Screen Designing : Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.

Introduction:

- A well-designed screen:
  - Reflects the capabilities, needs, and tasks of its users.
  - Is developed within the physical constraints imposed by the hardware on which it is displayed.
  - Effectively utilizes the capabilities of its controlling software.
  - Achieves the business objectives of the system for which it is designed.

Human Considerations in Screen Design:

How to Distract the Screen User:

- **Unclear captions and badly worded questions**. These cause hesitation, and rereading, in order to determine what is needed or must be provided. They may also be interpreted incorrectly, causing errors.

- **Improper type and graphic emphasis**. Important elements are hidden. Emphasis is drawn away from what is important to that which is not important.

- **Misleading headings**. These also create confusion and inhibit one's ability to see existing relationships.

- **Information requests perceived to be irrelevant or unnecessary.** The value of what one is doing is questioned, as is the value of the system.

- **Information requests that require one to backtrack and rethink a previous answer**, or look ahead to determine possible context. Inefficiency results, and mistakes increase.

- **Cluttered, cramped layout**. Poor layout creates a bad initial impact and leads to more errors. It may easily cause system rejection.

- **Poor quality of presentation, legibility, appearance, and arrangement**. Again, this degrades performance, slowing the user down and causing more errors.

What Screen Users Want:

- An orderly, clean, clutter-free appearance.
- An obvious indication of what is being shown and what should be done with it.
- Expected information located where it should be.
- A clear indication of what relates to what, including options, headings, captions, data, and so forth.

- A clear indication of when an action can make a permanent change in the data or system.

What Screen Users Do?

When interacting with a computer, a person

1.Identifies a task to be performed or need to be fulfilled: The task may be very structured or semi structured or structured with free form activities.

2.Decides how the task will be completed or the need fulfilled: set of transaction screens will be used. The proper transaction is identified and the relevant screen series retrieved.

3.Manipulates the computer's controls: To perform the task or satisfy the need, the keyboard, mouse and other similar devices are used

4.Gathers the necessary data: Screens information is collected from its source through forms or coworker and placed on the screen, through control manipulation.

5.Forms judgments resulting in decisions relevant to the task or need: Structured transactions will require minimal decision-making. Semi-structured transactions, in addition, may require decisions such as: Which set of screens, from all available,

Interface Design Goals:

- To make an interface easy and pleasant to use, then, the goal in design is to:
  - o Reduce visual work.
  - o Reduce intellectual work.
  - o Reduce memory work.
  - o Reduce motor work.
  - o Minimize or eliminate any burdens or instructions imposed by technology.

The Test for a Good Design :

- Can all screen elements be identified by cues other than by reading the words that make them up?
- A simple test for good screen design does exist. A screen that passes this test will have surmounted the first obstacle to effectiveness.
- The test is this: Can all screen elements (field captions, data, title, headings, text, types of controls, and so on) be identified without reading the words that identify or comprise them? That is, can a component of a screen be identified through cues independent of its content?
- If this is so, a person's attention can quickly be drawn to the part of the screen that is relevant at that moment. People look at a screen for a particular reason, perhaps to locate a piece of information such as a customer name, to identify the name of the screen, or to find an instructional or error message.

reduce visual search times and minimize confusion.

CREEN MEANING AND PURPOSE:

- Each screen element . . .
  - — Every control,All text,The screen organization,All emphasis,Each color,Every graphic
  - — All screen animation,Each message,All forms of feedback
- Must . . ….Have meaning to screen users,Serve a purpose in performing tasks.

Organizing Screen Elements Clearly and Meaningfully:

- Visual clarity is achieved when the display elements are organized and presented in meaningful and understandable ways. A clear and clean organization makes it easier to recognize screen's essential elements and to ignore its secondary information when appropriate.

Consistency:

- Provide real-world consistency. Reflect a person's experiences, expectations, work conventions and cultural conventions.
- Provide internal consistency. Observe the same conventions and rules for all aspects of a interface screen, and all application or Web site screens, including:
  - — Operational and navigational procedures.
  - — Visual identity or theme.
  - — Component, Organization, Presentation,Usage, Locations.
- Follow the same conventions and rules across all related interfaces.
- Deviate only when there is a clear benefit for the user.
- Quite simply, consistency greatly aids learning. It establishes an expectation

Ordering of Screen Data and Content:

- Divide information into units those are logical, meaningful, and sensible.
- Organize by the degree interrelationship between data or information.
- Provide an ordering of screen units of information and elements that is prioritized according to th user's expectations and needs.
- Possible ordering schemes include:
  - — Conventional/Sequence of use/ Frequency of use/ Function/ Importance/ General to specific.
- Form groups that cover all possibilities.
- Ensure that information that must be compared is visible at the same time.
- Ensure that only information relative to the users tasks or needs is presented on the screen.
- An organizational scheme's goal is to keep to a minimum the number of information

Screen Navigation and Flow:

- Provide an ordering of screen information and elements that:
  - — Is rhythmic, guiding a person's eye through the display.
    - o In establishing eye movement through a screen, also consider that the eye tends to move sequentially, for example:
      - ➢ From dark areas to light areas.
      - ➢ From big objects to little objects.
      - ➢ From unusual shapes to common shapes.
      - ➢ From highly saturated colors to unsaturated colors.
  - — Encourages natural movement sequences.
  - — Minimizes pointer and eye movement distances.
- Locate the most important and most frequently used elements or controls at the top left.
- Maintain a top-to-bottom, left-to-right flow.
- Assist in navigation through a screen by:
  - ❖ Aligning elements.
  - ❖ Grouping elements.
  - ❖ Using of line borders.
- Through focus and emphasis, sequentially, direct attention to items that are:
  1. Critical   2. Important.3. Secondary.4. Peripheral.
- Tab through window in logical order of displayed information.
- Locate command buttons at end of the tabbing order sequence.
- When groups of related information must be broken and displayed on separate screens, provide breaks at logical or natural points in the information flow.

VISUALLY PLEASING COMPOSITION:

- Provide visually pleasing composition with the following qualities:
  - ❖ Balance
  - ❖ Symmetry.
  - ❖ Regularity.
  - ❖ Predictability.
  - ❖ Sequentiality.
  - ❖ Economy.
  - ❖ Unity.
  - ❖ Proportion.

**Balance:** Create screen balance by providing an **equal weight of screen elements, left and right, top and bottom.**

❖ It is stabilization or equilibrium, a midway center of suspension. The opposite of balance is instability; the design elements seemingly ready to topple over.
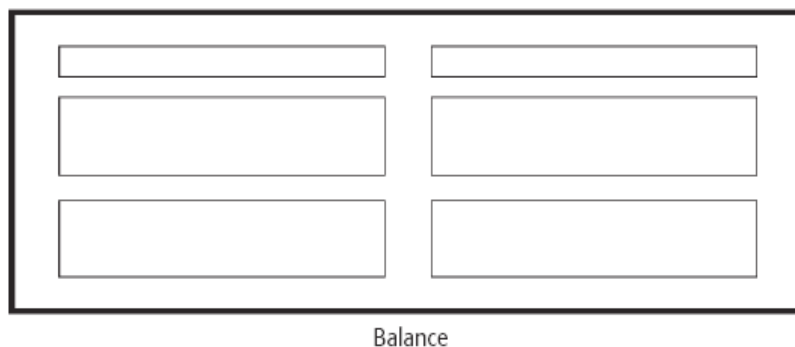
Balance

❖ Balance is most often informal or asymmetrical, with elements of different colors, sizes and shapes being positioned to strike the proper relationships.

❖ Dark colors, unusual shapes, and larger objects are "heavier," whereas light colors, regular shapes, and small objects are "lighter." Balance on a screen is accomplished through centering the display itself, maintaining an equal weighting of components on each side of the horizontal and vertical axis, and centering titles and illustrations.

❖ In Web page design, vertical, or left-to-right balance is usually the most important concept. Web pages are often scrollable thereby shifting the horizontal, or top-to bottom, balance point as the screen is scrolled. Horizontal balance is therefore more difficult to maintain.

Symmetry: Create symmetry by **replicating** elements left and right of the screen centerline.

❖ It is axial duplication: A unit on one side of the centerline is exactly replicated on the other side. This exact replication creates formal balance, but the difference is that balance can be achieved without symmetry.
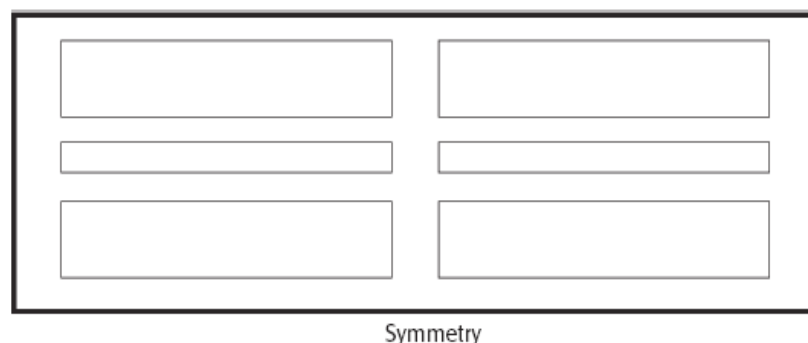
Symmetry

❖ Symmetry's opposite is asymmetry. Our eye tends to perceive something as more compressed or compact when it is symmetric. Asymmetric arrays are perceived as larger.

Regularity: Create regularity by establishing standard and consistently spaced horizontal and vertical alignment points & also use similar element sizes, shapes, colors, and spacing.
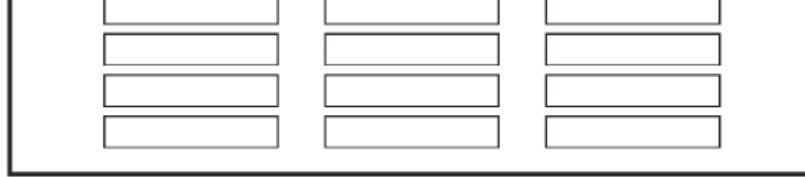
Regularity

❖ It is a uniformity of elements based on some principle or plan. Regularity in screen design is achieved by establishing standard and consistently spaced column and row starting points for screen elements.

❖ It is also achieved by using elements similar in size, shape, color, and spacing.

❖ The opposite of regularity, irregularity, exists when no such plan or principle is apparent. A critical element on a screen will stand out better, however, if it is not regularized.

Predictability: Create predictability by being consistent and following conventional orders or arrangements.
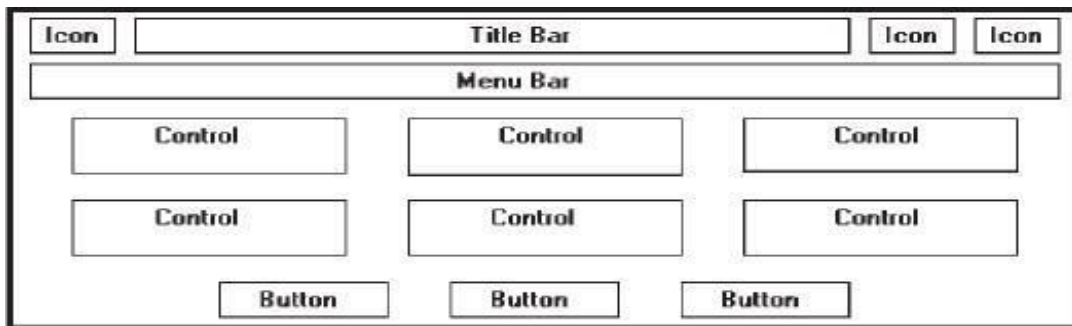

Predictability

❖ It suggests a highly conventional order or plan.

❖ Viewing one screen enables one to predict how another will look.

❖ Viewing part of a screen enables one to predict how the rest of the screen will look.

❖ The opposite of predictability—spontaneity—suggests no plan and thus an inability to predict the structure of the remainder of a screen or the structure of other screens. In screen design, predictability is also enhanced through design consistency.

Sequentiality: Provide sequentiality by arranging elements to guide the eye through the screen in an obvious, logical, rhythmic, and efficient manner.

- The eye tends to be attracted to:

  — A brighter element before one less bright.

  — Isolated elements before elements in a group.

  — Graphics before text/ Color before black and white/ Highly saturated colors before those less saturated/ Dark areas before light areas/ A big element before a small one.

  — An unusual shape before a usual one/ Big objects before little objects.
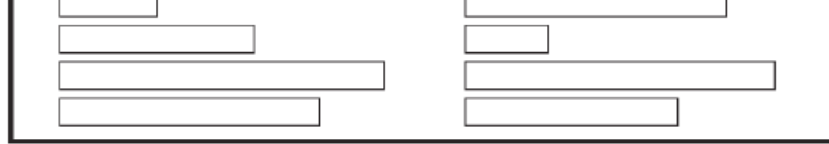
Sequentiality

**Economy:** Provide economy by using as few styles, display techniques, and colors as possible

❖ Economy is the frugal (economical) and judicious (well judged) use of display elements to get th[e] message across as simply as possible.

❖ The opposite is intricacy, the use of many elements just because they exist.

❖ The effect of intricacy is ornamentation, whichoften detracts from clarity.

❖ Economy in screen design means mobilizing just enoughdisplay elements and techniques t[o] communicate the desired message, and no more.

❖ Historically, the use of color in screens has often violated this principle, with screenssometime[s] taking on the appearance of Christmas trees.
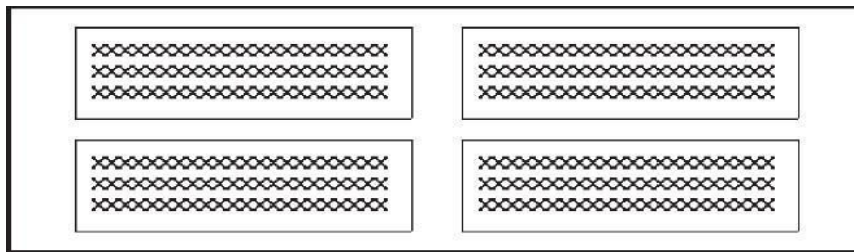
Economy

Unity: Create unity by:

— Using similar sizes, shapes, or colors for related information.

— Leaving less space between elements of a screen than the space left at the margins.
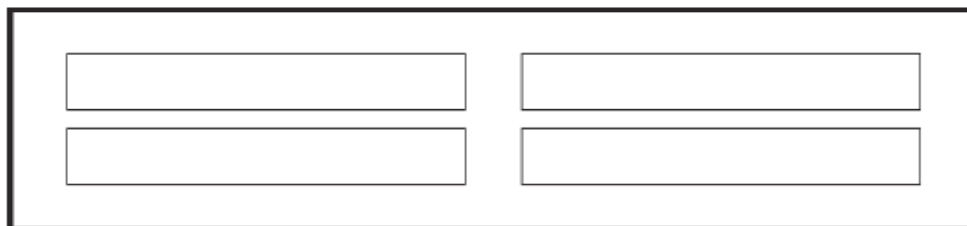
Unity

❖ It is coherence, a totality of elements that is visually all one piece. With unity, the elements seer[m] to belong together, to dovetail so completely that they are seen as one thing.

❖ The opposite of unity is fragmentation, each piece retaining its own character. In screen desig[n] similar sizes, shapes, and colors promote unity, as does *white space*—borders at the displa[y] boundary. Unity should exist between related screens, and Web site screens, as well.

Proportion: Create windows and groupings of data or text with aesthetically pleasing proportions.

[D]own through the ages, people and cultures have had preferred *proportional* relationships.

[S]quare (1:1). The simplest of proportions, it has an attention-getting quality and suggests stability an[d] [p]ermanence. When rotated it becomes a dynamic diamond, expressing movement and tension.

Golden rectangle
1:1.618

Square-root of three
1:1.732

Double square
1:2

Square root of two (1:1.414). A divisible rectangle yielding two pleasing proportional shapes. When divided equally in two along its length, the two smaller shapes that result are also both square roots of two rectangles. This property only occurs with this proportion and is often used in book design. An open book has the same outside proportion as the individual pages within it. The square root of two has been adopted as a standard paper size in many countries of the world

Golden rectangle (1:1.618). Early Greek architecture used this proportion, and a mathematical relationship exists between this number and growth patterns in plant and animal life.

This "divine division of a line" results when a line is divided such that the smaller part is to the greater part as the greater part is to the whole. The golden rectangle also has another unique property. A square created from part of the rectangle leaves a remaining area with sides also in the golden rectangle proportion.

Square root of three (1:1.732). Used less frequently than the other proportions, its narrowness gives it a distinctive shape.

Double square (1:2). In Japan, the tatami mat used for floor covering usually comes in this proportion. Rectangles more elongated than this one have shapes whose distinctiveness is more difficult to sense.

Simplicity (Complexity):

- Optimize the number of elements on a screen, within limits of clarity.
- Minimize the alignment points, especially horizontal or columnar.

Provide standard grids of horizontal and vertical lines to position elements.

Groupings: Provide functional groupings of associated elements.

- Create spatial groupings as closely as possible to five degrees of visual angle (1.67 inches in diameter or about 6 to 7 lines of text, 12 to 14 characters in width).
- Evenly space controls within a grouping, allowing 1/8 to 1/4 inch between each.
- Visually reinforce groupings:

  — Provide adequate separation between groupings through liberal use of white space.

  — Provide line borders around groups.

- Provide meaningful titles for each grouping.

Perceptual Principles and Functional Grouping

- Use visual organization to create functional groupings.

— Closure: [ ] [ ] [ ]

— Matching patterns: >><>

- Combine visual organization principles in logical ways.

    — Proximity and similarity: AAA BB CCC

    — Proximity and closure: [ ] [ ] [ ]

    — Matching patterns and closure: ( ) <> { }

    — Proximity and ordering:

1234	1	5
5678	2	6
3	7	
4	8	

- Avoid visual organization principles that conflict.

    — Proximity opposing similarity: AAA ABB BBC CCC

    — Proximity opposing closure:] [ ] [ ] [

    — Proximity opposing ordering:

1357	1	2
2468	3	4
5	6	
7	8	

Grouping Using White Space: Provide adequate separation between groupings through liberal use of white space.

- For Web pages, carefully consider the trade-off between screen white space and the requirement for page scrolling.

Grouping Using Borders : Incorporate line borders for

    — Focusing attention on groupings or related information.

    — Guiding the eye through a screen.

- Do not exceed three line thicknesses or two line styles on a screen, however.

- Leave sufficient padding space between the information and the surrounding borders.
- For adjacent groupings with borders, whenever possible, align the borders left, right, top, and bottom.
- Use rules and borders sparingly.
- In Web page design:
  — be cautious in using horizontal lines as separators between page sections.

  — Reserve horizontal lines for situations in which the difference between adjacent areas must be emphasized.

Grouping Using Backgrounds : Consider incorporating a contrasting background for related information.

  — The background should not have the "emphasis" of the screen component that should be attended to. Consider about a 25 percent gray screening.

  — Reserve higher contrast or "emphasizing" techniques for screen components to which attention should be drawn.

Visual Style in Web Page Design: Maintain a consistent and unified visual style throughout the pages of an entire Web site.

- Base the visual style on:
  — The profile and goals of the Web site owner.

  — The profile, tastes, and expectations of the Web site user.

AMOUNT OF INFORMATION:

- Present the proper amount of information for the task.
  — Too little is inefficient/ Too much is confusing.

- Present all information necessary for performing an action or making a decision on one screen whenever possible.
  — People should not have to remember things from one screen to the next.

- Restrict screen or window density levels to no more than about 30 percent.

Proper amount of information. Presenting too much information on a screen is confusing;there will be greater competition among a screen's components for a person's attention. Visual search times will be longer, and meaningful structure will be more difficult to perceive. Presenting too little information is

Present all necessary information. In general; present all information necessary for performing an action or making a decision on one screen. If information located on different screens must be remembered, a person's memory will again be taxed. Developing a screen with all the necessary information requires careful analysis of the user's tasks.

Screen density. One objective measure of "how much" should go on a screen has been developed, "density." Density, by definition, is a calculation of the proportion of display character positions on the screen, or an area of the screen containing something. Density is clearly related to complexity, since both measure "how much is there." Complexity looks at elements, density at characters, so they should rise and fall together.

Web Page Size: Minimize page length.

— Restrict to two or three screens of information.

- Place critical or important information at the very top so it is always viewable when the page is opened.

    — Locate it within the top 4 inches of page.

- Determining an optimum page length will require balancing these factors. Arguments for shorter pages and against longer pages are that longer pages:
    o Tax the user's memory, as related information is more scattered and not always visible.
    o Can lead to a lost sense of context as navigation buttons and major links disappear from view.
    o Display more content and a broader range of navigation links making it more difficult for users to find and then decide upon what path to follow.
    o Require excessive page scrolling, which may become cumbersome and inefficient.
    o Are less conducive to the "chunking" information organization scheme commonly employed in Web sites.
- Arguments for longer pages are that they:
    o Resemble the familiar structure of paper documents.
    o Require less "clicks" for navigating through a Web site.
    o Are easier to download and print for later reading.
    o Are easier to maintain because they possess fewer category navigation links to other pages.

Deciding on Long versus Short Pages : To find specific information quickly

— Create many links to short pages.

- To understand an entire concept without interruption:

    — Present the entire concept in one page with internal links to subtopics.

- If page will be loading over slow modems and all pages are not needed:
    — Create a comprehensive contents page with links to many short pages.

Scrolling and Paging:

- Scrolling: Avoid scrolling to determine a page's contents.
    — Minimize vertical page scrolling.

    — When vertical scrolling is necessary to view an entire page:

- Provide contextual cues within the page that it must be scrolled to view its entire contents.
- Provide a unique and consistent "end of page" structure.
    — Avoid horizontal page scrolling.

- Paging:
    — Encourage viewing a page through "paging."

    — Create a second version of a Web site, one consisting of individual screens that are viewed through "paging."

FOCUS AND EMPHASIS:

- Visually emphasize the:
    — Most prominent element &Most important elements.

    — Central idea or focal point.

- To provide emphasis use techniques such as:
    — Higher brightness.

    — Reverse polarity or inverse video,Larger and distinctive font, Underlining.

    — Blinking, Line rulings and surrounding boxes or frames,Contrasting color.

    — Larger size,Positioning,Isolation.

    — Distinctive or unusual shape,White space.

- De-emphasize less important elements.
- To ensure that emphasized screen elements stand out, avoid:
    — Emphasizing too many screen elements.

    — Using too many emphasis techniques.

In Web page design.

— Call attention to new or changed content.

— Ensure that page text is not overwhelmed by page background.

Conveying Depth Of Levels Or A Three-Dimensional Appearance:

Use perspective, highlighting, shading, and other techniques to achieve a threedimensionalappearance.

➤ Always assume that a light source is in the upper-left corner of the screen.

➤ Display command buttons above the screen plane.

➤ Display screen-based controls on, or etched or lowered below, the screen plane.

➤ Do not overdo things, and avoid:

— Using perspective for noninteractive elements.

— Providing too much detail.

Techniques used to achieve a three-dimensional appearance include overlapping,drop shadows, highlighting and lowlighting, growing and shrinking, and belevelededges (Marcus, 1992).

Overlapping. Fully display the window or screen element of current relevance andpartially hide beneath other screen windows or elements. The completeness or continuity of outline of the relevant element willmake it appear nearer than those partially covered.

Drop shadows. To further aid in the perception of the placement of a pull-downabove a screen, or a window above a screen or another window, locate a heavierline along the bottom and right edges of the pull-down or window. This createsthe impression of a shadow caused by a light source in the upper-left corner of thescreen, reinforcing the nearness of the important element. The light source shouldalways appear to be upper left, the shadow lower right.

Highlighting and lowlighting. Highlighted or brighter screen elements appear tocome forward, while lowlighted or less bright elements recede. Attention will bedirected to the highlighted element.

Shrinking and growing. Important elements can be made to grow in size, while lessimportant elements remain small or shrink. An icon, for example, should expandto a window when it is selected. The movement, as it expands, will focus attentionupon it.

Beveled edges.A beveled edge (lines that are not at right angles to the screen elementborders) will also give the impression of depth. With beveled edges, windows,buttons, and menu bar choices will appear to rise from the screen. Tostrengthen the three-dimensional aspect of the screen element, give it a dropshadow by shading the bottom and right sides with either a tone of gray or adarker shade of the basic screen color.

Texture change. Texture is the surface quality of an object. Varying the object's patternof light and dark areas creates it. Increased density of an object implies a furtherdistance. Increase the density of

characteristic of an object. Finally, provide consistency; establish only one meaning for a texture.

Color change. Objects farther away appear hazy and less saturated. Increase hazinessas screen element importance diminishes; display currently relevant elementsmore vividly.

Size change. Objects farther away appear smaller. Decrease the size of nonapplicablescreen elements; display currently relevant elements as larger.

Clarity change. Objects not at the eye's focus distance appear fuzzy or blurred. Display nonapplicable elements as blurred, and currently relevant screen elements asclear.

Vertical location. The horizon appears higher, objects up close lower. Present currentlyapplicable screen elements at the bottom of the screen, present nonapplicableelements at the screen's top.

Spacing change. Faraway objects appear more closely spaced, closer objects morewidely spaced. Display nonapplicable elements as more closely spaced, currentlyapplicable screen elements as more widely spaced.

Receding lines. Parallel lines converging and receding to a vanishing point implydepth.

Motion change. Objects moving at uniform speeds appear to be moving moreslowly the farther away they are.

PRESENTING INFORMATION SIMPLY AND MEANINGFULLY:

Provide legibility: Information is noticeable and distinguishable.

Provide readability: Information is identifiable, interpretable, and attractive.

Present information in usable form: Translations, transpositions, and references to documentation should not be required to interpret and understand information.

Utilize contrasting display features: To attract and call attention to different screen elements.

Create visual lines: Implicit and explicit, to guide the eye.

Be consistent: In appearance and procedural usage.

Typography

- In typography, by definition a typeface is the name of a type, such as Times New Roman, Arial, Verdana, or Helvetica. A font is a typeface of a particular size, such as Times Roman 16 point or Arial 12 point. In screen design, the terms have become somewhat interchangeable.

Font Types and Families

- Use simple, common, readable fonts.

    — Any sans serif such as Helvetica or Verdana.

    — Times Roman.

— Assign a separate purpose to each family.

— Allow one family to dominate.

Font Size

.Use no more than three sizes Ex: Consider "X" height.

- For graphical systems use Ex: 12 point for menus &10 point for windows.
- For Web pages use Ex:12–14 points for body text &18–36 points for titles and headings.
- For line spacing use one to one and one-half times font size.
- Never change established type sizes to squeeze in more text.

Font Styles and Weight

- Use no more than:
    — Two styles of the same family i.e Standard and italic.

    — Two weights i.e Regular and bold.

- Use italics when you want to call attention.
- Use bold when you want to call attention or create a hierarchy.
- In Web pages, use an underline only to indicate a navigation link.

Font Case:

- Use mixed-case for:
    — Control captions , Data, Control choice descriptions,Text, Informational messages.

    — Instructional information, Menu descriptions, Button descriptions.

- Consider using upper case or capitalization for:
    — Title.

    — Section headings.

    — Subsection headings.

    — Caution and warning messages.

    — Words or phrases small in point size.

- Use all lower case with caution.

Defaults:

- For graphical operating systems, use the standard system fonts.

- Establish a consistent hierarchy and convention for using typefaces, styles, and sizes.

  — Decide on a font for each different level of importance in the hierarchy.

  — Communicate hierarchy with changes in:

    • Size,Weight, Color.

Captions/Labels:

- Identify controls with captions or labels.
- Fully spell them out in a language meaningful to the user.
- Display them in normal intensity.
- Use a mixed-case font.
- Capitalize the first letter of each significant word.
- End each caption with a colon (:).
- Choose distinct captions that can be easily distinguished from other captions.

  — Minimal differences (one letter or word) cause confusion.

Data Fields: For entry or modifiable data fields, display data within:

  — A line box.

  — A reverse polarity box.

- For inquiry or display/read-only screens, display data on the normal screen background.
- Visually emphasize the data fields.

Control Captions/Data Fields

- Differentiate captions from data fields by using:

  — Contrasting features, such as different intensities, separating columns, boxes, and so forth.

  — Consistent physical relationships.

Sex: [Female   ]

Relation: [Daughter   ]

- For single data fields:

  — Place the caption to left of the data field.

Relation: [Daughter   ]

Relation:

```
Daughter
```

— Maintain consistent positional relations within a screen, or within related screens, wheneve possible.

- For multiple listings of columnar-oriented data, place the caption above the columnized dat fields.

Names:

```
Deirdra
Karin
Kim
Lauren
```

Control Caption/Data Field Justification

- First Approach

  — Left-justify both captions and data fields.

  — Leave one space between the longest caption and the data field column.

```
Division:    [                    ]
Department:  [                 ]
Title:       [                     ]
```

- 2. Second Approach

  — Left-justify data fields and right-justify captions to data fields.

  — Leave one space between each.

```
    Division: [                 ]
 Department: [              ]
      Title: [                   ]
```

Control Section Headings

- Provide a meaningful heading that clearly describes the relationship of the grouped controls.
- Locate section headings above their related screen controls, separated by one space line.

```
                PERSONNEL

      Manager:  [                        ]

    Employees:  [          ]

      Payroll   [
```

ndent the control captions to the right of the start of the heading.

- Fully spell out in an uppercase font.
- Display in normal intensity.

– Alternately, if a different font size or style exists, the heading may be displayed in mixed case, usin

ne headline style.

Control Subsection or Row Headings:

- Provide a meaningful heading that clearly describes the relationship of the grouped controls.
- Locate to the left of the:

  — Row of associated fields.

  — Topmost row of a group of associated fields.

- Separate from the adjacent caption through the use of a unique symbol, such as one or two greate

  than signs or a filled-in arrow.

- Separate the symbol from the heading by one space and from the caption by a minimum of thre

  spaces.

- Subsection or row headings may be left- or right-aligned.
- Fully spell out in an uppercase font.
- Display in normal intensity.

  — Alternately, if a different font size or style exists, the heading may be displayed in mixed-cas

  using the headline style.

- Center the field group heading above the captions to which it applies.
- Relate it to the captions by a solid line.
- Fully spell it out in an uppercase font.
- Display it in normal intensity.

— Alternately, if a different font size or style exists and is used, the heading may be displayed i

mixed-case, using the headline style.

Web Page Headings:

Control Headings: For groupings of controls, follow the control heading guidelines.

Page and Text Headings:

— Provide a meaningful page heading that clearly describes the content and nature of the pag

that follows.

— Provide meaningful text headings and subheadings that clearly describe the content and natu

of the text that follows.

— Establish a hierarchy of font styles, sizes, and weights dependent upon the organization create

and the importance of the text content.

— Settle on as few sizes and styles as necessary to communicate page content and organization t

the user.

— Do not randomly mix heading levels or skip heading levels.

Instructions Information: Incorporate instructions on a screen, as necessary:

— In a position just preceding the part, or parts, of a screen to which they apply.

— In a manner that visually distinguishes them, such as:

• Displaying them in a unique type style, a unique color.

— In a position that visually distinguishes them by:

1. Left-justifying the instruction and indenting the related field captions, headings, or text a minimum c

Kind:	
Model:	
Number:	

— Using a mixed-case font.

Completion Aids: Incorporate completion aids on a screen, as necessary:

— In a position to the right of the text entry control to which they apply.

— In a manner that visually distinguishes them, including:

• Displaying them within a parentheses ( ).

• Possibly displaying them in a unique font style.

— If the controls are arrayed on the screen in a columnar format, position the completion aid, c

aids:

Far enough to the right so as to not detract from the readability of the entry controls within the column.

But close enough to the related control so that they easily maintain an association with the relate

ontrol.

Left-alignment of completion aids in a column of controls is desirable but not absolutely necessary.

Completion Date: ☐ ☐ ☐

■ ☐

Information Entry and Modification (Conversational) Screens

- Organization:

— Logical and clear.

— Most frequently used information:

• On the earliest screens.

• At the top of screens.

— Required information: On the earliest screens, At the top of screens.

- Captions:

Text boxes/selection controls.Designate by boxes.

- Spacing and groupings:

  — create logical groupings.

  — Make them medium in size, about 5 to 7 lines.

- Headings:

  — Upper case or headline-style mixed case.

  — Set off from related controls.

- Control arrangement:

  — Align into columns.

  — Organize for top-to-bottom completion.

- Required and optional input:Consider distinguishing between required and optional data input through:

  - Placing required and optional information within different screens, windows, or groups.

  - Identifying information as required or optional in a completion aid.

  - Identifying required information with a unique font or symbol.

- Instructions and completion aids: Include as necessary.

  - Position instructions before the controls to which they apply.

  - Position completion aids to the right of the controls to which they apply.

Grids :

Usage: To enter large amounts of related data or information.

- Design guidelines:

  — provide descriptive headings and, where appropriate, subheadings for columns and rows.

- Do not include colons (:) after the headings.

  — Justify column headings according to the data presented in the table cells.

    - Left-justify headings for columns containing text.

    - Right-justify headings for columns containing numbers.

  — Left-justify row headings.

      • Place most important or frequently used information at the top.

      • Arrange information chronologically or sequentially.

— Use light backgrounds.

— Provide consistent spacing between columns and rows.

— If more than seven rows are presented, insert white space after every fifth row.

Data Presentation

- Provide visual emphasis to the data.
- Give the data a meaningful structure.

  — Spell out any codes in full.

  — Include natural splits or predefined breaks in displaying data.

~~338302345~~	~~072179~~	~~162152~~
338-30-2245	07/21/79	16:21:52

- For data strings of five or more numbers or alphanumeric characters with no natural breaks display in groups of three or four characters with a blank between each group.

~~K349612094~~	K349 612 094

Data Display

- Consider not displaying data whose values are none, zero, or blank.

Elephants:	612		Elephants:	612
Lions:	123		Lions:	123
~~Hippos:~~	~~0~~		Giraffes:	361
Giraffes:	361			
~~Kudus:~~	~~0~~			

- Consider creating "data statements," in which the caption and data are combined.

Elephants:	612		612 Elephants
Lions:	123		123 Lions
Giraffes:	361		361 Giraffes

Tables

- Usage:

Design guidelines:

— Provide descriptive headings and, where appropriate, subheadings for columns and rows.

  • Do not include colons (:) after the headings.

— Justify column headings according to the data presented in the table cells.

  • Left-justify for columns containing text.

  • Right-justify for columns containing numbers.

— Left-justify row headings.

— Organize the presented data or information logically and clearly.

  • Place similar information together.

  • Place most important or frequently used at the top.

  • Arrange chronologically or sequentially.

— Justify the data presented in a column according to its content.

  • Left-justify textual data.

  • Right-justify numeric data.

— Length should not exceed the depth of a screen.

— Use light backgrounds.

  • Highlight a particular cell, column, or row using a contrasting display technique.

— Provide consistent spacing between columns and rows.

— If more than seven rows are presented, insert white space after every fifth row.

— Use caution in placing borders around cells.

NTRANET DESIGN GUIDELINES:

- Provide a single home page containing at least:
  — A directory hierarchy &A search facility.

  — Current news.

- Include many options and features.
- Develop a strong navigational system.

Extranet Design Guidelines

- To distinguish the extranet from the Internet, provide a subtle difference in:

  — Visual style.

  — Navigation.

- Provide links to the public Internet site

Statistical Graphics:

A statistical graphic is data presented in a graphical format.A well-designed statistical graphic, also referred to as a **chart** or *graph*which consists of complex ideas communicated with clarity, precision, and efficiency.

It gives its viewer the greatest number of ideas, in the shortest time, and in the smallest space, and with least possible clutter. It will provide coherence to large amounts of information by tying them together in a meaningful way, and it will encourage data comparisons of its different pieces by the eye.

A welldesigned statistical graphic display also avoids distortions by telling the truth about the data.

Components of a Statistical Graphic:

Most statistical graphics have at least two axes, two scales, an area to present the data,a title, and sometimes a legend or key. Guidelines for graphic components include the following.

Data Presentation:

- ❖ Emphasize the data.
- ❖ Minimize the nondata elements.
- ❖ Minimize redundant data.
- ❖ Show data variation, not design variation.
- ❖ Provide the proper context for data interpretation.
- ❖ Restrict the number of information-carrying dimensions depicted to the number of data dimensions being illustrated.
- ❖ Employ data in multiple ways, whenever possible

- ❖ Avoid unnecessary embellishment of:
    - — Grids.
    - — Vibration.
    - — Ornamentation.
- ❖ Fill the graph's available area with data.

Axes: Values on an axis should increase as they move away from the origin.

- ❖ Use the horizontal axis (X) to show time or cause of an event (the independent variable).
- ❖ Use the vertical axis (Y) to show a caused effect (the dependent variable).

Values on an axis should increase as they move away from the origin. If the numericvalues displayed are positive, the origin point will be the lower-left point of thegraphic. If the data includes negative values and the axes must extend in both directionsfrom the zero point, position the origin in the center of the graph.

Use the horizontal axis (X) to show time or cause of an event (the independent variable).Use the vertical axis (Y) to show a caused effect (the dependent variable). Whenthe X-axis plots time intervals, the labeled points should represent the end of each timeinterval. The X-axis may also be called *abscissa* or *category* axis, the Y-axis the *ordinal* or*value* axis. If the graphic possesses three dimensions, the third axis is called the Z-axis,reflecting the graph's plane.

Scales and Scaling:

- ❖ Place ticks to marks scales on the outside edge of each axis.
- ❖ Employ a linear scale &Mark scales at standard or customary intervals.
- ❖ Start a numeric scale at zero (0).
- ❖ Keep the number of digits in a scale to a minimum.
- ❖ Display only a single scale on each axis.
- ❖ For large data matrices, consider displaying duplicate axes.
- ❖ Provide aids for scale interpretation.
- ❖ Provide scaling consistency across two or more related graphics.
- ❖ Clearly label each axis in a left-to-right reading orientation.

A scale is a set of measurement points or markers. Scaling is the positioning of datain relation to these points or markers. Choose an appropriate scale for both graph axes.If the scale is too expanded, the effect may be exaggerated, if too small, the effect maybe underreported.

Proportion:

- ❖ Provide accurate proportion of the displayed surfaces to the data they represent.
- ❖ Provide proper proportion by:
    - — Conforming to the shape of the data.

failure to display the correct proportions can create false impressions of magnitudes of differences i
izes or changes. This kind of graphical distortioncan be eliminated through clear, detailed, and thoroug
abeling, a topic to beaddressed shortly.

rovide proper proportion. When the relative proportions of a graphic are in balance,it looks better

Graphics should tend toward the horizontal, assuming a greaterlength than height.

here are a number of reasons for this recommendation.

irst, peopleprefer this shape.

econd, it is easier to read words arrayed left-to-right.

hird,many graphics plot cause and effect relationships, with effect on the vertical axis andcause on th

orizontal.

An elongated horizontal axis helps describe the causal variablein more detail. If, however, the **Lines:**

- ❖ Data lines should be the heaviest & Axes lines should be of medium weight.
    - o Extend the lines entirely around the graphic.
- ❖ Grid lines should be very thin or absent.

Labeling:

- ❖ Employ clear, detailed and thorough labeling.
- ❖ Maintain a left-to-right reading orientation.
- ❖ Integrate the labeling with the drawing.
    - o Do not curve letters to match the shape of curved lines.
- ❖ Use only one typeface, font, and weight.
    - o For emphasis, use different type sizes.
- ❖ Do not separate labeling from the data through ruled lines.
- ❖ Provide information about the source of the data.
- ❖ Use a legend for complicated graphs.

Title: Create a short, simple, clear, and distinctive title describing the purpose of the graphic.

- ❖ Position the title above, centered, or left-aligned to the rectangle formed by the extended axes.
- ❖ Spell it out fully, using a mixed-case or uppercase font.
- ❖ A title should be brief and descriptive of the graphic.

## Aiding Interpretation of Numbers:

- ❖ Display a grid on request.
- ❖ Permit the viewer to click on a data point to display actual values.
- ❖ Show numeric values automatically for each point or bar.
- ❖ Permit the viewer to zoom in on an area of the graphic.

Statistical graphics take many forms. There are curves and line graphs, surface charts,scatterplots, ba_
_raphs, histograms, segmented or stacked bars, and pie charts.

Curve and Line Graphs:

- ➢ Display data curves or lines that must be compared in a **single graph**.

- ➢ Display no more than **four** or **five curves** in a single graph.

- ➢ Identify each curve or line with an **adjacent label** whenever possible.

- ➢ If a legend must be included, order the legend to match the spatial ordering of the lines.

- ➢ For tightly packed curves or lines, provide data differentiation with a line-coding technique, suc_
  as different colors or different line composition types.

- ➢ Highlight curves or lines representing important or critical data.

- ➢ When comparing actual to projected data:
    - o Use solid curves or lines for actual data.
    - o Use broken curves or lines for projected data.

- ➢ Display a reference index if the displayed data must be compared to a standard or critical value.

- ➢ Display differences between two data sets as a curve or line itself.

Curves and line graphs can be used to show relationships between sets of data defined

y two continuous variables. They are especially useful showing data changes overtime, being superior t

ther graphic methods for speed and accuracy in determiningdata trends. With a curve, the data relation

_re summarized by a smoothed line. Witha line, straight line segments connect the data plots.
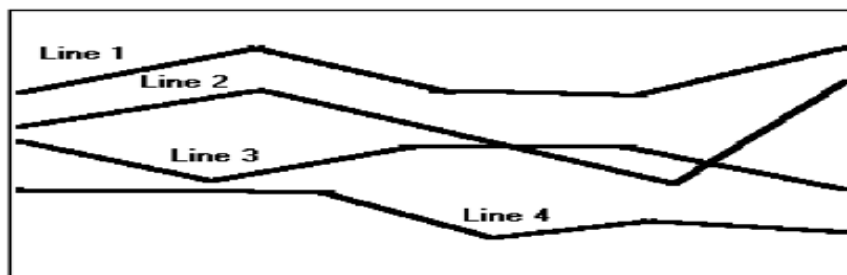
A line graph.

Surface Charts: Order the data categories so that:

– The least variable is at the bottom, and the most variable at the top.

– The largest is at the bottom and the smallest at the top.

 Use different texture or shading coding schemes to differentiate the areas below

_ach curve or line.

 Incorporate labels within the bands of data.

_f the data being depicted by a curve or line represents all the parts of a whole, considerdeveloping

urface chart : In this kind of graph, thecurves or lines are stacked above one another to indicat

Ordering. In ordering the data categories, place the least variable at the bottom and the most variable at the top. Irregularities in the bottom curve or line will affect those above it. This makes it difficult for a viewer to determine whether the irregularity in the upper curves reflect real data differences or is the result of this style of graph.

Coding schemes. Use different texture or shading coding schemes. Ensure that the coding scheme chosen for each area is visually distinguishable from all the others. Place darker shades or colors toward the bottom.
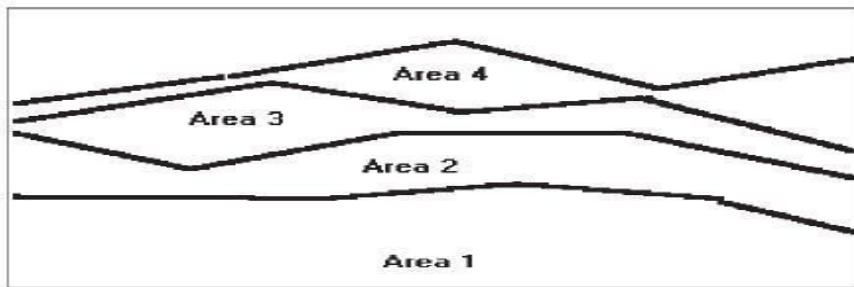
A surface chart.

Labels. Labels with a left-to-right reading orientation should be included within textured or shaded bands if possible. Legends showing individual percentages, or cumulative percentages, should only be incorporated where space constraints exist within the bands.

Scatterplots:

- Limit use to two-dimensional displays of data.
- Maintain consistent scale size intervals.
- Provide distinguishable, equal-sized plot points.
- If there is more than one set of data on the plot, use different symbols for each data set's points.
- Visually distinguish points of particular significance through a highlighting technique.

Scatter plots can be used to show relationships among individual data points in a two-dimensional array. A point is displayed on the plot where the X-axis and Y-axis variables intersect. Correlations and trends on scatterplots can be indicated by the superimposition of curves (thus combining the scatterplot with another kind of graphic display).

Two dimensions. Limit scatterplots to two dimensions. Three-dimensional scatterplots, while possible, do not yield clear, unambiguous displays.

Consistent intervals. Maintain consistent scale size intervals. Inconsistent spacing size between scale ticks on the two axes will distort the displayed data.

Distinguishable plots. Construct the plot points of distinguishable, equal-sized circles, squares, rectangles, or diamonds. These symbols may be filled in or empty.

Color may also be used to designate the points. Keep in mind that, when using color, different colors can
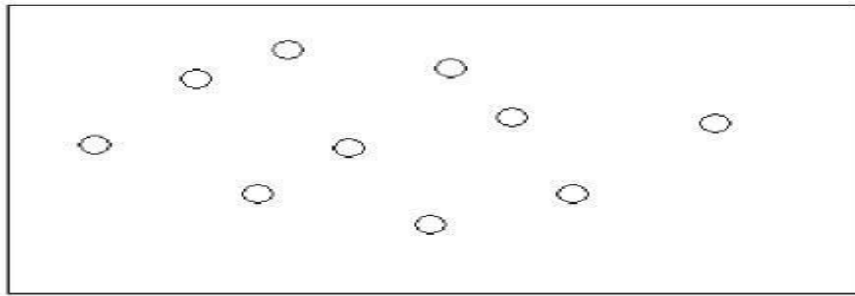
A scatterplot.

Significant points. Visually distinguish significant points. Points of particular significance in scatterplots can be made distinctive through highlighting techniquessuch as the use of high intensity, different colors, or different shapes.

Bar Graphs:

☐ Orient bars consistently, either horizontally or vertically.

☐ Use vertical bars when the item being counted is of greatest interest.

☐ Use horizontal bars:

– When the data labels are long.

– To highlight the information rather than the count.

☐ Use a meaningful organizing principle.

– If none exists, arrange the bars so that the length of bars is in ascending or descending order.

☐ Make the spacing between bars equal to one-half the width of the bars or less.

– If groupings of bars are presented, leave space between the groupings only.

☐ If different kinds of bars must be easily distinguished, provide differentiation through a coding technique.

– If possible, use a pattern or color that reinforces the data.

☐ Highlight bars representing important or critical data.

☐ Provide a consistent ordering for related groups of bars.

☐ Display a reference index if displayed data must be compared to a standard or criticalvalue.

☐ Identify each bar with an adjacent label.

– Place labels below, or to the left of, the baseline.

☐ When a great many pieces of data must be compared, consider using histograms orstep charts.

Bar graphs can be used to show a few differences between separate entities or toshow differences in a variable at a few discrete intervals. A bar graph consists of a seriesof bars extending from a common origin or baselineor they may extend between separately plotted high and low points, as shown below having only one axis. Bar graphs may be arrayed horizontally or vertically.Vertical bar graphs are sometimes called *column charts*.
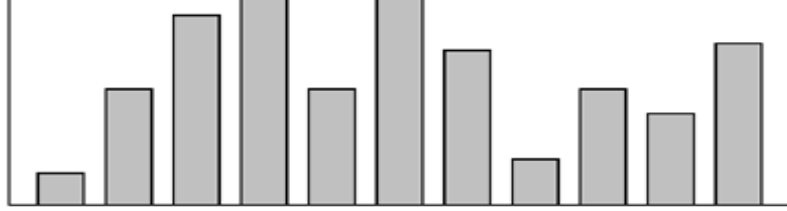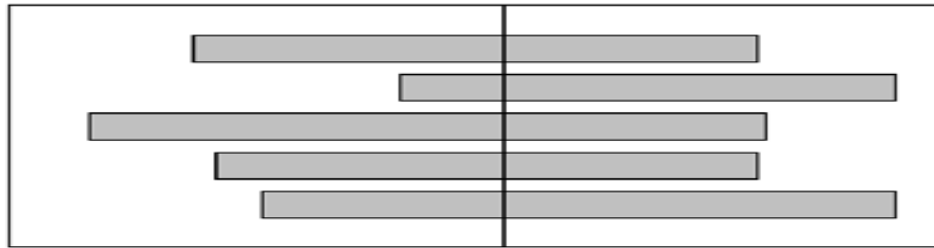
Figure 3.75 A bar graph with a common origin point.

A bar graph with separately plotted high and low points.

A histogram or step chart.

Segmented or Stacked Bars: Order the data categories in the same sequence.

☐ Order the data categories so that:

– The least variable is at the bottom.

– The most variable is at the top.

☐ Limit the number of segments to those that are large enough to be seen and labeled.

☐ Use different texture or coding schemes to differentiate the areas within each bar.

☐ Clearly associate labels with bars or segments.

– Place segment labels to the right on a vertical chart or above on a horizontalchart.If both the total measure of a value and its component portions are of interest, considerusing *segmented or stacked bars.* These bars are similar to bar graphs except that thebar is segmented into two or more pieces reflecting the component values. In this way they are similar to surface graphs and pie charts. Designguidelines are similar to stacked bars, except for the following:
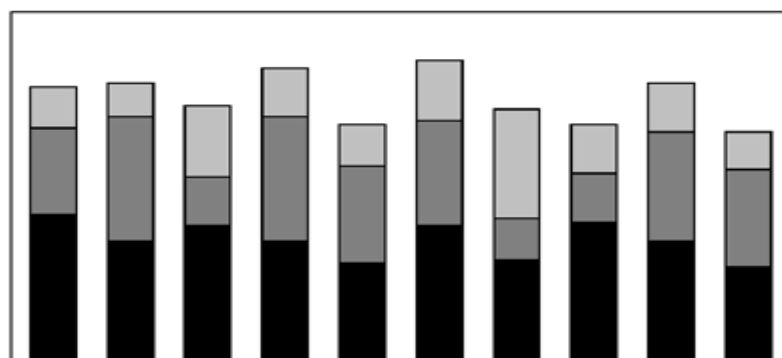
– They must add up to 100 percent.

– Use five segments or fewer.

– Each segment should take up at least 5 percent (18 degrees) of the circle.

– Place the largest segment starting at 12:00.

– Directly label each segment in the normal reading orientation.

– If leaders for labels in small segments are necessary, orient them in as few anglesas possible.

– Include numbers with segment labels to indicate percentages of absolute values.

– Texture- or color-coding selected for segments should not emphasize one segment over another (unless it is intended).

– Highlight segments requiring particular emphasis through a contrasting display technique or by "exploding" it.

– Never tilt a pie.
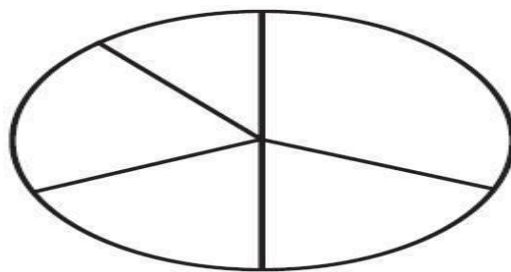
A pie chart.

Pie charts, a circle broken up into pie-shaped pieces, can be used to show an apportionment of a total into its component parts, as illustrated in Figure 3.79. Bar graphs,however, usually permit more accurate estimates of proportions. Experts cautionagainst the use of pie charts because:

They provide no means of absolute measurement.

They cannot represent totals greater than 100 percent.

They can only represent a fixed point in time.

Human estimation of relationships is more accurate with linear than with angularrepresentations.

Choosing a Graph Type:

Determine what kind of information is most important for the viewer to extract.

Choose the type of graph best suited for presenting that kind of information.

The types of graphics just described have rarely been experimentally studied todetermine their most effective use.

Some studies addressing this issue, however,are those of Hollands and Spence (1992) and Simkin and Hastie (1987).

These researcherscollected data on three tasks:

1) determining a proportion of a wholewhere the proportion *was* a part of the whole (proportion),

3) determining a change over time (change). The results are summarized in

Flow Charts:

☐ Displayed steps should be designed to:

– Follow some logical order.

– Minimize path link.

☐ Orient the chart following common flowchart reading conventions such as left-toright and top-to-bottom.

☐ Follow common flowchart coding conventions to distinguish elements.

☐ Use arrows in conventional ways to indicate directional relationships.

☐ Highlight elements requiring particular attention through a contrasting display technique.

☐ Require only one decision at each step.

☐ Be consistent in all option ordering and wording.

If the data to be displayed flows in a complex, yet sequential, process, consider using a *flowchart* to schematically represent it. Flowcharts can also be used to aid problem solving in which a solution can be reached by answering a series of questions. They are not useful when trade-offs must be made.

Technological Considerations in Interface Design:

Interface design is also affected by the physical characteristics of the display device itself and the characteristics of the interfaces controlling software.

Graphical Systems

☐ Screen design must be compatible with the capabilities of the system, including:

– System power.

– Screen size.

– Screen resolution.

– Display colors.

– Other display features.

☐ Screen design must be compatible with the capabilities of the:

– System platform being used.

– Development and implementation tools being used.

– Platform style guide being used.

Graphical system design must be compatible with the system's power, screen size,screen resolution, and displayable colors, fonts and other features. Designs for Websystems must also take into consideration the characteristics of the browsers beingused and the bandwidth of the communication medium. The

Other Display Features

The design must be compatible with the system platform and any development and implementation tool being used. The design may also take into consideration any available platform style guide. Finally, the design must effectively utilize the various available display features or attributes.

Platform Compatibility

The design must be compatible with the windowing platform being used—Apple Computer's Macintosh, Microsoft Windows or any other.

Development and Implementation Tool Compatibility

More that half of software code is now devoted to user interface design. To use a very old cliché, the tail is now beginning to wag the dog. Available tools include toolkits, interface builders, and user interface management systems.

A *toolkit* is a library of controls or widgets such as menus, buttons, and scroll bars. Toolkits have a programmatic interface and must be used by programmers. They are usually for a specific windowing platform. Examples of toolkits include those for Motif, OpenLook, and the Macintosh.

An **interface builder** is a graphical tool that helps a programmer create dialog boxes, menus, and other controls. It provides a palette to select and position controls, and to set properties. Interface builders are limited to use in laying out the static parts of the interface. They cannot handle the parts of the interface that involve graphical objects

moving around.

A *user interface management system* (UIMS) extends the features of a builder by also providing assistance with creating and managing the insides of windows. Examples include HyperCard and Visual Basic

Style Guide Compatibility: A thrust for commonality in graphical system application design has emerged as providers have finally come to realize that design consistency is a virtue that has been ignored too long.

To achieve this consistency in interface design, most providers' have developed style guidelines for system developers. These guidelines specify the appearance and behavior of the user interface. They describe the windows, menus, and various controls available, including what they look like and how they work. They also provide some guidance on when to use the various components.

Web Systems

- Understand the current level of Web technology.
- Design for system configuration used by most users.
- Refrain from haphazard use of leading-edge technology.

technological advances. Monitors with smallscreens must coexist with large screens. Color must coexist with monochrome displays.

High-resolution displays must coexist with those of low resolution. High-speed information transmission must coexist with low speed. New browsers that contain and support many different and desirable features must coexist with old browsers that support little.

Browsers

□ **Compatibility**: Make the Web site accessible to all users' browsers & Use browser defaults as much as possible.

□ **Monitor size and resolution**: Design within the boundaries of an image-safe area for all browsers.

– Present images at a resolution appropriate for all users' monitors.

□ **Fonts:** Use fonts that can be displayed on a variety of browsers.

□ **Colors**: Use colors that succeed on a variety of browsers and platforms.

□ A palette of 216 colors.

□ **Bandwidth**: Design for the most commonly used bandwidth.

□ A 56-kbps modem is most common for home users.

□ **Versions** : Create multiple versions that support multiple browsers.

□ Always provide a text-only version & Make use of browser sniffers.

□ **Other Web Considerations :**

□ Downloading: Provide fast page download times, no more than 8 to 10 seconds per page.

□ Minimize the use of design techniques that cause longer download times.

□ Long pages,Large chunky headings,Numerous or large graphics and images.

□ Animation,Excessive amount of color,Excess use of frames.

– Provide enough information to the user so that whether or not to request a download

□an be determined, including:

□ Program or document description.

□ Type of download.

□ Size of download.

□ Download version.

□ Estimated loading time.

□ Special operating requirements.

□ Currency: Keep Web site information current.

□ Page printing:

– Provide a means to print,Groups of related pages,Individual pages,Sections of pages.

□ Maintainability: Ensure easy Web site maintainability.