Systems Analysis and Design

Chapter 6: Designing Interfaces

Learning Objectives

6.1 Explain the process of designing forms and reports and the deliverables for their creation

6.2 Apply the general guidelines for formatting forms and reports

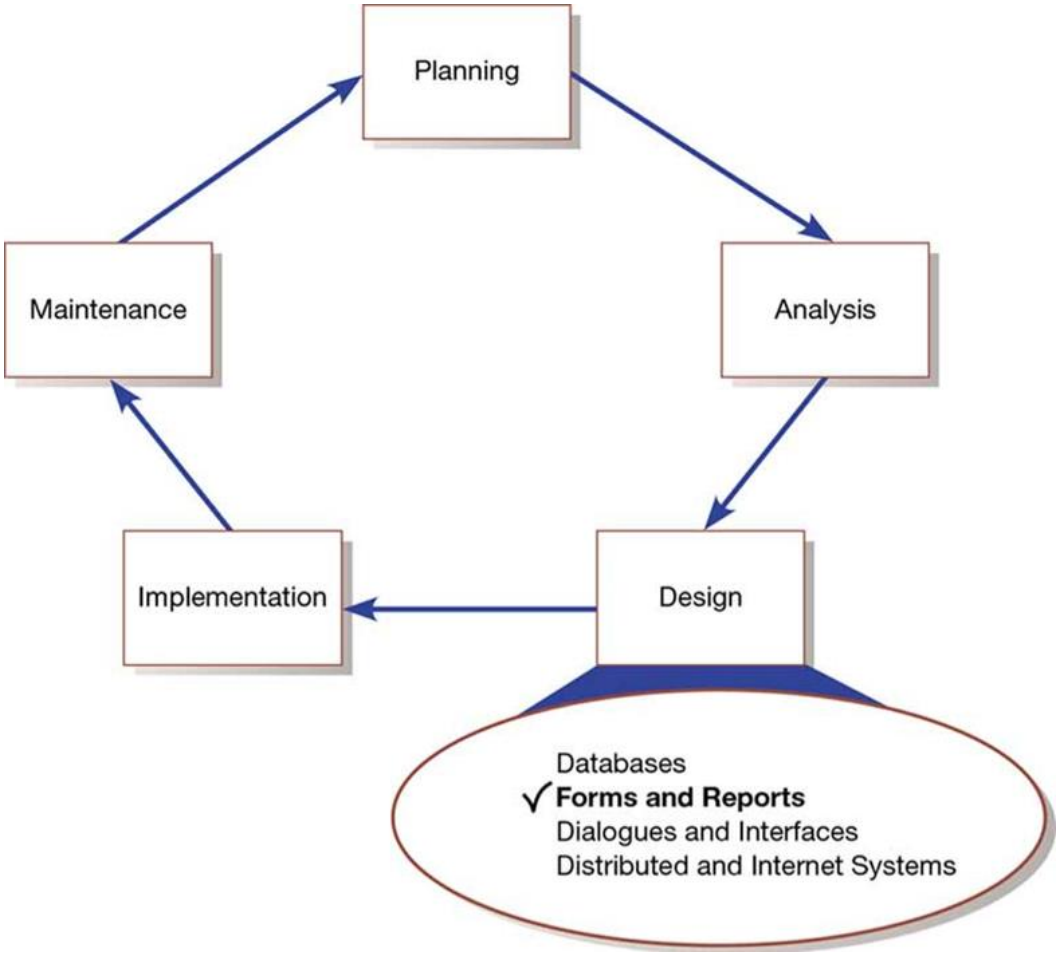
6.3 Use color and know when color improves the usability of information

6.4 Format text, tables, and lists effectively

6.5 Explain how to assess usability and describe how variations in users, tasks, technology, and environmental characteristics influence the usability of forms and reports

6.6 Discuss guidelines for the design of forms and reports for Internet-based electronic commerce systems

Systems Development Life Cycle with Logical Design Phase Highlighted



Designing Interfaces: Forms and Reports

- **Form** – business document that contains some predefined data and may include some areas where additional data are to be filled in. An instance of a form is typically based on one database record.
  - Usually in a stylized format and not a simple row and column look
- **Report** – business document that contains only predefined data; it is a passive document used solely for reading or viewing. A report typically contains data from many unrelated records or transactions
  - Reports typically contain data from many unrelated records or transactions

Common Types of Business Reports

Report Name	Description
Scheduled Reports	Reports produced at predefined intervals—daily, weekly, or monthly—to support the routine informational needs of an organization.
Key-Indicator Reports	Reports that provide a summary of critical information on a recurring basis.
Exception Reports	Reports that highlight data that are out of the normal operating range.
Drill-Down Reports	Reports that provide details behind the summary values on a key-indicator or exception report.
Ad-hoc Reports	Unplanned information requests in which information is gathered to support a nonroutine decision.

The Process of Designing Interfaces (1 of 3)

- A user-centered activity that follows a **prototyping** approach:
  - Understanding the target audience and their needs
  - Collect initial requirements
  - Structure and refine this information into an initial prototype
  - Users then evaluate the prototype
  - Make any needed refinements until users are satisfied and accept the prototype

Fundamental Questions When Designing Forms and Reports

1. Who will use the form or report?
2. What is the purpose of the form or report?
3. When is the form or report needed and used?
4. Where does the form or report need to be delivered and used?
5. How many people need to use or view the form or report?

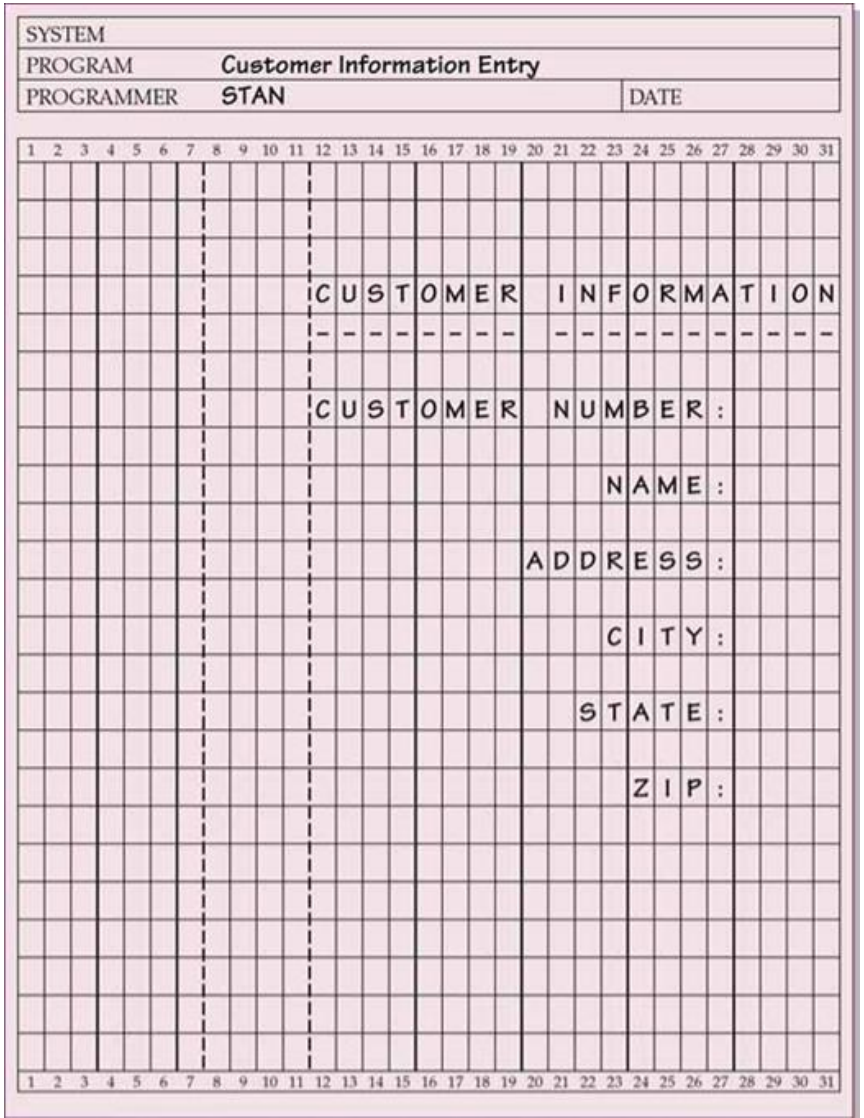
The Process of Designing Interfaces (2 of 3)

- **Paper prototype** – series of mock screens that can be used to test content, look, and feel, as well as the task flow and other usability factors
  - Focus is on the design (content, layout, flow)
- **Wireframe** – simple design to show the placement of information elements on a screen and the space needed for each element
  - Allows users to get a sense and feel of a design

The Process of Designing Interfaces (3 of 3)

- A coding sheet is an “old” tool for designing forms and reports in text-based format (see figure 10-2)
- A wireframe is an input screen roughed out on a sheet of paper (see figure 10-3A)
- A data input screen designed in Visual Basic allows a variety of font sizes, colors, and highlighting (see figure 10-3B)

The Layout of a Data Input Form Using a Coding Sheet



A Data Input Screen Designed as a Wireframe

A Data Input Screen Designed in Microsoft's Visual Basic.NET

Deliverables and Outcomes

- Design specifications are the major deliverables and contain three sections:
  1. Narrative overview
     - Characterizes, users, tasks, system, and environmental factors
  2. Sample design
     - Image of the form is more thoroughly tested and assessed
  3. Testing and usability assessment
     - Provides all testing and assessment information
     - Determine usability

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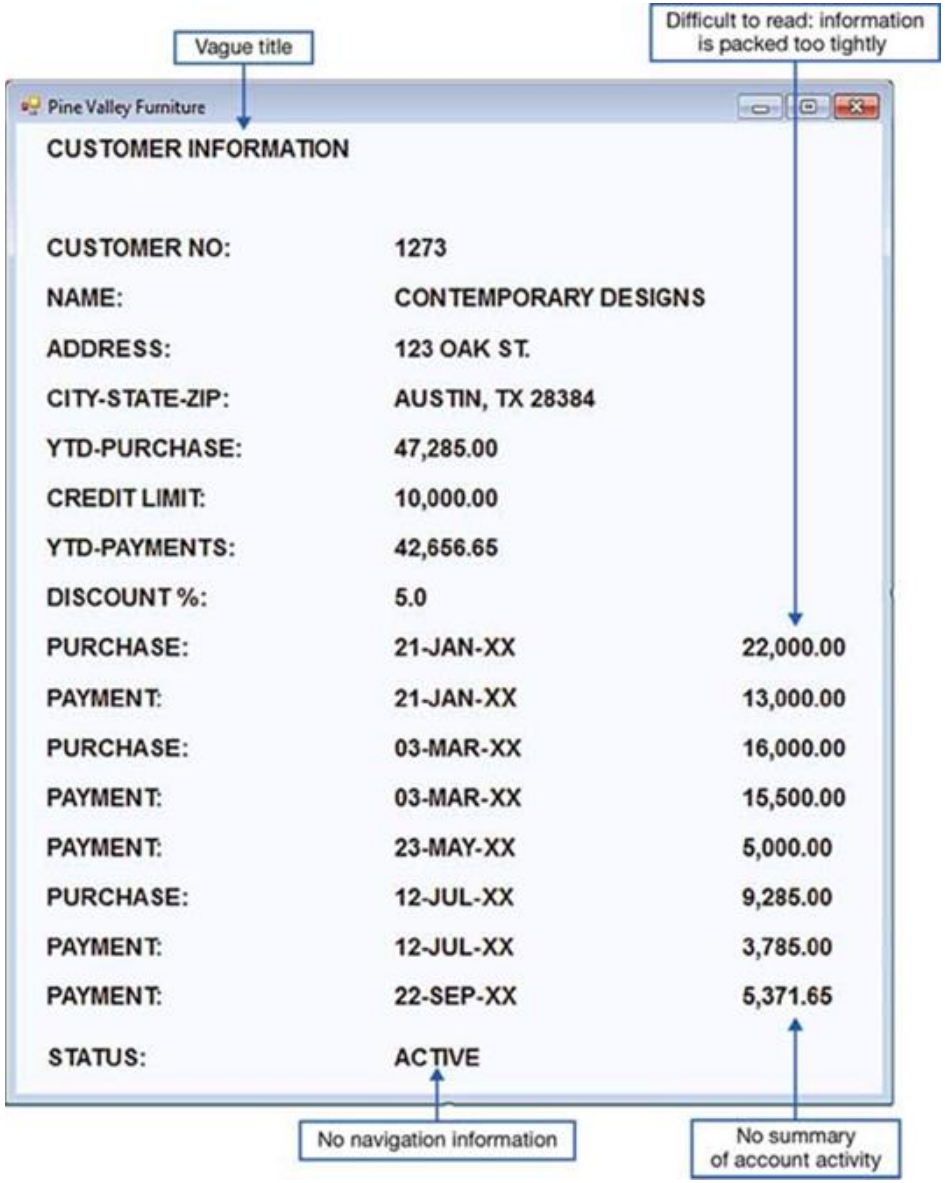
General Guidelines for the Design of Interfaces (1 of 2)

- **Meaningful Titles:**
  - Clear and specific titles describing content and use of form or report
  - Revision date or code to distinguish a form or report from prior versions
  - Current date, which identifies when the form or report was generated
  - Valid date, which identifies on what date (or time) the data in the form or report were accurate
- **Meaningful Information:**
  - Only needed information should be displayed
  - Information should be provided in a manner that is usable without modification

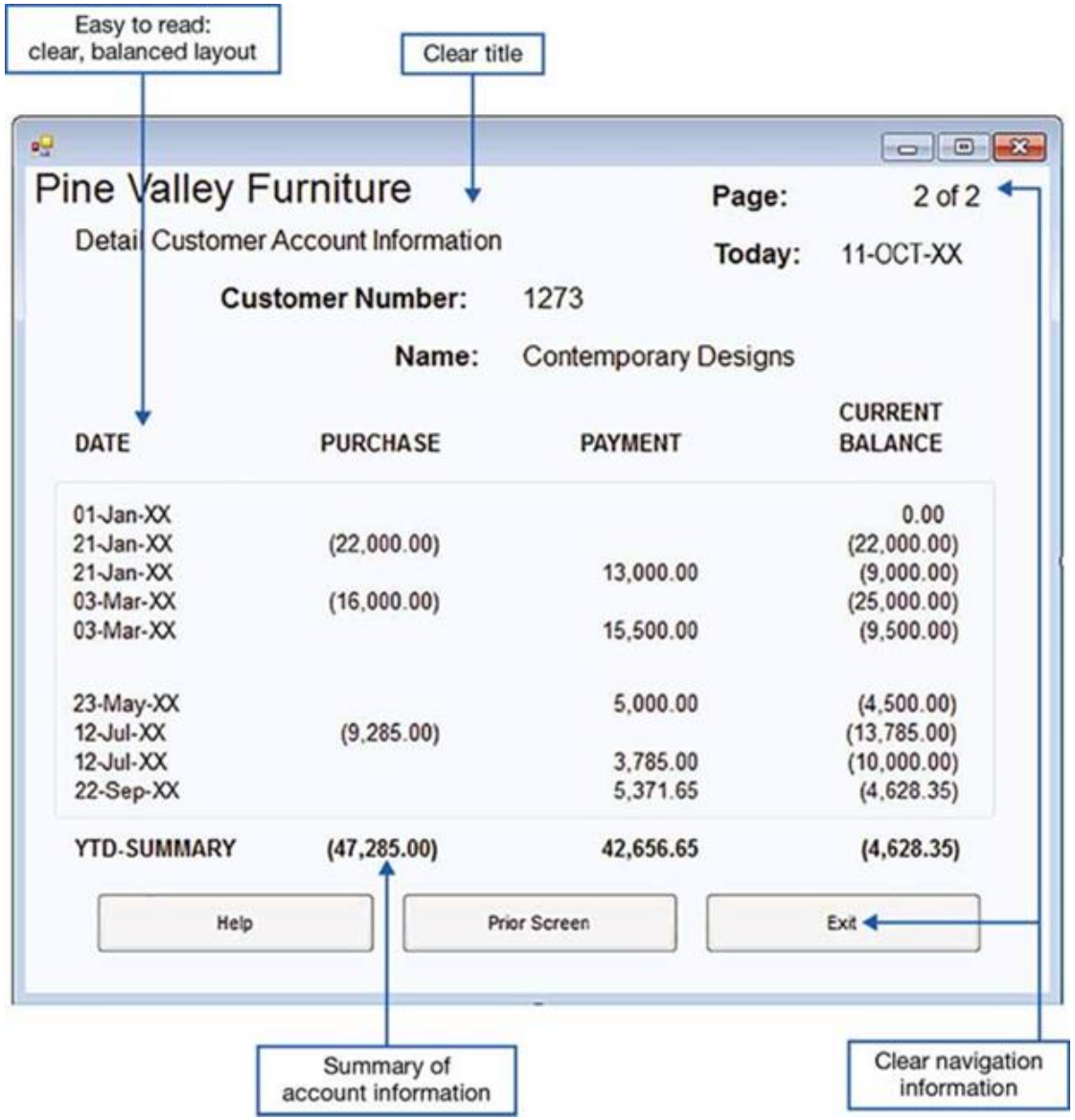
General Guidelines for the Design of Interfaces (2 of 2)

- **Balance the Layout:**
  - Information should be balanced on the screen or page
  - Adequate spacing and margins should be used
  - All data and entry fields should be clearly labeled
- **Design an Easy Navigation System:**
  - Clearly show how to move forward and backward
  - Clearly show where you are (e.g., page 1 of 3)
  - Notify user when on the last page of a multipaged sequence

Contrasting Customer Information Forms (Pine Valley Furniture) (a) Poorly Designed Form



Contrasting Customer Information Forms (Pine Valley Furniture) (b) Improved Design for Form



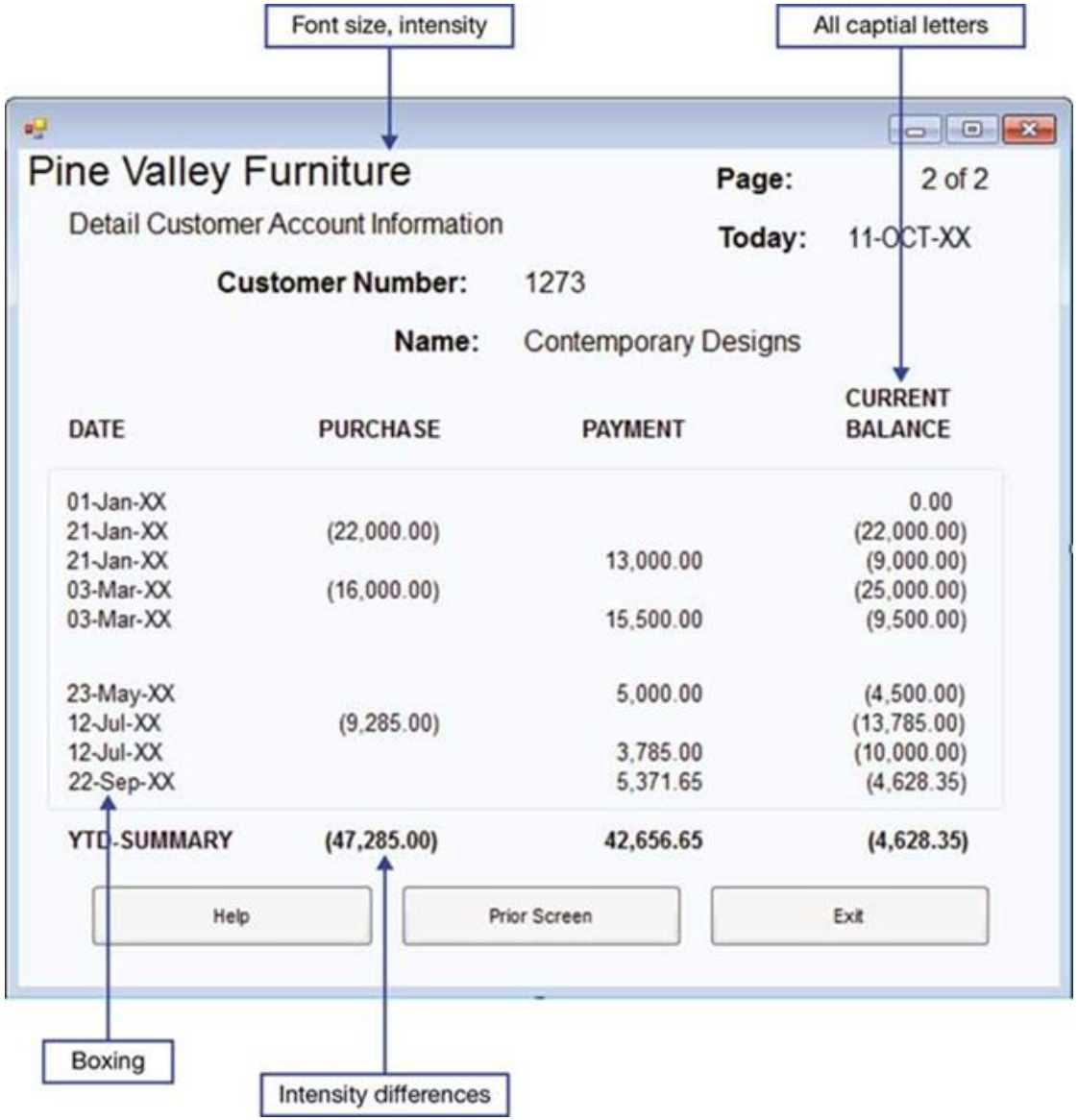
Methods of Highlighting

- Blinking and audible tones
- Color differences
- Intensity differences
- Size differences
- Font differences
- Reverse video
- Boxing
- Underlining
- All capital letters
- Offsetting the position of nonstandard information

Highlighting Information

- Several situations when highlighting can be a valuable technique for conveying special information include:
  - Notifying users of errors in data entry or processing
  - Providing warnings to users regarding possible problems such as unusual data values or an unavailable device
  - Drawing attention to keywords, commands, high-priority messages, and unusual data values

Customer Account Status Display Using Various Highlighting Techniques



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Color Use Guidelines

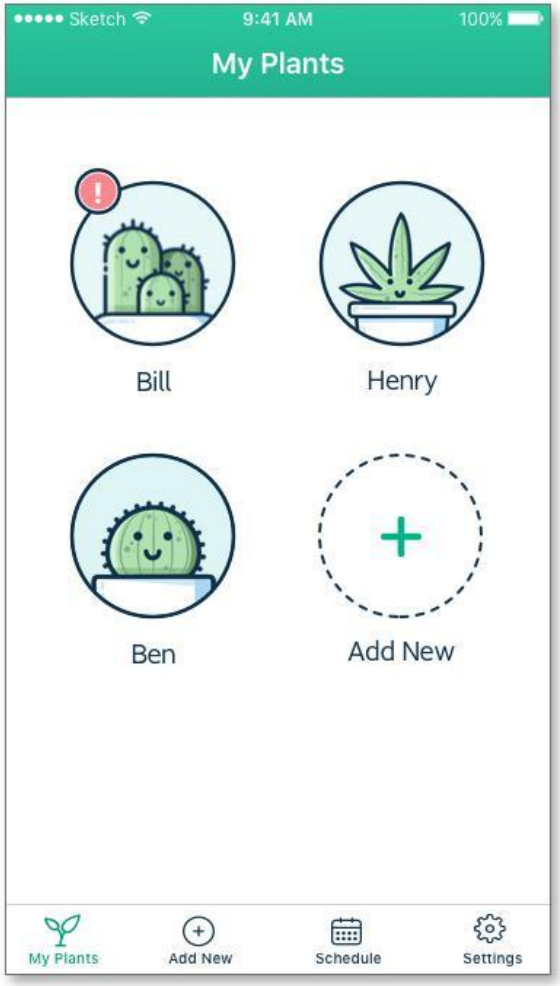
- Don’t use too many colors
- Use color coding to support use tasks
- Allow users to control color coding
- Design for monochrome then add color
- Use color coding consistently
- Avoid color pairings which clash
- Use color change to show status change
- Be aware that color displays are usually lower resolution

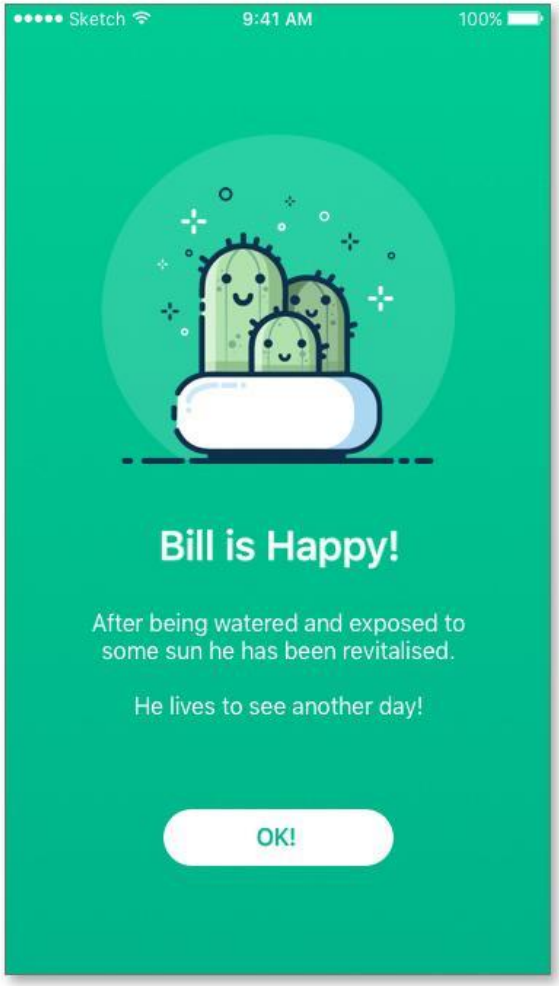
Benefits and Problems from Using Color

- **Benefits from Using Color:**
  - Soothes or strikes the eyes
  - Accents an uninteresting display
  - Facilitates subtle discriminations in complex displays
  - Emphasizes the logical organization of information
  - Draws attention to warnings
  - Evokes more emotional reactions
- **Problems with Using Color:**
  - Color pairings may wash out or cause problems for some users (e.g., color blindness)
  - Resolution may degrade with different displays
  - Printing or conversion to other media may not easily translate

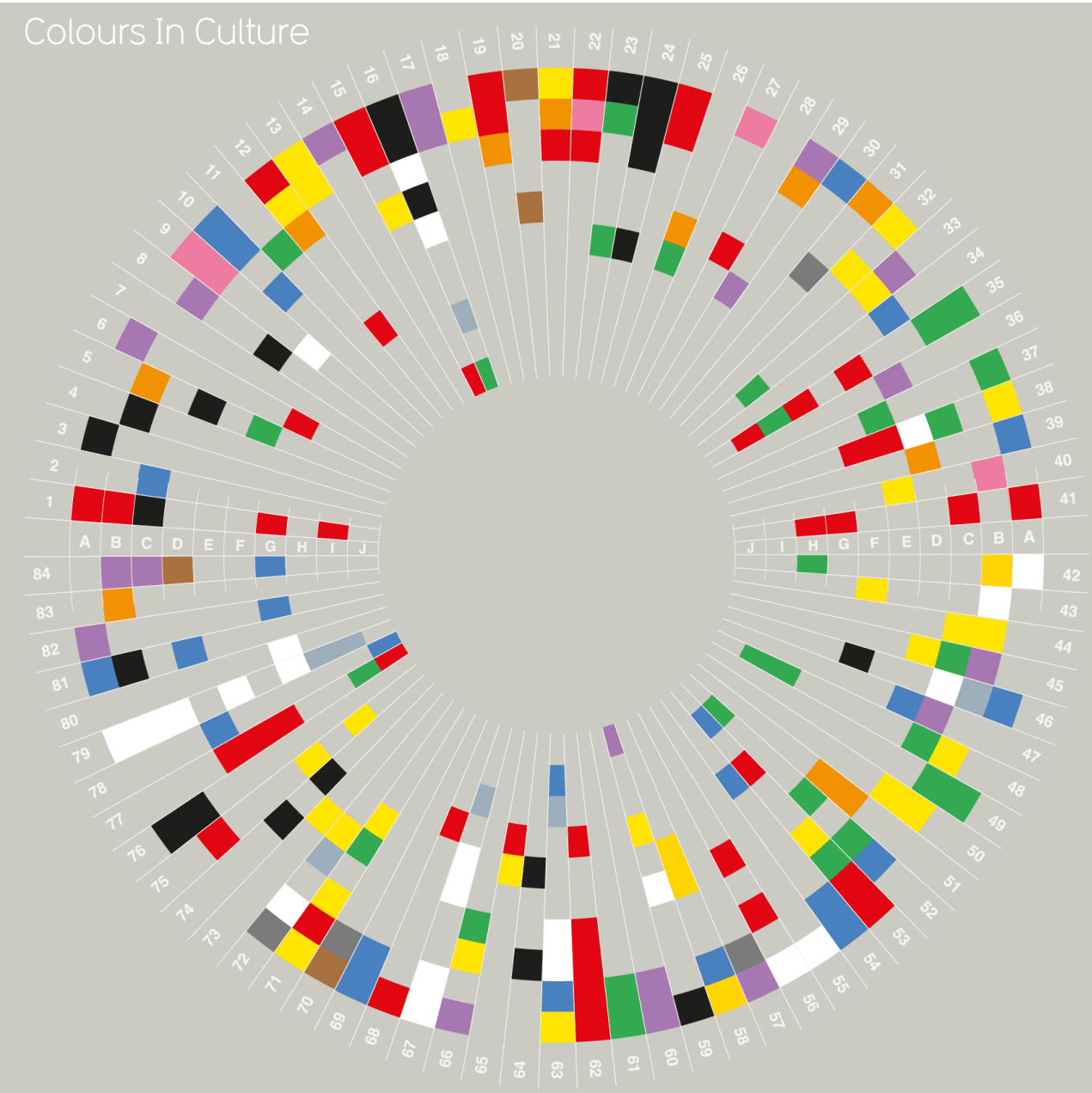
(**Source:** Based on Shneiderman et al., 2016; Benbasat, Dexter, & Todd, 1986)

The Psychology of Color





Color in Culture



A Western / American
B Japanese
C Hindu
D Native American
E Chinese
F Asian
G Eastern European
H Arab
I African
J South American

1 Anger
2 Art / Creativity
3 Authority
4 Bad Luck
5 Balance
6 Beauty
7 Calm
8 Celebration
9 Children
10 Cold
11 Compassion
12 Courage
13 Cowardice
14 Cruelty
15 Danger
16 Death
17 Decadence
18 Deceit
19 Desire
20 Earthy
21 Energy
22 Erotic
23 Eternity
24 Evil
25 Excitement
26 Family
27 Femininity
28 Fertility
29 Flamboyance
30 Freedom
31 Friendly
32 Fun
33 God
34 Gods
35 Good Luck
36 Gratitude

37 Growth
38 Happiness
39 Healing
40 Healthy
41 Heat
42 Heaven
43 Holiness
44 Illness
45 Insight
46 Intelligence
47 Intuition
48 Religion
49 Jealousy
50 Joy
51 Learning
52 Life
53 Love
54 Loyalty
55 Luxury
56 Marriage
57 Modesty
58 Money
59 Mourning
60 Mystery
61 Nature
62 Passion
63 Peace
64 Penance
65 Power
66 Personal power
67 Purity
68 Radicalism
69 Rational
70 Reliable
71 Repels Evil
72 Respect
73 Royalty
74 Self-cultivation
75 Strength
76 Style
77 Success
78 Trouble
79 Truce
80 Trust
81 Unhappiness
82 Virtue
83 Warmth
84 Wisdom

Yellow
Gold
Grey
Silver

Rule 60-30-10

- Is a simple theory for creating color palettes that are well-balanced and visually interesting:
- Generally something fairly neutral (either literally or psychologically) makes up 60% of the palette
- Another complementary color makes up 30% of the palette
- And then a third color is used as an accent for the remaining 10% of the design

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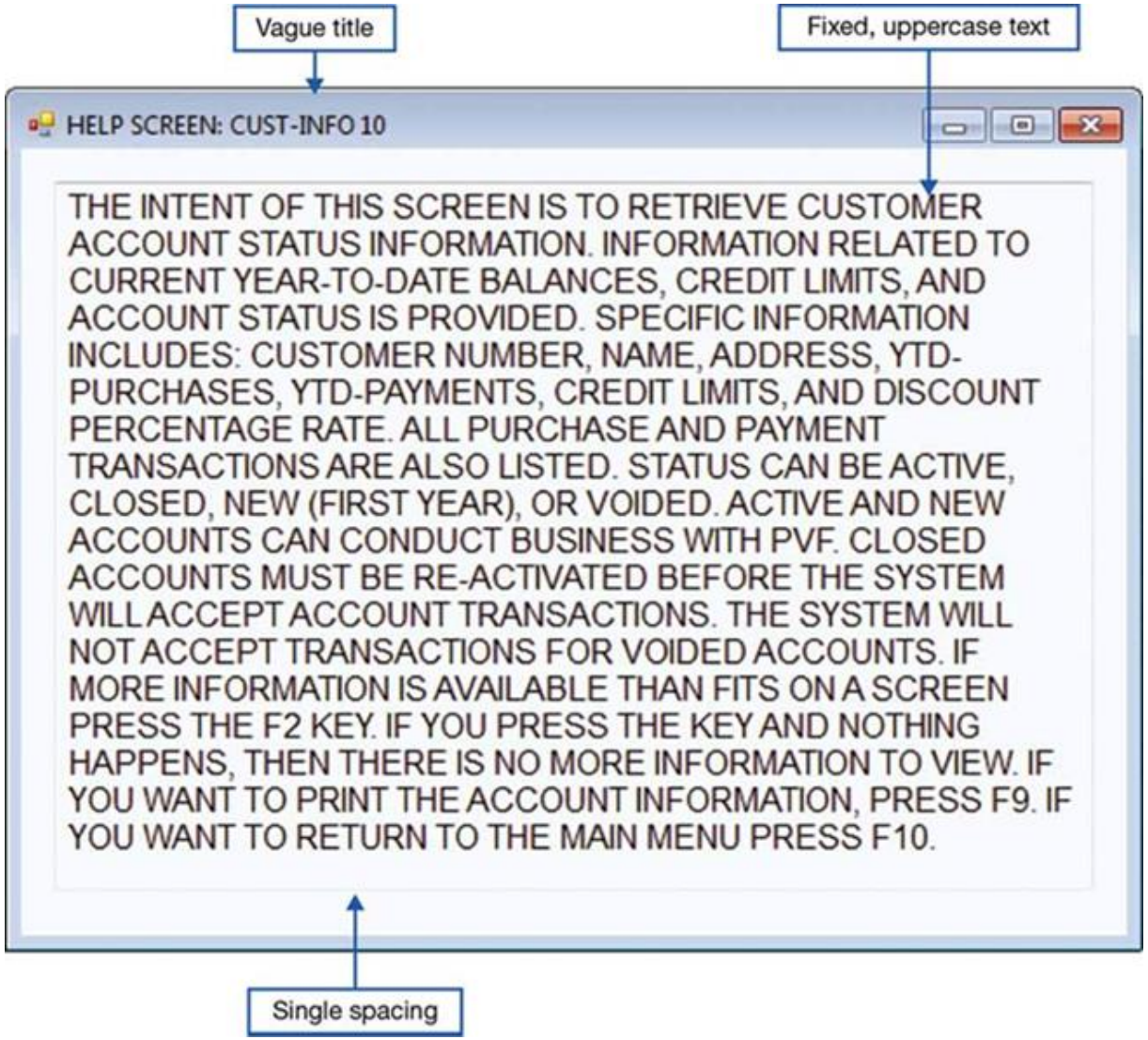
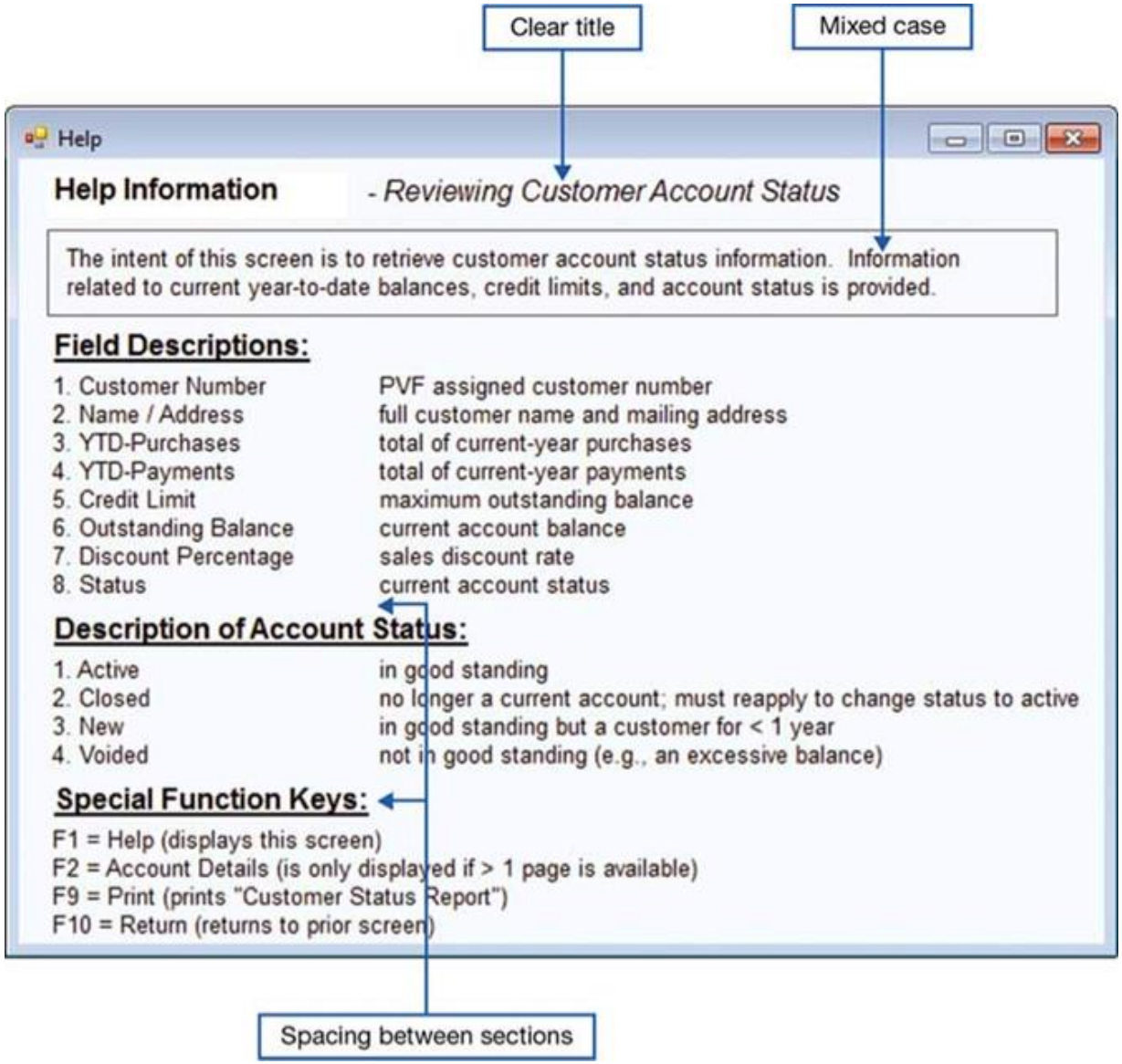
Guidelines for Displaying Text

Case	Display text in mixed uppercase and lowercase and use conventional punctuation.
Spacing	Use double spacing if space permits. If not, place a blank line between paragraphs.
Justification	Left-justify text and leave a ragged-right margin.
Hyphenation	Do not hyphenate words between lines.
Abbreviations	Use abbreviations and acronyms only when they are widely understood by users and are significantly shorter than the full text.

Contrasting the Display
(a) Poorly-Designed Help Screen with Many Violations of the General Guidelines



Contrasting the Display
(b) An Improved Design for a Help Screen



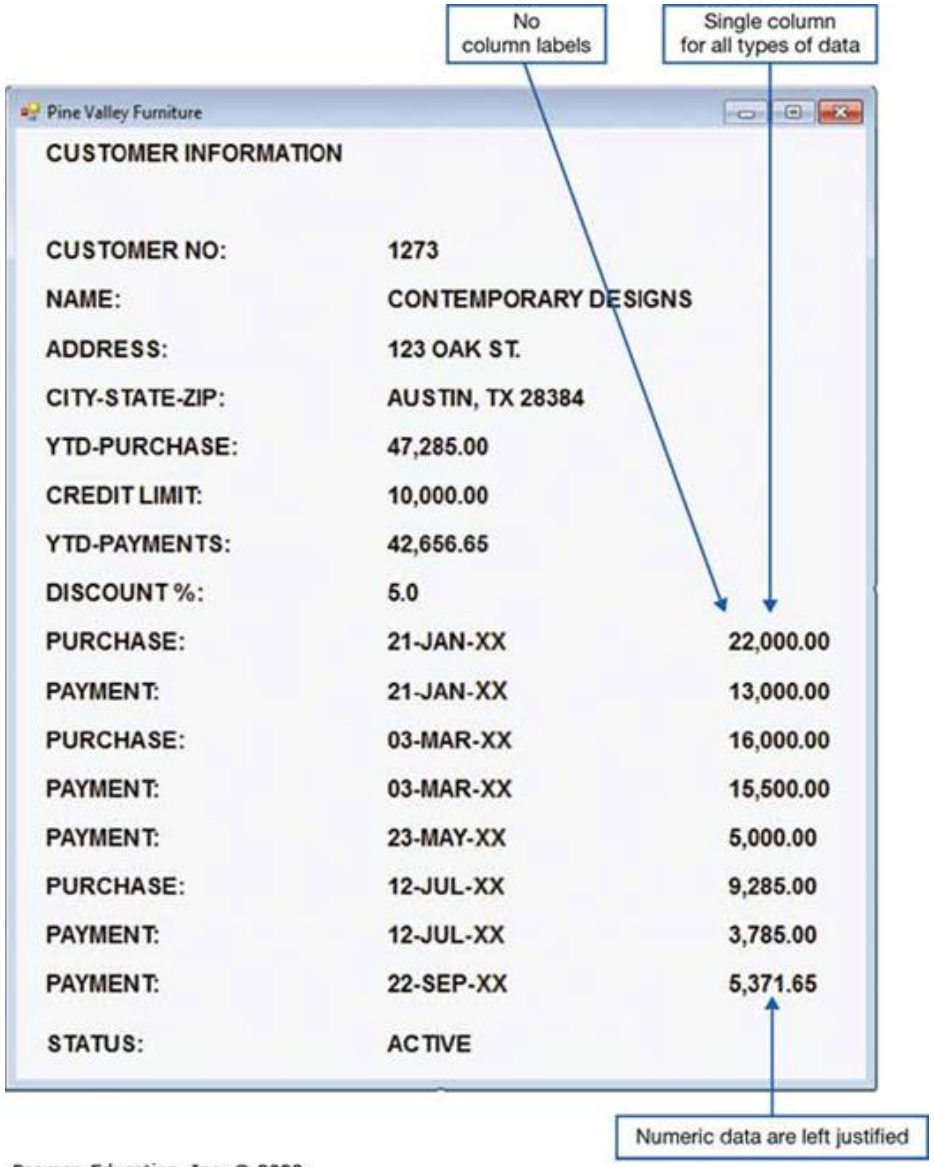
General Guidelines for Displaying Tables and Lists (1 of 2)

- **Use meaningful labels:**
  - All columns and rows should have meaningful labels
  - Labels should be separated from other information by using highlighting
  - Redisplay labels when the data extend beyond a single screen or page
- **Formatting columns, rows, text:**
  - Sort in a meaningful order (e.g., ascending, descending, or alphabetic)
  - Place a blank line between every five rows in long columns
  - Similar information displayed in multiple columns should be sorted vertically (i.e., read from top to bottom, not left to right)
  - Columns should have at least two spaces between them
  - Allow white space on printed reports for user to write notes

General Guidelines for Displaying Tables and Lists (2 of 2)

- **Formatting columns, rows, text: (cont.)**
  - Use a single typeface, except for emphasis
  - Use same family of typefaces within and across displays and reports
  - Avoid overly fancy fonts
- **Formatting numeric, textual, and alphanumeric date:**
  - **Right-justify numeric data** and align columns by decimal points or other delimiter
  - **Left-justify textual data**. Use short line length, usually 30–40 characters per line (this is what newspapers use, and it is easier to speed-read).
  - Break long sequences of **alphanumeric data** into small groups of three to four characters each

Contrasting the Display of Tables and Lists (a) Poorly- Designed Form



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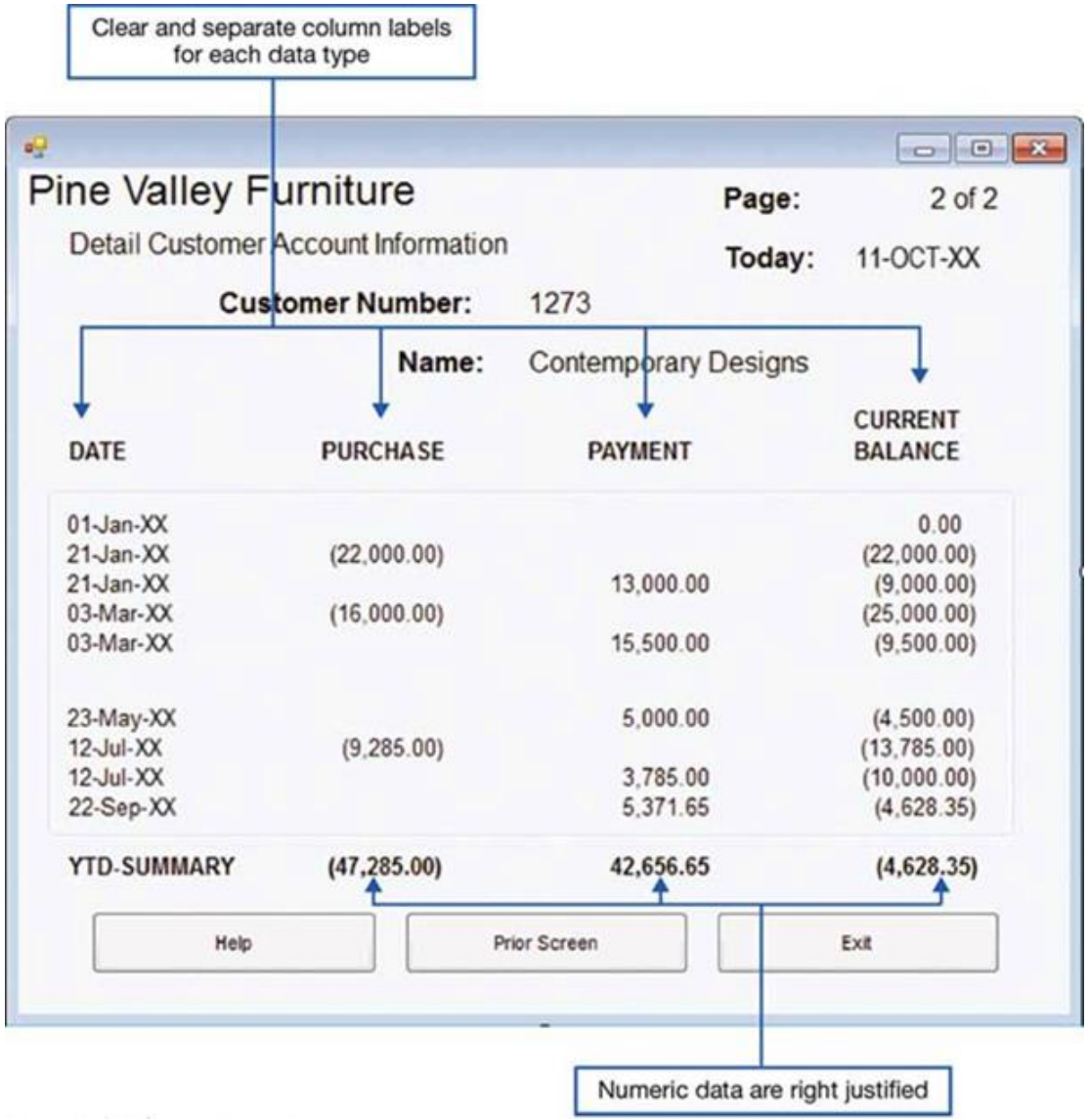
Contrasting the Display of Tables and Lists (b) Improved Design for Form



Guidelines for Selecting Tables Versus Graphs

- **Tables**
  - Reading individual data values
- **Graphs**
  - Providing a quick summary of data
  - Detecting trends over time
  - Comparing points and patterns of different variables
  - Forecasting activities
  - Reporting vast amounts of information when relatively simple impressions are to be drawn

Tabular Report Illustrating Numerous Design Guidelines (Pine Valley Furniture)

Place meaningful labels on all columns and rows

Alphabetic text is left justified

Use a meaningful title

Box the table data to improve the appearance of the table

Pine Valley Furniture

Salesperson Annual Summary Report, 2020

January 10, 2021

Page 1 of 2

Region	Salesperson	SSN	*Quarterly Actual Sales* First	Second	Third	Fourth
Northwest & Mountain						
	Baker	999-99-9999	195,000	146,000	133,000	120,000
	Hawthorne	999-99-9999	220,000	175,000	213,000	198,000
	Hodges	999-99-9999	110,000	95,000	170,000	120,000
Midwest & Mid-Atlantic						
	Franklin	999-99-9999	110,000	120,000	170,000	90,000
	Stephenson[1]	999-99-9999	75,000	66,000	80,000	80,000
	Swenson	999-99-9999	110,000	98,000	100,000	90,000
New England						
	Brightman	999-99-9999	250,000	280,000	260,000	330,000
	Kennedy	999-99-9999	310,000	190,000	270,000	280,000

[1]Sales reflect July 1, 2020 – December 31, 2020.

Superscript characters can be used to alert reader of more detailed information

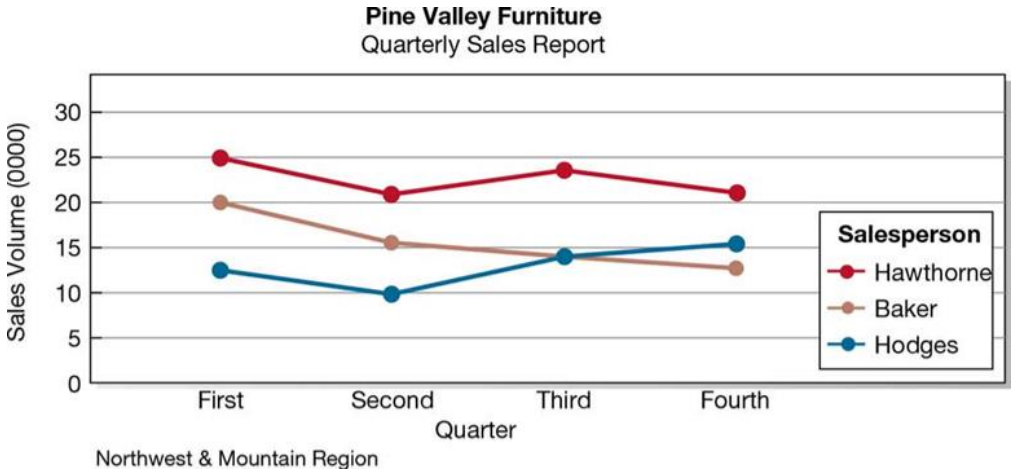
Sort columns in some meaningful order (names are sorted alphabetically within region)

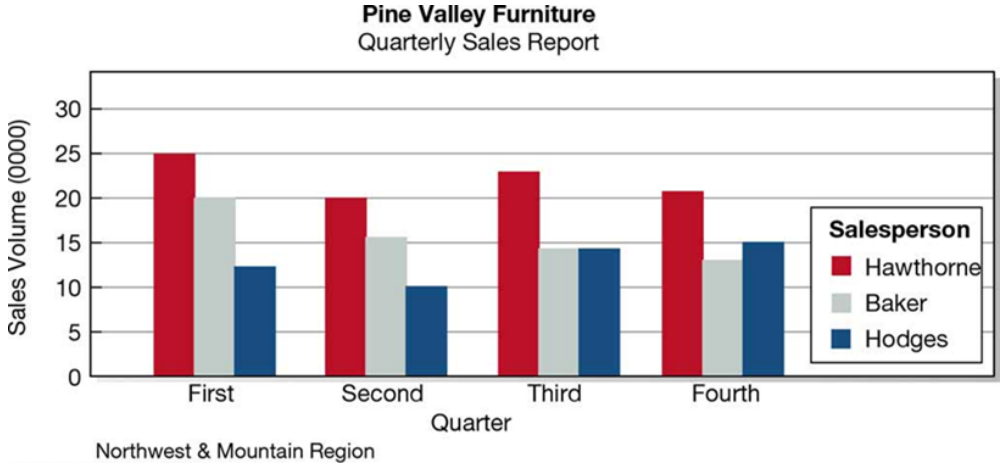
Long sequence of alphanumeric data is grouped into smaller segments

Right justify all numeric data

Try to fit table onto a single page to help in making comparisons

Graphs for Comparison (a) Line Graph (b) Bar Graph





Paper vs Electronic Reports

- Laser and ink-jet printers can print reports that look like display screen
  - Same guidelines apply
- High-speed impact printers are faster, but less user-friendly in appearance
  - Good for large batch reports
  - The coding sheet from figure 10-2 may be useful for these types of reports

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Assessing Usability

- **Usability** – overall evaluation of how a system performs in supporting a particular user for a particular task
- Three characteristics of usability:
  1. Speed – Can you complete a task efficiently?
  2. Accuracy – Does the system provide what you expect?
  3. Satisfaction – Do you like using the system?

General Design Guidelines for Usability of Forms and Reports

Usability Factor	Guidelines for Achievement of Usability
Consistency	Consistent use of terminology, abbreviations, formatting, titles, and navigation within and across outputs. Consistent response time each time a function is performed.
Organization	Formatting should be designed with an understanding of the task being performed and the intended user. Text and data should be aligned and sorted for efficient navigation and entry. Entry of data should be avoided where possible (e.g., computing rather than entering totals).
Clarity	Outputs should be self-explanatory and not require users to remember information from prior outputs in order to complete tasks. Labels should be extensively used, and all scales and units of measure should be clearly indicated.
Format	Information format should be consistent between entry and display. Format should distinguish each piece of data and highlight, not bury, important data. Special symbols, such as decimal places, dollar signs, and ± signs, should be used as appropriate.
Flexibility	Information should be viewed and retrieved in a manner most convenient to the user. For example, users should be given options for the sequence in which to enter or view data and for use of shortcut keystrokes, and the system should remember where the user stopped during the last use of the system.

Characteristics for Consideration When Designing Forms and Reports

Characteristic	Consideration for Form and Report Design
User	Issues related to experience, skills, motivation, education, and personality should be considered.
Task	Tasks differ in amount of information that must be obtained from or provided to the user. Task demands such as time pressure, cost of errors, and work duration (fatigue) will influence usability.
System	The platform on which the system is constructed will influence interaction styles and devices.
Environment	Social issues such as the users' status and role should be considered in addition to environmental concerns such as lighting, sound, task interruptions, temperature, and humidity. The creation of usable forms and reports may necessitate changes in the users' physical work facilities.

(**Source:** Based on Norman, 1991)

Measures of Usability

- Methods to assess usability:
  - **Learnability** – usability dimension concerned with how difficult it is for the user to perform a task for the first time
  - **Efficiency** – usability dimension concerned with how quickly users can perform tasks once they know how to perform them
  - **Error rate** – usability dimension concerned with how many errors a user might encounter and how easy it is to recover from those errors
  - **Memorability**—How easy is it to remember how to accomplish a task when revisiting the system after some period of time?
  - **Satisfaction and aesthetics**—How enjoyable is the system's visual appeal and how enjoyable is the system to use?

Common Errors When Designing the Layout of Web Pages (1 of 2)

Error	Recommendation
Nonstandard Use of GUI Widgets	Make sure that when using standard design items, they behave in accordance with major interface design standards. For example, the rules for radio buttons state that they are used to select one item among a set of items, that is, not confirmed until “OK’d” by a user. In many Web sites selecting radio buttons is used as both selection and action.
Anything That Looks Like Advertising	Because research on Web traffic has shown that many users have learned to stop paying attention to Web advertisements, make sure that you avoid designing any legitimate information in a manner that resembles advertising (e.g., banners, animations, pop-ups).
Bleeding-Edge Technology	Make sure that users don’t need the latest browsers or plug-ins to view your site.
Scrolling Test and Looping Animations	Avoid scrolling text and animations because they are both hard to read and users often equate such content with advertising.
Nonstandard Link Colors	Avoid using nonstandard colors to show links and for showing links that users have already used; nonstandard colors will confuse the user and reduce ease of use.

Common Errors When Designing the Layout of Web Pages (2 of 2)

Error	Recommendation
Outdated Information	Make sure your site is continuously updated so that users “feel” that the site is regularly maintained and updated. Outdated content is a sure way to lose credibility.
Slow Download Times	Avoid using large images, lots of images, unnecessary animations, or other time-consuming content that will slow the downloading time of a page.
Fixed-Formatted Text	Avoid fixed-formatted text that requires users to scroll horizontally to view content or links.
Displaying Long Lists as Long Pages	Avoid requiring users to scroll down a page to view information, especially navigational controls. Manage information by showing only N items at a time, using multiple pages, or by using a scrolling container within the window.

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Designing Forms and Reports at PVF

- Guidelines established at Pine Valley Furniture (PVF) include:
  - Use lightweight graphics
  - Establish forms and data integrity rules
  - Use stylesheet-based HTML

Lightweight Graphics

- **Lightweight graphics** – small, simple images that allow a Web page to be displayed more quickly
- Forms and data integrity rules:
  - All forms that request information should be clearly labeled and provide adequate room for input
  - Specific fields requiring specific information must provide a clear example
  - Forms must designate which fields are optional, required, and which have a range of values

Stylesheet-Based HTML

- **Stylesheet-Based HTML** – Web design approach that separates content from the way in which it is formatted and presented, making ongoing maintenance easier and site-wide consistency much higher
  - Allows content of a Web page to remain separate from the way it is formatted
  - Facilitates site-wide consistency

Summary (1 of 2)

- In this chapter you learned how to:
  - Explain the process of designing forms and reports and the deliverables for their creation
  - Apply the general guidelines for formatting forms and reports
  - Use color and know when color improves the usability of information
  - Format text, tables, and lists effectively

Summary (2 of 2)

- In this chapter you learned how to:
  - Explain how to assess usability and describe how variations in users, tasks, technology, and environmental characteristics influence the usability of forms and reports
  - Discuss guidelines for the design of forms and reports for Internet-based electronic commerce systems