the users. Therefore, analysts must know what the reports are for and what kind of format the users want. If analysts fail to understand the type and the purpose of the reports, the reports will contain only useless data. Operational, technical, and economic feasibility: feasibility is always important because analysts must ensure that the users’ requirements can be met within an organization’s technical and economic ability.

12. • Implementation method: what method is best for a particular type of output
   • Frequency of the output being generated
   • Pages of output generated for a single copy of a printed output
   • Number of copies for each output
   • Distribution control of the output
13. Preprinted forms are helpful if there are external or turnaround documents because some or most of the information they contain is constant and less likely to change. What are some of the design issues for screen output design?

- Size
- Scrolling
- Navigation
- Partitioning
- Information hiding
- Highlighting
- Printing

14. Frames are pages within pages; therefore, users can scroll independently within pages. Frames can also be used for a legend, table of contents, or summary information.

Problems and Exercises

1. One hundred years ago, the only delivery method (other than a verbal presentation) was to print the report, and the only medium was paper. Fifty years ago, there were still only two options: paper and microfilm. Today there are at least seven delivery methods: printed, microfilm, screen, POS, multimedia, e-mail, and hyperlinks. Arguably, the biggest change in reports has been the speed in which the report can be generated and disseminated.

2. One approach would be to show a summary report of the number of cases by age for each child protection worker in tabular format. A simplified logical data structure for this report might be as follows:

```
REPORT = REPORT TITLE
  + REPORT DATE
  + 1 (CPS WORKER LNAME + CPS WORKER FI +
    CPS WORKER CASES OPEN 1-30 DAYS +
    CPS WORKER CASES OPEN 31-60 DAYS +
    CPS WORKER CASES OPEN OVER 60 DAYS +
    CPS WORKER TOTAL OPEN CASES)
  + TOTAL CASES OPEN 1-30 DAYS
  + TOTAL CASES OPEN 31-60 DAYS
  + TOTAL CASES OPEN OVER 60 DAYS +
  + GRAND TOTAL OPEN CASES
```
3. Shown below is an example of a basic version of the report:

| Department of Social Services                      |
| Child Protection Agency                           |
| Summary Report of Caseload by Age and CPS Worker |
| April 2005                                         |

<table>
<thead>
<tr>
<th>CPS Worker</th>
<th>Cases Open 1 – 30 Days</th>
<th>Cases Open 31 – 60 Days</th>
<th>Cases Open Over 60 Days</th>
<th>Total Open Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anderson, J</td>
<td>12</td>
<td>6</td>
<td>0</td>
<td>18</td>
</tr>
<tr>
<td>Jenkins, T</td>
<td>14</td>
<td>8</td>
<td>1</td>
<td>23</td>
</tr>
<tr>
<td>La Rosa, S</td>
<td>17</td>
<td>1</td>
<td>1</td>
<td>19</td>
</tr>
<tr>
<td>Hannigan, A</td>
<td>21</td>
<td>10</td>
<td>8</td>
<td>39</td>
</tr>
<tr>
<td>Shelby, S</td>
<td>14</td>
<td>3</td>
<td>0</td>
<td>17</td>
</tr>
<tr>
<td>Tsai, B</td>
<td>29</td>
<td>1</td>
<td>0</td>
<td>30</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
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</tr>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>Miller, G</td>
<td>11</td>
<td>2</td>
<td>1</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>118</td>
<td>31</td>
<td>11</td>
</tr>
</tbody>
</table>

4. Based upon the examples shown in the book, line and area charts would be inappropriate because they show changes in data over a period of time, whereas this report is a “snapshot” of caseload as of a specific date. A radar chart would also be inappropriate because it compares different elements of multiple categories or series of data.

Appropriate chart types include bar, column, pie, and donut charts. The bar and column charts can be used to compare series or categories of data. The pie and donut chart depict the parts in a single series or category of data, and the relationship of these parts to their whole.
The most appropriate or best one to use would depend upon what the customer want to see in this report. For example, if the director wants to compare CPS worker caseloads, the most appropriate chart to use would be a bar or column chart. If the director wants to look at open cases over 60 days compared to total caseload for an individual CPS worker, then a pie or donut chart would be the most appropriate one to use.

5. This is a summary report. Depending on what the sales manager needs to know, each row could show total sales for the previous week and year to date by vehicle category (new, used, commercial etc.), salesperson, make and model of vehicle, etc. But you need to ask the sales manager specifically what is needed, preferably before designing the report!

6. The sales manager needs an exception report. Data elements would include sales period, salesperson name, sales category (used cars, new cars, commercial vehicles, etc.), and number of vehicles sold for previous week and for year to date. You could group the report in several ways, e.g., depending upon customer preference by sales category, by number of vehicles sold starting with the least (since this is an exception report), or by sales category and then subgroup to number of vehicles sold.

7. A10, B11, C12, D9, E6, F1, G8, H2, I7, J4, K5, L, M3,

8. Bar charts are a highly effective graphic tool for comparing a data series over a period of time, such as annual sales by quarter. Pie charts are not! Pie charts are not intended to show discrete data, but the relationship of the parts to the whole for a single series of data.

9. A detail report showing open cases by CPS worker needs to be designed. Data elements should include CPS worker name, the identifying name and/or case number for each open case, the age of each case or date opened, a line for the CPS worker to enter the case status, and a line to enter the estimated date of completion. Since the intent of this report is to help CPS workers manage and prioritize their caseloads, case should be listed in order by age (oldest first) rather than in alphabetical order. A simple prototype design might look like the following:
DEPARTMENT OF SOCIAL SERVICES  
CHILD PROTECTION AGENCY  
DETAIL REPORT OF OPEN CASES BY CPS WORKER  
IN CASE AGE ORDER  
APRIL 2005

CPS Worker: Hannigan, A

<table>
<thead>
<tr>
<th>Date Opened</th>
<th>Case Number</th>
<th>Status of Case</th>
<th>Estimated Date of Completion</th>
</tr>
</thead>
<tbody>
<tr>
<td>01/03/2005</td>
<td>A54321</td>
<td></td>
<td></td>
</tr>
<tr>
<td>01/12/2005</td>
<td>F01512</td>
<td></td>
<td></td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td></td>
<td></td>
</tr>
<tr>
<td>04/29/2005</td>
<td>B35723</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Please return the completed copy of this report to the director no later than ____________

10. 1. The purpose of outputs is to present information to system users. Because they are the most visible part of an information system, system users and owners often base the value of an information system on the outputs.

2. In designing outputs, a good place to begin is with the physical data flow diagrams, because they identify both the net outputs and the implementation method.

3. Outputs can be categorized by two characteristics: 1) by their distribution and audience and 2) by their implementation method.

4. In a report, subtotals often occur at control breaks, which are used to transition from one group of data to the next one.

5. In a tabular report, readability is influenced by column spacing, which generally should be 3-5 spaces.

11. Based upon the brief information you have been given, you already know the type of report output is to be shown in a summary report for internal use, as well as the report frequency and the information to be included in the report. The remaining design issues need to address the implementation methods, specifically:

1) What implementation method should you use for this report? Since this
report is for an executive, you should consider designing both screen and printed output, so the report can be viewed regardless of whether the Vice President has access to the company network.

2) For screen output, what are the limitations of the users’ screen displays? Since this report is being created for the executive level, screen output can be designed based upon higher-end displays.

3) For printed output, what size should the report be? In general, most executives today prefer the 8 ½ by 11 size report. What about page orientation? Portrait is generally preferred by executives, but landscape is better suited to tabular reports.

12. If CASE tools or other dedicated report writing tools are not available, Microsoft Access makes an excellent, widely used and commonly available tool for prototyping.

Critical design principles include:

• Design the output to be simple to read and to understand; avoid jargon, cryptic prompts, and labels that are not clear.
• Include only required information in the report.
• Navigation to, from and within the report should be intuitive.
• Report availability should match the frequency of the report (i.e., a daily report for executives should be ready first thing every morning.)
• Perhaps most important, know how the executives plan to use the report in order to make sure it meets their needs.

13. As with all elements of systems design, screen design for websites should focus on the needs of the target users. In addition to general design principles, screen design considerations should include the following:

• Avoid colors that are low-contrast and which make text difficult to read.
• Special attention should be paid to designing navigation buttons and tools that are easy to read and to understand.
• Pages should have ample white space and not be cluttered.
• Font styles and sizes should be chosen for their readability.
• On-line help messages should be clear and not cryptic.
• Avoid any gimmickry, such as blinking or reverse video.
• Screen resolution should be based upon the “lowest common denominator” principle, and should not be designed for high-resolution monitors.
• Minimize the amount of scrolling needed, which may be difficult for many senior citizens with arthritis or limited hand mobility.
• Shading separating each detail line should be used to improve readability.
• Avoid multimedia players which may require an extension or plug-in to be downloaded.
Projects and Research

1. The student should find numerous articles on this subject, and not have any problems finding different viewpoints, which should be reflected in their responses. Perhaps the most common viewpoint among industry writers and experts is that while the paperless office is not likely to occur in the near future, company intranets and other technological advancements make the “less-paper” office a viable option.

2. The purpose of this question is to have the student appreciate the human interface engineering issues involved in designing a form or interface. Responses regarding what is “good,” as well as the student’s redesign of a “bad” form, should be consistent with the guidelines discussed in this chapter. The last two questions are open-ended, but the response should indicate a thoughtful consideration of these issues.

3. Other than paper and microfilm, the timeline should show that all other output methods were not developed and/or not commercially available more than 10 – 25 years ago. Student responses should recognize that turn-around documents have probably existed in some form or another since the invention of paper or papyrus, and that microfilm, which become commercially available in the first half of the 20th century, had a major impact upon the storage of archival records. Responses should also be able to describe the enormous changes in organizational business processes and cultures wrought by the PC, of which the ability to view reports and information on screen was a significant part. Further, responses should link PC monitors as a necessary predecessor to e-mail. As for the output method that has had the most significant impact, responses should indicate that it is paper of course.

4. These questions are very open-ended as to responses. Their purpose is to get the student thinking dynamically about what the future may hold in terms of technological changes, the impact it may have upon what they do and how they do it, and how or if they should try to prepare for these changes.

5. The purpose of these questions is to help students understand the unique capabilities – both from a theoretical and practical standpoint – of intranets in terms of their screen interfaces, and how their unique differences from internet website interfaces may impact design guidelines and decisions. As such, responses are open-ended, but should indicate that the student understands the unique and essential characteristics of intranets.
6. Like several of the preceding questions, the purpose of these questions is to help the student understand and appreciate the tremendous impact that technological changes have had upon the flow of information. Responses can be open-ended, but should indicate that the student understands the gravity of the changes at organizational and individual levels.

**Minicases**

1. Please refer to page 584 for a discussion on each type of report.

2. I suggest they either use Formmail.cgi or PHP code. The coding for this is minimal, but does require server-side scripting.

   e.g. with Formmail:

   ```html
   <form method=POST action="/cgi-bin/formmail/formmail.cgi" target="_top">
   <INPUT TYPE="HIDDEN" NAME="recipient" VALUE="yourname @wherever ">
   <INPUT TYPE="HIDDEN" NAME="subject" VALUE="WebSite Contact">
   <INPUT TYPE="HIDDEN" NAME="redirect" VALUE=" thanks.htm">
   <INPUT TYPE="HIDDEN" NAME="required" VALUE="email,your_name">
   <input type=hidden name="sort" value="title, interest, your_name, company_name, street_address, city_name, state_name, zipcode, phone, company_name, email, comments">
   </form>
   </FORM>
   </input>

3. Data should be entered one time only. Otherwise, there is more of an opportunity for errors and there will be a much higher (unnecessarily so) labor cost associated with the data. Examples of data problems are formatting data types such as: Date. Should it be 1/2/05, January 2, 2005, or something else?

4. There is no set answer to this. Students should be graded in most part on their ability to understand the positive aspects of one design, and use that to improve a poor design.

**Team and Individual Exercises**

There are no answers to this section.