MODULE 3

3.1 STRUCTURES OF MENUS

- Menus vary in form from very simple to very complex.
- May range from small dialog boxes requesting the user to choose between one of two alternatives, to hierarchical tree schemes with many branches and level of depth.
- Menu's structure defines the amount of control given to the user in performing a task.

1. **Single Menus:**
   - a single screen or window is presented to seek the user's input or request an action to be performed. (Figure 3.1)

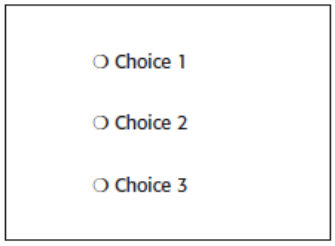


Figure 3.1: Single Menu

   - Example: In playing a game, choices presented may be "novice," "intermediate," or "expert."
   - Single menus conceptually require choices from this single menu only, and no other menus will follow necessitating additional user choices.
   - user needs to only consider the immediate consequences of the item being chosen and need not be concerned with any other additional system menus.
   - While other single menus may exist in the system and might be encountered later, these other menus are not perceived by the user as comprising a series of choices.
   - A single menu may be iterative if it requires data to be entered into it and this data input is subject to a validity check that fails. The menu will then be represented to the user with a message requesting reentry of valid data.

2. **Sequential Linear Menus:**
   - Presented on a series of screens possessing only one path.
   - Menu screens are presented in a preset order, and, generally, their objective is for specifying parameters or for entering data.
   - length of the path may be short, or long, depending upon the nature of the information being collected.

- All the menus are important to the process at hand and must be answered in some manner by the user. A sequential linear menu is illustrated in Figure 3.2.

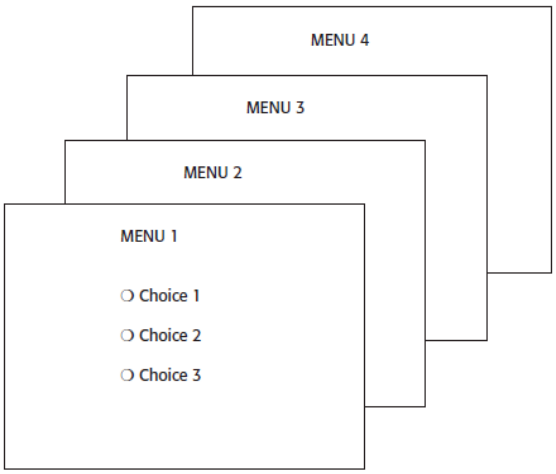


Figure 3.2: sequential linear menu

- Shortcomings:
  - ✓ A long sequence may become tedious as menu after menu is presented.
  - ✓ user may not remember an answer to a previous question, a question important to the currently presented choices.
  - ✓ user may also want to return to a previous menu to change an answer or look at an answer, an awkward process that must be allowed.
  - ✓ user may conceptually want to complete the menus in a different order than which they are being presented.

3. Simultaneous Menus:

- Instead of being presented on separate screens, all menu options are available simultaneously. (Figure 3.3).

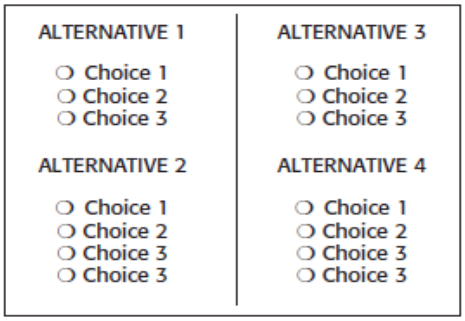


Figure 3.3: Simultaneous Menus

- menu may be completed in the order desired by the user, choices being skipped and returned to later.
- All alternatives are visible for reminding of choices, comparing choices, and changing answers.
- Tediousness associated with a long series of sequential menus is greatly reduced.

- Problems:
  - ✓ for large collections of menu alternatives screen clutter can easily occur
  - ✓ screen paging or scrolling may be necessary to view all the choices.
  - ✓ menu must also clearly indicate menu choice relationships and dependencies. Presenting many menu dependencies and relationships on a screen especially if poorly indicated, can also be very confusing for a novice user.

4. Hierarchical Menus

- When many relationships exist between menu alternatives, and some menu options are only appropriate depending upon a previous menu selection, a hierarchical structure is the best solution.
- A hierarchical structure results in an increasing refinement of choice as menus are stepped through, for example, from options, to suboptions, from categories to subcategories, from pages to sections to subsections, and so on.
- A hierarchical structure can best be represented as an inverse tree, leading to more and more branches as one moves downward through it.
- Hierarchical structures are characterized by depth and breadth, depth being the number of choice levels one must traverse to reach the destination, breadth being the number of alternatives found at each level.
- Examples: menu bars with their associated pull-downs, and in Web sites with their navigation links.
- order and structure of branching in a hierarchy is preset and the normal order of flow one-way, top down.
- Disadvantages:
  - ✓ defined branching order may not fit the users' conception of the task flow.
  - ✓ If users are not familiar with the hierarchical menu, or are unable to predict what sub-options lie below a particular choice, they may go down wrong paths and find it necessary to go back up the tree to change a choice, or perhaps even return to the top-level menu.
- hierarchies must be consistent with user expectations, and choice uncertainties be reduced as much as possible.
- It must also be easy to back upward through the tree to facilitate exploration of the tree.
- A hierarchical menu is illustrated in Figure 3.4.
- Top level of the tree is considered level 0 with subsequent levels numbered sequentially beginning with number 1. Starting at the top, level 0, two selections, or mouse clicks, are required to reach level 2.

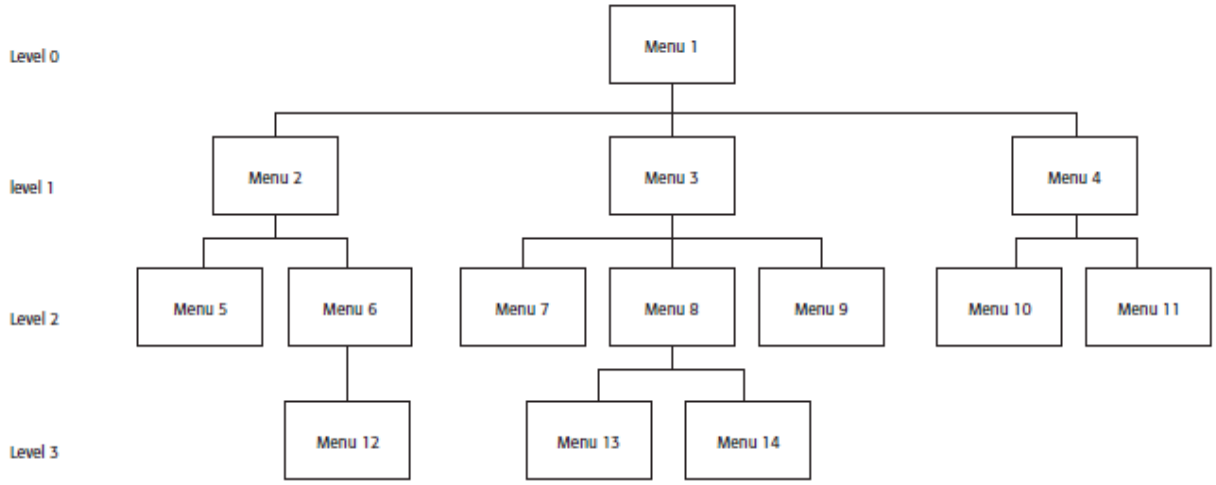


Figure 3.4: Hierarchical Menus

5. **Connected Menus:**
   - Connected menus are networks of menus all interconnected in some manner.
   - Movement through a structure of menus is not restricted to a hierarchical tree, but is permitted between most or all menus in the network.
   - there is no top-down traversal of the menu system but an almost unhindered wandering between any two menus of interest.
   - A connected menu system may be cyclical, with movement permitted in either direction between menus, or acyclical, with movement permitted in only one direction.
   - These menus also vary in connectivity, the extent to which menus are linked by multiple paths.
   - Advantage: it gives the user full control over the navigation flow.
   - Disadvantage: Its complexity, and its navigation may be daunting for an inexperienced user.
   - An example connected menu structure is represented in Figure 3.5.

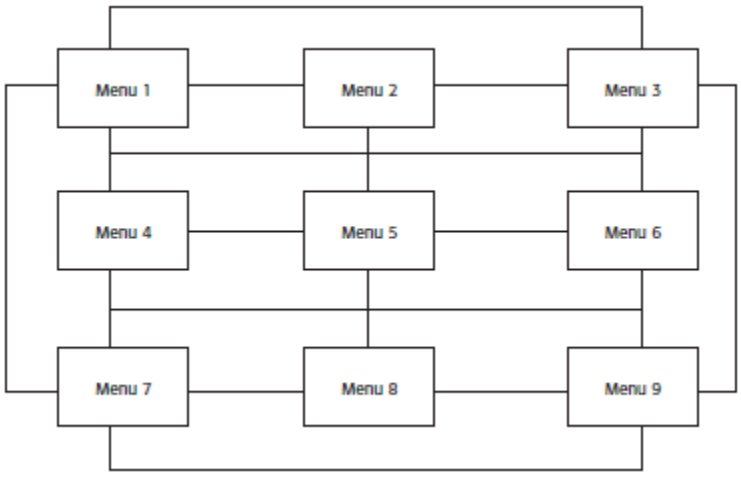


Figure 3.5: Connected Menus

6. Event-Trapping Menus:

- Event Trapping menus provide an ever-present background of control over the system's state and parameters while the user is working on a foreground task.
- They are a set of simultaneous menus imposed on hierarchical menus.
- In a graphical system, for example, existing together are a simultaneous menu, the menu bar, and a hierarchy—the menu bar and its pull-downs.
- Event-trapping menus generally serve one of three functions.

  1. immediately change some parameter in the current environment (bold a piece of text)

  2. take the user out of the current environment to perform a function without leaving the current environment (perform a spell check)

  3. exit the current environment and allow the user to move to a totally new environment (Exit).
- These menus can also change content based upon the system state, or an event, existing at that moment.
- A Paste option in a word-processing application, for example, will only function if there is something in a clipboard to paste. A Grid option on a pulldown, as another example, will toggle between a "Hide Grid" or "Show Grid" state, depending upon whether or not a grid is displayed on the screen at that moment.
- Event-Trapping menus such as menu bars are constantly available to aid in establishing a sense of context, or where one is, while things may be changing in the foreground.

3.2 FUNCTIONS OF MENUS

1. Navigation to a New Menu: Each user selection causes another menu in a hierarchical menu tree to be displayed. The purpose of each selection is to steer the user toward an objective or goal. Selection errors may lead the user down wrong paths, and cost time and, perhaps, aggravation, but these errors are non-destructive and usually undoable.

2. Execute an Action or Procedure: A user selection directs the computer to implement an action or perform a procedure. The action may be similar to opening or closing a file, copying text, or sending a message. In some cases, execution may only occur after a hierarchical menu tree is navigated. In other cases, actions may be performed as successive hierarchical menus are encountered and traversed. Selection errors may or may not have serious consequences, depending upon the nature of the action. Accidental selection of critical irreversible actions must be prevented in interface design.

3. Displaying Information: The main purpose of selecting a menu choice may simply be to display information. The user may be searching for specific information in a database or browsing the Web. The

user's focus is primarily on the information desired and less on the selection function. In many cases, information retrieval may occur only after a hierarchical menu tree is navigated. The content material and the user's interests will determine the paths followed. Users may spend considerable time and effort understanding and processing uncovered information inorder to evaluate subsequently displayed menu choices. Wrong turns in the process will again cost time and perhaps aggravation, but these errors are nondestructive and usually undoable.

4. Data or Parameter Input: Each selection specifies a piece of input data for the system or provides a parameter value. Data or values may be input on a single menu or spread over a hierarchy of menus. The user's focus is primarily on the information being provided and, again, less on the selection function. Selection errors can easily be corrected if detected by the system.

3.3 CONTENT OF MENUS

- A menu consists of four elements, its *context*, its *title*, its *choice descriptions*, and its *completion instructions*.

1. **Menu Context:**
   - provides information to keep the user oriented.
   - This information is critical in complex or hierarchical menu systems, where loss of position or disorientation can easily occur.
   - Feedback necessary that tells users where they are in a process, what their past choices were, and possibly how much farther they still have to navigate.
   - Verbal linkage, spatial linkage, or both may be used to provide navigation feedback.
   - *Verbal linkage* - involves providing on the current menu screen a listing of choices made on previous menus that have led to this position.
     - It also involves assuring the user that the displayed menu is the menu desired.
     - title should mirror the option selected on the previous menu and its content should reflect its title.
   - *Spatial linkage* - can be accomplished by graphic methods.
     - Each succeeding menu screen can be displayed overlapping the previous menu screen so a succession of choices can be seen in a single view.
     - A sense of progress and distance can then be easily ascertained.

2. **Menu Title:**
   - A menu's title provides the context for the current set of choices.
   - title must reflect the choice selected on the previously displayed menu.

3. **Choice Descriptions:**
   - Choice descriptions are the alternatives available to the user.
   - can range from a mnemonic, numeric, or alphabetized listing of choices to single words or phrases to full sentences or more.
   - style chosen will reflect
     - ✓ experience of the user (novice or expert)
     - ✓ nature of the choices (well-learned alternatives or not)
     - ✓ nature of the selection mechanism (keyboard or mouse)
     - ✓ nature of the system (business system application or Web page).
4. **Completion Instructions:**
   - Completion instructions tell users how to indicate their choices.
   - may include the rationale for why the user is being asked to make this choice and the impact the choice will have on subsequent processes.
   - Explicit instructions may be needed for first time or casual users of a system.
   - Experienced users will find very wordy instructions unnecessary.
   - needs of all system users, and the nature of the system, must be considered in creating this kind of on-screen guidance.

3.4 FORMATTING OF MENUS

The following are the ***guidelines*** for formatting menus.

1. **Consistency:**
   - menu design consistency is an integral component of system usability.
   - Provide consistency with the user's expectations.
   - Provide consistency in menu-
     - ✓ Formatting - including organization, presentation, and choice ordering.
     - ✓ Phrasing - including titles, choice descriptions, and instructions.
     - ✓ Choice selection methods.
     - ✓ Navigation schemes.

2. **Display:**
   - Frequency of use determines if menu displayed continually or on demand.
   - If continual or frequent references to menu options are necessary, permanently display the menu in an area of the screen that will not obscure other screen data.
   - This will provide memory support and immediate access to what is needed most.
   - Occasionally needed menus may be presented on demand or request via pop-ups or pull-downs.

- Critical options should always be continuously displayed.

3. Presentation:

- A menu and its choices should be immediately recognizable by the user as being a menu of choices.
- accomplished by giving the menu a distinctive and consistent structure and presenting it in a consistent screen or page location.
- Presentation techniques must be compatible with those used for other purposes on the remainder of the screen.
- enclose the menu in a box or display it using a background that contrasts with the remainder of the screen.
- Techniques chosen should be consistent throughout the system.
- Web page navigation links, which may be scattered throughout a page, are displayed underlined and in a unique color to differentiate and identify them. Ensure that other system elements do not possess qualities that allow users to confuse them with menu choices.
- In Web page design, for example, the underlining of any system component other than navigation links is not recommended because of the possibility that they may be confused with links.
- Ensure that other system components do not possess the same visual qualities as menu choices.

4. Organization:

1) **General menu:** The top-level menu in a hierarchical menu scheme should be a general or main menu, consisting of basic system options. This will provide a consistent starting point for all system activities and a "home base" to which the user may always return.
2) **Relevant alternatives:** A menu should provide all relevant alternatives at the point at which it is displayed. Including irrelevant choices on a menu screen increases learning requirements and interferes with performance. Alternatives that are conditionally inactive may be displayed along with the conditionally active choices, if the active choices can be visually highlighted in some manner (such as through bolding or reverse video), or the inactive choices can be visually subdued (perhaps as through graying them out). Whatever method is chosen should be consistently followed throughout a system. Options to be implemented in the future may also be displayed if they can be visually marked in some way (through a display technique or some other annotation).
3) **Matching menu structure to the tasks:** Menus should be organized according to how people structure their tasks. They should reflect the most efficient sequence of steps to accomplish a person's most frequent or likely goals**.**
4) **Minimize number of levels:** In creating a multilevel menu structure, determine how many items will be placed on one menu (its breadth) and how many levels it will consume (its depth). The more

choices contained on a menu (greater breadth), the less will be its depth. the fewer choices on a menu (less breadth), the greater will be its depth.

advantages of a menu system with greater *breadth* and less depth (broad menu):

- Fewer steps and shorter time to reach one's objective.
- Fewer opportunities to wander down wrong paths.
- Easier learning by allowing the user to see relationships of menu items.

Disadvantages of broad menu:

- A more crowded menu that may reduce the clarity of the wording of choices.
- Increased likelihood of confusing similar choices because they are seen together.

advantages of greater *depth*:

- Less crowding on the menu.
- Fewer choices to be scanned.
- Easier hiding of inappropriate choices.
- Less likelihood of confusing similar choices since there is less likelihood that they will be seen together.

Greater depth disadvantages:

- More steps and longer time to reach one's objective.
- More difficulties in learning since relationships between elements cannot always be seen.
- More difficulties in predicting what lies below, resulting in increased likelihood of going down wrong paths or getting lost.
- Higher error rates.

Fewer levels of menus aid the decision-making process, but trying to put too many choices on a single menu also has a negative impact. Large linearly ordered, well-learned listings, such as months of the year, or numbers, would be better presented in a one-level menu, rather than by breaking them into multiple levels.

5) **Limit the number of choices:** Be conservative in the number of menu choices presented on a screen. If the choices cannot be logically grouped, restrict the number to 4 to 8. If the choices can be grouped, 18 to 24 can be displayed, with no more than 10 items within a group.
6) **Provide decreasing direction menus:** In a multilevel menu, a *decreasing* direction structure presents successively fewer choices as each lower level is traversed. An *increasing* direction structure presents successively more choices as each lower level is traversed. Decreasing direction menus are significantly faster and more accurate than increasing menus.

7) **Scrolling:** Never require menus to be scrolled. Keep all choices visible at all times.
8) **Easy to restructure:** Menus should be capable of being restructured by a user. Not everyone works the same way.

5. Complexity:

- Providing two sets of menus will more effectively satisfy the differing needs of the novice and expert user.
- novice or casual user often only requires a minimal set of actions and menus to accomplish tasks.
- expert may prefer a full set of options.
- Make selection, and changing, between simple and complex menus easy to accomplish, preferably through a menu bar choice.

6. Item Arrangement:

- For scanning ease, menu choices should be left-justified and aligned vertically into columns.
- Research has found that columnar menus and listings are searched much faster than horizontally-oriented menus.
- Do not array a menu in multiple columns.
- When menus are included on other screens, space constraints often exist, and the menu must be arrayed horizontally.
- If a single-row (horizontal) orientation is necessary, organize for left-to-right reading.
- If two or more rows are available for displaying choices, organize for top-to-bottom, then left-to-right reading to facilitate visual scanning.

7. Ordering:

- Within information categories included on a menu, or in menus in which categories are not possible, options must be ordered in meaningful ways.
- When a menu contains multiple categories of information, the ordering of categories will follow these same principles.
- A meaningful ordering is necessary to:
  - ✓ Facilitate search for an item.
  - ✓ Provide information about the structure and relationships among items.
  - ✓ Provide compatibility with the user's mental model of the item structure.
  - ✓ Enhance the user's ability to anticipate a choice's location.
- When items are organized along some dimension or characteristic, the user can use that information to locate items faster.

Example: An alphabetized list provides an indication of approximately where in the listing an item beginning with a particular letter will be found.

- Understanding structure and relationships, item similarities and dissimilarities, can also aid in focusing attention on that which is relevant.
- incompatibility with the user's mental model will disrupt searching. Example: Months of the year presented in alphabetic order, would be very disrupting.
- Following are the common ***ordering schemes for menus***:

i. **Natural ordering.** If items have a natural sequence, such as chapters in a book, days in a week, or months in the year, the ordering scheme should follow this natural sequence. The screen viewer will have learned these ordering schemes very well.

ii. **Numeric ordering**. Use numeric ordering for choices associated with numbers, for example, type size, baud rate, or number of pixels.

iii. **Small number of options**. For groupings with a small number of options (about seven or fewer), *sequence of use, frequency of use,* or *importance* are good ordering schemes. Ordering can also be by *semantic similarity*, along a semantic dimension such as impact, potency, or emphasis. Type style, for example, may be ordered by emphasis from least to most: regular, underlined, italicized, and bold.

iv. **Alphabetic order.** For a large number of options, alphabetic ordering of alternatives is desirable. Alphabetic ordering is also recommended for small lists where no frequency or sequence pattern is obvious. It has been found that alphabetically ordered menus can be searched much faster than randomly ordered menus.

v. **Separate destructive choices.** Destructive menu choices, such as delete or clear, should be positioned as far away from frequently chosen choices as possible to minimize the chance of accidental selection.

vi. **Do not reorder menus.** Static menu has fixed menu. Dynamic menu is based upon the frequency in which menu items are chosen. Dynamic menus slower to use and less preferred than static menus. The continual reordering in dynamic menu interferes with menu order learning.

vii. **Consistency between menus.** Options found on more than one menu should be consistently positioned on all menus. If menus are of variable length, maintain relative positioning of all item options (for example, always place Exit at the bottom or end of the list). If menus are of fixed length, place options in the same physical position within the list.

8. Groupings:

- Create groupings of items that are logical, distinctive, meaningful, and mutually exclusive.

- **Create groupings.** Items displayed on menus should be logically grouped to aid learning and speed up the visual search process. Categorical organization may facilitate the transition from novice to expert user because information is visually represented in the way people think about it.
- **Categorizing.** Groupings should cover all the possibilities and contain items that are non-overlapping. Some collections of information will be easily partitioned into logical groups and others may be very difficult to partition. Some users may not understand the designer's organizational framework, and there may be differences among users based on experience. No perfect solution may exist and extensive testing and refinement may be necessary to create the most natural and comprehensible solution.
- **Number.** Limit the number of groupings on a screen to six or seven. The total number of items within all the groupings should not exceed about 18 to 24.
- **Ordering.** Groupings of menu items may be ordered following the ordering guidelines. Ordering alternatives include alphabetic, sequence of use, frequency of use, importance, and semantic similarity.
- **Arbitrary visual groupings**. Uncategorized menus should be broken in arbitrary visual groupings through the use of space or lines. Groups should be as equal in size as possible and consist of about four or five options. Groupings should never exceed more than seven options.
- **Separation.** Perceptually separate groupings by leaving a wider spacing between groupings, or by inscribing line separators between groupings.
- **Critical choices.** Choices that are critical or frequently chosen should be accessible as quickly and through as few steps as possible. Place them on the highest-level menu, whenever possible.

3.4.1 Line Separators

- Inscribing subtle solid or dashed lines between groupings can reinforce groupings and subgroupings of vertically arrayed related choices.
- For breaking subgroupings within one category, the line or lines should only extend from the first character of the descriptions to the end of the longest description (Figure 3.6).

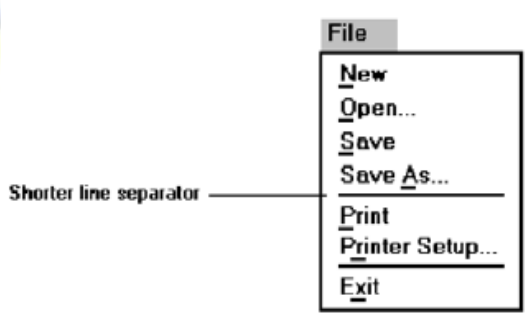


Figure 3.6: Partial line Separator

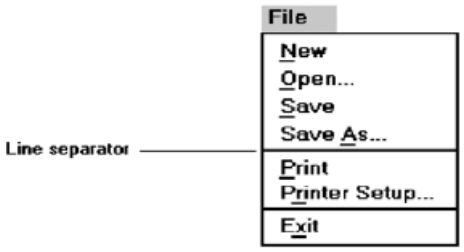


Figure 3.7: Extended line separator

- Many graphical platforms always extend the line from menu border to border. (Figure 3.7). This extended line results in too strong a visual separation between what are related menu parts.
- For independent groups of choices, extend the horizontal line from menu border to border to indicate to the user that the groupings are independent of one another.
- use partial line for separating related choices and an extended line for separating unrelated or independent choices.

3.5 PHRASING THE MENU

- A menu must communicate to the user information about:
  - ✓ nature and purpose of the menu itself.
  - ✓ nature and purpose of each presented choice.
  - ✓ How the proper choice or choices may be selected.
- Writing the content of menu components, the menu's title, the choice descriptions, and instructions, is difficult because of the varying experience levels of the menu users.
- Explaining everything in detail has screen space constraints and limits on what people want to read.
- Following are **guidelines** for creating menu titles, choice descriptions, Web navigation links, and menu instructions. The standard graphical system conventions inscribed on menus, intent indicators, keyboard equivalents, and keyboard accelerators, are also described.

3.5.1 MENU TITLES

- meaningful menu title aids in defining the context of the menu and increases menu comprehension.
- *Main menu*:
  - menu title should immediately orient the viewer to the menu's content and purpose
  - should be short, clear, distinctive, and descriptive.
  - Title should represent the entire series of choices.
  - It is an important contextual and navigation component.
  - title MAIN MENU OPTIONS - no information except that the user is top of a hierarchical menu tree.

- *Submenus*:
  - Submenu titles must be worded exactly the same way as the menu choice previously selected to display them.
  - This will provide structural continuity and assure users that they are progressing as expected through a menu hierarchy.
- *General*:
  - Locate the title at the top of a listing of choices, in the title bar if one is available.
  - Display title in uppercase or in a mixed-case font using the headline style of presentation.
  - For headline style, capitalize the first letter of each significant title word.
  - case style chosen should be consistently used on all menus.
  - Superfluous titles, titles that add nothing to the understanding of menu content and context, may be omitted.
  - A pop-up menu requested during a text editing task, for example, is displayed within the context of the task being performed.
  - presented choice descriptions by themselves (Copy, Font, and so on) provide the context.
  - Message windows do not need a title either; the text of the message provides the context.

3.5.2 MENU CHOICE DESCRIPTIONS

- ***Meaningful****:*
  - Menu item descriptions should be composed of familiar and fully spelled out words.
  - abbreviations may occasionally be necessary and they should be kept to a minimum. Only use abbreviations that are standard or well known.
  - Descriptions should be concise, contain few words as possible, and distinctive, constructed of words that make each choice clearly different from all others.
  - Repeated use of the same word or words in multiple choice descriptions hinders distinctiveness and signals the necessity for creating a grouping whose title is based upon the repeated word.
  - Use high-imagery keywords, words that elicit a mental image of the object or action.
  - Avoid low-imagery words that have more general meanings. Example: when obtaining a printout of a screen, the term “print” is much more descriptive than “list.”
  - Never assume that the description chosen by the designer will have the same meaning to the user. Names chosen by experts may not be same as those chosen by non-experts. Iteratively test and refine the choices to achieve as much agreement in meaning by users as possible.
- ***Size*****:**
  - Item descriptions may be single words, compound words, multiple words, or phrases.

- Menu bar items should be a single word, if possible. If a menu bar item must be a multiple word, tie the two words together by a hyphen between them.
- Web page content links will typically be phrases.

➢ ***Keyword first*:**
- Arrange multi-item descriptions so that the descriptive and unique words appear at its beginning. This optimizes scanning and recognition while the user is learning the menu.
- Description phrasing and wording should also be consistent across all menus to aid learning further.

➢ ***Capitalization*:**
- Use headline style of presentation.
- Capitalize the first letter of each significant choice description word.

➢ ***Task-oriented wording***:
- Task-oriented wording preferable to data-oriented wording.
- Task-oriented wording usually positions a verb first, such as *Manage Customer Information*.
- An example of data-oriented wording would be to simply say *Customers*. What is being done with, for, or to customers is unclear.

➢ ***Parallel construction*:**
- When choices composed of phrases, use a parallel word construction in creating descriptions for related choices.
- Parallel construction would be: *Print* a File, *Execute* a Program, and *Eject* a Disk. An example of nonparallel construction is: *Print*; *Execute* a Program, and Disk *Eject.*

➢ ***Relationship to title*:**
- menu choice must never have the same wording as the title of the menu on which it is presented.

➢ ***Consistency across menus*:**
- Identical choices on different menus should be worded the same.

➢ ***Numbering*:**
- Items should not be numbered unless listing is numeric in nature, graphic, or a list of varying items.

➢ ***Command language***:
- If menu options used in conjunction with a command language, the capitalization and syntax of the captions should be consistent with those of the command language.

➢ ***Word as a command to computer*:**
- Phrase all menu choices as commands to the computer whenever possible.

- Example:

  Choose one:

  Save and exit

  Exit without saving

  rather than:

  Do you want to save and exit?

  Yes

  No

- Wording a choice as a command to the computer describes clearly the action of what the command accomplishes.
- Yes/No alternatives shown above must be comprehended in conjunction with the question being asked.
- Wording a choice as a command also provides choice phrasing that is consistent with other system commands. Example: A system contains the standard commands *Save* and *Exit*.
- command wording enhances the learning of command mnemonics.
- wording implies that the initiative is with the user in the dialog, not with the computer.

3.5.3 MENU INSTRUCTIONS

- People not familiar with a system and its menus may need guidance on how to complete a menu.
- Experienced users may not want or desire guidance to complete a menu.
- satisfying the needs of all kinds of users at the same time necessitates menu instructions to be included on a menu such that these instructions are easily ignored by those who do not need them.
- ***Novice or inexperienced users*:**
  - Provide explicit menu completion instructions for novice or inexperienced menu users.
  - Place instructions in a position just preceding the part, or parts, of the menu to which they apply.
  - Left-justify the instruction and indent the related menu choice descriptions a minimum of three spaces to the right.
  - Leave a space line, if possible, between the instructions and the choice descriptions. Present the instructions in a mixed-case, sentence-style font.
- ***Expert users*:**
  - Instructions when included on menus must be visually recognized as instructions.
  - This will allow them to be easily ignored by the expert user when they are not needed, or no longer needed.

- visual aspect of the instruction must indicate that it *is* an instruction.
- The form user then immediately recognizes them as instructions, and they can be read or ignored as is desired.

- present instructions in a unique font or color to make them immediately recognizable as instructions on a menu.
- If one of these methods is used, cautions concerning the excessive use of different font styles and colors must be followed.
- Begin the instruction to the left of the screen elements to which it applies, the left-justification identifying it as an instruction.
- Try to leave a space line between the instruction and the elements to which it relates, whenever possible.

3.5.4 INTENT INDICATORS

- Provide an indication of what will happen when a menu item is selected to enhance predictability and exploration of a graphical system.
- If a choice leads to another lower-level menu, include a *cascade indicator*, a right-pointing arrow, following the item description.
- If a choice leads *to a window*, include an ellipsis following the item description.
- Items causing a direct action will have no indicator.
- These intent indicators are illustrated in Figure 3.8.

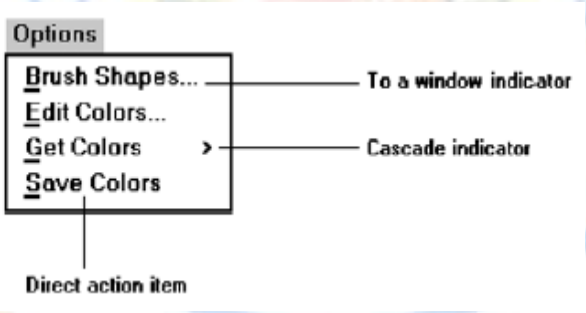


Figure 3.8: Intent indicators

- IBM's SAA CUA designates choices leading to submenus or windows as *routing* choices, and items causing direct actions as *action* choices.
- Microsoft Windows *intent indicator* - implies that additional information is needed. This additional information request is presented in a window, but it need not necessarily be restricted to a window.

3.5.5 KEYBOARD EQUIVALENTS

- ***Keyboard selection*:**
  - ability to select a menu alternative through the keyboard should always be provided.

- accomplished by providing a keyboard *equivalent* for each menu alternative.

➢ ***Mnemonics*:**

- Keyboard equivalents with meaningful associations to their corresponding choices will be more easily learned and remembered.
- simple truncation good method for creating mnemonics.
- first letter of the item description is the recommended mnemonic. In following this method, duplications easily occur and so an alternative principle must also be provided. A simple scheme is to use the second consonant for duplicate items. This duplication-breaking scheme need not always be faithfully followed, however. Occasionally another letter in the menu item may be more meaningful to the user. In these cases, it should be selected.

➢ ***Designation*:**

- Mnemonic codes can be visually indicated in a number of ways.
- recommended method - underline beneath the proper character within the choice.
- Other methods - a different character color, different character intensity, or a contrasting color bar through the relevant character are visually more complex and should be avoided.
- Underlined keyboard equivalents are illustrated in Figure 3.9.

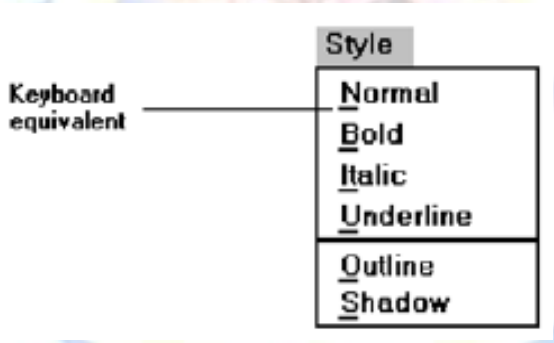


Figure 3.9: Keyboard Equivalents

➢ ***Industry standards***:

- Standard industry keyboard equivalents have been established for many common system menu choices.
- Where these standard equivalents have been established, they should be followed.
- Microsoft Windows calls keyboard equivalents *access keys.*
- Standard keyboard equivalents are shown in Table 3.1.

Table 3.1 Standard keyboard Equivalents

About	Help	Print	Send To
Apply	Help Topics	Print Preview	Show
Back	Insert	Properties	Size
Browse	Maximize	Redo	Split
Close	Minimize	Repeat	Stop
Copy	Move	Restore	Undo
Cut	New	Resume	View
Delete	Next	Retry	Yes
Edit	No	Rerun	
Exit	Open	Save	
File	Paste	Save As	
Find	Page Setup	Select All	

3.5.6 KEYBOARD ACCELERATORS

- *Accelerators* are keys, or combinations of keys, that invoke an action regardless of cursor or pointer position.
- used to activate a menu item without opening the menu.
- most useful for frequent activities performed by experienced users.
- IBM's SAA CUA and Microsoft Windows calls these keys *shortcut* keys. They may also be called *hot keys*.
- Many products have, within their guidelines, standard accelerator key recommendations as well as rules for creating new accelerator keys.
- For frequently used items, assign a key, or combination of keys, to accomplish an action.
- Function key shortcuts are usually easier to learn than modifier plus letter shortcuts.
- Pressing no more than two keys simultaneously is preferred; three keystrokes is the maximum. Use a plus (+) sign to indicate on the screen menu that two or more keys must be pressed at the same time.
- Accelerators should have some associative value to the item and be identified by their actual key-top engraving.
- In situations where multiple kinds of keyboards exist, and there are keyboard terminology differences, use the term most commonly found on the keyboards or use the term contained on the newest PC, if evolution to the new PCs is expected.
- Display the accelerator right-aligned and enclosed in parentheses to the right of the choice. Incorporating key names within parentheses indicates that they are prompts. They may easily be ignored when not being used.

- Most graphic systems do not place them within parentheses, giving them much too strong a visual emphasis. (Figure 3.10).

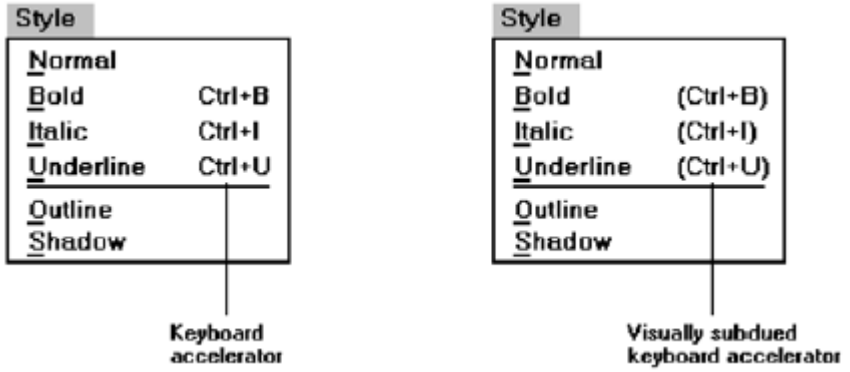


Figure 3.10: keyboard Accelerator

- Do not use accelerators for menu items that lead to cascaded menus.
- do not use accelerators on pop-up menus, because they are mouse driven.
- Use standard keyboard accelerators when they exist. Standard industry accelerators are shown in Table 3.2.

Table 3.2: Standard keyboard Accelerators

THIS ACCELERATOR:	DESIGNATES THIS ACTION:
Ctrl+C	Copy
Ctrl+N	New
Ctrl+0	Open
Ctrl+P	Print
Ctrl+S	Save
Ctrl+V	Paste
Ctrl+X	Cut
Ctrl+Z	Undo
F1	Display contextual help window
Shift+F1	Activate context-sensitive help
Shift+F10	Display pop-up menu
Spacebar	Select (single mouse click)
Esc	Cancel
Alt	Activate a menu bar

3.6 SELECTING MENU CHOICES

Menu items can be selected by pointing at the choice with a mechanical pointer, by pointing at the choice through the keyboard, or by keying a value designating the choice.

3.6.1 Initial Cursor Positioning

- If one option has a significantly higher probability of selection, position the cursor at that option.
- If repeating the previously selected option has the highest probability of occurrence, position the cursor at this option.
- If no option has a significantly higher probability of selection, position the cursor at the first option.

3.6.2 Choice Selection

- Pointers:
  - Select the choice by directly pointing at it with a mechanical device such as a mouse or trackball pointer, or light pen, or pointing with one's finger.
  - Visually indicate:
    - Which options can be selected.
    - When the option is directly under the pointer and can be selected.
  - Visually distinguish single- and multiple-choice menu alternatives.
  - If pointing with a mechanical device is the selection method used:
  - The selectable target area should be at least twice the size of the active area of the pointing device or displayed pointer. In no case should it be less than 6 millimeters square.
  - Adequate separation must be provided between adjacent target areas.
  - If finger pointing is the selection method used:
    - The touch area must be a minimum of 20 to 30 millimeters square.
    - The touch area must encompass the entire caption plus one character around it.

- Keyboard:
  - If moving the cursor to a menu choice:

- The up and down arrow keys should move the cursor up or down vertically oriented menu options.
- The left and right cursor keys should move the cursor left or right between horizontally oriented menu options.

- If keying a choice identifier value within an entry field:
  - Locate the entry field at the bottom of the last choice in the array of choices.
  - Uppercase, lowercase, and mixed -case typed entries should all be acceptable.

- Selection/execution:
  - Provide separate actions for selecting and executing menu options.
  - Indicate the selected choice through either:
    - Highlighting it with a distinctive display technique.
    - Modifying the shape of the cursor.
  - Permit unselecting choice before execution.
    - If a menu is multiple choice, permit all options to be selected before execution.
- Combining techniques:
  - Permit alternative selection techniques, to provide flexibility.

3.6.3 Defaults

- Provide a default whenever possible.
- Display as bold text.

3.6.4 Unavailable Choices

- Unavailable choices should be dimmed or “grayed out.”
- Do not add or remove items from a menu unless the user takes explicit action to add or remove them through the application.

3.6.5 Mark Toggles or Settings

- Purpose:

  — Use to designate that an item or feature is active or inactive over a relatively long period of time.

  — Use to provide a reminder that an item or feature is active or inactive.

- Guidelines:

— Position the indicator directly to the left of the option.

— For situations where several nonexclusive choices may be selected, consider Including one alternative that deselects all the items and reverts the state to the "normal" condition.

- Mark toggles or settings, illustrated in Figure 4.11, are menu items that toggle between active and not active. When it is active, an indicator is displayed adjacent to the item description. For nonexclusive choices, a check mark is displayed; for mutually exclusive choices, another distinctive symbol, such as a diamond or circle, is displayed. When the item is not active, no mark or symbol will appear.

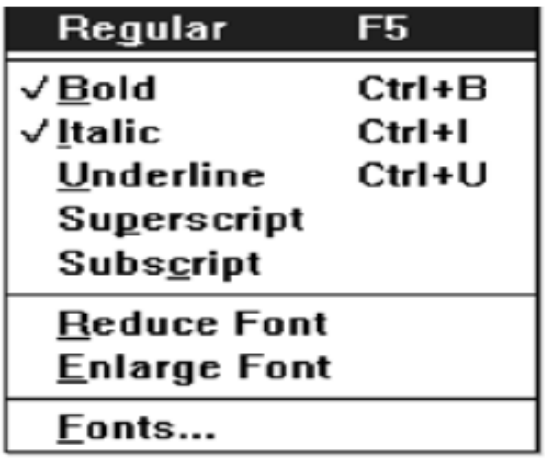


Figure 4.11 Mark toggles.

- Examples of items using mark toggles are: having a specific application automatically loaded after the system is loaded, having windows automatically reduced to icons when they are made inactive, or making a setting without requiring a dialog box.
- **Advantages/disadvantages.**

  Mark toggles provide a visual indication of the state of an item. They are accessed quickly but may not always be visible. Mark toggles are best suited to items or features that remain active or inactive over relatively long periods of time. They provide good reminders of the state that exists.

3.6.6 Toggled Menu Items

- Purpose:

  — Use to designate two opposite commands that are accessed frequently.

  — Use when the menu item displayed will clearly indicate that the opposite condition currently exists.

- Guidelines:

  — Provide a meaningful, fully spelled-out description of the action.

  — Begin with a verb that unambiguously represents the outcome of the command.

  — Use mixed-case letters, with the first letter of each word capitalized.

- A toggled menu item is a one menu item command that toggles back and forth between the current state and its alternative state. When the menu item is first displayed, it reflects the alternative state to the condition that currently exists.

Figure 4.12 Toggled menu item.

- For example, in Figure 4.12, if a background grid is currently being displayed, the menu item reads *Hide Grid.* When Hide Grid is selected, the grid is removed from the window, and the menu item dynamically changes to reflect the opposite action.
- It will now read *Show Grid*. When a grid is again requested, it will change back to Hide Grid. The purpose of toggled menu item is to use a single menu item to designate and activate the one, opposite, alternative of a two-state command setting.
- **Advantages/disadvantages.**

  Toggled menu items shorten menus, decrease visual clutter, provide quicker access, and foster faster comprehension of the command action. When they are located on a pull-down menu, however, the actions themselves are not always visible. The opposite action reflecting the current state of the attribute, since it too is not visible, can cause uncertainty for novice users concerning what the state actually is. Toggled menu items are also limited in use to commands only.

3.7 NAVIGATING MENUS

- Navigation, and an efficient navigational structure, is the most important element in system usability.
- In Web site design, the most successful sites have been found to be those with easy to use and understand navigational systems.
- A system's organizational structure and its navigational tools, including elements such as menus, links, toolbars, and command buttons influence the system's navigational ease of use. So does the size of the system, as well as the navigational aids available, including site maps and indexes.
- In Web site navigation design, the unique, often incompatible, relationship the browser has to the Web site application being presented can also strain navigation ease.

3.7.1 WEB SITE NAVIGATION PROBLEMS

- Web site navigational issues and problems are both technical and usage-related.

***1. Technical issues*:**

- In a graphical system application screens tend to flow in an orderly and predictable manner. A Web application is composed of pages, each of which can, theoretically, be linked to any other page in the application.
- graphical application user normally begins a process at a prescribed starting point and proceeds sequentially until a process or task is finished. Web users can perform tasks or satisfy needs at will, easily moving between most screens in the application "spider web" in any order desired, and even jumping to other spider webs when the urge arises.
- graphical system user must deal with only one operating system whose navigational characteristics are standard and fairly consistent. Web user must confront two navigational systems, that of the browser being used and that of the Web site being viewed.
- A click of the browser Back button, for example, simply redisplays the page that was previously displayed on the screen. This page may have been in another Web site, and the user is transported there. Neither Web site application is aware of this change. Nothing that might have been done on the page "moved back from" is changed.
- To move around within a Web site requires links within the Web site, either in the form of textual links or command buttons.
- data must always be thought of as separate from the controls used to display it, not as being seamless, as occurs in graphical systems.
- Web users, especially novices, often do not recognize where the browser ends and the Web site application begins.

- Because of expanding nature of the Web, Web sites also have a tendency to grow and grow. As more and more is added, what may have been initially a reasonable structure and menu scheme slowly dissolves into a confusing mass of listings and linked pages. Result is unrelated information that is presented in no particular order.

2. ***Usage problems***:

- two most serious user problems in Web navigation - heavy mental loads imposed to use the Web and the feeling of spatial disorientation that often occurs.
- This problem may also occur in hierarchically structured graphical systems.
- mental overhead of the user spent in making decisions concerning which links to follow, or to abandon.
- there are too many links presented on a page, many of whose meanings are not clear.
- Links frequently offer few clues to where they lead, how much information will be found at the other end, and how this information relates to the currently displayed page.
- For the user to reach a goal, each link's relevance to the task at hand must be determined.
- not all links on a page are always obvious. Often leads to much trial-and-error - the user aimlessly clicking to see what happens.
- Feelings of disorientation experienced when one becomes "lost in Web space."
- A scrolling page can lead to loss of local context when the basic navigational elements, such as links to other local pages in the Web site disappear.
- There are then no familiar landmarks to then navigate by.
- Long chains of links to reach relevant material can be tedious and also lead to loss of context, and a "Where Am I?" reaction.

3.7.2 NAVIGATION GOALS

- A well-designed navigation system facilitates quick and easy navigation between components whose structure and relationship are easily comprehendible.
- For the user, answers to the following questions must be obvious at all times during an interaction:
  - Where am I now?
  - Where did I come from?
  - Where can I go from here?
  - How can I get there quickly?
- Referred to as "wayfinding," a good navigational scheme, and the proper navigational tools, will minimize, if not eliminate, the problems associated with cognitive or mental overload and feelings of disorientation.

- General ***system navigation guidelines*** include the following.

1. Control:

- Navigation through menu levels should be accomplished through simple actions.
- It should always be very easy to return to the next higher-level menu and the main, general, or top menu.
- Provide multiple pathways, whenever possible, through a hierarchical menu structure.

2. Menu Navigation Aids:

- To aid menu navigation and learning, provide an easily accessible:
  - Menu map or overview of the menu hierarchy.
  - A "look ahead" at the next level of choices, alternatives that will be presented when a currently viewed choice is selected.
  - Navigation history.
- Menu maps**: A**s one wanders deeper into a multilevel menu system, it is increasingly difficult to maintain a sense of position or orientation resulting in getting lost in the menu maze. Providing a graphic representation of the menu structure in map form, either in hard copy or online, resulted in fewer errors or wrong choices, faster navigation, and greater user satisfaction when compared to providing no guides or simply providing indexes or narrative descriptions of the menu structure. Menu maps or graphic representations of the menu structure are desirable and should be included on top-level menu screens. They should also be included in the system documentation where available, and through Help function.
- Look-aheads**:** Menu navigation and learning will be assisted if a person is able to browse the next level of choices before the currently displayed choice is selected. As the cursor moves across a menu bar, for example, the pull-down menu may be automatically dropped, permitting review of the choices available if that menu bar item is selected. Such look-aheads are useful if ambiguity exists at higher-level choice points. They have been found to decrease errors and improve satisfaction. Menu search time may be longer.
- Navigation history**:** It has been found that being able to view, on the screen, the path one is following improves learning and performance, and reduces feelings of disorientation. Provide a navigation history that summarizes the menu choices made leading to the currently displayed menu or screen.

3.7.3 WEB SITE NAVIGATION

- Web sites usually have much less *perceived* structure than typical graphical system applications.
- Web pages can be of any length and possess any number of links to any number of other pages.
- The user can wander at will or whim through multitudes of links, pages, and Web sites, and any meaningful structure a Web site design does possess can easily disappear from one's memory in the maze of directional twists and turns being made.
- The potential for getting lost is extremely high, unless numerous, obvious, and understandable landmarks are available as a guide.
- ***Web Site Organization***
  - Easier to develop a clear and comprehendible navigation scheme for Web site that is organized and structured in a meaningful way.
  - ***design goal*** - a proper balance of menus and pages that can be easily and efficiently moved between.
  - **Logical fragments, units, or chunks**: Smaller discrete fragments or chunks of information are often easier to navigate than long, undifferentiated units. Hypertext is a nonlinear way of organizing information based upon the following *principles*:
    - A large body of information exists that can be organized into fragments.
    - The fragments relate to one another.
    - The user needs only a small fraction of the fragments at any one time.

    In organizing a Web site, information is first divided into logical fragments, units, or chunks. Coherent chunks that focus on a single topic is the desired goal.

  - **Hierarchy of generality or importance**: Having identified the information units, information is now organized in according to importance or generality, from general to specific. Hierarchical tree is the most recommended organization scheme. Sun Microsystems (1998) suggests that whenever possible:
    - State conclusions and link to supporting details.
    - Enumerate categories of information and link them to detailed listings.
    - Summarize information and link to full-length treatments.

    A document organizational tree structure, (table of contents, chapters, sections, and subsections) is very familiar to people, and have an excellent mental model of this organization. Such structure provides information about information sequence, information quantity, and the relationships existing between components.

Other organizational schemes - topics followed by subtopics, or prioritization from most to least important. objective - allow the user to scan the page and then select relevant and useful content for further review. Excessive fragmentation of a long, sequential story should be avoided. Reading will be impeded and printing made more difficult.

- **Structure the relationships:** Identify the relationships that exist between various elements in the hierarchical tree. In a large Web site, two levels of navigation will exist.
  1. movement within the subject area: includes moving *within a branch*—up to a parent page or down to a child page. Also involves navigating across branches to sibling pages or other sections of a site. What other points on other tree branches it will be beneficial to go directly to then, must be established.
  2. global or site-wide: What other site features, such as search a facility, site maps, and other major content areas should be mentioned on each page? Do not mention all features on all pages. Restrict the number presented to the several most useful features.
- To unveil the Web site's structure, use *progressive disclosure*. Heading levels, shown in varying type sizes (as on paper), will be helpful in aiding understanding of site organization.
- **Hierarchical tree:** Web sites pages should be organized as offshoots of a single home page. If a site has a large number of information categories, and each category contains a lot of content, create submenus to aid navigation. Design goal- a well-balanced hierarchical tree that facilitates quick access to all information and also helps people understand how the site is organized. Spoke design, where every page is linked to every other page, has been found to lead to lower usability.

  Hierarchical breadth is greatly preferable to hierarchy depth. A few menus with a larger number of choices are better than a large number of menus each with a smaller amount of choices.

  When menu levels go to four, five, or more, the chance of users becoming lost or disoriented is greatly increased. Restrict, whenever possible, the hierarchical tree to two levels requiring no more than two clicks to reach the deepest content. A two level structure encompasses a home page and two additional levels below it.

3.7.4 COMPONENTS OF A WEB NAVIGATION SYSTEM

- Navigation links allow to move between Web site information fragments.
- They are contained within a framework of tools or controls, including the browser's command buttons, textual phrases, Web site navigation bars, and Web site command buttons.
- Collectively, these are all referred to as links.
- Links are one of the most discussed issues in Web site design.

- A link functions as a menu choice that, when selected, results in the connected information being displayed, or results in a file being opened or downloaded.
- A movement link may transport the user to another location within a page, to a new site page, or to another Web site.
- Links give the user an idea about a Web site, document, or page.
- The wording of a textual link enables a person to predict what lies submerged below, or what will happen if it is activated.
- This lets the user determine whether a link should be followed, reading the page continued, reading the page ended, or a retreat to an earlier point initiated.
- Providing an extensive collection of link navigation tools will focus the user on the Web site itself and its content, drawing attention away from the general-purpose browser links.
- Making these tools consistent and predictable will help the user create an understandable mental model of the site and its organization.
- *general link guidelines* :

1. **Sensible:** All navigation controls, in the absence of site context, must make sense to the user. The user may have "lost" the context, or the page or Web site may have been entered from almost anywhere.
2. **Available:** All navigational controls must be easy to access. If they are not readily available, the full advantages of hypermedia may not be achieved.
3. **Obvious and distinctive:** A navigation link or control must look like a navigation control. Its appearance to the user must immediately suggest that it is an entity to be clicked or otherwise selected. This is accomplished through a tool's appearance as well as its location. Non-obvious control choices lead to aimless and tedious page clicking and ultimately confusion and frustration. Do not make any other screen element look like a navigation tool if it is not one. The obviousness of a link is called its *affordance*. A control with high affordance will be quickly identified as a control. Techniques to create the necessary affordance and distinctiveness differ depending upon the kind of link.
4. **Consistent:** Like all elements of the interface, navigation links, toolbars, and command buttons must be consistent in appearance and behavior.
5. **Textual:** All navigation must have a textual label or description. Navigation using textual descriptions is much preferable to graphical-only navigation because the purpose and function of graphic images are often unclear. They also take longer to download. Textual links are also necessary for users who do not have graphics, or who have chosen not to display graphics.

6. **Provide multiple navigation paths:** Offer multiple paths or ways to move around the Web. Provide structural components such as site maps, a table of contents, and indexes to go directly to a point of interest, provide content links to move around non-sequentially, and provide command buttons, such as *Next* and *Previous,* to move sequentially.

3.7.4.1 Browser Command Buttons:

- The browser being used in interacting with the Web provides its own command buttons.
- pressing the browser *Back* and *Forward* buttons can create confusion because they can transport a user in and out of a Web site.
- Novice users often do not recognize where browser control ends and application control starts, and vice versa.
- Than relying on the browser's buttons, provide navigation controls within the application for movement within the application. They can take the form of links or command buttons such as *Next* and *Previous*.

3.7.4.2 Web Site Navigation Bars:

- A Web site navigation bar is a menu, an array of textual phrases, graphical images or icons, or command buttons as illustrated in Figures 3.13, 3.14, and 3.15.

Figure 3.13: textual explicit listing navigation bars

Figure 3.14: Graphical or iconic navigation bar

Figure 3.15: Command button navigation bar

- A Web site contains at least three levels of navigation links

  - *global,* or site-wide, links, indicating the site's total scope or categories of available information.

  - *local* specific navigation links within the category or topical area being displayed;

  - *minor* illustrative, parenthetical, or footnote links.

- An evolving standard in design is to locate the global links at the page top, the categorical links in a columnar array down the pages left side, and the minor links at the page bottom. This structure, illustrated in Figure 3.16, separates navigation from content, making it easy for users to find each.

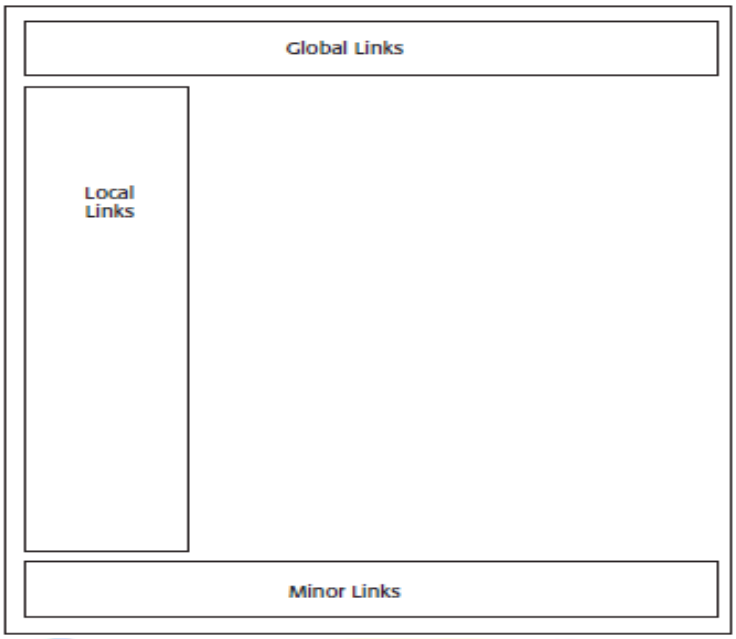


Figure 3.16: Web Navigation component locations

- Locating the global links at the page top makes sense if one considers the logical flow of information through a screen. A selection from this global area eventually results in display of a page and its content, a top-to-bottom sequential eye flow. The left-justified category navigation area would, however, have been better positioned on the right.
- Given the common cultural left-to-right reading sequence, upon completion of reading of a page's content the eyes will be flowing right toward the right side of the screen.
- Finding the navigation links next needed would be more efficient. A right positioning of these links would also place them next to a scroll bar, a common focus of the user's attention on screens being scrolled.
- This vertically arrayed category navigation listing, while optimizing visual scanning of alternatives, is quite wasteful of screen space, consuming about 20 percent of a screen's pixels.

Its space-consuming orientation is a usability trade-off, ease of scanning being enhanced at the expense of screen efficiency.

- All in all, navigation consistency reduces learning and avoids user confusion, so to now change its location would probably unleash greater problems.
- For long scrolling pages, repeat important global or local links at the page bottom. When finishing a page, the user, then, will not have to scroll upward to locate important navigation links.

Textual Phrases: Textual phrases are words, or short pieces of highlighted text, serving as links. Textual phrase links possess two distinct structures, explicit and embedded. An *explicit* menu is a listing of textual phrase links set apart from the main page content, often in a toolbar. These listings usually include links to various Web site topics, links to site global features such as the site map or search facility, and perhaps links to other related sites. These listings closely resemble typical screen menu arrays in their structure and presentation.

A typical explicit menu is shown in **Figure 3.13**. An *embedded* menu is a link contained within the textual content of a page. Certain words or phrases are designated as links, highlighted, and when selected display the linked component for the user.

An embedded menu is illustrated in Figure 3.17. Web sites usually contain both explicit link listings and embedded links in various mixes.

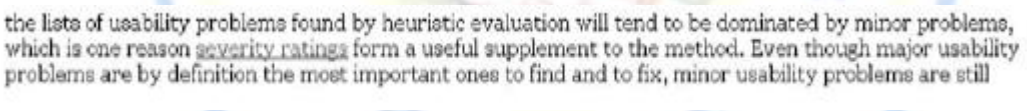

the lists of usability problems found by heuristic evaluation will tend to be dominated by minor problems, which is one reason severity ratings form a useful supplement to the method. Even though major usability problems are by definition the most important ones to find and to fix, minor usability problems are still

Figure 3.17: Embedded link Menu

Graphical Images or Icons

- Graphical images or icons may appear in an array in the form of a navigation bar, or be individually located at relevant points in a page.

Command Buttons

- Command buttons may appear in an array in the form of a navigation bar, or be individually located at relevant points in a page.

3.7.4.3 Other Web Site Navigation Elements

In addition to Navigation bars, a number of other Web site elements are also important components of the Web navigation system. Among these are overviews, including executive summaries, site maps, indexes, and tables of contents. Other elements are historical trails and search engines.

Overviews

■ Provide:

— An executive summary that provides a preview of the site and contains links to all major concepts.

— A site map illustrating the site's hierarchical structure and the relationships of components.

— Both global and local maps.

— An alphabetized site index.

— A table of contents.

■ Allow accessibility from any point in the Web site.

- Overviews provide a top-level view of a site's organization and content. Having an understanding of how a site is organized, the landmarks available within it, and the content it contains, assists the navigation process. In driving an automobile, referring to a road map before embarking on trip usually results in reaching one's destination faster, easier recovery from inadvertent wrong turns, a better ability to handle any unexpected detours that may be encountered, and a less stressful trip.
- Overviews are most useful if provided in several forms. They may be needed during a Web interaction as well as before starting into a site. A graphical system help function, for example, may be available in tutorial form, be accessible by topics, or be organized in alphabetic form for easy scanning. It is difficult to predict the user's exact need at any moment in a session.
- An *executive summary* will provide an overview of the site in narrative form and contain links to all major concepts. A *site map* will illustrate the site's hierarchical structure in either graphical or textual form. These elements provide a prospective on one's position in the spatial hierarchy. Maps may be made available at both a global or local level within the site, depending upon the site's complexity. An alphabetized site *index* will permit quick access through keywords and specific topics. A *table of contents,* structured as in a printed book, will permit review of major topics and the subtopics within. All of a Web site's overview elements should be accessible from any point within the site.

- **Historical Trails**

■ Provide:

— Breadcrumb Trails.

• Locate at the top of the page below the navigation links.

— History Lists.

— History Trees.

— Footprints.

— Bookmarks.

  - Historical navigation aids try to show the user's position in an information space by showing where they have come from, or where they have been. Seeing a navigation path enables a user to better understand the context of the currently displayed page.
  - Displayed paths also provide a means to easily return to places of interest. A *breadcrumb trail* in a hierarchical Web site structure is a sequential textual listing of pages traversed from the parent page to the page currently being displayed. A trail, illustrated in Figure 4.18, is also a series of links that permit the user to go back to any page in the sequence with one click. At this moment no standard exists for how to separate the page names in a trail. Symbols used include an arrow (->), a colon (:), a greater than sign (>), and a slash (/). Until a standard evolves, any of the above symbols remain acceptable. Do not use anything else, however. Position a breadcrumb trail at the top of the page below any existing navigation links.
  - A *history list* is a sequential textual listing of sites or pages visited over a specific time period, a session, a day, or some other time period. A *history tree* is an overview map of a site's structure with pages already visited marked by an indicator such as a plus sign, check mark, or asterisk. The markings serve as *footprints*, guiding the user back to pages of interest, and/or signaling which have already been seen and may no longer be of interest. A *bookmark* is similar to a history list except that it is designated by the user to mark locations of continuing interest.

- **Search Facility**
  - Provide a search facility.

3.7.5 Web Site Navigation Guidelines

How many links should exist on a page? How should textual links be presented to make them obvious? What kinds of links should be included on a page? These and similar questions are addressed next.

Scrolling

■ Do not require scrolling of navigation-only pages.

■ Minimize the need for scrolling to view all links on pages containing content.

■ Never require horizontal scrolling.

Never require scrolling of navigation-only pages. Besides being tedious, not being able to see all links at the same time makes comparison of the alternatives for selection purposes much more difficult. For scrollable content pages, minimize the need to scroll to see all links. Also, ensure that all related links on a screen are seen together to facilitate comparison. Never require horizontal scrolling. It makes text reading difficult and users dislike it.

Number of Links

■ Every page should contain at least one link.

■ Be conservative in the total number of links presented on a screen:

— Without logical groupings of elements, limit links to 4 to 8.

— With logical groupings of elements, limit links to 18 to 24.

■ Restrict embedded links to those most important, pertinent, and interesting.

— Place less relevant links in a listing.

One link. At a minimum, every page should contain at least one link. To follow a path and then reach a dead end is frustrating. Also, a dead-end page, if accessed from another Web site, provides no means for the user to navigate to other site pages.

Conservative number. How many links presented on a page is ultimately determined by the complexity of the site and its content. Menu research indicates that without choice groupings, links should be limited to 4 to 8, with groupings, limited to 18 to 24. Some experts in Web design recommend even fewer, a maximum of 8 to 12 links. In general, the more links contained on a page, the more decisions concerning which link to follow are imposed on the user. Where any link ambiguity exists, the odds of guessing correctly which link to follow diminish. A smaller number of links also increases

the likelihood that those being looked for will be noticed. It is not necessary to mention all features of a site on all pages. To reduce the number of links, restrict those presented to the most important site content or useful features.

Embedded links. The trade-off that must be addressed in creating embedded links is linkability versus readability. Embedded links can be a distraction and reduce page readability, especially if used in abundance. They may also be overlooked in text scanning, especially if the scanning is not carefully done. Embedded links, however, can provide more meaningful context, adjacent phrases or sentence words being useful in understanding the link's purpose. The best trade-off is to incorporate embedded links in moderation. Reserve them for the most important, pertinent, and interesting document points. If other relevant content exists, present it in an explicit link listing.

Presenting Links

■ Link text:

— Underline all link text, including that:

• Embedded in page content.

• Contained in explicit menu listings.

• Contained in headings.

• Used as graphical labels.

— Distinguish between unselected/unvisited links and selected/visited links.

• Make unselected/unvisited links blue.

• Make selected/visited links purple.

■ Kinds of links:

— Distinguish links leading to different Web destinations through a differentiating

symbol:

• Precede links to content within the same page with a pound sign (#).

– For links moving downward in the page, use: #The principles of design.

– For links moving upward in the page use: #^ Principles introduction.

• Precede links to external or foreign sites with another unique symbol such as

an asterisk (*): * Additional information.

• Do not precede links to other site pages with any symbol:

– More principles of design.

— Also distinguish links leading to different Web destinations by presenting them

in consistent locations.

■ Graphical links:

— Distinguish graphical links from decorative graphics through:

• Underlining graphical text labels.

■ Links in toolbars:

— Distinguish links contained in toolbars through:

• Presenting in consistent locations.

• Using different colored backgrounds.

Links must be easy to find. They must not be confused with other screen graphics or textual content. Having to search for links can be a tedious and frustrating process. Whether a link has been navigated before must also be obvious. When looking for something new, continually embarking down a path already traveled can also be frustrating.

Link text. To identify a link, the well-established convention is to *underline* the link text. All link text must be underlined, including that embedded in page content, that presented in explicit listings, that contained in headings, and that taking the form of labels in graphical images.

Unselected/unvisited links must be *distinguishable* from selected/visited links. The ability to understand what links have been followed is one of the few standard navigational aids available in browsers. Stick with the default colors of *blue* for links already followed and *purple* for links not yet ventured down. While the choice of blue as a text color was poor because of its degraded reading ability it is now well learned. Its use is recommended because it is now very familiar.

Using nonstandard link colors can lead to severe problems. It is difficult to remember what color means what, increasing link selection errors. It can also lead to confusion with normal underlined text in a document.

Kinds of links. Visually distinguish links leading to different Web destinations. A link that simply moves within a page, if unknown to the user, can be confusing, leading people to follow a link prematurely. A link that moves to another Web site can be aggravating if the user was not ready to move on. A link's destination should be as predictable as the content at the other end. One way to distinguish these different kinds of links is to precede the link text with a unique symbol if it does not simply lead to a new page within a Web site being viewed. To create distinctiveness, precede links to content *within the same page* with a pound sign (#). For links moving to content downward in the page, use the pound sign by itself. For links moving to content upward in the page use, the pound sign with an upward pointing arrow (#^). For links to *external or foreign* sites, precede the text with another unique symbol such as an asterisk (*). For links to *other site pages*, do not adorn the text with any symbol. A destination convention has yet to be established in Web site design. When one is established, it should be applied.

Designation of different destinations can also be accomplished by grouping links by kind, giving them a descriptive heading, and placing them in unique and consistent *locations* on a page. In the margins, for example, or at the page's top or bottom. Locating within-page links at the page's top would make most sense; locating links to other or foreign sites at the page bottom would be the most logical choice.

Graphical links. If care is not exercised, graphical links may be confused with decorative graphics. A principle of graphical or icon design is to always provide a text label. (See Step 11.) Distinguish graphical links by underlining the graphical text labels, as is done with plain link text.

Links in toolbars. Distinguish links contained in toolbars from page content by presenting the toolbars in consistent locations, and/or displaying them in backgrounds of a contrasting color to the page content. Global toolbars, most often in iconic or button form, are becoming consistently arrayed across the top of a page.

Category or topical toolbars are now commonly arrayed down the left side of the page. Toolbars containing textual listings that contrast less with textual page content, can be emphasized and differentiated through presenting them with a background that contrasts with the content. Some kinds of links to avoid are summarized in **Table 4.3.**

Table 4.3 Links to Avoid (or Links to Aggravate the User)	
Orphan Link	A link leading to a page that does not possess any navigation options.
Boomerang Link	A links that returns to the exact same spot.
Gotcha Link	A link that leads to little or no content.
False Alarm Link	A warning to not follow a link you really should follow.
Mystery Link	A link that does not look like a link because it is not properly labeled or does not possess a raised appearance.
Link-mania	Linking every time the same keyword is mentioned in a page.
Link-drunk	A long succession of links that must be followed to reach the destination.
Stairmaster Links	No *Next* link in a series of pages, necessitating continual return to a table of contents.
Gratuitous Link	A link to other sites to return a favor.
Missed opportunities	For useful links.

3.7.5.1 Other Link Guidelines

These guidelines should be reviewed in conjunction with this brief summary that follows.

■ Writing:

— Provide links to satisfy a range of user needs.

— Create descriptive links clearly indicating their destination or resulting action.

■ Grouping:

— Group links by the most relevant menu-grouping scheme.

— Separate visually the following types of navigation:

• Upward to the immediate parent page.

• Upward to the beginning of the section or category of information.

• Across to main sections or categories of information.

• To basic utilities.

■ Ordering:

— Order links by the most relevant menu choice-ordering scheme.

■ Heading:

— Where appropriate, provide a listing heading describing the organizing category, principle, or theme.

■ Size:

— Provide graphical images and command buttons of sufficient and equal size.

■ Spacing:

— Create equal spacing between choices graphical image and textual listing toolbars.

■ Inapplicability:

— Disable and display dimmed links conditionally not applicable.

■ Writing:

— Provide links to satisfy a range of user needs.

— Create descriptive links clearly indicating their destination or resulting action.

■ Grouping:

— Group links by the most relevant menu-grouping scheme.

— Separate visually the following types of navigation:

• Upward to the immediate parent page.

• Upward to the beginning of the section or category of information.

• Across to main sections or categories of information.

• To basic utilities.

■ Ordering:

— Order links by the most relevant menu choice-ordering scheme.

■ Heading:

— Where appropriate, provide a listing heading describing the organizing category,

principle, or theme.

■ Size:

— Provide graphical images and command buttons of sufficient and equal size.

■ Spacing:

— Create equal spacing between choices graphical image and textual listing toolbars.

■ Inapplicability:

— Disable and display dimmed links conditionally not applicable.

Writing. People with a *broad range* of needs and interests will use Web sites. Create links to satisfy disparate goals. Redundant links (different links to the same page) may be useful in satisfying these varied needs. A link should be *descriptive*, clearly indicating its destination or resulting action. The success of the link will be dependent on how well the user can predict where the link will lead. Descriptiveness aids prediction.

Grouping. Place links of a similar purpose and function together. Develop groupings using the most relevant grouping scheme. In Web navigation, it useful to visually separate the following types of links: upward to the immediate parent page, upward to the beginning of the presented section or category of information, across to main sections or categories of information, and to basic utilities. People make better link choices when they can readily eliminate wrong links. Grouping helps this process.

Ordering. Arrange the links by the most relevant menu-choice-ordering scheme, such as importance, frequency of use, or sequence of use, as previously described.

Headings. When appropriate, provide an introductory word or phrase at top of the link list as a heading. Inform viewers about the list's organizing category, principle, or theme. Establishing list context will aid users in selecting the correct link.

Size. To achieve balance, create a visually pleasing composition, make all links readily identifiable as links, create icons and command buttons of equal size. The size of any text inscribed on icons or buttons should also be consistent in size. In addition, explicit listings of textual links should be of the same size.

Spacing. To also achieve balance, and a visually pleasing composition, all groups of links composed of icons, command buttons, listings of textual links should be equally spaced.

Inapplicability. Links that are irrelevant in a given situation should be disabled and displayed dimmed out.

3.7.5.2 Kinds of Links

■ Within a page:

— For long pages, include links to internal page content.

■ Within a Web site:

— On all pages include links to:

• The Web site home page.

• Global Web site features.

• Other main pages, navigation points, or categories.

• The likely Web site starting point.

• Main pages with links to the page.

— On sequential pages, include links to the:

• Next page.

• Previous page.

— Also consider including links to:

• Places of related interest.

• Important pages.

• Background or explanatory information.

• Supplemental information.

• New or changed content.

• Web site Quit or Exit.

■ External links:

— Most appropriate for informational sites.

— Provide links to relevant information on other Web sites.

• Related content.

• Reference information.

• Background reading.

— Place external links on a separate page.

— Provide an indication when a link goes outside the current site.

Within a page. For long pages, include links to for important content within the page. Place these links at the top of the page and identify them, by a heading or symbol (see discussion above), as internal links. *Within a Web site,* on all pages include the following links:

Home page. A home link will transport the user directly to the site's home page, a stable and safe anchor point to escape to in times of difficulty. Easy access is also achieved when the user is ready to start over, or ready to commence a new navigation. A home link eliminates the necessity for sequential backward movement up through a series of pages.

Global features. Provides links to a site's global features, including the highest level of information categories and utilities such as the Search facility.

Other main pages, navigation points, sections, or categories. Do not link to all sections of the site from all pages; to do so will be overwhelming. To provide easy navigation throughout a site, provide links to a site's major navigation points, sections, or categories of information. Pages linked to must possess substantive content.

MYTH Why do users need a road map of a Web site. They'll know where to go.

The likely Web site starting point. Provide links to the site's likely starting point, the home page, a site map, or an index.

Main pages with links to page. Provide links back to the main pages that have links to the displayed page. A return link describing the page one is going back to provides better predictability and much clearer context. It also provides escapability.

While the browser's Back button will accomplish the same thing, it does not say what it is going back too, in case the user has forgotten where arrival was from. It also keeps navigation within the application itself (as opposed to the browser).

For *sequential* pages, provide easily accessible links to adjacent pages:

Next. To allow sequential movement downward through pages, place a Next link at at the end of each page. Explain, whenever possible, what will happen or where one. will go when the link is selected.

Without this link, the user will have to continually refer to a table of contents or menu listing to continue navigation. This link will also allow users, should they choose, to leaf through the site as they would a printed book.

Previous. Also include Previous link returning the user to the prior page in the Web site structure, thereby reversing direction in screen navigation. The browser Back button will only return the user to the last page *viewed*. This will facilitate movement through a site for those entering from another Web site into the page. Leafing backward through the page hierarchy will also be easy. Locate this link at the end of the page. For long pages, also include a Previous link at the page top.

Also consider including links such as the following:

Places of related interest. Provide links to other pages with related content. Wherever the user's attention is likely to be captured, provide a direct link to related places. Also, during a search, especially when using a search facility, people rarely land directly on the desired page. Often, however, they get close. Provide links to the answers they are most likely looking for.

Important pages. Provide links to important or high-priority areas or pages you want to make sure the user sees.

Background or explanatory information. Provide links to background or explanatory information to aid users who do not have the necessary knowledge to understand or use the page. Every page must be considered independent, and its content must be understood based upon the assumption that the user has seen no other related pages.

Supplemental information. Use links to provide supplemental information like definitions of terms and abbreviations

New or changed content. Draw attention to new or changed content by making it easy to notice and go directly to. A prominently placed *What's New?* link can be used for this purpose.

Quit or Exit. The Web has no way to stop running an application without closing the browser or leaving by a link. Non-Web platforms have clearly marked exit paths, including a *Quit* or *Exit* on the File Menu. Provide this command so the users can confirm that an application is finished and any entered data should be saved. This command may be included on a special exit page showing external links and other useful information.

Provide *external* links to other relevant Web sites and information sources. There is some evidence that the inclusion of outbound links increases a site's credibility. It indicates that the site authors have done their homework, and they are not afraid to let users visit other sites.

Informational sites. Links to external or foreign sites are most appropriate for informational sites, where browsing is a primary usage purpose. In applications, where a task must be completed, focusing on the task is the most important aspect **Related content.** Provide links to relevant information on other Web sites, including sites with similar content to that mentioned in your Web site. Also provide links to other resources, repositories, reference information, and background reading.

Separate page. Whenever possible, locate links that go outside of the Web site on a separate page. To accomplish this, use a *See Also* link to this additional page. Placing these links on a separate page will not disrupt the flow of the displayed pages, and not tempt people to leave the site before they have adequately reviewed it.

Outside indication. Identify links leading away from the site by a heading or a unique symbol (see discussion above). Also inform users that they are leaving the displayed site for another Web site.

Link Maintenance

■ Maintain correct internal links.

■ Frequently check and correct external links.

As sites are modified, internal links may have to be revised. Carefully check sequential pages if *Next* and *Previous* links are used within the site. External links should also be checked and corrected frequently. Due to the volatile nature of the Web, a linked site's content may change, its location may change, or a site may cease to exist. The credibility of a site's entire content suffers if it is not properly maintained.

3.7.6 Maintaining a Sense of Place

- As has been said several times, a sense of place—where one currently is in the labyrinth of the Web—is often difficult to maintain. A site's organizational structure is often complex, and the boundaries between sites often seem nonexistent. Navigation links can transport a person from anywhere to anywhere, as does the *Star Trek* spaceship transporter machine. (While this machine moves humanoids to a new environment, the Web moves the new environment to the humanoid.) These radical shifts in context created by jumping around information space through links can be extremely confusing.

- It is important that one's location be continually reinforced, because people desire stability and assurance that they are where they think they are. They also need a sense of exactly where they can go from their current location.
- Paper documents create a sense of where one is located through a mixture of graphical and textual cues supplied by the design of the book, including the varying fonts and images used. Cues are also provided by the organizational scheme outlined in the table of contents, and the physical sensation of the entire book itself. Looking at where a bookmark is placed in a novel provides an excellent indication of one's location in the reading space. The answers to questions like "Can I finish before the aircraft lands and the business conference starts?" are capable of being predicted with some reliability.
- Electronic documents provide few of these physical cues. To provide a sense of place, plentiful and explicit cues relating to site context and organization must be provided. These cues are provided by the site's overall design characteristics and the specific orientation elements included within the Web site.

Design Characteristics That Aid in Maintaining a Sense of Place

- To assist maintaining a sense of place within a Web site:
  - Provide a simple hierarchical tree structure.
  - Provide ease of movement to important site features.
- To assist maintaining a sense of place across multiple Web sites:
  - Provide consistency in all Web site design elements, including:
    - Graphical identity schemes.
    - Component presentation.
    - Component organization and location.

Within a Web site. A simple hierarchical tree structure with obvious and linked major categories is an easily understood organization scheme. Easy identification of important site features, and ease of movement to them, is also important.

Across multiple Web sites. Design consistency contributes significantly to maintaining one's sense of place when one is moving between multiple sites. Design consistency gives a site a unique look and feel that becomes obvious as links are followed within it. Moving to a new site will be clearly evident when the design scheme changes. Consistency in the graphical identity scheme, use of colors, patterns, graphics, font styles, and so forth, will be the most noticeable aspects. Consistency in component presentation, organization, and location are also very important.

Design Elements That Aid in Maintaining a Sense of Place

■ Provide a home base.

■ Use recurring navigation tools on all pages.

■ Use recurring elements on all pages.

■ Provide page numbers for sequential pages.

■ Provide ongoing feedback that shows where users are in a site.

■ Provide on-demand aids that illustrate the user's location within a site.

— Site maps.

— Table of contents.

■ Provide clearly written link labels.

Home base. As previously mentioned, a site's home page is a stable, concrete, and safe anchor point to escape to in times of difficulty.

Recurring navigation tools. Standard navigation tools should appear on every page. In addition to creating uniformity in sight appearance, recurring tools create a more stable page environment, enhance navigation learning, and increase the user's control of the dialog.

Recurring page elements. Repeated page elements, such as titles, banners, logos, and icons, also create site uniformity. Omanson, Cline, Kilpatrick, and Dunkerton (1998) found that the page element that most significantly aided user orientation was the site logo.

Page numbers. For a long series of sequential pages provide page numbers on each page to indicate where in the page string one is located. Another useful feature is to convert page numbers into links and present them on each page. A search, for example, may return a dozen pages of matches.

At the bottom of each page inscribe, in link form, page numbers, as follows:

1 2 3 4 5 6 7 8 9 10 11 12

An estimation of document length is obtained, and the pages need not be viewed in sequential order.

Ongoing feedback showing location in Web site. Provide an historical trail, such as a breadcrumb trail, that shows where the user is located within a branch of a site. In addition to providing context for the displayed page, the trail permits easy return to any page up the trail.

On-demand aids illustrating location. Navigation aids, such as a site map or table of contents, when retrieved should show exactly where the user's current location fits within the structure of the site. The current position should be highlighted within the presented information structure. Ideally, in a site map, the complete navigation path from the home page through intermediate pages to the current page should be presented.

Clearly written links. Labels that clearly indicate the function of the link, its destination, or its resulting action, reduce disorientation. Bad links are less likely to be followed and aimless wandering reduced.

3.8 KINDS OF GRAPHICAL MENUS

- Providing the proper kinds of graphical menus to perform system tasks is also critical to system success. The best kind of menu to use in each situation depends on several factors.
- The following must be considered:
  - The number of items to be presented in the menu.
  - How often the menu is used.
  - How often the menu contents may change.

3.8.1 Menu Bar

- Proper usage:

  To identify and provide access to common and frequently used application actions that take place in a wide variety of different windows.

  A menu bar choice by itself should not initiate an action.

- The highest-level graphical system menu is commonly called the menu bar. A menu bar consists of a collection of descriptions that serve as headings or titles for a series of actions on an associated pull-down menu. A menu bar choice by itself should not initiate an action.
- The menu is typically arrayed in a horizontal row at the top of a window. Occasionally a menu bar is referred to as a collection of menu *titles.* In reality it is a menu in itself, and it is appropriate to simply refer to it as a *menu*.
- Menu bars often consist of a series of textual words, as represented in Figure 4.19.

Figure 4.19 Menu bar composed of text.

- Macintosh, Presentation Manager, and Microsoft Windows illustrate examples of this textual approach. Some products have placed the choices within buttons, as represented in Figure 4.20. An example of this approach is Sun Microsystems' Open Look, which calls them *menu buttons*. There are also combinations of both. OSF/Motif presents a list of textual choices, but when one is selected, it resembles a button. Motif refers to these as *cascade buttons*.

Figure 4.20 Menu bar composed of buttons.

- The *advantages* of menu bars are that they:
  - Are always visible, reminding the user of their existence.
  - Are easy to browse through.
  - Are easy to locate consistently on the screen.
  - Usually do not obscure the screen working area.
  - Usually are not obscured by windows and dialog boxes.
  - Allow for use of keyboard equivalents.

- The *disadvantages* of menu bars are that:
  - They consume a full row of screen space.
  - They require looking away from the main working area to find.
  - They require moving pointer from the main working area to select.
  - The menu options are smaller than full-size buttons, slowing selection time.
  - Their horizontal orientation is less efficient for scanning.
  - Their horizontal orientation limits number of choices that can be displayed.
- **Display**
  - All primary windows must have a menu bar.
  - All menu bars must have an associated pull-down menu containing at least two choices.
  - Do not allow the user to turn off the display of the menu bar.
  - If all the items in its associated pull-down menu are disabled, then disable the menu bar item.
    - — Display the disabled item in a visually subdued manner.
    - — However, the disabled pull-down menu must always be capable of being pulled down so that the choices may be seen.

- **Location**
  - Position choices horizontally over the entire row at the top of the screen, just below the screen title.
  - A large number of choices may necessitate display over two rows.
- **Title**
  - The window title will be the menu bar title.
  - The window title will serve as the menu bar title.
- **Item Descriptions**
  - The menu item descriptions must clearly reflect the kinds of choices available in the associated pull-down menus.
  - Menu item descriptions will be the “titles” for pull-down menus associated with them.
  - Use mixed-case letters to describe choices.
  - Use single-word choices whenever possible.
  - Do not display choices that are never available to the user.
- **Organization**
  - Follow standard platform ordering schemes where they exist.
    - — Place application-specific choices where they fit best.
  - Order choices left-to-right with:
    - — Most frequent choices to the left.
    - — Related information grouped together.
  - Choices found on more than one menu bar should be consistently positioned.
  - Left-justify choices within the line.
  - When choices can be logically grouped, provide visual logical groupings, if possible.
  - Help, when included, should be located at the right side of the bar.

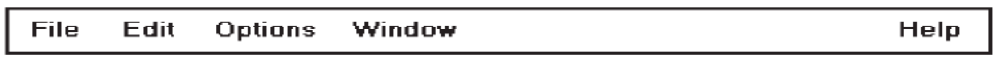


Figure 4.21

- **Layout**
  - Indent the first choice one space from the left margin.
  - Leave at least three spaces between each of the succeeding choices (except for Help which will be right-justified).
  - Leave one space between the final choice and the right margin.

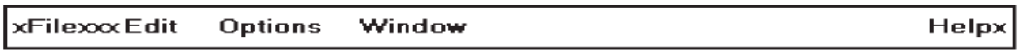


Figure 4.22

- **Separation**
  - Separate the bar from the remainder of the screen by:

    — A different background, or Solid lines above and below.

- **Other Components**
  - Keyboard equivalent mnemonics should be included on menu bars.
  - Keyboard accelerators, to a window indicators, and cascade indicators need not be included.
- **Selection Indication**
  - Keyboard cursor:

    — Use a reverse video, or reverse color, selection cursor to surround the choice.

    — Cover the entire choice, including one blank space before and after the choice word.

Figure 4.23

  - Pointer:

    — Use reverse video, or reverse color, to highlight the selected choice.

3.8.2 Pull-Down Menu

- Proper usage:

  — To initiate frequently used application actions that take place on a wide variety of different windows.

  — A small number of items.

  — Items best represented textually.

  — Items whose content rarely changes.

  - Selection of an alternative from the menu bar results in the display of the exact actions available to the user. These choices are displayed in a vertically arrayed listing that appears to pull down from the bar.
  - Hence, these listings, as illustrated in Figure 4.24, are typically referred to as *pull-downs*. Other identification terms may be used, such as d*rop-downs*.

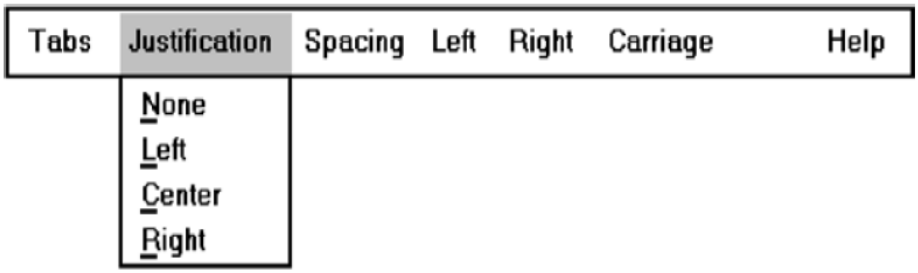


Figure 4.24 Menu bar pull-down.

- Pull-downs are first-level menus used to provide access to common and frequently used application actions that take place on a wide variety of different windows. They are most useful for a small number of rarely changing items, usually about 5 to 10.
- Pull-downs are best suited for items represented textually, but graphical presentations, such as colors, patterns, and shades, may also be used.

- The *advantages* of pull-down menus are:
  - The menu bar cues a reminder of their existence.
  - They may be located relatively consistently on the screen.
  - No window space is consumed when they are not used.
  - They are easy to browse through.
  - Their vertical orientation is most efficient for scanning.
  - Their vertical orientation is most efficient for grouping.
  - Their vertical orientation permits more choices to be displayed.
  - They allow for display of both keyboard equivalents and accelerators.
- The *disadvantages* of pull-down menus are:
  - They require searching and selecting from another menu before seeing options.
  - They require looking away from main working area to read.
  - The require moving the pointer out of working area to select (unless using keyboard equivalents).
  - The items are smaller than full-size buttons, slowing selection time.
  - The may obscure the screen working area.

- **Display**
  - Display all possible alternatives.
  - Gray-out or dim items that cannot be chosen due to the current state of an application.

- **Location**
  - Position the pull-down directly below the selected menu bar choice. The pull-down will be located directly below the menu bar choice by which it is selected.
- **Size**
  - Must contain a minimum of two choices.
  - Restrict to no more than 5 to 10 choices, preferably 8 or less.
- **Title**
  - Not necessary on a pull-down menu. The title will be the name of the menu bar item chosen.
- **Item Descriptions**
  - Use mixed-case, headline-style words to describe choices.
  - If the choices can be displayed graphically, for example, as fill-in patterns, shades, or colors, textual descriptions are not necessary.
  - Do not:

    — Identify a menu item by the same wording as its menu title.

    — Change the meaning of menu items through use of the Shift key.

    — Use scrolling in pull-downs.

    — Place instructions in pull-downs.

- **Organization**
  - Follow standard platform ordering schemes when they exist.

    — Place application-specific choices where they fit best.

  - Place frequent or critical items at the top.
  - Separate destructive choices from other choices.
  - Align choices into columns, with:

    — Most frequent choices toward the top.

    — Related choices grouped together.

    — Choices found on more than one pull-down consistently positioned.

  - Left-align choice descriptions.
  - Multicolumn menus are not desirable. If necessary, organize top-to-bottom, then left-to-right.

- **Layout**
  - Leave the menu bar choice leading to the pull-down highlighted in the selected manner (reverse video or reverse color).
  - Physically, the pull-down menu must be wide enough to accommodate the longest menu item description and its cascade or accelerator indicator.
  - Align the first character of the pull-down descriptions under the second character of the applicable menu bar choice.
  - Horizontally, separate the pull-down choice descriptions from the pull-down borders by two spaces on the left side and at least two spaces on the right side.

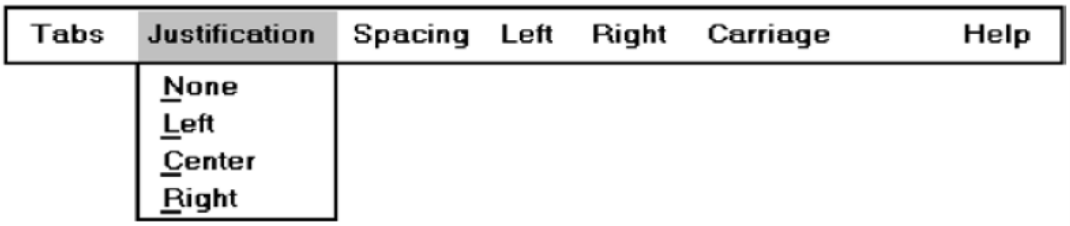


Figure 4.25

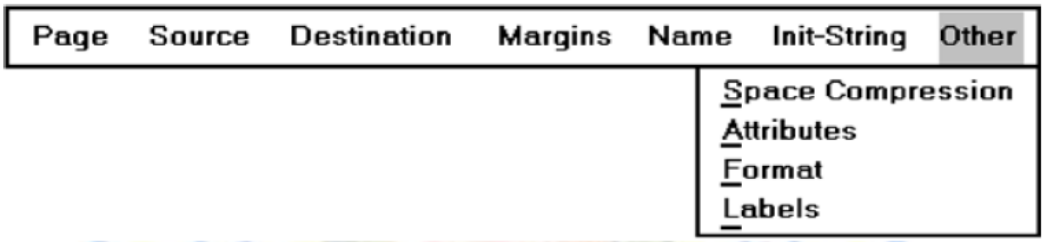


Figure 4.26

- **Groupings**
  - Provide groupings of related pull-down choices:

    — Incorporate a solid line between major groupings.

    — Incorporate a dotted or dashed line between subgroups.

    — Left-justify the lines under the first letter of the columnized choice descriptions.

    — Right-justify the lines under the last character of the longest choice description.

    — Display the solid line in the same color as the choice descriptions.

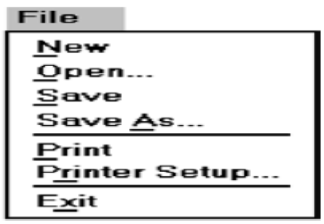


Figure 4.27

- **Mark Toggles or Settings**
  - If a menu item establishes or changes the attributes of data or properties of the interface, mark the pull-down choice or choices whose state is current or active "on."
    — For nonexclusive items, display a check mark to the left of the item description.
  - If the two states of a setting are not obvious opposites, a pair of alternating menu item descriptions should be used to indicate the two states.
    — For exclusive choices, precede the choice with a contrasting symbol such as a diamond or circle.

- **Pull-Downs Leading to Another Pull-Down**
  - If a pull-down choice leads to another pull-down, provide a cascade indicator as follows:
    — Place an arrow or right-pointing triangle after the choice description.
    — Align the triangles to the right side of the pull-down.
    — Display the triangle in the same color as the choice descriptions.

Figure 4.28

- **Pull-Downs Leading to a Window**
  - For pull-down choices leading to a window:
    — Place an ellipsis (three dots) after the choice description.
    — Do not separate the dots from the description by a space.
    — Display the ellipsis in the same color as the choice descriptions.

Figure 4.29

- **Keyboard Equivalents and Accelerators**
  - Provide unique mnemonic codes by which choices may be selected through typewriter keyboard.
  - Indicate the mnemonic code by underlining the proper character.
  - Provide key accelerators for choice selection.
  - Identify the keys by their actual key-top engravings.
  - Use a plus (+) sign to indicate that two or more keys must be pressed at the same time.
  - Enclose the key names within parentheses ( ).
  - Right-align the key names, beginning at least three spaces to the right of the longest choice description.
  - Display the key alternatives in the same color as the choice descriptions.

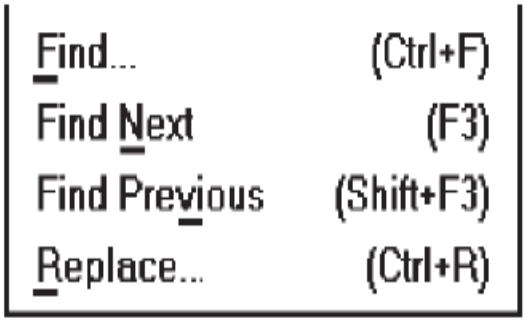


Figure 4.30

  - Enabling the user to select pull-down choices through the keyboard provides flexibility and efficiency in the dialogue. One method of doing this is to provide single-character mnemonic codes that, when typed, will also cause the choice to be invoked. Mnemonic codes can be visually indicated in a number of ways. The recommended method is an underline beneath the proper character within the choice.
  - Another method is to assign accelerators (one key, or a combination of keys) to accomplish the action. Identify these keys exactly as they are engraved on the keyboard. Accelerators should be reserved for the most common commands.

- **Separation**
  - Separate the pull-down from the remainder of the screen, but visually relate it to the menu bar by:

    — Using a background color the same as the menu bar.

    — Displaying choice descriptions in the same color as the menu bar.

    — Incorporating a solid-line border completely around the pull-down in the same color as the choice descriptions.

- **Selection Cursor**
  - Use a reverse video, or reverse color, selection cursor the same color as the menu bar to surround the choice.
  - Create a consistently sized cursor as wide as the pull-down menu.

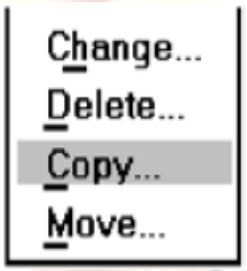


Figure 4.31

3.8.3 Cascading Menus

- Proper usage:

  — To reduce the number of choices presented together for selection.

  — When a menu specifies many alternatives and the alternatives can be grouped in meaningful related sets on a lower-level menu.

  — When a choice leads to a short, fixed list of single-choice properties.

  — When there are several fixed sets of related options.

  — To simplify a menu.

  — Avoid using for frequent, repetitive commands.

- A cascading menu is a submenu derived from a higher-level menu, most typically a pull-down. Cascades may also be attached to other cascades or pop-up menus, however. Cascading menus are located to the right of the menu item on the previous menu to which they are related, as illustrated in Figure 4.32. Menu items that lead to cascading menus are typically indicated by a right-pointing triangle.

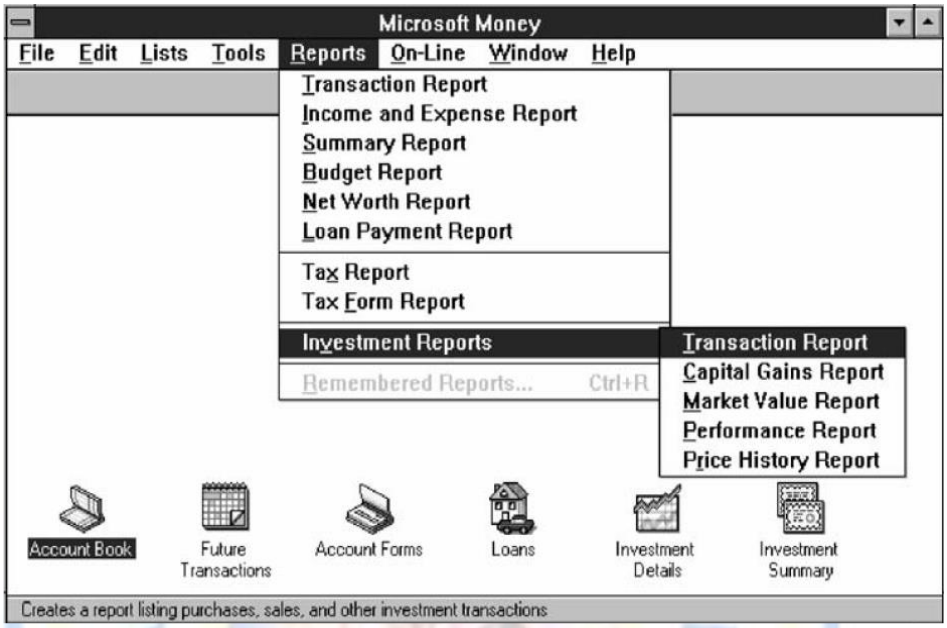


Figure 4.32

- The *advantages* of cascading menus are that:
  - The top-level menus are simplified because some choices are hidden.
  - More first-letter mnemonics are available because menus possess fewer alternatives.
  - High-level command browsing is easier because subtopics are hidden.
- The *disadvantages* of cascading menus are:
  - Access to submenu items requires more steps.
  - Access to submenu items requires a change in pointer movement direction.
  - Exhaustive browsing is more difficult; some alternatives remain hidden as pulldowns become visible.
- **Cascade Indicator**
  - Place an arrow or right-pointing triangle to the right of each menu choice description leading to a cascade menu.
  - Separate the indicator from the choice description by one space.

- Display the indicator in the same color as the choice descriptions.

Figure 4.33

- **Location**
  - Position the first choice in the cascading menu immediately to the right of the selected choice.
  - Leave the choice leading to the cascading menu highlighted.

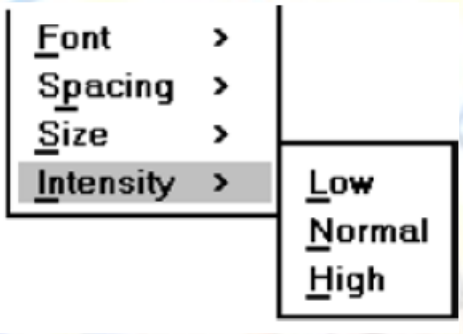


Figure 4.34

- **Levels**
  - Do not exceed three menu levels (two cascades).
  - Only one cascading menu is preferred.
  - Each additional cascade level presented reduces ease of access and increases visual clutter. The number of cascade levels presented should represent a balance between menu simplification, ease in menu comprehension, and ease in item selection. Whenever possible, do not exceed three levels of menus.

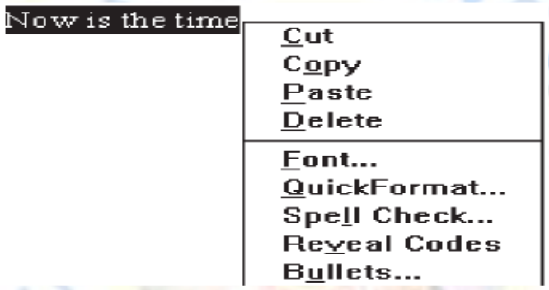
- **Title**
  - Not necessary on the cascading menu.

    --The title will be the name of the higher-level menu item chosen.
  - The title of the cascading menu will be the choice selected on the menu from which it cascades.
- **Other Guidelines**

- Follow the organization, content, layout, separation, and selection cursor guidelines for the kind of menu from which the menu cascades.
- The design of a cascade menu should follow all relevant guidelines for the family of menus to which it belongs. Included are organization, content, layout, and selection cursor.

3.8.4 Pop-Up MENUS

- Use to present alternatives or choices within the context of the task.
- Choices may also be presented to the user on the screen through pop-up menus, vertically arrayed listings that only appear when specifically requested.
- Pop-up menus may be requested when the mouse pointer is positioned over a designated or hot area of the screen (a window border or text, for example) or over a designated icon.
- In look, they usually resemble pull-down menus, as shown in Figure 4.35.



- The kinds of choices displayed in pop-up menus are context sensitive, depending on where the pointer is positioned when the request is made.
- They are most useful for presenting alternatives within the context of the user's immediate task. If positioned over text, for example, a pop-up might include text-specific commands.
- For experienced users, pop-up menus are an alternative to retrieve frequently used contextual choices in pull-down menus. Choices should be limited in number and stable or infrequently changing in content.
- Windows contains many contextual pop-up menus. They are also referred to as *context menus* or *shortcut menus*. Examples include the *window pop-up* and an *icon pop-up*, which presents operations of the objects represented by icons.

- The *advantages* of pop-up menus are:
  - They appear in the working area.
  - They do not use window space when not displayed.
  - No pointer movement is needed if selected by button.
  - Their vertical orientation is most efficient scanning.
  - Their vertical orientation most efficient for grouping.
  - Their vertical orientation allows more choices to be displayed.
  - They may be able to remain showing ("pinned") when used frequently.
  - They allow for display of both keyboard equivalents and accelerators.
- The *disadvantages* of pop-up menus are:
  - Their existence must be learned and remembered.
  - Means for selecting them must be learned and remembered.
  - They require a special action to see the menu (mouse click).
  - Items are smaller than full-size buttons, slowing selection time.
  - They may obscure the screen working area.
  - Their display locations may not be consistent.
- **Display**
  - Provide a pop-up menu for common, frequent, contextual actions.

    If the pointer is positioned over an object possessing more than one quality (for example, both text and graphics), at minimum present actions common to all object qualities.
  - Items that cannot be chosen due to the current state of an application should not be displayed.
  - Continue to display a pop-up until:

    — A choice is selected.

    — An action outside the pop-up is initiated.

    — The user removes the pop-up.
- **Location**
  - Position the pop-up:

    — Centered and to the right of the object from which it was requested.

    — Close enough to the pointer so that the pointer can be easily moved onto the menu.

    — But not so close that the pointer is positioned on an item, possibly leading to accidental selection.

- If the pointer is positioned in such a manner that the pop-up would appear off screen or clipped, position the menu:

  — As close as possible to the object, but not covering the object.

  — So that it appears fully on the screen.

- **Size**
  - Restrict the pop-up to no more than 5 to 10 choices, preferably 8 or less.
  - Limit pop-up menus to about eight choices or fewer. If a large number of choices are needed, consider creating cascading menus. Minimize the number of levels of cascades, however, to provide ease of access and prevent visual clutter.
- **Title**
  - Not necessary on a pop-up menu.
  - If included, clearly describe the menu's purpose.
  - Locate in a centered position at the top.
  - Display in uppercase or mixed-case letters.
  - Separate it from the menu items by a line extending from the left menu border to the right border.
  - A title is not necessary on a pop-up menu, since it is an expert feature. Some graphical platforms include titles, others do not.
  - The title should be set off from the item descriptions by using uppercase letters or mixedcase
  - letters in the headline style.
- **Other Guidelines**
  - Arrange logically organized and grouped choices into columns.
  - If items are also contained in pull-down menus, organize pop-up menus in the same manner.
  - Left-align choice descriptions.
  - Use mixed-case headline-style words to describe choices.
  - Separate groups with a solid line the length of the longest choice description.
  - If the choice leads to a pop-up window, place an ellipsis after the choice description.
  - To separate the pop-up from the screen background:

    — Use a contrasting, but complementary background.

    — Incorporate a solid line border around the pull-down.

Note: Follow the same menu guidelines as for pull-down menus regarding organization, content, layout, separation, and selection cursor.

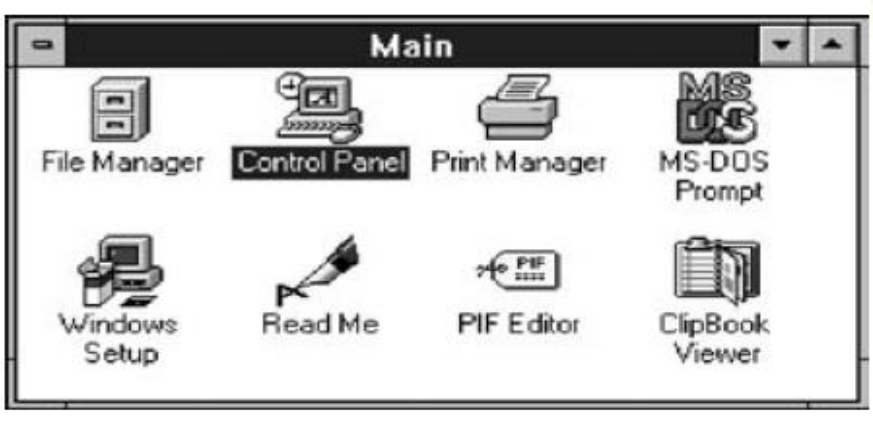
3.8.5 TEAR-OFF MENUS

Note: Follow all relevant guidelines for pull-down menus.

- A tear-off menu is a pull-down menu that can be positioned anywhere on the screen for constant referral. As such, it possesses all the characteristics of a pull-down. It may also be called a *pushpin, detachable,* or *roll-up* menu. Its purpose is to present alternatives or choices to the screen user that are needed infrequently at some times and heavily at other times.
- **Advantages/disadvantages.** No space is consumed on the screen when the menu is not needed. When needed, it can remain continuously displayed. It does require extra steps to retrieve, and it may obscure the screen working area. Tear-off menus are most useful for expert users. Use these menus in situations where the items are sometimes frequently selected and other times infrequently selected. Items should be small in number and rarely change in content. A typical use would be to detach and permanently leave displayed a pull-down menu when it must be frequently used. Since a tear-off menu is a pull-down style, all pull-down guidelines should be followed.

3.8.6 ICONIC MENUS

- Use to remind users of the functions, commands, attributes, or application choices available.
- Create icons that:
  - — Help enhance recognition and hasten option selection.
  - — Are concrete and meaningful.
  - — Clearly represent choices.
- An iconic menu is the portrayal of menu items or objects in a graphic or pictorial form, as illustrated in Figure 4.36. The purpose of an iconic menu is to remind users of the functions, commands, attributes, or application choices available.



- **Advantages/disadvantages.** Pictures help facilitate memory of applications, and their larger size increases speed of selection. Pictures do, however, consume considerably more screen space than text, and they are difficult to organize for scanning efficiency. To create meaningful icons requires special skills and an extended amount of time. Iconic menus should be used to designate applications or special functions within an application. Icons must be meaningful and clear.

3.8.6 PIE MENUS

- Consider using for:
  - Mouse-driven selections, with one- or A pie menu is a circular representation of menu items, as illustrated in Figure 4.37, that can be used as an alternative to a pull-down or pop-up menu. Research has found that this style of menu yields higher performance than the typical vertical array, especially when the menu tasks are unrelated.
  - Their basic advantage is that, when presented with the mouse pointer positioned in the pie's center, average movement to any pie wedge is shorter.

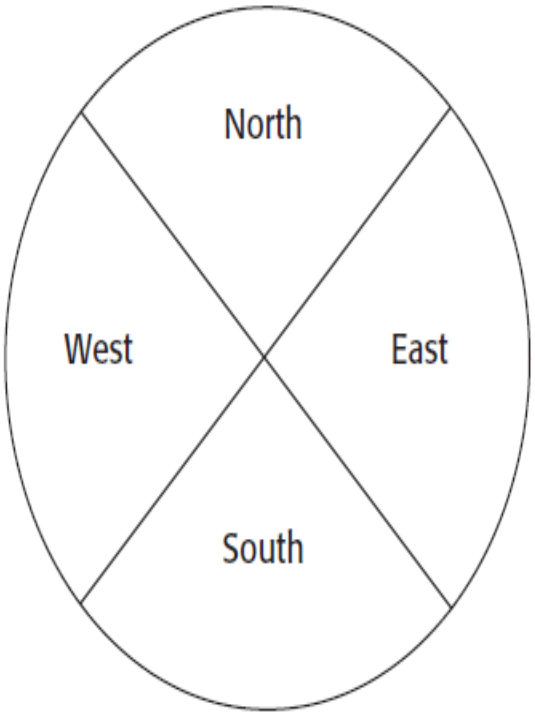


Figure 4.37 Pie menu.

3.8.7 Default Menu Items

- Every system will provide a set of standard menu items. Using the default items will reduce design time and encourage interface consistency. System learning time will also be reduced. Microsoft Windows, for example, provides the following standard and optional menu bar items and pull-down actions.

- **File**
  - A standard element, the File menu provides all the commands needed to open, create, and save files. Some standard File functions are:
    - New
    - Open
    - Close
    - Save
    - Save As
    - Print Preview
    - Print
    - Exit

- **Edit**
  - A standard element, the Edit menu provides commands that affect the state of selected objects. Some standard Edit functions are:
  - Undo
  - Cut
  - Copy
  - Paste
  - Select All
  - Find
  - Replace

- **View**
  - An optional element, the View menu provides commands that affect the perspective, details, and appearance of the application. They affect the view, not the data itself.
  - The view functions are application-specific and include the following:
  - Toolbars
  - Status Bar
  - Magnify
  - Zoom In
  - Zoom Out
  - Grid Points
- ***Window***
  - The Window menu, an optional element, provides commands to manipulate entire windows. Included are items such as:
  - New Window
  - Arrange All
  - Hide
  - Show
- **Help**
  - The Help menu, a standard element, provides Help commands, including:
  - Contents
  - Search for Help On
  - How to Use Help
  - About (Application)

Table 4.4 Menu Proper Usage Summary

Menu Bar	To identify and provide access to: • Common and frequently used application actions. • Actions that take place in a wide variety of different wind
Pull-Down Menu	For frequently used application actions that take place in a variety of different windows: • A small number of items (5–10). • Items rarely changing in content.
Cascading Menu	To simplify a higher-level menu. To provide easier browsing of a higher-level menu. For mutually exclusive choices. Restrict to 1–2 cascades.
Pop-Up Menu	For: • Frequent users. • Frequently used contextual commands. • A small number of items (5–10). • Items rarely changing in content. • Items that require a small amount of screen space.
Tear-Off Menu	For items: • Sometimes frequently selected. • Sometimes infrequently selected. • Small in number (5–10). • Rarely changing in content.
Iconic Menu	To designate applications available. To designate special functions within an application.

Table4.4

- These standard menu items also have a prescribed order on the menu bar: File, Edit, View, Window, and Help. Items on their related pull-down menus also follow standard orders.

3.8.8 Functions Not Represented by Default Items

- Having established the usability of the standard menu functions, additional system functions must be identified. Commands to accomplish these functions must be created and added to the pertinent menus.
- **Command design guidelines include the following**:
- **Labels**
  - General:

— Provide a label for each command.

— Use labels that indicate:

The purpose of the command, or

The result of what happens when the command is selected.

— Use familiar, short, clear, concise words.

— Use distinctive wording.

— Use mixed case, with the first letter capitalized.

— Begin commands with verbs or adjectives, not nouns.

— Preferably, use only one word. If multiple words are required for clarity, capitalize the first letter of each significant word.

- Dynamic labels:
  - As contexts change, dynamically change the label wording to make its meaning clearer in the new context.
    - For example, after a cut operation, Undo may be changed to Undo Cut.
  - Provide a clear label for each command, indicating the purpose of the command or the result of what happens when the command is selected. Preferably, use single-word commands.
  - If multiple words are required for clarity, capitalize the first letter of each significant word.
  - As contexts change, the label wording may be dynamically changed to make its meaning clearer in the new context. For example, after a cut operation, Undo may be changed to Undo Cut. This is called a *toggled menu item* and was previously described.

- **Disabled Commands**
  - When a command is not available, indicate its disabled status by displaying it grayed out or subdued.
  - If selection of a disabled command is attempted, provide a message in the information area that the "Help" function will explain why it is disabled.
  - When a command is not available, indicate its disabled status by displaying it grayed out or subdued. If selection of a disabled command is attempted, provide a message in the information area that the Help function will explain why it is disabled

- **Navigation and Selection**
  - General:

— Permit multiple methods for selecting commands.

  - Keyboard equivalents:

— Assign a mnemonic for each command.

— A mnemonic should be as meaningful as possible. Use: The first letter of the command, or if duplications exist, The first letter of another word in the command, or Another significant consonant in the command.

— For standard commands, use mnemonics provided by the tool set.

- Keyboard accelerators:

  — Assign keyboard accelerators for frequently used commands.

  — For standard commands, use keyboard accelerators provided by the tool set.

Question Bank

1. Explain and illustrate the structure of menus? (10)
2. Describe the guidelines to be followed in phrasing of menus during development of system menus?(10)
3. Explain the Contents of Menus?(10)
4. List and explain navigational goals of well-designed navigational system?(10)
5. Describe the components of web navigation system with illustration?(10)
6. List all kinds of graphical menus and explain in detail?(10)