Module III

Windows and controls

Objective

- To understand the purpose and usage of different kinds of windows for respective tasks.
- To identify proper input devices for implementing to the user based on their characteristics
- To identify proper screen based controls for implementing to the user based on their characteristics

Select the Proper Kinds of Windows

- A window is an area of the screen, usually rectangular in shape, defined by a border that contains a particular view of some area of the computer or some portion of a person's dialog with the computer.
- It can be moved and rendered independently on the screen.

Window Characteristics

- A window is seen to possess the following characteristics:
    - A name or title, allowing it to be identified.
    - A size in height and width (which can vary).
    - A state, accessible or active, or not accessible. (Only active windows can have their contents altered.)
    - Visibility—the portion that can be seen. (A window may be partially or fully hidden behind another window, or the information within a window may extend beyond the window's display area.)
    - A location, relative to the display boundary.
    - Presentation, that is, its arrangement in relation to other windows. It may be tiled, overlapping, or cascading.
    - Management capabilities, methods for manipulation of the window on the screen.
    - Its highlight, that is, the part that is selected.
    - The function, task, or application to which it is dedicated.

The Attraction of Windows

- While all the advantages and disadvantages of windows are still not completely understood, windows do seem to be useful in the following ways.

- **Presentation of Different Levels of Information:** A document table of contents can be presented in a window. A chapter or topic selected from this window can be simultaneously displayed in more detail in an adjoining window.

- **Presentation of Multiple Kinds of Information:** Variable information needed to complete a task can be displayed simultaneously in adjacent windows. For example in one window billing can be done and in one window stock

Maintenance can be done at the same time using windows. Significant windows could remain displayed so that details may be modified as needed prior

- **Sequential Presentation of Levels or Kinds of Information**: Steps to accomplish a task can be sequentially presented through windows. Key windows may remain displayed, but others appear and disappear as necessary. This sequential preparation is especially useful if the information-collection process leads down various paths.

- **Access to Different Sources of Information**: Independent sources of information may have to be accessed at the same time. Independent sources of information may have to be accessed at the same time

- **Combining Multiple Sources of Information**: Text from several documents may have to be reviewed and combined into one. Pertinent information is selected from one window and copied into another.

- **Performing More Than One Task**: While waiting for a long, complex procedure to finish, another can be performed. Tasks of higher priority can interrupt less important ones and then the interrupted tasks can be preceded.

- **Reminding**: It can be used to provide remainder through messages or popup or menus.

- **Monitoring**: Data in one window can be modified and its effect on data in another window can be studied.

- **Multiple Representations of the Same Task**: the same task can be represented in two different ways in two windows. For example a report can be given as table in one window and as a chart in another window.

Constraints in Window System Design

- Historically, system developers have been much more interested in solving hardware problems than in user considerations.
- This lack of guidelines makes it difficult to develop acceptable and agreeable window standards.
- The result is that developers of new systems create another new variation each time they design a product, and users must cope with a new interface each time they encounter a new windowing system.

Hardware Limitations

- Either seeing all the contents of one window is preferable to seeing small parts of many windows or the operational and visual complexity of multiple windows is not wanted.
- Poor screen resolution and graphics capability may also deter effective use of windows by not permitting sharp and realistic drawings and shapes

Human Limitations

- These window management operations are placed on top of other system operations, and window management can become an end in itself. This can severely detract from the task at hand.
- The results suggest that advantages for windows do exist, but they can be negated by excessive window manipulation requirements.
- It is also suggested that to be truly effective, window manipulation must occur implicitly as a result of user task actions, not as a result of explicit window management actions by the user.

Other Limitations

- Other possible window problems include the necessity for window borders to consume valuable screen space, and that small windows providing access to large amounts of information can lead to excessive, bothersome scrolling

Components of a Window

Frame

- A window will have a frame or border, usually rectangular in shape, to define its boundaries and distinguish it from other windows.
- While a border need not be rectangular, this shape is a preferred shape for most people.

Title Bar

- The title bar is the top edge of the window, inside its border and extending its entire width.
- This title bar is also referred to by some platforms as the *caption, caption bar,* or *title area*.
- The title bar contains a descriptive title identifying the purpose or content of the window.

Title bar Icon

- Located at the left corner of the title bar in a primary window, this button is used in Windows to retrieve a pull-down menu of commands that apply to the object in the window.
- It is 16 X□16 version of the icon of the object being viewed.

Window Sizing Buttons

- Located at the right corner of the title bar, these buttons are used to manipulate the size of a window.

- The leftmost button, the *minimize* button— inscribed with a short horizontal line toward the bottom of the button—is used to reduce a window to its minimum size, usually an icon. It also hides all associated windows.
- The *maximize* button—typically inscribed with a large box—enlarges a window to its maximum size, usually the entire screen. When a screen is maximized, the *restore* button replaces the maximize button, since the window can no longer be increased in size.

- When these buttons are displayed, use the following guidelines:

    - When a window does not support a command, do not display its command button.
    - The *Close* button always appears as the rightmost button. Leave a gap between it and any other buttons.
    - The *Minimize* button always precedes the *Maximize* button.
    - The *Restore* button always replaces the *Maximize* button or the *Minimize* button when that command is carried out.

What's This? Button

- The *What's This?* Button, which appears on secondary windows and dialog boxes, is used to invoke the What's This?
- Windows command to provide contextual Help about objects displayed within a secondary window.

Menu Bar

- A menu bar is used to organize and provide access to actions. It is located horizontally at the top of the window, just below the title bar.
- A menu bar contains a list of topics or items that, when selected, are displayed on a pull-down menu beneath the choice.

Status Bar

- Information of use to the user can be displayed in a designated screen area or areas. They may be located at the top of the screen in some platforms and called a *status area*, or at the screen's bottom.
- Microsoft recommends the bottom location and refers to this area as the *status bar.* It is also referred to by other platforms as a *message area* or *message bar*.

Scroll Bars

- When all display information cannot be presented in a window, the additional information must be found and made visible.

- This is accomplished by scrolling the display's contents through use of a scroll bar.
- A scroll bar is an elongated rectangular container consisting of a scroll area or shaft, a slider box or elevator, and arrows or anchors at each end.
- For vertical scrolling, the scroll bar is positioned at the far right side of the work

Split Box

- A window can be split into two or more pieces or panes by manipulating a *split box* located above a vertical scroll bar or to the left of a horizontal scroll bar.
- A split box is sometimes referred to as a *split bar*.
- A window can be split into two or more separate viewing areas that are called *panes*

Toolbar

- Toolbars are permanently displayed panels or arrays of choices or commands that must be accessed quickly. They are sometimes called *command bars*.
- Toolbars are designed to provide quick access to specific commands or options. Specialized toolbars are sometimes referred to as *ribbons, toolboxes, rulers,* or *palettes*.

Command Area

- In situations where it is useful for a command to be typed into a screen, a command area can be provided.
- The desired location of the command area is at the bottom of the window.

Size Grip

- A size grip is a Microsoft Windows special handle included in a window to permit it to be resized.
- When the grip is dragged the window resizes, following the same conventions as the sizing border. Three angled parallel lines in the lower-right corner of a window designate the size grip.

Work Area

- The work area is the portion of the screen where the user performs tasks.
- It is the open area inside the window's border and contains relevant peripheral screen components such as the menu bar, scroll bars, or message bars.
- The work area may also be referred to as the *client area*.

Table 5.1 Microsoft Windows Components

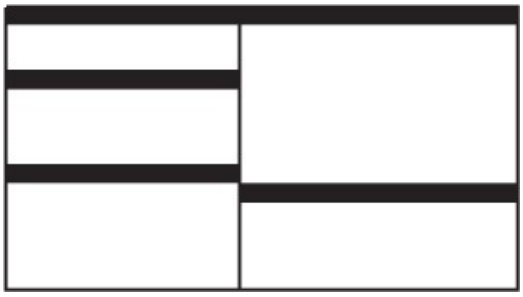
COMPONENT	WINDOWS CONTAINING COMPONENT		
	PRIMARY	SECONDARY	DIALOG BOX
Frame or Border • Boundary to define shape. • If sizable, contains control points for resizing.	X	X	X
Title Bar Text • Name of object being viewed in window. • Control point for moving window.	X	X	X
Title Bar Icon • Small version of icon for object being viewed. • Access point for commands that apply to the object.	X		
Title Bar Buttons • Shortcuts to specific commands.	X	X	X
Close	X	X	X
Minimize/Maximize/Restore	X		
What's This? – Displays context-sensitive Help about any object displayed on window.		X	X
Menu Bar • Provides basic and common application commands.	X		
Status Bar • An area used to display status information about what is displayed in window.	X		
Scroll Bar • Standard control to support scrolling.	X		
Size Grip • Control to resize window, located at right side of status bar.	X		

Window Presentation Styles

- The presentation style of a window refers to its spatial relationship to other windows.
- There are two basic styles, commonly called tiled or overlapping.

Tiled Windows

- Tiled windows derive their name from common floor or wall tile. Tiled windows appear in one plane on the screen and expand or contract to fill up the display surface, as needed.
- Most systems provide two-dimensional tiled windows, adjustable in both height and width.

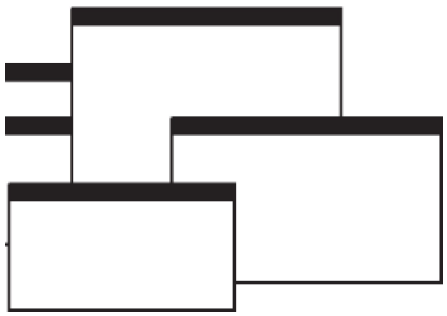


- advantages:
    - The system usually allocates and positions windows for the user, eliminating the necessity to make positioning decisions.
    - Open windows are always visible, eliminating the possibility of them being lost and forgotten.
    - Every window is always completely visible, eliminating the possibility of information being hidden.
    - They are perceived as fewer complexes than overlapping windows, possibly because there are fewer management operations or they seem less "magical."
    - They are easier, according to studies, for novice or inexperienced people to learn and use.
    - They yield better user performance for tasks where the data requires little window manipulation to complete the task.

- Disadvantages
    - Only a limited number can be displayed in the screen area available.
    - As windows are opened or closed, existing windows change in size. This can be annoying.
    - As windows change in size or position, the movement can be disconcerting.
    - As the number of displayed windows increases, each window can get very tiny.
    - The changes in sizes and locations made by the system are difficult to predict.
    - The configuration of windows provided by the system may not meet the user's needs.
    - They are perceived as crowded and more visually complex because window borders are flush against one another, and they fill up the whole screen. Crowding is accentuated if borders contain scroll bars or control icons. Viewer attention may be drawn to the border, not the data.
    - They permit less user control because the system actively manages the windows.

Overlapping Windows

- Overlapping windows may be placed on top of one another like papers on a desk.
- They possess a three-dimensional quality, appearing to lie on different planes.

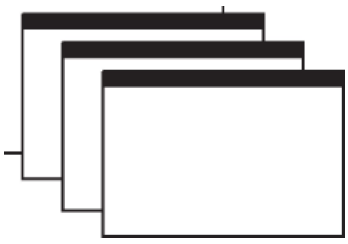


- Advantages:
    - Visually, their look is three-dimensional, resembling the desktop that is familiar to the user.
    - Greater control allows the user to organize the windows to meet his or her needs.
    - Windows can maintain larger sizes.
    - Windows can maintain consistent sizes.
    - Windows can maintain consistent positions.
    - Screen space conservation is not a problem, because windows can be placed on top of one another.
    - There is less pressure to close or delete windows no longer needed.
    - The possibility exists for less visual crowding and complexity. Larger borders can be maintained around window information, and the window is more clearly set off against its background. Windows can also be expanded to fill the entire display.
    - They yield better user performance for tasks where the data requires much window manipulation to complete the task.

- Disadvantages
    - They are operationally much more complex than tiled windows. More control functions require greater user attention and manipulation.
    - Information in windows can be obscured behind other windows.
    - Windows themselves can be lost behind other windows and be presumed not to exist.
    - That overlapping windows represent a three-dimensional space is not always realized by the user.
    - Control freedom increases the possibility for greater visual complexity and crowding. Too many windows, or improper offsetting, can be visually overwhelming.

Cascading Windows

- A special type of overlapping window has the windows automatically arranged in a regular progression.
- Each window is slightly offset from others, as illustrated in Figure



- Advantages
    - No window is ever completely hidden.
    - Bringing any window to the front is easier.
    - It provides simplicity in visual presentation and cleanness.

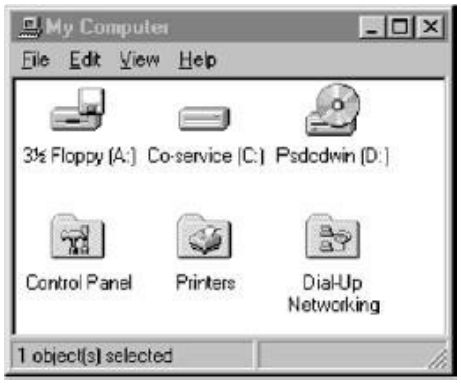
Picking a Presentation Style

- Use tiled windows for:
    - Single-task activities.
    - Data that needs to be seen simultaneously.
    - Tasks requiring little window manipulation.
    - Novice or inexperienced users.

- Use overlapping windows for:
    - Switching between tasks.
    - Tasks necessitating a greater amount of window manipulation.
    - Expert or experienced users.
    - Unpredictable display contents.

Types of Windows

Primary Window



- Proper usage:
  — Should represent an independent function or application.
  — Use to present constantly used window components and controls.
    • Menu bar items that are:
  — Used frequently.
  — Used by most, or all, primary or secondary windows.
    • Controls used by dependent windows.
  — Use for presenting information that is continually updated.
    • For example, date and time.
  — Use for providing context for dependent windows to be created.
  — Do not:
    • Divide an independent function into two or more primary windows.
    • Present unrelated functions in one primary window.
- It has also been variously referred to as the *application* window or the *main* window. In addition, it may be referred to as the *parent* window if one or more *child* windows exist

Secondary Windows

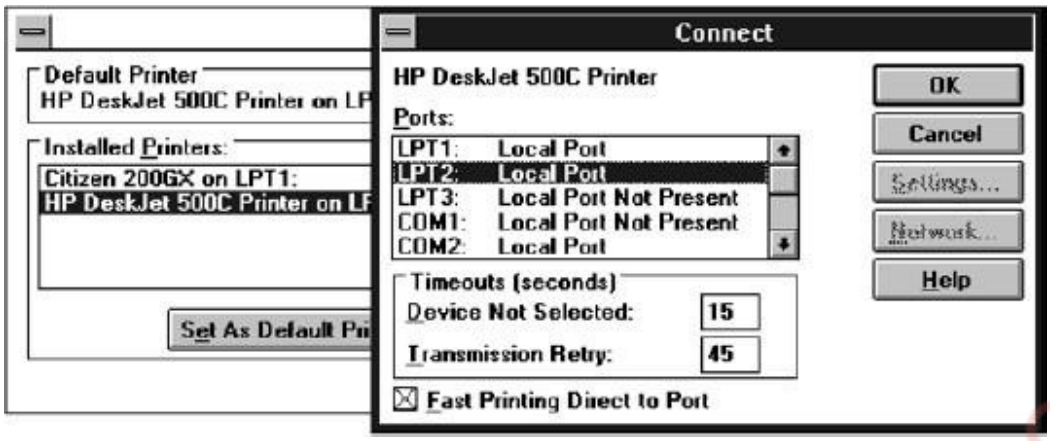
- Proper usage:
  — For performing subordinate, supplemental, or ancillary actions that are:
    • Extended or more complex in nature.
    • Related to objects in the primary window.
  — For presenting frequently or occasionally used window components.
- Important guidelines:
  — Should typically not appear as an entry on the taskbar.
  — A secondary window should not be larger than 263 dialog units x 263 dialog units.
- A *dependent* secondary window is one common type. It can only be displayed from a command on the interface of its primary window. It is typically associated with a single data object, and appears on top of the active window when requested. It is movable, and scrollable.
- An *independent* secondary window can be opened independently of a primary window—for example, a property sheet displayed when the user clicks the Properties command on the menu of a desktop icon.

Modal and Modeless

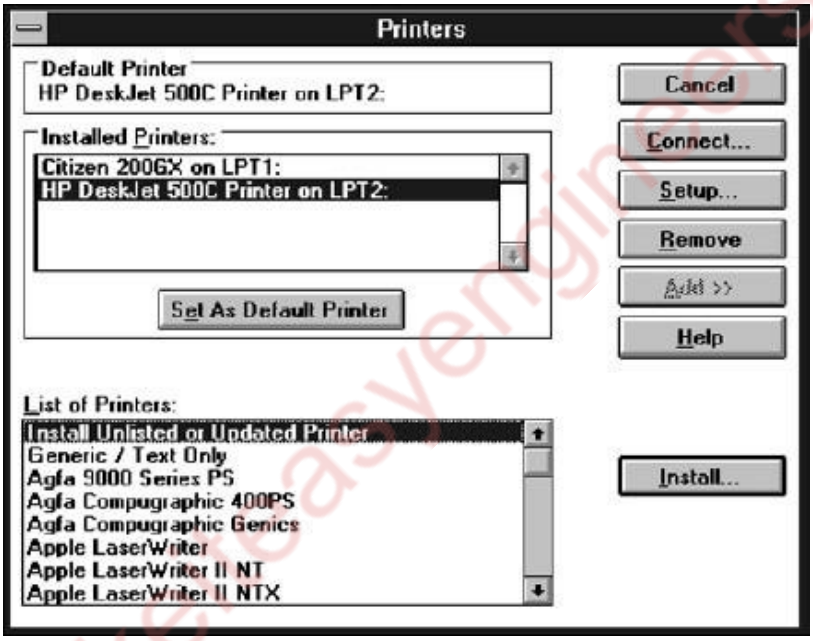
- Modal:
  — Use when interaction with any other window must not be permitted.
  — Use for:
    • Presenting information.
  — For example, messages (sometimes called a message box).
    • Receiving user input.
  — For example, data or information (sometimes called a prompt box).
    • Asking questions.
  — For example, data, information, or directions (sometimes called a question box).
  — Use carefully because it constrains what the user can do.
- Modeless:
  — Use when interaction with other windows must be permitted.
  — Use when interaction with other windows must be repeated.

Cascading and Unfolding

- Cascading:
  — Purpose:
    • To provide advanced options at a lower level in a complex dialog.
  — Guidelines:
    • Provide a command button leading to the next dialog box with a "To a Window" indicator, an ellipsis (. . .).
    • Present the additional dialog box in cascaded form.
    • Provide no more than two cascades in a given path.
    • Do not cover previous critical information.
  — Title Bar.
  — Relevant displayed information.
    • If independent, close the secondary window from which it was opened.
- Unfolding:
  — Purpose:
    • To provide advanced options at the same level in a complex dialog.
  — Guidelines:
    • Provide a command button with an expanding dialog symbol (>>).
    • Expand to right or downward.

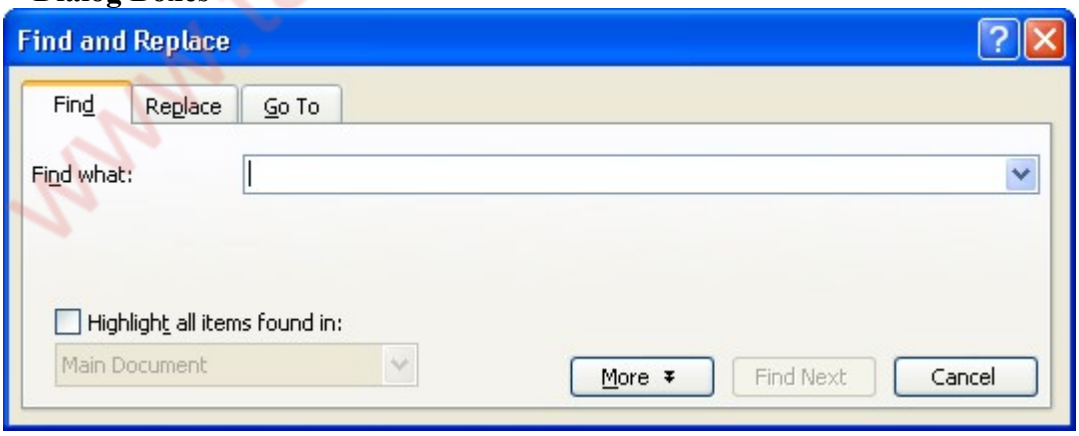


Cascaded Window



Unfolded Window

Dialog Boxes

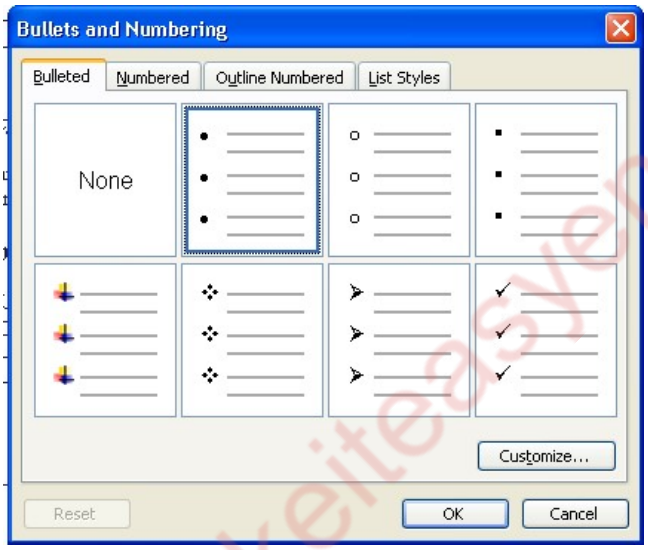


- Use for presenting brief messages.
- Use for requesting specific, transient actions.
- Use for performing actions that:
  — Take a short time to complete.
  — Are not frequently changed.
- Command buttons to include:
  — OK.
  — Cancel.
  — Others as necessary.

Property Sheets and Property Inspectors

Secondary windows provide two other techniques for displaying properties, *property sheets* and *property inspectors.*

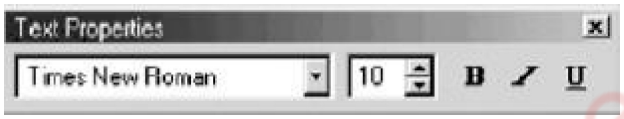
Property Sheets



- Use for presenting the complete set of properties for an object.
- Categorize and group within property pages, as necessary.
  — Use tabbed property pages for grouping peer-related property sets.

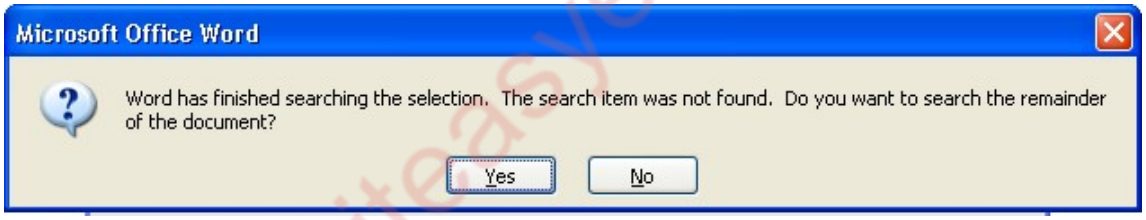
— The recommended sizes for property sheets are:
    • 252 DLUs wide x 218 DLUs high
    • 227 DLUs wide x 215 DLUs high
    • 212 DLUs wide x 188 DLUs high
— Command buttons to include:
    • OK.
    • Cancel.
    • Apply.
    • Reset.
    • Others as necessary.
— For single property sheets, place the commands on the sheet.
— For tabbed property pages, place the commands outside the tabbed pages.

Property Inspectors



- Use for displaying only the most common or frequently accessed objects properties.
- Make changes dynamically.

Message Boxes

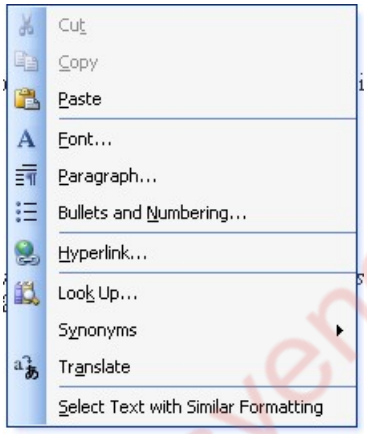


- Use for displaying a message about a particular situation or condition.
- Command buttons to include:
    — OK.
    — Cancel.
    — Help.
    — Yes and No.
    — Stop.
    — Buttons to correct the action that caused the message box to be displayed.
- Enable the title bar close box only if the message includes a cancel button.
- Designate the most frequent or least destructive option as the default command

Palette Windows

- Use to present a set of controls.
- Design as resizable.
  — Alternately, design them as fixed in size.

Pop-up Windows



- Use pop-up windows to display:
  — Additional information when an abbreviated form of the information is the main presentation.
  — Textual labels for graphical controls.
  — Context-sensitive Help information

Window Management

Microsoft Windows also provides several window management schemes, a *single document interface, a multiple-document interface, workbooks*, and *projects*.

Single-Document Interface

- Description:
  — A single primary window with a set of secondary windows.
- Proper usage:
  — Where object and window have a simple, one-to-one relationship.
  — Where the object's primary presentation or use is as a single unit.
  — To support alternate views with a control that allows the view to be changed.
  — To support simultaneous views by splitting the window into panes.
- Advantages:

— Most common usage.
— Window manipulation is easier and less confusing.
— Data-centered approach.

- Disadvantage:
  — Information is displayed or edited in separate windows.

Multiple-Document Interface

- Description:
  — A technique for managing a set of windows where documents are opened into windows.
  — Contains:
    • A single primary window, called the parent.
    • A set of related document or child windows, each also essentially a primary window.
  — Each child window is constrained to appear only within the parent window.
  — The child windows share the parent window's operational elements.
  — The parent window's elements can be dynamically changed to reflect the requirements of the active child window.
- Proper usage:
  — To present multiple occurrences of an object.
  — To compare data within two or more windows.
  — To present multiple parts of an application.
  — Best suited for viewing homogeneous object types.
  — To clearly segregate the objects and their windows used in a task.
- Advantages:
  — The child windows share the parent window's interface components (menus, toolbars, and status bars), making it a very space-efficient interface.
  — Useful for managing a set of objects.
  — Provides a grouping and focus for a set of activities within the larger environment of the desktop.
- Disadvantages:
  — Reinforces an application as the primary focus.
  — Containment for secondary windows within child windows does not exist, obscuring window relationships and possibly creating confusion.
  — Because the parent window does not actually contain objects, context cannot always be maintained on closing and opening.
  — The relationship between files and their windows is abstract, making an MDI application more challenging for beginning users to learn.
  — Confining child windows to the parent window can be inconvenient or inappropriate for some tasks.
  — The nested nature of child windows may make it difficult for the user to distinguish a child window in a parent window from a primary window that is a peer with the parent window but is positioned on top.

Workbooks

- Description:

— A window or task management technique that consists of a set of views organized like a tabbed notebook.
— It is based upon the metaphor of a book or notebook.
— Views of objects are presented as sections within the workbook's primary windows; child windows do not exist.
— Each section represents a view of data.
— Tabs can be included and used to navigate between sections.
— Otherwise, its characteristics and behavior are similar to those of the multiple document interface with all child windows maximized.

- Proper usage:
  — To manage a set of views of an object.
  — To optimize quick navigation of multiple views.
  — For content where the order of the sections is significant.
- Advantages:
  — Provides a grouping and focus for a set of activities within the larger environment of the desktop.
  — Conserves screen real estate.
  — Provides the greater simplicity of the single-document window interface.
  — Provides greater simplicity by eliminating child window management.
  — Preserves some management capabilities of the multiple-document interface.
- Disadvantage:
  — Cannot present simultaneous views.

Projects

- Description:
  — A technique that consists of a container: a project window holding a set of objects.
  — The objects being held within the project window can be opened in primary windows that are peers with the project window.
  — Visual containment of the peer windows within the project window is not necessary.
  — Each opened peer window must possess its own menu bar and other interface elements.
  — Each opened peer window can have its own entry on the task bar.
  — When a project window is closed, all the peer windows of objects also close.
  — When the project window is opened, the peer windows of the contained objects are restored to their former positions.
  — Peer windows of a project may be restored without the project window itself being restored.
- Proper usage:
  — To manage a set of objects that do not necessarily need to be contained.
  — When child windows are not to be constrained.
- Advantages:
  — Provides a grouping and focus for a set of activities within the larger environment of the desktop.
  — Preserves some management capabilities of the multiple document interface.
  — Provides the greatest flexibility in the placement and arrangement of windows.

- Disadvantage:
  — Increased complexity due to difficulty in differentiating peer primary windows of the project from windows of other applications.

Organizing Window Functions

Window Organization

- Organize windows to support user tasks.
- Support the most common tasks in the most efficient sequence of steps.
- Use primary windows to:
  — Begin an interaction and provide a top-level context for dependent windows.
  — Perform a major interaction.
- Use secondary windows to:
  — Extend the interaction.
  — Obtain or display supplemental information related to the primary window.
- Use dialog boxes for:
  — Infrequently used or needed information.
  — "Nice-to-know" information.

Number of Windows

- Minimize the number of windows needed to accomplish an objective.
- The general rule:
  - Minimize the number of windows used to accomplish an objective.
  - Use a single window whenever possible. Consider, however, the user's task.
  - Don't clutter up a single window with rarely used information when it can be placed on a second, infrequently used, window.

Window Operations

Active Window

- A window should be made active with as few steps as possible.
- Visually differentiate the active window from other windows.

General Guidelines

- Design easy to use and learn windowing operations.
  — Direct manipulation seems to be a faster and more intuitive interaction style than indirect manipulation for many windowing operations.
- Minimize the number of window operations necessary to achieve a desired effect.
- Make navigating between windows particularly easy and efficient to do.
- Make the setting up of windows particularly easy to remember.
- In overlapping systems, provide powerful commands for arranging windows on the screen in user-tailorable configurations.

Opening a Window

- Provide an iconic representation or textual list of available windows.
  — If opening with an expansion of an icon, animate the icon expansion.
- When opening a window:
  — Position the opening window in the most forward plane of the screen.
  — Adapt the window to the size and shape of the monitor on which it will be presented.
  — Designate it as the active window.
  — Set it off against a neutral background.
  — Ensure that its title bar is visible.
- When a primary window is opened or restored, position it on top.
  — Restore all secondary windows to the states that existed when the primary window was closed.
- When a dependent secondary window is opened, position it on top of its associated primary window.
  — Position a secondary window with peer windows on top of its peers.
  — Present layered or cascaded windows with any related peer secondary windows.
- When a dependent secondary window is activated, its primary window and related peer windows should also be positioned at the top.
- If more than one object is selected and opened, display each object in a separate window.
- Designate the last window selected as the active window.
- Display a window in the same state as when it was last accessed.
  — If the task, however, requires a particular sequence of windows, use a fixed or consistent presentation sequence.
- With tiled windows, provide an easy way to resize and move newly opened windows.

Sizing Windows

- Provide large-enough windows to:
  — Present all relevant and expected information for the task.
  — Avoid hiding important information.
  — Avoid crowding or visual confusion.
  — Minimize the need for scrolling.
    - But use less than the full size of the entire screen.
- If a window is too large, determine:
  — Is all the information needed?
  — Is all the information related?
- Otherwise, make the window as small as possible.
  — Optimum window sizes:
    - For text, about 12 lines.
    - For alphanumeric information, about seven lines.
- Larger windows seem to have these advantages:
  - They permit displaying of more information.

    - They facilitate learning: Data relationships and groupings are more obvious.
    - Less window manipulation requirements exist.
    - Breadth is preferred to depth (based on menu research).
    - More efficient data validation and data correction can be performed.
- Disadvantages include:
    - Longer pointer movements are required.
    - Windows are more crowded.
    - More visual scanning is required.
    - Other windows more easily obscure parts of the window.
    - It is not as easy to hide inappropriate data.

Window Placement

- Considerations:
  — In placing a window on the display, consider:
    • The use of the window.
    • The overall display dimensions.
    • The reason for the window's appearance.
- General:
  — Position the window so it is entirely visible.
  — If the window is being restored, place the window where it last appeared**.**
  — If the window is new, and a location has not yet been established, place it:
    • At the point of the viewer's attention, usually the location of the pointer or cursor.
    • In a position convenient to navigate to.
    • So that it is not obscuring important or related underlying window information.
  — For multiple windows, give each additional window its own unique and discernible location.
    • A cascading presentation is recommended.
  — In a multiple-monitor configuration, display the secondary window on the same monitor as its primary window.
  — If none of the above location considerations apply, then:
    • Horizontally center a secondary window within its primary window just below the title bar, menu bar, and any docked toolbars.
  — If the user then moves the window, display it at this new location the next time the user opens the window.
    • Adjust it as necessary to the current display configuration.
  — Do not let the user move a window to a position where it cannot be easily repositioned.
- Dialog boxes:
  — If the dialog box relates to the entire system, center it on screen.
  — Keep key information on the underlying screen visible.
  — If one dialog box calls another, make the new one movable whenever possible.

Window Separation

- Crisply, clearly, and pleasingly demarcate a window from the background of the screen on which it appears.
  — Provide a surrounding solid line border for the window.
  — Provide a window background that sets the window off well against the overall screen background.
  — Consider incorporating a drop shadow beneath the window.

Moving a Window

- Permit the user to change the position of all windows.
- Change the pointer shape to indicate that the move selection is successful.
- Move the entire window as the pointer moves.
  — If it is impossible to move the entire window, move the window outline while leaving the window displayed in its original position.
- Permit the moving of a window without its being active.

Resizing a Window

- Permit the user to change the size of primary windows.
  — Unless the information displayed in the window is fixed or cannot be scaled to provide more information.
- Change the pointer shape to indicate that the resizing selection is successful.
- The simplest operation is to anchor the upper-left corner and resize from the lower right corner.
  — Also permit resizing from any point on the window.
- Show the changing window as the pointer moves.
  — If it is impossible to show the entire window being resized, show the window's outline while leaving the window displayed in its original position.
- When window size changes and content remains the same:
  — Change image size proportionally as window size changes.
- If resizing creates a window or image too small for easy use, do one of the following:
  — Clip (truncate) information arranged in some logical structure or layout when minimum size is attained, or
  — When no layout considerations exist, format (restructure) information as size is reduced, or
  — Remove less useful information (if it can be determined), or
  — When minimum size is attained, replace information with a message that indicates that the minimum size has been reached and that the window must be enlarged to continue working.
- Permit resizing a window without its being active.

Other Operations

Permit primary windows to be maximized, minimized, and restored.

Window Shuffling

Window shuffling must be easy to accomplish.

Keyboard Control/Mouse less Operation

- Window actions should be capable of being performed through the keyboard as well as with a mouse.
- Keyboard alternatives should be designated through use of mnemonic codes as much as possible.
- Keyboard designations should be capable of being modified by the user.

Closing a Window

- Close a window when:
  — The user requests that it be closed.
  — The user performs the action required in the window.
  — The window has no further relevance.
- If a primary window is closed, also close all of its secondary windows.
- When a window is closed, save its current state, including size and position, for use when the window is opened again.

Select the Proper Device-Based Controls

Device-based controls, often called input devices, are the mechanisms through which people communicate their desires to the system.

Characteristics of Device-Based Controls

Several specific tasks are performed using graphical systems.

- To point at an object on the screen.
- To select the object or identify it as the focus of attention.
- To drag an object across the screen.
- To draw something free form on the screen.
- To track or follow a moving object.
- To orient or position an object.
- To enter or manipulate data or information.

Direct and Indirect Devices

- *Direct* devices are operated on the screen itself. Examples include the light pen, the finger, and voice.
- *Indirect* devices are operated in a location other than the screen, most often on the desktop.

Trackball

- Description:
  — A spherical object (ball) that rotates freely in all directions in its socket.
  — Direction and speed is tracked and translated into cursor movement.
- Advantages:

— Direct relationship between hand and pointer movement in terms of direction and speed.
— Does not obscure vision of screen.
— Does not require additional desk space (if mounted on keyboard).

- Disadvantages:
  — Movement is indirect, in a plane different from the screen.
  — No direct relationship exists between hand and pointer movement in terms of distance.
  — Requires a degree of eye-hand coordination.
  — Requires hand to be removed from keyboard keys.
  — Requires different hand movements.
  — Requires hand to be removed from keyboard (if not mounted on keyboard).
  — Requires additional desk space (if not mounted on keyboard).
  — May be difficult to control.
  — May be fatiguing to use over extended time.

Joystick

- Description:
  — A stick or bat-shaped device anchored at the bottom.
  — Variable in size, smaller ones being operated by fingers, larger ones requiring the whole hand.
  — Variable in cursor direction movement method, force joysticks respond to pressure, movable ones respond to movement.
  — Variable in degree of movement allowed, from horizontal-vertical only to continuous.
- Advantages:
  — Direct relationship between hand and pointer movement in terms of direction.
  — Does not obscure vision of screen.
  — Does not require additional desk space (if mounted on keyboard).
- Disadvantages:
  — Movement indirect, in plane different from screen.
  — Indirect relationship between hand and pointer in terms of speed and distance.
  — Requires a degree of eye-hand coordination.
  — Requires hand to be removed from keyboard keys.
  — Requires different hand movements to use.
  — Requires hand to be removed from keyboard (if not mounted on keyboard).
  — Requires additional desk space (if not mounted on keyboard).
  — May be fatiguing to use over extended time.
  — May be slow and inaccurate.

Graphic Tablet

- Description:
  — Pressure-, heat-, light-, or light-blockage-sensitive horizontal surfaces that lie on the desktop or keyboard.
  — May be operated with fingers, light pen, or objects like a stylus or pencil.
  — Pointer imitates movements on tablet.

- Advantages:
  — Direct relationship between touch movements and pointer movements in terms of direction, distance, and speed.
  — More comfortable horizontal operating plane.
  — Does not obscure vision of screen.
- Disadvantages:
  — Movement is indirect, in a plane different from screen.
  — Requires hand to be removed from keyboard.
  — Requires hand to be removed from keyboard keys.
  — Requires different hand movements to use.
  — Requires additional desk space.

  — Finger may be too large for accuracy with small objects

Touch Screen

- Description:
  — A special surface on the screen sensitive to finger or stylus touch.
- Advantages:
  — Direct relationship between hand and pointer location in terms of direction, distance, and speed.
  — Movement is direct, in the same plane as screen.
  — Requires no additional desk space.
  — Stands up well in high-use environments.
- Disadvantages:
  — Finger may obscure part of screen.
  — Finger may be too large for accuracy with small objects.
  — Requires moving the hand far from the keyboard to use.
  — Very fatiguing to use for extended period of time.
  — May soil or damage the screen.
- Design Guidelines:
  — Screen objects should be at least 3/4″□□□3/4″□in size.
  — Object separation should be at least 1/8″.
  — Provide visual feedback in response to activation. Auditory feedback may also be appropriate.
  — When the consequences are destructive, require confirmation after selection to eliminate inadvertent selection.
  — Provide an instructional invitation to begin using.

Light Pen

- Description:
  — A special surface on a screen sensitive to the touch of a special stylus or pen.
- Advantages:
  — Direct relationship between hand and pointer movement in terms of direction, distance, and speed.
  — Movement is direct, in the same plane as screen.
  — Requires minimal additional desk space.

— Stands up well in high-use environments.
— More accurate than finger touching.

- Disadvantages:
  — Hand may obscure part of screen.
  — Requires picking it up to use.
  — Requires moving the hand far from the keyboard to use.
  — Very fatiguing to use for extended period of time.

Voice

- Description:
  — Automatic speech recognition by the computer.
- Advantages:
  — Simple and direct.
  — Useful for people who cannot use a keyboard.
  — Useful when the user's hands are occupied.
- Disadvantages:
  — High error rates due to difficulties in:
    • Recognizing boundaries between spoken words.
    • Blurred word boundaries due to normal speech patterns.
  — Slower throughput than with typing.
  — Difficult to use in noisy environments.
  — Impractical to use in quiet environments.

Mouse

- Description:
  — A rectangular or dome-shaped, movable, desktop control containing from one to three buttons used to manipulate objects and information on the screen.
  — Movement of screen pointer mimics the mouse movement.
- Advantages:
  — Direct relationship between hand and pointer movement in terms of direction, distance, and speed.
  — Permits a comfortable hand resting position
  — Selection mechanisms are included on mouse.
  — Does not obscure vision of the screen.
- Disadvantages:
  — Movement is indirect, in a plane different from screen.
  — Requires hand to be removed from keyboard.
  — Requires additional desk space.
  — May require long movement distances.
  — Requires a degree of eye-hand coordination.
- ***Mouse Usage Guidelines***
  - Provide a "hot zone" around small or thin objects that mouse positioning.
  - Never use double-clicks or double-drags as the only means operations.
  - Do not use mouse plus keystroke combinations.
  - Do not require a person to point at a moving target.

Keyboard

- Description:
  — Standard typewriter keyboard and cursor movement keys.
- Advantages:
  — Familiar.
  — Accurate.
  — Does not take up additional desk space.
  — Very useful for:
    • Entering text and alphanumeric data.
    • Inserting in text and alphanumeric data.
    • Keyed shortcuts—accelerators.
    • Keyboard mnemonics—equivalents.
  — Advantageous for:
    • Performing actions when less than three mouse buttons exist.
    • Use with very large screens.
    • Touch typists.
- Disadvantages:
  — Slow for non-touch-typists.
  — Slower than other devices in pointing.
  — Requires discrete actions to operate.
  — No direct relationship between finger or hand movement on the keys and cursor movement on screen in terms of speed and distance.
- **Keyboard Guidelines**
  - Provide keyboard accelerators.
  - Assign single keys for frequently performed, small-scale tasks.
  - Use standard platform accelerators.
  - Assign Shift-*key* combinations for actions that extend or are complementary to the actions of the key or key combination used without the Shift-*key*.
  - Assign Ctrl-*key* combinations for:
    • Infrequent actions.
    • Tasks that represent larger-scale versions of the task assigned to the unmodified key.
  - Provide keyboard equivalents.
  - Use standard platform equivalents.
  - Use the first letter of the item description.
  - If first letter conflicts exist, use:
    • Another distinctive consonant in the item description.
    • A vowel in the item description.
  - Provide window navigation through use of keyboard keys.

Selecting the Proper Device-Based Controls

- Consider the characteristics of the task.
  — Provide keyboards for tasks involving:
    • Heavy text entry and manipulation.
    • Movement through structured arrays consisting of a few discrete objects.

— Provide an alternative pointing device for graphical or drawing tasks.
— The following are some suggested best uses:
• Mouse—pointing, selecting, drawing, and dragging.
• Joystick—selecting and tracking.
• Trackball—pointing, selecting and tracking.
• Touch screen—pointing and selecting.
• Graphic tablet—pointing, selecting, drawing, and dragging.
— Provide touch screens under the following conditions:
• The opportunity for training is minimal.
• Targets are large, discrete, and spread out.
• Frequency of use is low.
• Desk space is at a premium.
• Little or no text input requirement exists.

- Consider user characteristics and preferences.
  — Provide keyboards for touch typists.
- Consider the characteristics of the environment.
- Consider the characteristics of the hardware.
- Consider the characteristics of the device in relation to the application.
- Provide flexibility.
- Minimize eye and hand movements between devices.

Keyboard versus Mouse

Speed is obviously one reason. An experienced typist, through kinesthetic memory, has memorized the location of keyboard keys. The keying process becomes exceptionally fast and well learned. The mouse is slower,

Control Research

- A survey of the research literature comparing and evaluating different devices yields the following summarization concerning tasks involving pointing and dragging:
  - The fastest tools for pointing at stationary targets on screens are the devices that permit direct pointing: the touch screen and light pen. This is most likely due to their high level of eye-hand coordination and because they use an action familiar to people.
  - In terms of positioning speed and accuracy for stationary targets, the indirect pointing devices—the mouse, trackball, and graphic tablet, do not differ greatly from one another. The joystick is the slowest, although it is as accurate as the others. Of most importance in selecting one of these devices will be its fit to the user's task and working environment.
  - A separate confirmation action that must follow pointer positioning increases pointing accuracy but reduces speed. The mouse offers a very effective design configuration for tasks requiring this confirmation.

    - For tracking small, slowly moving targets, the mouse, trackball, and graphic tablet are preferred to the touch screen and light pen because the latter may obscure the user's view of the target.
- Another common manipulation task is dragging an object across the screen. Using a mouse, graphic tablet, and trackball for this task, as well as pointing, was studied by MacKenzie, Sellen, and Buxton (1991). They report the following:
    - The graphic tablet yielded best performance during pointing.
    - The mouse yielded best performance during dragging.
    - The trackball was a poor performer for both pointing and dragging, and it had a very high error rate in dragging.

Pointer Guidelines

The pointer:
— Should be visible at all times.
— Should contrast well with its background.
— Should maintain its size across all screen locations and during movement.
— The hotspot should be easy to locate and see.
— Location should not warp (change position).
The user should always position the pointer.
The shape of a pointer:
— Should clearly indicate its purpose and meaning.
— Should be constructed of already defined shapes.
— Should not be used for any other purpose other than its already defined meaning.
— Do not create new shapes for already defined standard functions.
Use only as many shapes as necessary to inform the user about current location and status. Too many shapes can confuse a person.
Be conservative in making changes as the pointer moves across the screen.
— Provide a short "time-out" before making noncritical changes on the screen.
Animation should not:
— Distract.
— Restrict one's ability to interact.

Choose the Proper Screen-Based Controls

- Screen-based controls, often simply called *controls* and sometimes called *widgets*, are the elements of a screen that constitute its body.
- By definition, they are graphic objects that represent the properties or operations of other objects. A control may:
    - Permit the entry or selection of a particular value.
    - Permit the changing or editing of a particular value.
    - Display only a particular piece of text, value, or graphic.
    - Cause a command to be performed.
    - Possess a contextual pop-up window.
- Three extremely important principles regarding controls should be noted:
    - A control must:
      Look the way it works.

Work the way it looks.
    - A control must be used exactly as its design intended.
    - A control must be presented in a standard manner.
- The look of a control should make it obvious that it is a control. Its design characteristics should signal "enterability" or "clickability." Microsoft Windows, for example, presents the following simple rules:
    - Raised elements can be pressed.
    - Recessed elements cannot be pressed.
    - Elements on a flat white background can be opened, edited, or moved.

Operable Controls

- Operable controls are those that permit the entry, selection, changing, or editing of a particular value, or cause a command to be performed.
- Classes include buttons, text entry/read-only, selection, combination entry/selection, and other specialized controls.

Buttons

- Description:
  — A square or rectangular-shaped control with a label inside that indicates action to be accomplished.
  — The label may consist of text, graphics, or both.
- Purpose:
  — To start actions.
  — To change properties.
  — To display a pop-up menu.
- Advantages:
  — Always visible, reminding one of the choices available.
  — Convenient.
  — Can be logically organized in the work area.
  — Can provide meaningful descriptions of the actions that will be performed.
  — Larger size generally provides faster selection target.
  — Can possess 3-D appearance:
    • Adds an aesthetically pleasing style to the screen.
    • Provides visual feedback through button movement when activated.
  — May permit use of keyboard equivalents and accelerators.
  — Faster than using a two-step menu bar/pull-down sequence.
- Disadvantages:
  — Consumes screen space.
  — Size limits the number that may be displayed.
  — Requires looking away from main working area to activate.
  — Requires moving the pointer to select.
- Proper usage:
  — Use for frequently used actions that are specific to a window.
    • To cause something to happen immediately.
    • To display another window.

- To display a menu of options.
- To set a mode or property value.

- A button comes in three styles.

Command buttons.

Toolbar buttons without labels.

Symbol button

Command Buttons

Command button guidelines include the following.

Usage

- For windows with a menu bar:
  — Use to provide fast access to frequently used or critical commands.
- For windows without a menu bar:
  — Use to provide access to all necessary commands.

Structure

- Provide a rectangular shape with the label inscribed within it.
- Give the button a raised appearance.
- Maintain consistency in style throughout an application.

Labels

- Use standard button labels when available.
- Provide meaningful descriptions of the actions that will be performed.
- Use single-word labels whenever possible.
  — Use two-three words for clarity, if necessary.
- Use mixed-case letters with the first letter of each significant label word capitalized.
- Display labels:
  — In the regular system font.
  — In the same size font.
- Do not number labels.

- Center the label within the button borders, leaving at least two pixels between the text and the button border.
- Provide consistency in button labeling across all screens.

Size

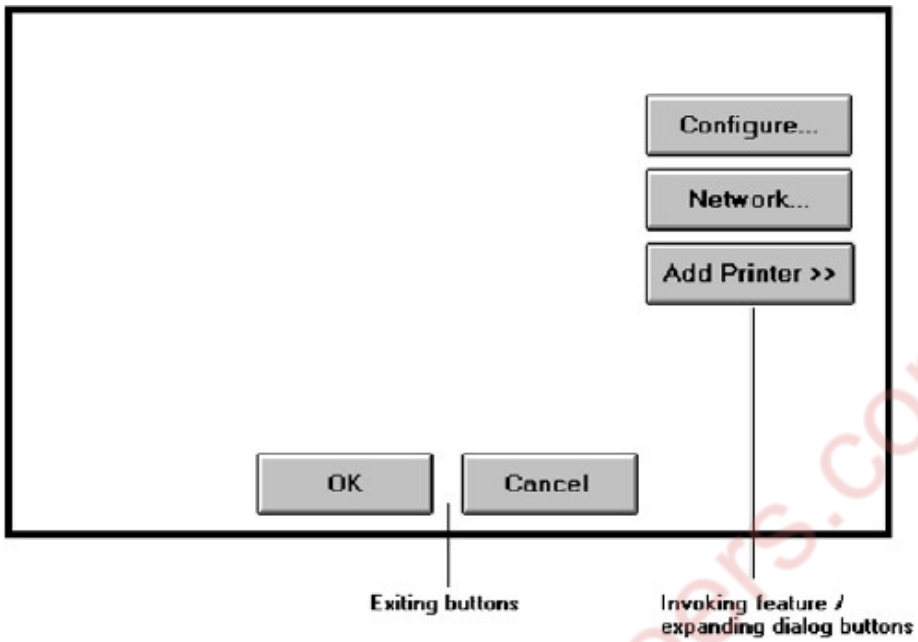
- Provide as large a button as feasible.
- Maintain consistent button heights and widths.
- Exception: Buttons containing excessively long labels may be wider.

Number

- Restrict the number of buttons on a window to six or fewer.

Location and Layout

- Maintain consistency in button location between windows.
- Never simply "fit" buttons in available space.
- If buttons are for exiting the dialog:
  — Position them centered and aligned horizontally at the bottom.
- If buttons are used for invoking a dialog feature or expanding the dialog:
  — Position them centered and aligned vertically on the right side.
- If a button has a contingent relationship to another control:
  — Position it adjacent to the related control.
- If a button has a contingent relationship to a group of controls:
  — Position it at the bottom or to right of related controls.
- If, due to space constraints, exiting and expanding/invoking feature buttons must be placed together:
  — If at the bottom, place exiting buttons to the right, separating the groupings by one button's width.
  — If along the right side, place exiting buttons at the bottom, separating the groupings by one button's height.
- For exiting and expanding/invoking feature buttons, do not:
  — Align with the other screen controls.
  — Present displayed within a line border.
- Provide equal and adequate spacing between adjacent buttons.
- Provide adequate spacing between buttons and the screen body controls.



Organization

- Organize standard buttons in the manner recommended by the platform being used.
- For other buttons, organize them in common and customary grouping schemes.
  - — For buttons ordered left to right, place those for most frequent actions to the left.
  - — For buttons ordered top to bottom, place those for most frequent actions at the top.
- Keep related buttons grouped together.
- Separate potentially destructive buttons from frequently chosen selections.
- Buttons found on more than one window should be consistently positioned.
- The order should never change.
- For mutually exclusive actions, use two buttons; do not dynamically change the text.
- Windows recommends the following:
  - An affirmative action to the left (or above).
  - The default first.
  - OK and Cancel next to each other.
  - Help last, if supported.

Intent Indicators

- When a button causes an action to be immediately performed, no intent indicator is necessary.

- When a button leads to a cascading dialog, include an ellipsis (...) after the label.

- When a button leads to a menu, include a triangle pointing in the direction the menu will appear after the label.

- When a button leads to an expanding dialog, include a double arrow (>>) with the label.

- When a button has a contingent relationship to another control that must be indicated, include a single arrow (->) pointing at the control.

Expansion Buttons

- Gray them out after expansion.
- Provide a contraction button, if necessary.
  — Locate it beneath, or to right of, the expansion button.
  — Gray it out when not applicable.

Defaults

- Intent:
  — When a window is first displayed, provide a default action, if practical.
- Selection:
  — A default should be the most likely action:
    • A confirmation.
    • An application of the activity being performed.
    • A positive action such as OK, unless the result is catastrophic.
  — If a destructive action is performed (such as a deletion), the default should be Cancel.
- Presentation:
  — Indicate the default action by displaying the button with a bold or double border.
- Procedures:
  — The default can be changed as the user interacts with the window.
  — When the user navigates to a button, it can temporarily become the default.
  — Use the Enter key to activate a default button.
  — If another control requires use of the Enter key, temporarily disable the default while the focus is on the other control.
  — Permit double-clicking on a single selection control in a window to also carry out the default command.

Unavailable Choices

- Temporarily unavailable choices should be dimmed or grayed out.

Keyboard Equivalents and Accelerators

- Equivalents:
  — Assign a keyboard equivalent mnemonic to each button to facilitate keyboard selection.
  — The mnemonic should be the first character of the button's label.
    • If duplication exists in first characters, for duplicate items, use another character in the label.
    • Preferably, choose the first succeeding consonant.
  — Designate the mnemonic character by underlining it.
  — Maintain the same mnemonic on all identical buttons on other screens.

- Accelerators:
  — Assign a keyboard accelerator to each button to facilitate keyboard selection.

Scrolling

- If a window can be scrolled, do not scroll the command buttons.
  — Exception: if the screen cannot scroll independently of the buttons.
- Use buttons to move between multipage forms, not scroll bars.
  — Label buttons Next and Previous.

Button Activation

Pointing:
— Highlight the button in some visually distinctive manner when the pointer is resting on it and the button is available for selection.
Activation:
— Call attention to the button in another visually distinctive manner when it has been activated or pressed.
— If a button can be pressed continuously, permit the user to hold the mouse button down and repeat the action.

Toolbars

- *Toolbars* are compilations of commands, actions, or functions, usually graphical in structure but sometimes textual, grouped together for speedy access.
- Toolbars may also be called *button bars*, *control bars,* or *access bars*. Specialized toolbars may also be referred to as *ribbons*, *toolboxes*, or *palettes*. Toolbars may also appear in palette windows.

Usage

- To provide easy and fast access to most frequently used commands or options across multiple screens.
- To invoke a sub application within an application.
- To use in place of certain menu items.

Structure

- Images:
  — Provide buttons of equal size.
  — Create a meaningful and unique icon.
    • Design them using icon design guidelines.
  — Center the image within the button.
  — Give the button a raised appearance.
  — Ensure that toolbar images are discernible from Web page graphical images.
- Text:
  — Create a meaningful label, adhering to label guidelines for command buttons.
  — Create toolbar buttons of equal size, following the size guidelines recently described.
- Consistency:
  — Use the same icon throughout an application and between applications.

Size

- Button:
  — 24 (w) by 22 (h) pixels, including border.
  — 32 (w) by 30 (h) pixels, including border.
  — Larger buttons can be used on high-resolution displays.
- Label:
  — 16 (w) by 16 (h) pixels.
  — 14 (w) by 24 (h) pixels.
- Default:
  — Provide the smaller size as the default size with a user option to change it.
- Image:
  — Center the image in the button.

Organization

- Order the buttons based on common and customary grouping schemes.
  — For buttons ordered left to right, place those for the most frequently used actions to the left.
  — For buttons ordered top to bottom, place those for the most frequently used actions at the top.
- Keep related buttons grouped together.
- Separate potentially destructive buttons from frequently chosen selections.
- Permit user reconfiguration of button organization.

Location

- Position main features and functions bar horizontally across top of window just below menu bar.
- Position subtask and sub features bars along sides of window.
- Permit the location of the bar to be changed by the user.
- Permit display of the bar to be turned on or off by the user.
  — Also provide access through standard menus.

Active Items

- Make only currently available toolbar items available.
- Temporarily not available items may be displayed grayed out.

Customization

- Permit toolbars to be turned off by the user.
- Allow the customizing of toolbars.
  — Provide a default, however.

Keyboard Equivalents and Accelerators

- Equivalents:
  — Assign keyboard equivalents to facilitate keyboard selection.
  — Maintain the same mnemonic on all identical buttons on all screens.
- Accelerators:
  — Assign a keyboard accelerator to facilitate keyboard selection.

Button Activation

- Pointing:
  — Highlight the button in some visually distinctive manner when the pointer is resting on it and the button is available for selection.
- Activation:
  — Call attention to the button in another visually distinctive manner when it has been activated or pressed.

Text Entry/Read-Only Controls

- A Text Entry/Read-Only control contains text that is exclusively entered or modified through the keyboard.
- It may also contain entered text being presented for reading or display purposes only.

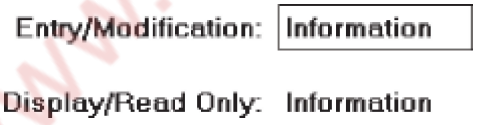
Text Boxes

- Description:
  — A control, usually rectangular in shape, in which:

    - Text may be entered or edited.
    - Text may be displayed for read-only purposes.
  — Usually possesses a caption describing the kind of information contained within it.
  — An outline field border:
    - Is included for enterable/editable text boxes.
    - Is not included for read-only text boxes.
  — Two types exist:
    - Single line.
    - Multiple line.
  — When first displayed, the box may be blank or contain an initial value.
- Purpose:
  — To permit the display, entering, or editing of textual information.
  — To display read-only information.
- Advantages:
  — Very flexible.
  — Familiar.
  — Consumes little screen space.
- Disadvantages:
  — Requires use of typewriter keyboard.
  — Requires user to remember what must be keyed.
- Proper usage:
  — Most useful for data that is:
    - Unlimited in scope.
    - Difficult to categorize.
    - Of a variety of different lengths.
  — When using a selection list is not possible.

Types of text box

- Two types of *text boxes* exist. One consists of a rectangular box into which information is typed. It may also be referred to as an *edit* control.
- The second is also rectangular in shape but contains text displayed purely for read-only purposes. The former type has historically been referred to as an *entry field*, the latter as an *inquiry* or *display field*.



Two forms of Text Box
Single-Line and Multiple-Line Text Boxes

- Single line:
  — Description:
    - A control consisting of no more than one line of text.
  — Purpose:

• To make textual entries when the information can be contained within one line of the screen.

— Typical uses:

• Typing the name of a file to save.
• Typing the path of a file to copy.
• Typing variable data on a form.
• Typing a command.

- Multiple line:

— Description:

• A control consisting of a multiline rectangular box for multiple lines of text.

— Purpose:

• To type, edit, and read passages of text.

— Typical uses:

• Creating or reading an electronic mail message.
• Displaying and editing text files.

Captions

- Structure and size:

— Provide a descriptive caption to identify the kind of information to be typed, or contained within, the text box.
— Use a mixed-case font.
— Display the caption in normal intensity or in a color of moderate brightness.

- Formatting:

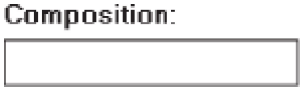
— Single fields:

• Position the field caption to the left of the text box.

— Place a colon (:) immediately following the caption.
— Separate the colon from the text box by one space.

• Alternately, the caption may be placed above the text box.

— Place a colon (:) immediately following the caption.
— Position above the upper-left corner of the box, flush with the left edge.
— Multiple occurrence fields:

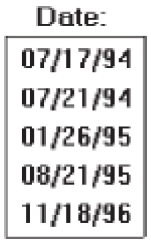


• For entry/modification text boxes:

— Position the caption left-justified one line above the column of entry fields.

• For display/read-only boxes:

— If the data field is long and fixed-length, or the displayed data is about the same length, center the caption above the displayed text box data.

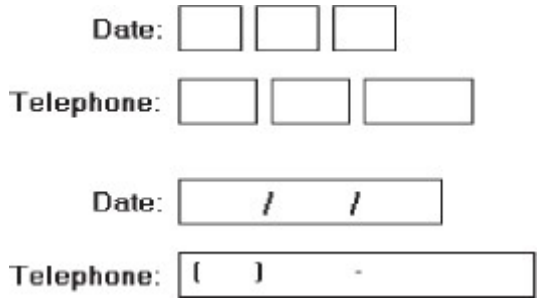


— If the data displayed is alphanumeric, short, or quite variable in length, left-justify the caption above the displayed text box data.

— If the data field is numeric and variable in length, right-justify the caption above the displayed text box data.

Fields

- Structure:
  — Identify entry/modification text boxes with a line border or reverse polarity rectangular box.
    • To visually indicate that it is an enterable field, present the box in a recessed manner.
    • Present display/read-only text boxes on the window background.
  — Break up long text boxes through incorporation of slashes (/), dashes (-), spaces, or other common delimiters.



- Size:
  — Size to indicate the approximate length of the field.
  — Text boxes for fixed-length data must be large enough to contain the entire entry.
  — Text boxes for variable-length data must be large enough to contain the majority of the entries.
  — Where entries may be larger than the entry field, scrolling must be provided to permit keying into, or viewing, the entire field.
  — Employ word wrapping for continuous text in multiple-line text boxes.
- Highlighting:
  — Call attention to text box data through a highlighting technique.
    • Higher intensity.
    • If color is used, choose one that both complements the screen background and contrasts well with it.
- Unavailable fields:
  — Gray-out temporarily unavailable text boxes.
- Fonts:
  — To support multiple fonts, use a *Rich-Text Box*.

Selection Controls

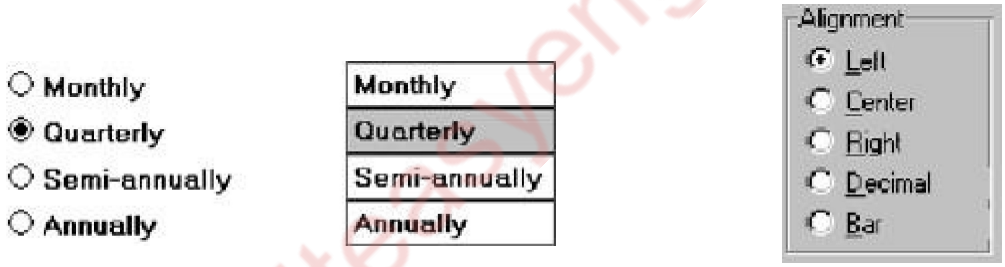
- A selection control presents on the screen all the possible alternatives, conditions, or choices that may exist for an entity, property, or value.
- The relevant item or items are selected from those displayed.
- Selection controls include radio buttons, check boxes, list boxes, drop-down/pop-up list boxes, and palettes.

Radio Buttons

- Description:
  — A two-part control consisting of the following:
    • Small circles, diamonds, or rectangles.
    • Choice descriptions.
  — When a choice is selected:
    • The option is highlighted.
    • Any existing choice is automatically unhighlighted and deselected.
- Purpose:
  — To set one item from a small set of mutually exclusive options (2 to 8).
- Advantages:

— Easy-to-access choices.
— Easy-to-compare choices.
— Preferred by users.

- Disadvantages:
  — Consume screen space.
  — Limited number of choices.
- Proper usage:
  — For setting attributes, properties, or values.
  — For mutually exclusive choices (that is, only one can be selected).
  — Where adequate screen space is available.
  — Most useful for data and choices that are:
    • Discrete.
    • Small and fixed in number.
    • Not easily remembered.
    • In need of a textual description to meaningfully describe the alternatives.
    • Most easily understood when the alternatives can be seen together and compared to one another.
    • Never changed in content.
  — Do not use:
    • For commands.
    • Singly to indicate the presence or absence of a state.



Choice Descriptions

- Provide meaningful, fully spelled-out choice descriptions clearly describing the values or effects set by the radio buttons.
- Display in a single line of text.
- Display using mixed-case letters, using the sentence style.
- Position descriptions to the right of the button. Separate them by at least one space from the button.
- When a choice is conditionally unavailable for selection, display the choice description grayed out or dimmed.
- Include a none choice if it adds clarity.

Size

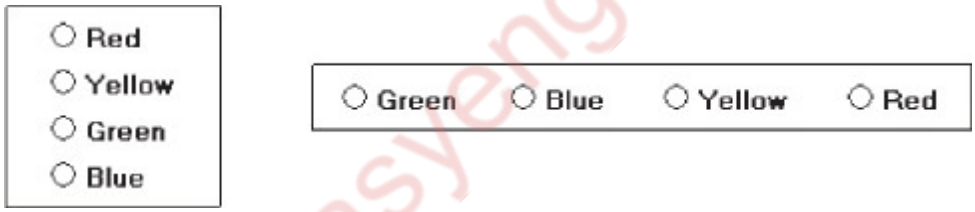
- Show a minimum of two choices, a maximum of eight.

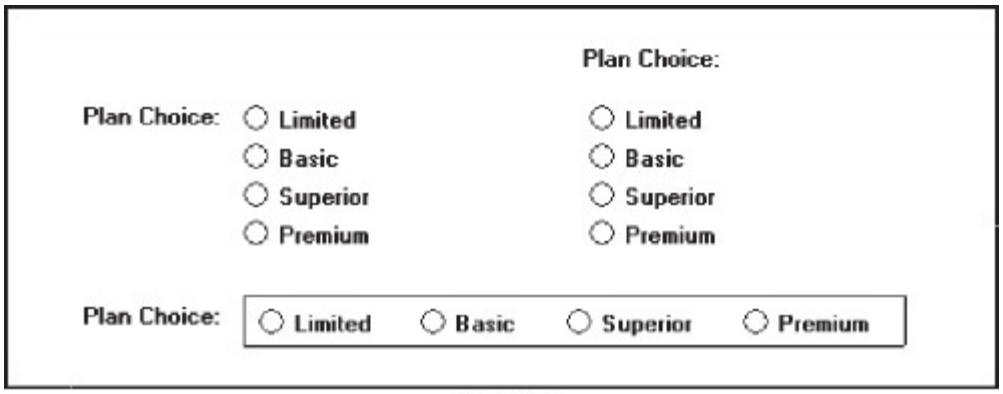
Defaults

- When the control possesses a state or affect that has been predetermined to have a higher probability of selection than the others, designate it as the default and display its button filled in.
- When the control includes choices whose states cannot be predetermined, display all the buttons without setting a dot, or in the *indeterminate* state.
- When a multiple selection includes choices whose states vary, display the buttons in another unique manner, or in the *mixed value* state.

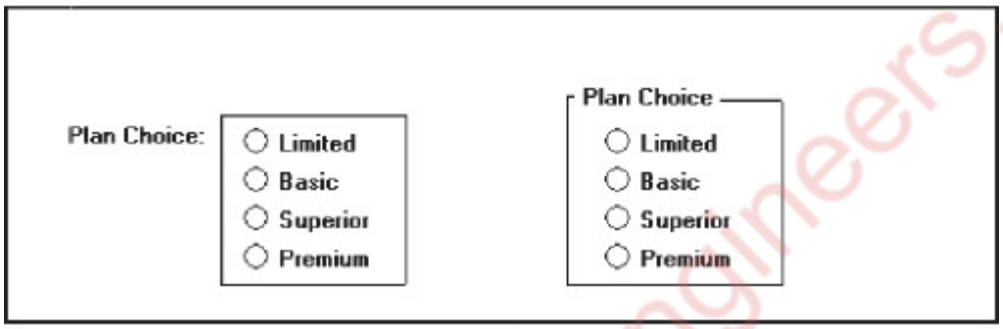
Structure

- A columnar orientation is the preferred manner of presentation.
- Left-align the buttons and choice descriptions.
- If vertical space on the screen is limited, orient the buttons horizontally.
- Provide adequate separation between choices so that the buttons are associated with the proper description.
  — A distance equal to three spaces is usually sufficient.
- Enclose the buttons in a border to visually strengthen the relationship they possess.





Still Better



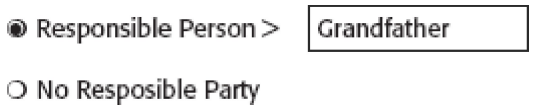
Best

Organization

- Arrange selections in expected order or follow other patterns such as frequency of occurrence, sequence of use, or importance.
  — For selections arrayed top to bottom, begin ordering at the top.
  — For selections arrayed left to right, begin ordering at the left.
- If, under certain conditions, a choice is not available, display it subdued or less brightly than the available choices.

Related Control

- Position any control related to a radio button immediately to the right of the choice description.
- If the radio button choice description also acts as the label for the control that follows it, end the label with an arrow (>).

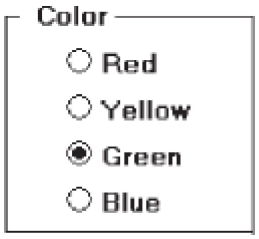


Captions

- Structure:
  — Provide a caption for each radio button control.

• Exception: In screens containing only one radio button control, the screen title may serve as the caption.

- Display:
  — Fully spelled out.
  — In mixed-case letters, capitalizing the first letter of all significant words.
- Columnar orientation:
  — With a control border, position the caption:
    • Upper-left-justified within the border.



    • Alternately, the caption may be located to the left of the topmost choice description.
  — Without an enclosing control border, position the caption:
    • Left-justified above the choice descriptions, separated by one space line.

    • Alternately, the caption may be located to the left of the topmost choice description.

- Horizontal orientation:
  — Position the caption to the left of the choice descriptions.

    • Alternately, with an enclosing control border, left-justified within the border.

  — Be consistent in caption style and orientation within a screen.

Keyboard Equivalents

- Assign a keyboard mnemonic to each choice description.

- Designate the mnemonic by underlining the applicable letter in the choice description.

Selection Method and Indication

- Pointing:
  — The selection target area should be as large as possible.
    • Include the button and the choice description text.
  — Highlight the selection choice in some visually distinctive way when the cursor's resting on it and the choice is available for selection.
    • This cursor should be as long as the longest choice description plus one space at each end. Do not place the cursor over the small button.

- Activation:
  — When a choice is selected, distinguish it visually from the unselected choices.
    • A radio button should be filled in with a solid dark dot or made to look depressed or higher through use of a shadow.
  — When a choice is selected, any other selected choice must be deselected.
- Defaults:
  — If a radio button control is displayed that contains a choice previously selected or a default choice, display the selected choice as set in the control

Check Boxes

- Description:
  — A two-part control consisting of a square box and choice description.
  — Each option acts as a switch and can be either "on" or "off."
    • When an option is selected (on), a mark such as an "X" or "check" appears within the square box, or the box is highlighted in some other manner.
    • Otherwise the square box is unselected or empty (off).
  — Each box can be:
    • Switched on or off independently.
    • Used alone or grouped in sets.
- Purpose:
  — To set one or more options as either on or off.
- Advantages
  — Easy-to-access choices.
  — Easy-to-compare choices.
  — Preferred by users.
- Disadvantages:

— Consume screen space.
— Limited number of choices.
— Single check boxes difficult to align with other screen controls.

- Proper usage:
  — For setting attributes, properties, or values.
  — For nonexclusive choices (that is, more than one can be selected).
  — Where adequate screen space is available.
  — Most useful for data and choices that are:
    • Discrete.
    • Small and fixed in number.
    • Not easily remembered.
    • In need of a textual description to describe meaningfully.
    • Most easily understood when the alternatives can be seen together and compared to one another.
    • Never changed in content.
  — Can be used to affect other controls.
  — Use only when both states of a choice are clearly opposite and unambiguous.

Choice Descriptions

- Provide meaningful, fully spelled-out choice descriptions clearly describing the values or effects set by the check boxes.
- Display them in a single line of text.
- Display them using mixed-case letters in sentence style.
- Position descriptions to the right of the check box. Separate by at least one space from the box.
- When a choice is unavailable for selection under a certain condition, display the choice description visually dimmed.

Size

- Show a minimum of one choice, a maximum of eight.

Defaults

- When the control possesses a state or affect that has been preset, designate it as the default and display its check box marked.
- When a multiple selection includes choices whose states vary, display the buttons in another unique manner, or the *mixed value* state.

Structure

- Provide groupings of related check boxes.
- A columnar orientation is the preferred manner of presentation for multiple related check boxes.
- Left-align the check boxes and choice descriptions.
- If vertical space on the screen is limited, orient the boxes horizontally.
- Provide adequate separation between boxes so that the buttons are associated with the proper description.
  — A distance equal to three spaces is usually sufficient.
- Enclose the boxes in a border to visually strengthen the relationship they possess.

Organization

- Arrange selections in logical order or follow other patterns such as frequency of occurrence, sequence of use, or importance.
  — For selections arrayed top to bottom, begin ordering at the top.
  — For selections arrayed left to right, begin ordering at the left.
- If, under certain conditions, a choice is not available, display it subdued or less brightly than the available choices.

Related Control

- Position any control related to a check box immediately to the right of the choice description.
  — If a the check box choice description also acts as the label for the control that follows it , end the label with an arrow (>).

Captions and Keyboard Equivalents

Same as Radio Button

Selection Method and Indication

- Pointing:
  — The selection target area should be as large as possible.
    • Include the check box and the choice description text.
  — Highlight the selection choice in some visually distinctive way when the cursor's resting on it and the choice is available for selection.
    • This cursor should be as long as the longest choice description plus one space at each end. Do not place the cursor over the check box.

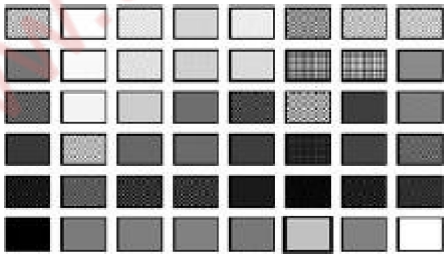
- Activation:
  — When a choice is selected, distinguish it visually from the non-selected choices.
    - A check box should be filled in or made to look depressed or higher through use of a shadow.
- Defaults:
  — If a check box is displayed that contains a choice previously selected or default choice, display the selected choice as set in the control.
- Select/deselect all:
  — Do not use *Select All* and *Deselect All* check boxes.
- Mixed-value state:
  — When a check box represents a value, and a multiple selection encompasses multiple value occurrences set in both the on and off state, display the check box in a *mixed value* state.

    - Fill the check box with another easily differentiable symbol or pattern.

  — Toggle the check box as follows:
    - Selection 1: Set the associated value for all elements. Fill the check box with an "X" or "check."
    - Selection 2: Unset the value for all associated elements. Blank-out the check box.
    - Selection 3: Return all elements to their original state. Fill the check box with the mixed value symbol or pattern.

Palettes

- Description:
  — A control consisting of a series of graphical alternatives. The choices themselves are descriptive, being composed of colors, patterns, or images.
  — In addition to being a standard screen control, a palette may also be presented on a pull-down or pop-up menu or a toolbar.



- Purpose:
  — To set one of a series of mutually exclusive options presented graphically or pictorially.
- Advantages:
  — Pictures aid comprehension.

— Easy-to-compare choices.
— Usually consume less screen space than textual equivalents.

- Disadvantages:
  — A limited number of choices can be displayed.
  — Difficult to organize for scanning efficiency.
  — Requires skill and time to design meaningful and attractive graphical representations.
- Proper usage:
  — For setting attributes, properties, or values.
  — For mutually exclusive choices (that is, only one can be selected).
  — Where adequate screen space is available.
  — Most useful for data and choices that are:
    • Discrete.
    • Frequently selected.
    • Limited in number.
    • Variable in number.
    • Not easily remembered.
    • Most easily understood when the alternatives may be seen together and compared to one another.
    • Most meaningfully represented pictorially or by example.
    • Can be clearly represented pictorially.
    • Rarely changed in content.
  — Do not use:
    • Where the alternatives cannot be meaningfully and clearly represented pictorially.
    • Where words are clearer than images.
    • Where the choices are going to change.

Graphical Representations

- Provide meaningful, accurate, and clear illustrations or representations of choices.
- Create images large enough to:
  — Clearly illustrate the available alternatives.
  — Permit ease in pointing and selecting.
- Create images of equal size.
- Always test illustrations before implementing them.

Size

- Present all available alternatives within the limits imposed by:
  — The size of the graphical representations.
  — The screen display's capabilities.

Layout

- Create boxes large enough to:
  — Effectively illustrate the available alternatives.
  — Permit ease in pointing and selecting.

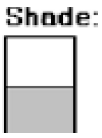
- Create boxes of equal size.
- Position the boxes adjacent to, or butted up against, one another.
- A columnar orientation is the preferred manner.
- If vertical space on the screen is limited, orient the choices horizontally.

Organization

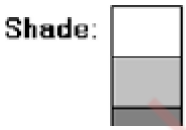
- Arrange palettes in expected or normal order.
  — For palettes arrayed top to bottom, begin ordering at the top.
  — For palettes arrayed left to right, begin ordering at the left.
- If an expected or normal order does not exist, arrange choices by frequency of occurrence, sequence of use, importance, or alphabetically (if textual).
- If, under certain conditions, a choice is not available, display it subdued or less brightly than the other choices.

Captions

- Provide a caption for each palette.
  — On screens containing only one palette, the screen title may serve as the caption.
- Display the caption fully spelled out using mixed-case letters.
- Columnar orientation:
  — The field caption may be positioned left-aligned above the palette.

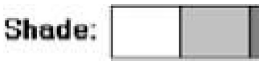


  — Alternately, the caption may be positioned to the left of the topmost alternative.



- Horizontal orientation:
  — The field caption may be positioned above the palette.

  — Alternately, the caption may be positioned to the left of the alternatives.



Selection Method and Indication

- Pointing:
  — Highlight the choice in some visually distinctive way when the pointer or cursor is resting on it and the choice is available for selection.
- Activation:

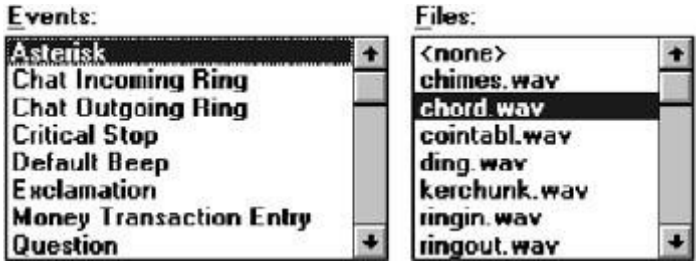
— When a choice is selected, distinguish it visually from the unselected choices by highlighting it in a manner different from when it is pointed at, or by placing a bold border around it.

- Defaults:
  — If a palette is displayed with a choice previously selected or a default choice, display the currently active choice in the manner used when it was selected.

List Boxes

- Description:
  — A permanently displayed box-shaped control containing a list of attributes or objects from which:
    • A single selection is made (mutually exclusive), or
    • Multiple selections are made (non-mutually-exclusive).
  — The choice may be text, pictorial representations, or graphics.
  — Selections are made by using a mouse to point and click.
  — Capable of being scrolled to view large lists of choices.
  — No text entry field exists in which to type text.
  — A list box may be may be associated with a *summary list box* control, which allows the selected choice to be displayed or an item added to the list.
- Purpose:
  — To display a collection of items containing:
    • Mutually exclusive options.
    • Non-mutually-exclusive options.
- Advantages:
  — Unlimited number of choices.
  — Reminds users of available options.
  — Box always visible.
- Disadvantages:
  — Consumes screen space.
  — Often requires an action (scrolling) to see all list choices.
  — The list content may change, making it hard to find items.
  — The list may be ordered in an unpredictable way, making it hard to find items.
- Proper usage:
  — For selecting values or setting attributes.
  — For choices that are:
    • Mutually exclusive (only one can be selected).
    • Non-mutually-exclusive (one or more may be selected).
  — Where screen space is available.
  — For data and choices that are:
    • Best represented textually.
    • Not frequently selected.
    • Not well known, easily learned, or remembered.
    • Ordered in an unpredictable fashion.
    • Frequently changed.
    • Large in number.
    • Fixed or variable in list length.

— When screen space or layout considerations make radio buttons or check boxes impractical.



List Box General Guidelines

Selection Descriptions

- Clearly and meaningfully describe the choices available. Spell them out as fully as possible.
  — Graphical representations must clearly represent the options.
- Present in mixed case, using the sentence style structure.
- Left-align into columns.

List Size

- Not actual limit in size.
- Present all available alternatives.
- Require no more than 40 page-downs to search a list.
  — If more are required, provide a method for using search criteria or scoping the options.

Box Size

- Must be long enough to display 6 to 8 choices without requiring scrolling.
  — Exceptions:
  • If screen space constraints exist, the box may be reduced in size to display at least three items.
  • If it is the major control within a window, the box may be larger.
  — If more items are available than are visible in the box, provide vertical scrolling to display all items.
- Must be wide enough to display the longest possible choice.

— When box cannot be made wide enough to display the longest entry:
• Make it wide enough to permit entries to be distinguishable, or,
• Break the long entries with an ellipsis (...) in the middle, or,
• Provide horizontal scrolling.

Organization

- Order in a logical and meaningful way to permit easy browsing.
  — Consider using separate controls to enable the user to change the sort order or filter items displayed in the list.
- If a particular choice is not available in the current context, omit it from the list.
  — Exception: If it is important that the existence and unavailability of a particular list item be communicated, display the choice dimmed or grayed out instead of deleting it.

Layout and Separation

- Enclose the choices in a box with a solid border.
  — The border should be the same color as the choice descriptions.
- Leave one blank character position between the choice descriptions and the left border.
- Leave one blank character position between the longest choice description in the list and the right border, if possible.

Captions

- Use mixed-case letters.
- The preferred position of the control caption is above the upper-left corner of the list box.

- Alternately, the caption may be located to the left of the topmost choice description.

- Be consistent in caption style and orientation within a screen, and related screens.

Disabling

- When a list box is disabled, display its caption and show its entries as grayed out or dimmed.

Selection Method and Indication

- Pointing:
  — Highlight the selection choice in some visually distinctive way when the pointer or cursor is resting on it and the choice is available for selection.
- Selection:
  — Use a reverse video or reverse color bar to surround the choice description when it is selected.
  — The cursor should be as wide as the box itself.

  — Mark the selected choice in a distinguishing way.
- Activation:
  — Require the pressing of a command button when an item, or items, is selected.

Single-Selection List Boxes

- Purpose:
  — To permit selection of only one item from a large listing.
- Design guidelines:
  — Related text box
  • If presented with an associated text box control:
  — Position the list box below and as close as possible to the text box.
  — The list box caption should be worded similarly to the text box caption.

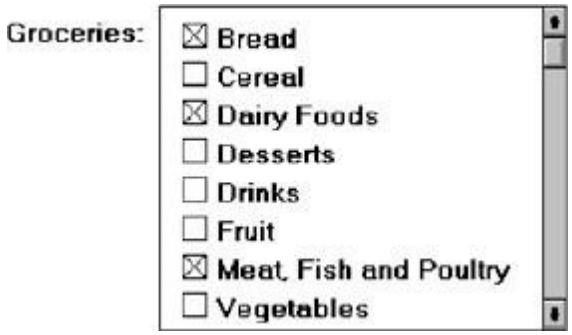
— If the related text box and the list box are very close in proximity, the caption may be omitted from the list box.

— Use the same background color for the text box as is used in the list box.

- Defaults:
  • When the list box is first displayed:
  — Present the currently active choice highlighted or marked with a circle or d diamond to the left of the entry.
  — If a choice has not been previously selected, provide a default choice and display it in the same manner that is used in selecting it.
  — If the list represents mixed values for a multiple selection, do not highlight an entry.
- Other:
  —Follow other relevant list box guidelines.

Extended and Multiple-Selection List Boxes

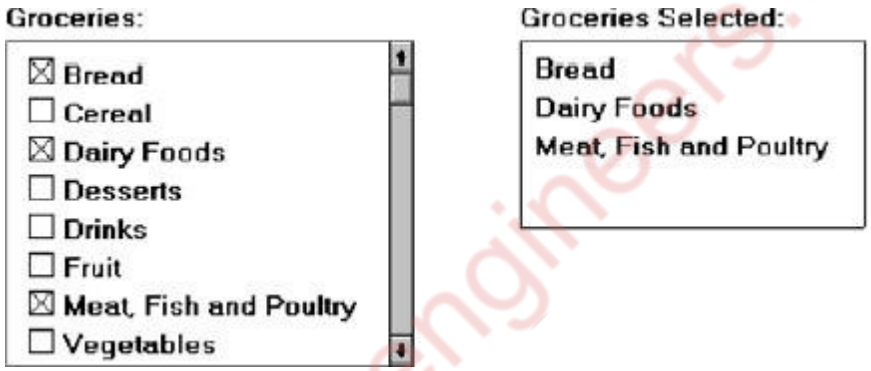
- Purpose:
  — To permit selection of more than one item in a long listing.
    • Extended list box: Optimized for individual item or range selection.
    • Multiple-selection list box: Optimized for independent item selection.
- Design guidelines:
  — Selection indication:
    • Mark the selected choice with an X or check mark to the left of the entry.



• Consider providing a *summary list box*.

— Position it to the right of the list box.

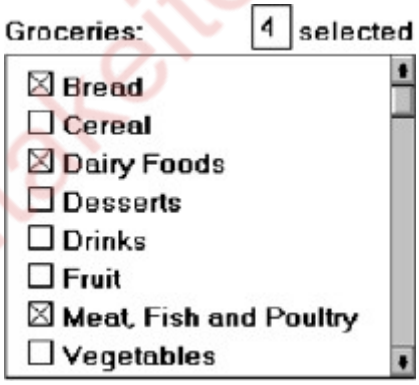
— Use the same colors for the summary list box as are used in the list box.



— Provide command buttons to *Add* (one item) or *Add All* (items) to the summary list box, and *Remove* (one item) or *Remove All* (items) from the summary list box.

- Consider providing a display-only text control indicating how many choices have been selected.

— Position it justified upper-right above the list box.



— Select all and Deselect All buttons

— Provide command buttons to accomplish fast *Select All* and *Deselect All* actions, when these actions must be frequently or quickly performed.

— Defaults:

- When the list box is first displayed:

— Display the currently active choices highlighted.

— Mark with an X or check mark to the left of the entry.

— If the list represents mixed values for a multiple selection, do not highlight an entry.

— Other:

• Follow other relevant list box guidelines.

List View Controls

- Description:
  — A special extended-selection list box that displays a collection of items, consisting of an icon and a label.
  — The contents can be displayed in four different views:
    • Large Icon: Items appear as a full-sized icon with a label below.
    • Small Icon: Items appear as a small icon with label to the right.
    • List: Items appear as a small icon with label to the right.
      — Arrayed in a columnar, sorted layout.
    • Report: Items appear as a line in a multicolumn format.
      — Leftmost column includes icon and its label.
      — Subsequent columns include application-specific information.
- Purpose and usage:
  — Where the representation of objects as icons is appropriate.
  — To represent items with multiple columns of information.

Drop-down/Pop-up List Boxes

- Description
  — A single rectangular control that shows one item with a small button to the right side.
  • The button provides a visual cue that an associated selection box is available but hidden.
  — When the button is selected, a larger associated box appears, containing a list of choices from which one may be selected.
  — Selections are made by using the mouse to point and click.
  — Text may not be typed into the control.
- Purpose:
  — To select one item from a large list of mutually exclusive options when screen space is limited.
- Advantages:
  — Unlimited number of choices.
  — Reminds users of available options.
  — Conserves screen space.
- Disadvantages:
  — Requires an extra action to display the list of choices.
  — When displayed, all choices may not always be visible, requiring scrolling.
  — The list may be ordered in an unpredictable way, making it hard to find items.
- Proper usage:
  — For selecting values or setting attributes.
  — For choices that are mutually exclusive (only one can be selected).
  — Where screen space is limited.

— For data and choices that are:
  - Best represented textually.
  - Infrequently selected.
  - Not well known, easily learned, or remembered.
  - Ordered in a unpredictable fashion.
  - Large in number.
  - Variable or fixed in list length.

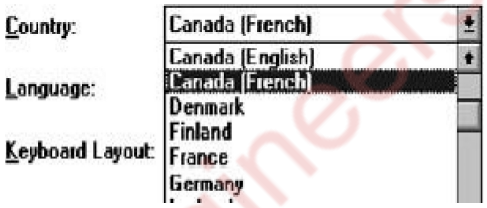
— Use drop-down/pop-up lists when:
  - Screen space or layout considerations make radio buttons or single-selection list boxes impractical.
  - The first, or displayed, item will be selected most of the time.

— Do not use a drop-down list if it important that all options be seen together.

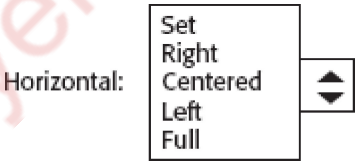
Drop Down List Box

Before selection

After Selection



Pop Up List Box



Prompt Button

- Provide a visual cue that a box is hidden by including a downward pointing arrow, or other meaningful image, to the right side of the selection field.
  — Position the button directly against, or within, the selection field.

Selection Descriptions

- Clearly and meaningfully describe the choices available. Spell them out as fully as possible.
  — Graphical representations must clearly represent the options.
  — Left-align them in columns.
  — Display the descriptions using mixed-case letters.

List Size

- Not limited in size.

- Present all available alternatives.

Box Size

- Long enough to display 6 to 8 choices without scrolling.
  — If more than eight choices are available, provide vertical scrolling to display all items.
- Wide enough to display the longest possible choice.
- When a box cannot be made wide enough to display the longest entry:
  — Make it wide enough to permit entries to be distinguishable, or,
  — Break long entries with ellipses (...) in the middle, or,
  — Provide horizontal scrolling.

Organization

- Order in a logical and meaningful way to permit easy browsing.
- If a particular choice is not available in the current context, omit it from the list.
  — Exception: If it is important that the existence and unavailability of a particular list item be communicated, display the choice dimmed or grayed out instead of deleting it.

Layout and Separation

- Enclose the choices in a box composed of a solid line border.
  — The border should be the same color as the choice descriptions.
  — Leave one blank character position between the choices and the left border.
  — Leave one blank character position between the longest choice description in the list and the right border, if possible.

Captions

- Display using mixed-case letters.
- Position the caption to the left of the box.
  — Alternately, it may be positioned left-justified above the box.

Defaults

- When the drop-down/pop-up listing is first presented, display the currently set value.
- If a choice has not been previously selected, provide a default choice.

Disabling

- When a drop-down/pop-up list box is disabled, display its caption and entries as disabled or dimmed.

Selection Method and Indication

- Pointing:
  — Highlight the selection choice in some visually distinctive way when the pointer or cursor is resting on it and the choice is available for selection.
- Activation:
  — Close the drop-down/pop-up list box when an item is selected.

Combination Entry/Selection Controls

- It is possible for a control to possess the characteristics of both a text field and a selection field.
- The types of combination entry/selection fields are spin boxes, attached combination boxes, and drop-down/pop-up combination boxes.

Spin Boxes

- Description:
  — A single-line field followed by two small, vertically arranged buttons.
    • The top button has an arrow pointing up.
    • The bottom button has an arrow pointing down.
  — Selection/entry is made by:
    • Using the mouse to point at one of the directional buttons and clicking. Items will change by one unit or step with each click.
    • Keying a value directly into the field itself.
- Purpose:
  — To make a selection by either scrolling through a small set of meaningful predefined choices or typing text.
- Advantages:
  — Consumes little screen space.
  — Flexible, permitting selection or typed entry.
- Disadvantages:
  — Difficult to compare choices.
  — Can be awkward to operate.
  — Useful only for certain kinds of data.
- Proper usage:
  — For setting attributes, properties, or values.
  — For mutually exclusive choices (only one can be selected).
  — When the task requires the option of either key entry or selection from a list.
  — When the user prefers the option of either key entry or selection from a list.
  — Where screen space is limited.
  — Most useful for data and choices that are:
    • Discrete.
    • Infrequently selected.
    • Well known, easily learned or remembered, and meaningful.
    • Ordered in a predictable, customary, or consecutive fashion.
    • Infrequently changed.
    • Small in number.
    • Fixed or variable in list length.

List Size

- Keep the list of items relatively short.
- To reduce the size of potentially long lists, break the listing into subcomponents, if possible.

List Organization

- Order the list in the customary, consecutive, or expected order of the information contained within it.
  — Ensure that the user can always anticipate the next (not-yet-visible) choice.
- When first displayed, present a default choice in the box.

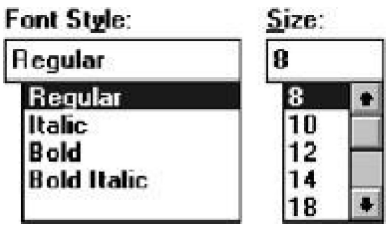
Other Spin Box Guidelines

- Box size:
  — The spin box should be wide enough to display the longest entry or choice.
- Caption:
  — Display it using mixed-case letters.
  — Position the caption to the left of the box.
    • Alternately, it may be positioned left-justified above the box.
- Entry and selection methods:
  — Permit completion by:
    • Typing directly into the box.
    • Scrolling and selecting with a mouse.
    • Scrolling and selecting with the up/down arrow keys.
  — For alphabetical values:
    • Move down the order using the down arrow.
    • Move up the order using the up arrow.
    • For numeric values or magnitudes:
    • Show a larger value using the up arrow.
    • Show a smaller value using the down arrow.

Combo Boxes

- Description:
  — A single rectangular text box entry field, beneath which is a larger rectangular list box (resembling a drop-down list box) displaying a list of options.
  — The text box permits a choice to be keyed within it.
  — The larger box contains a list of mutually exclusive choices from which one may be selected for placement in the entry field.

    - Selections are made by using a mouse to point and click.
  — As text is typed into the text box, the list scrolls to the nearest match.
  — When an item in the list box is selected, it is placed into the text box, replacing the existing content.
  — Information keyed may not necessarily have to match the list items.
- Purpose:
  — To allow either typed entry in a text box or selection from a list of options in a permanently displayed list box attached to the text box.
- Advantages:
  — Unlimited number of entries and choices.
  — Reminds users of available options.
  — Flexible, permitting selection or typed entry.
  — Entries not necessarily restricted to items selectable from list box.
  — List box always visible.
- Disadvantages:
  — Consumes some screen space.
  — All list box choices not always visible, requiring scrolling.
  — Users may have difficulty recalling sufficient information to type entry, making text box unusable.
  — The list may be ordered in an unpredictable way, making it hard to find items.
- Proper usage:
  — For entering or selecting objects or values or setting attributes.
  — For information that is mutually exclusive (only one can be entered or selected).
  — When users may find it practical to, or prefer to, type information rather than selecting it from a list.
  — When users can recall and type information faster than selecting it from a list.
  — When it is useful to provide the users a reminder of the choices available.
  — Where data must be entered that is not contained in the selection list.
  — Where screen space is available.
  — For data and choices that are:
    - Best represented textually.
    - Somewhat familiar or known.
    - Ordered in an unpredictable fashion.
    - Frequently changed.
    - Large in number.
    - Variable or fixed in list length.



Combo Box Guidelines

For the text box entry field, see “Text Box/Single Line” guidelines. For the list box, see “Drop-down/Pop-up List Box” guidelines.

Drop-down/Pop-up Combo Boxes

- Description:
  — A single rectangular text box with a small button to the side and an associated hidden list of options.
    • The button provides a visual cue that an associated selection box is available but hidden.
  — When requested, a larger associated rectangular box appears, containing a scrollable list of choices from which one is selected.
  — Selections are made by using the mouse to point and click.
  — Information may also be keyed into the field.
  — As text is typed into the text box, the list scrolls to the nearest match.
  — When an item in the list box is selected, it is placed into the text box, replacing the existing content.
  — The information keyed does not necessarily have to match list items.
  — Combines the capabilities of both a text box and a drop-down/pop-up list box.
- Purpose:
  — To allow either typed entry or selection from a list of options in a list box that may be closed and retrieved as needed.
- Advantages:
  — Unlimited number of entries and choices.
  — Reminds users of available options.
  — Flexible, permitting selection or typed entry.
  — Entries not restricted to items selectable from list box.
  — Conserves screen space.
- Disadvantages:
  — Requires an extra step to display the list of choices.
  — When displayed, all box choices may not always be visible, requiring scrolling.
  — User may have difficulty in recalling what to type.
  — The list content may change, making it hard to find items.
  — The list may be ordered in an unpredictable way, making it hard to find items.
- Proper usage:
  — For entering or selecting objects or values or setting attributes.
  — For information that is mutually exclusive (only one can be entered or selected).
  — When users may find it practical to, or prefer to, type information rather than selecting it from a list.
  — When users can recall and type information faster than selecting from a list.
  — When it is useful to provide the users with an occasional reminder of the choices available.
  — Where data must be entered that is not contained in the selection list.
  — Where screen space is limited.
  — For data and choices that are:
    • Best represented textually.

- Somewhat familiar or known.
- Ordered in an unpredictable fashion.
- Frequently changed.
- Large in number.
- Variable or fixed in list length.

Prompt Button

- Provide a visual cue that a list box is hidden by including a downward-pointing arrow to the right of the text box.
- Separate the button from the text box by a small space.

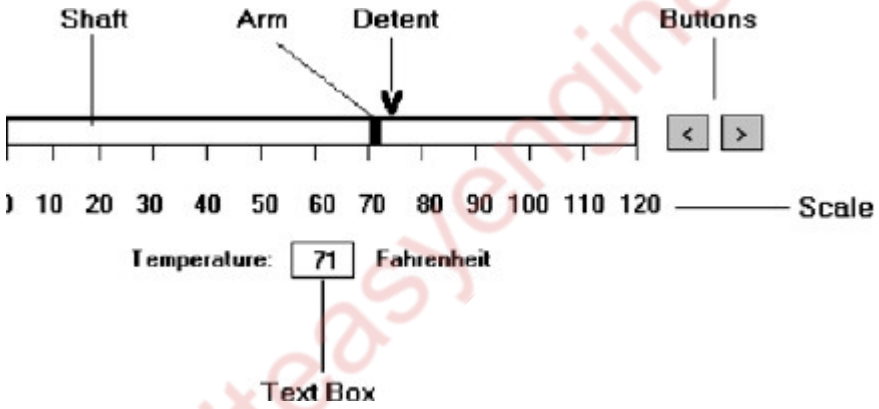
Other Guidelines

For the text box entry field, see the "Text Box/Single Line" guidelines. For the box and selection components, see the "Drop-down/Pop-up List Box" guidelines.

Slider

- Description:
  — A scale exhibiting degrees of a quality on a continuum.
  — Includes the following:
    - A shaft or bar.
    - A range of values with appropriate labels.
    - An arm indicating relative setting through its location on the shaft.
    - Optionally, a pair of buttons to permit incremental movement of the slider arm.
    - Optionally, a text box for typing or displaying an exact value.
    - Optionally, a detent position for special values.
  — May be oriented vertically or horizontally.
  — Selected by using the mouse to:
    - Drag a slider across the scale until the desired value is reached.
    - Point at the buttons at one end of the scale and clicking to change the value.
    - Keying a value in the associated text box.
- Purpose:
  — To make a setting when a continuous qualitative adjustment is acceptable, it is useful to see the current value relative to the range of possible values.

- Advantages:
  — Spatial representation of relative setting.
  — Visually distinctive.
- Disadvantages:
  — Not as precise as an alphanumeric indication.
  — Consumes screen space.
  — Usually more complex than other controls.
- Proper usage:
  — To set an attribute.
  — For mutually exclusive choices.
  — When an object has a limited range of possible settings.
  — When the range of values is continuous.
  — When graduations are relatively fine.
  — When the choices can increase or decrease in some well-known, predictable, and easily understood way.
  — When a spatial representation enhances comprehension and interpretation.
  — When using a slider provides sufficient accuracy.



General

- Use standard sliders whenever available.

Caption and Labels

- Caption:
  — Provide meaningful, clear, and consistent captions.
  — Display them using mixed-case letters.
  — Position the caption to the left of the box.
    • Alternately, it may be positioned left-justified above the slider.
- Labels:
  — Provide meaningful and descriptive labels to aid in interpreting the scale.

Scale

- Show a complete range of choices.

- Mark the low, intermediate, and high ends of the scale.
- Provide scale interval markings, where possible.
- Provide consistent increments.
- Permit the user to change the units of measure.
- If the precise value of a quantity represented is important, display the value set in an adjacent text box.

Slider Arm

- If the user cannot change the value shown in a slider, do not display a slider arm.

Slider Buttons

- Provide slider buttons to permit movement by the smallest increment.
- If the user cannot change the value shown in a slider, do not display slider buttons.

Detents

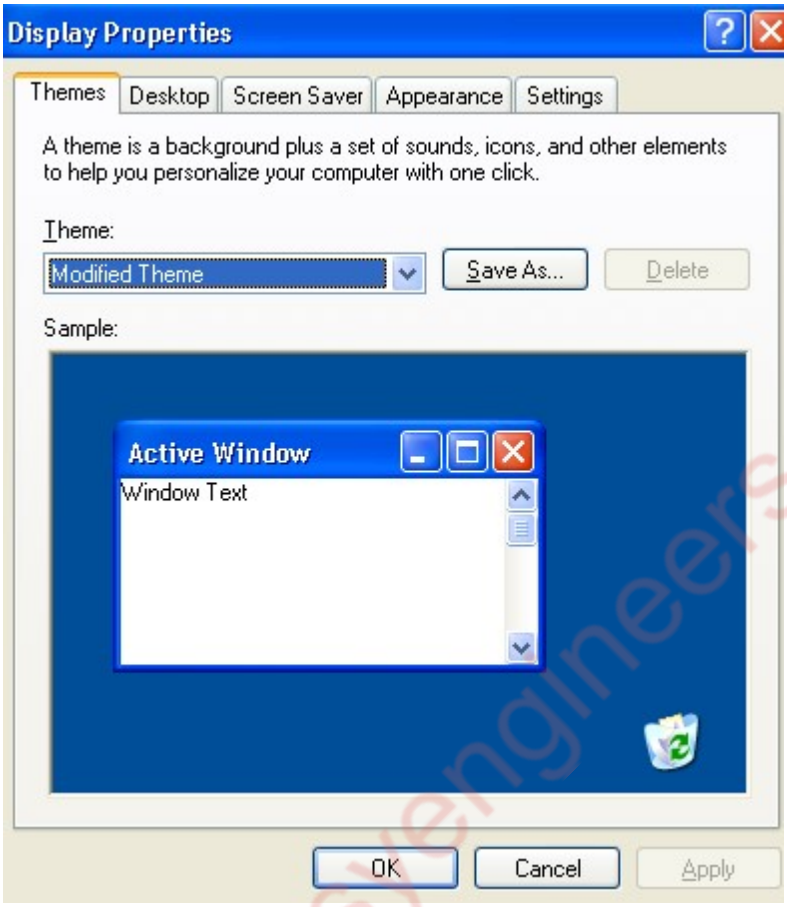
- Provide detents to set values that have special meaning.
- Permit the user to change the detent value.

Proportions

- To indicate the proportion of a value being displayed, fill the slider shaft in some visually distinctive way.
  — Fill horizontal sliders from left to right.
  — Fill vertical sliders from bottom to top.

Tabs

- Description:
  — A window containing tabbed dividers that create pages or sections.
  — Navigation is permitted between the pages or sections.
- Purpose:
  — To present information that can be logically organized into pages or sections within the same window.
- Advantages:
  — Resembles their paper-based cousins.
  — Visually distinctive.
  — Effectively organize repetitive, related information.
- Disadvantages:
  — Visually complex.
- Proper usage:
  — To present discrete, logically structured, related, information.
  — To present the setting choices that can be applied to an object.
  — When a short tab label can meaningfully describe the tab's contents.
  — When the order of information use varies.



Sections and Pages

- Place related information within a page or section.
- Order them meaningfully.
- Arrange pages so they appear to go deeper, left to right and top to bottom.
- Provide pages of equal size.

Location, Size, and Labels

- Place the tabs at the top of the page or section.
- Provide fixed-width tabs for pages or sections of related information.
- Provide textual labels.
  — Use system fonts.
  — Keep information brief and the same general length.
    • Nouns are usually better than verbs.
  — Use mixed case, capitalizing each significant word.
  — Assign a keyboard equivalent for keyboard access.
- Center the labels within the tabs.
- Restrict tabs to only one row.
- Arrange tabs so that they appear to go deeper, left to right and top to bottom.

Command Buttons

- If they affect only a page or section, locate the buttons on the page or section.
- If they affect the entire tabbed control, locate the buttons outside the tabbed pages

Date-Picker

- Description:
  — A drop-down list box that displays a 1-month calendar in the drop-down list box.
  — The displayed month can be changed through pressing command buttons with left- and right-pointing arrows.
    • The left arrow moves backward through the monthly calendars.
    • The right arrow moves forward through the monthly calendars.
  — A date for the list box can be selected from the drop-down calendar.
- Purpose:
  — To select a date for inscribing in a drop-down list box.
- Advantages:
  — Provides a representation of a physical calendar, a meaningful entity.
  — The calendar listing is ordered in a predictable way.
  — Visually distinctive.
- Disadvantages:
  — Requires an extra step to display the calendar.
  — When displayed, all month choices are not visible, requiring a form of scrolling to access the desired choice.
- Proper usage:
  — To select and display a single date in close monthly proximity to the default month presented on the drop-down list box.

Tree View

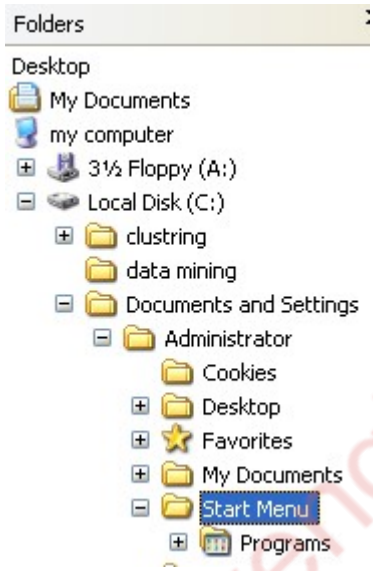
- Description:
  — A special list box control that displays a set of objects as an indented outline, based on the objects' logical hierarchical relationship.
  — Includes, optionally, buttons that expand and collapse the outline.
    • A button inscribed with a plus (+) expands the outline.

• A button inscribed with a minus (-) collapses the outline.

— Elements that can optionally be displayed are:

• Icons.
• Graphics, such as a check box.
• Lines to illustrate hierarchical relationships.

- Purpose and proper usage:
  — To display a set of objects as an indented outline to illustrate their logical hierarchical relationship.



Scroll Bars

- Description:
  — An elongated rectangular container consisting of:
    • A scroll area.
    • A slider box or elevator inside.
    • Arrows or anchors at either end.
  — Available, if needed, in primary and secondary windows, some controls, and Web pages.
  — May be oriented vertically or horizontally at the window or page edge.
- Purpose:
  — To find and view information that takes more space than the allotted display space.
- Advantages:
  — Permits viewing data of unlimited size.
- Disadvantages:
  — Consumes screen space.
  — Can be cumbersome to operate.
- Proper use:
  — When more information is available than the window space for displaying it.
  — Do not use to set values.

Scroll Bar Design Guidelines

- General:
  — Provide a scroll bar when invisible information must be seen.
- Scroll area or container:
  — To indicate that scrolling is available, a scroll area or container should be provided.
    - Construct it of a filled-in bar displayed in a technique that visually contrasts with the window and screen body background.
- Scroll slider box or handle:
  — To indicate the location and amount of information being viewed, provide a slider box or handle.
    - Constructed of a movable and sizable open area of the scroll area, displayed in a technique that contrasts with the scroll area.
    - By its position, spatially indicate the relative location in the file of the information being viewed.
    - By its size, indicate, proportionately, the percentage of the available information in the file being viewed.
- Scroll directional arrows:
  — To indicate the direction in which scrolling may be performed, directional arrows should be provided.
    - Construct them as arrows in small boxes, with backgrounds that contrast with the scroll area.
- Selection:
  — When the slider box/handle has been selected, highlight it in some visually distinctive way.
- Location:
  — Position a vertical (top-to-bottom) scroll bar to the right of the window.
  — Position a horizontal (left-to-right) scroll bar at the bottom of the window.
- Size:
  — A vertical scroll bar should be the height of the scrollable portion of the window body.
  — A horizontal scroll bar should be at least one-half the width of the scrollable portion of the window body.
- Current state indication:
  — Whenever the window's size or the position of the information changes, the scroll bar components must also change, reflecting the current state.
  — Include scroll bars in all sizable windows.
    - If no information is currently available by scrolling in a particular direction, the relevant directional arrow should be subdued or grayed out.

Scroll Bar Usage Guidelines

- Scroll bar style:
  — Stick with standard, proven design styles.

- Directional preference:
  — Use vertical (top-to-bottom) scrolling.
  — Avoid horizontal (left-to-right) scrolling.

Media Controls

- For all playable files provide the following controls.
  — Play.
  — Pause/Resume.
  — Stop.
  — Rewind.
  — Fast Forward.
  — Volume.

Custom Controls

- Implement custom controls with caution.
- If used, make the look and behavior of custom controls different from that of standard controls.

Presentation Controls

- Common presentation controls are *static text fields, group boxes column headings, ToolTips, balloon tips,* and *progress indicators*.

Static Text Fields

- Description:
  — Read-only textual information.
- Purpose:
  — To identify a control by displaying a control caption.
  — To clarify a screen by providing instructional or prompting information.
  — To present descriptive information.
- Proper usage:
  — To display a control caption.
  — To display instructional or prompting information.
  — To display descriptive information.

Static Text Field Guidelines

- Captions:
  — Include a colon (:) as part of the caption.
  — Include a mnemonic for keyboard access.
  — When the associated control is disabled, display it dimmed.
  — Follow all other presented guidelines for caption presentation and layout.

- Instructional or prompting information:
  — Display it in a unique and consistent font style for easy recognition and differentiation.
  — Follow all other presented guidelines for prompting and instructional information.
- Descriptive information:
  — Follow all other guidelines for required screen or control descriptive information.

Group Boxes

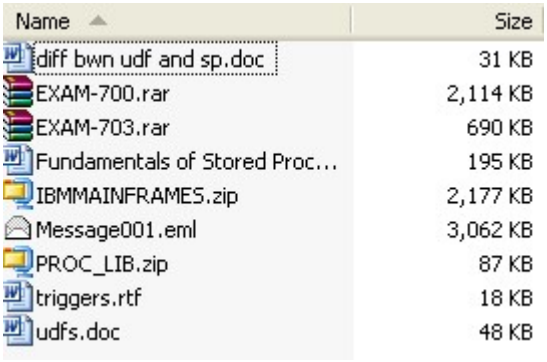
- Description:
  — A rectangular frame that surrounds a control or group of controls.
  — An optional caption may be included in the frame's upper-left corner.
- Purpose:
  — To visually relate the elements of a control.
  — To visually relate a group of related controls.
- Proper usage:
  — To provide a border around radio button or check box controls.
  — To provide a border around two or more functionally related controls.
- Guidelines:
  — Label or heading:
    • Typically, use a noun or noun phrase for the label or heading.
    • Provide a brief label or heading, preferably one or two words.
    • Relate label or heading's content to the group box's content.
    • Capitalize the first letter of each significant word.
    • Do not include and ending colon (:).
  — Follow all other guidelines presented for control and section borders.

Column Headings

- Description:
  — Read-only textual information that serves as a heading above columns of text or numbers.
  — Can be divided into two or more parts.
- Purpose:
  — To identify a column of information contained in a table.
- Proper usage:
  — To display a heading above a column of information contained in a table.
- Guidelines:
  — Heading:
    • Provide a brief heading.
    • Can include text and a graphic image.

• Capitalize the first letter of each significant word.
• Do not include an ending colon (:).

— The width of the column should fit the average size of the column entries.
— Does not support keyboard access.



ToolTips

- Description:
  — A small pop-up window containing descriptive text that appears when a pointer is moved over a control or element either:
    • Not possessing a label.
    • In need of additional descriptive or status information.
- Purpose:
  — To provide descriptive information about a control or screen element.
- Advantages:
  — Identifies an otherwise unidentified control.
  — Reduces possible screen clutter caused by control captions and descriptive information.
  — Enables control size to be reduced.
- Disadvantages:
  — Not obvious, must be discovered.
  — Inadvertent appearance can be distracting.
- Proper usage:
  — To identify a control that has no caption.
  — To provide additional descriptive or status information about a screen element.

ToolTip Guidelines

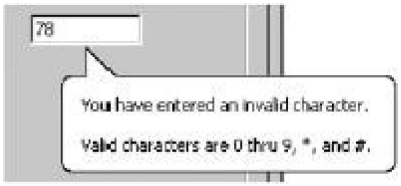
- Display after a short time-out.
- For toolbars, provide a brief word as a label.
  — Use mixed case in the headline style of presentation with no ending punctuation.
- For other elements, provide a brief phrase presenting descriptive or status information.
  — Use mixed case in the sentence style of presentation.
- Present ToolTips at the lower-right edge of the pointer.
  — Display them fully on the screen.

— For text boxes, display ToolTips centered under the control.

- Display them in the standard system ToolTip colors.
- Remove the ToolTip when the control is activated or the pointer is moved away.
- Don't substitute ToolTips for good design.

Balloon Tips

- Description:
  — A small pop-up window that contains information in a word balloon.
  — Components can include:
    • Title.
    • Body text.
    • Message Icons.
  — Appear adjacent to the item to which they apply, generally above or to left.
  — Only one tip, the last posted, is visible at any time.
  — Tips are removed after a specified time period.
- Purpose:
  — To provide additional descriptive or status information about a screen element.
- Advantages:
  — Provides useful reminder and status information.
- Disadvantages:
  — If overused they lose their attention-getting value.
  — If overused in situations the user considers not very important, their continual appearance can be aggravating.
- Proper usage:
  — To display noncritical:
    • Reminder information.
    • Notification information.
  — Do not use tips to display critical information.



Balloon Tip Guidelines

- General:
  — Use a notification tip to inform the user about state changes.
  — Use a reminder tip for state changes that the user might not usually notice.
  — Point the tip of the balloon to the item it references.

— Do not use them to replace ToolTips.
— Do not overuse balloon tips.

- Content:
  — Restrict them to a length of 100 characters, including title and body text.
  — Title text should:
    • If the tip refers to an icon or other image representing a specific object, include:
      — The object's name, using its normal capitalization.
      — The object's status, using sentence-style presentation without ending punctuation.
    • Be presented in bold.
  — Body text should:
    • Include a description of the situation in one or two brief sentences.
    • Include a brief suggestion for correcting the situation.
    • Be presented using mixed-case in the sentence style.

Progress Indicators

- Description:
  — A rectangular bar that fills as a process is being performed, indicating the percentage of the process that has been completed.
- Purpose:
  — To provide feedback concerning the completion of a lengthy operation.
- Proper usage:
  — To provide an indication of the proportion of a process completed.

Progress Indicator Guidelines

- When filling the indicator:
  — If horizontally arrayed, fill it from left to right.
  — If vertically arrayed, fill it from bottom to top.
- Fill it with a color or a shade of gray.
- Include descriptive text for the process, as necessary.
- Place text outside of the control.

Sample Box

- Description:

— A box illustrating what will show up on the screen based upon the parameter or parameters selected.
— May include text, graphics, or both.

- Purpose:
  — To provide a representation of actual screen content based upon the parameter or parameters selected.
- Guidelines:
  — Include a brief label.
  — Use mixed case in the headline style.
  — Locate it adjacent to the controls upon which it is dependent.

Scrolling Tickers

- Description:
  — Text that scrolls horizontally through a container window.
- Advantages:
  — Consume less screen space than full text.
- Disadvantages:
  — Hard to read.
  — Time-consuming to interpret.
  — Distracting.
- Guideline:
  — Do not use.

Selecting the Proper Controls

- The proper control will enable a person to make needed selections, entries, and changes quickly, efficiently, and with fewer mistakes. Improper selection most often leads to the opposite result.

Entry versus Selection—A Comparison

- Studies looked at the advantages and disadvantages of using either entry fields or selection fields for data collection.
- Entry involved keying text; selection was performed by pointing at a choice through the keyboard using the cursor control keys (not a mouse).
- The information compared was of three kinds: dates, text, and data. The first conclusion:

Choosing a Type of Control

- For familiar, meaningful data choose the technique that, in theory, requires the fewest number of keystrokes to complete.
- If the data is unfamiliar or prone to typing errors, choose a selection technique

Aided versus Unaided Entry

- Provide aided entry whenever possible.
  — Absorb any extra and unnecessary keystrokes.
  — Provide an auditory signal that auto completion has been performed.

Comparison of GUI Controls

DIRECT MANIPULATION
1. Drag and Drop On • The items are arrayed horizontally. An item is dragged to a new location above another item and released. The item in that position moves to the old location of the arriving item.
2. Drag and Drop Between • The items are arrayed horizontally. An item is dragged to a new location between two other items and released. The items are readjusted into new positions, including, when necessary, automatic wrap-around for items located at the end of the line.
SELECTION
3. Icons • The items are arrayed horizontally. Icons are positioned between each pair of items. Selecting an icon switches the positions of each adjacent item.
4. Radio Buttons • The items are presented in a matrix, item name along the left side, item position numbers across the top. Radio buttons in the matrix are selected to represent each item's position.
5. Menus (Drop-down List Boxes) • Items are positioned horizontally. A drop-down listing is activated, and the item for that location selected.
ENTRY
6. One Entry Area • A single text entry field is provided. A one-character mnemonic (F,N,S,D) is provided for each choice. The mnemonics are keyed in the order in which the items are to be arrayed.
7. Four Entry Areas • Four text entry fields, labeled with the item names are arranged vertically. A number (1-4) is keyed into each field, indicating the manner in which the items are to be ordered.

Mutually Exclusive Choice Controls

- For a small set of options (5), a medium set (12), and a large set (30), radio buttons were significantly faster than the other mutually exclusive controls.

- The medium and large set sizes (12 and 30) are larger than generally recommended for radio buttons (8 or less). The results indicate that radio buttons may effectively be used for these larger quantities

Nonexclusive Choice Controls

- For a small set of options (5) with two selected choices, a medium set (12) with three selected choices, and a large set (30) with eight selected choices, check boxes were significantly faster than the other nonexclusive controls.

Controls for Selecting a Value within a Range

- Setting range values included indicating a time, a percentage, or the transmission frequency of a radio station.
- Controls evaluated were the spin button, text entry field, and the slider.
- The spin button was the most accurate, and the text entry field fastest and most preferred.
- General conclusions are:
    - Making all options always visible will enhance performance.
    - Requiring additional actions to make further options visible slows performance.
    - For longer lists, scrolling tends to degrade performance more than the action associated with retrieving a hidden list.

Control Selection Criteria

- Selection of the proper control, then, depends on several factors. The first is the structure and characteristics of the property or data itself.
- Other considerations include the nature of the task, the nature of the user, and the limitations of the display screen itself
- Data considerations include the following:
    - Is the property or data *mutually exclusive* or *nonexclusive*? Does entry/selection require single or multiple items?
    - Is the property or data *discrete* or *continuous*? Discrete data can be meaningfully specified and categorized, while continuous data cannot.
    - Is the property or data *limited* or *unlimited* in scope? If limited, how many items will the data normally not exceed?
    - Is the property or data *fixed* or *variable* in list length? Are there always a fixed number of items, or will it varies?
    - Is the property or data ordered in a *predictable* or *unpredictable* fashion? If predictable, will the user be able to anticipate the next, unseen, item?
    - Can the property or data be *represented pictorially*? Will a picture or graphic be as meaningful as a textual description?
- Task considerations reflect the nature of the job. Considerations include the following:
    - *How often* is an item *entered* or *selected*?

- *How often* is an item *changed*?
- How *precisely* must the item be entered or selected?

- User considerations reflect the characteristics of the user. Important considerations:
  - How much *training* in control operation will be provided?
  - How *meaningful* or *known* is the property or data to the user?
  - How *easily remembered or learned* by the user is the property or data?
  - How *frequently used* will the system be?
  - Is the user an *experienced typist*?
- Display considerations reflect the characteristics of the screen and hardware.
  - How much *screen space* is available to display the various controls?

Choosing a Control Form

When to Permit Text Entry

- Permit text entry if any of the following questions can be answered *Yes*:
  — Is the data unlimited in size and scope?
  — Is the data familiar?
  — Is the data *not* conducive to typing errors?
  — Will typing be faster than choice selection?
  — Is the user an experienced typist?

What Kind of Control to Choose

- Next are two tables providing some control recommendations based upon a control's known advantages, disadvantages, and proper usage characteristics

Best Controls for Certain Tasks and Screen Conditions

TASK	BEST CONTROL	IF SCREEN SPACE CONSTRAINTS EXIST
Mutually Exclusive	Radio Buttons	Drop-down/Pop-up List Box
Not Mutually Exclusive	Check Boxes	Multiple-Selection List Box
Select or Type a Value Text Entry Field	Radio Buttons with "Other"	Drop-down Combo Box
Setting a Value within a Range	Spin Button	Text Box

From Johnsgard et al., 1995

1. *IF:*	*USE:*
• *Mutually exclusive* alternatives. • Discrete data. • Best represented verbally. • Very limited in number (2 to 8). *AND:* • Typed entry is never necessary. • Content can never change. • Adequate screen space is available.	Radio Buttons
OR: • Typed entry is never necessary. • Content can never change. • Adequate screen space is not available.	Drop-down/Pop-up List Box
OR: • Typed entry may be necessary. • Content can change. • Adequate screen space is available.	Combo box
OR: • Typed entry may be necessary. • Content can change. • Adequate screen space is not available.	Drop-down/Pop-up Combo Box
2. *IF:*	*USE:*
• *Mutually exclusive* alternatives. • Discrete data. • Best represented verbally. • Potentially large in number (9 or more). *AND:* • Typed entry is never necessary. • Content can never change. • Adequate screen space is available.	Single-Selection List Box
OR: • Typed entry is never necessary. • Content can never change. • Adequate screen space is not available.	Drop-down/Pop-up List Box
OR: • Typed entry may be necessary. • Content can change. • Adequate screen space is available.	Combo Box
OR: • Typed entry may be necessary. • Content can change. • Adequate screen space is not available.	Drop-down/Pop-up Combo Box

Suggested Uses for Graphical Controls

3. *IF:*	*USE:*
• *Mutually exclusive* alternatives. • Discrete data. • Best represented graphically. • Content rarely changes. • Small or large number of items.	Palette
4. *IF:*	***USE:***
• *Mutually exclusive* alternatives. • Not frequently selected. • Content does not change. • Well-known, easily remembered data. • Predictable, consecutive data. • Typed entry sometimes desirable. *AND:* • Adequate screen space is not available.	Spin Box
OR: • Adequate screen space is available.	Combo Box
5. *IF:*	***USE:***
• *Mutually exclusive* alternatives. • Continuous data with a limited range of settings. • Value increases/decreases in a well-known, predictable way. • Spatial representation enhances comprehension.	Slider
6. *IF:*	***USE:***
• *Nonexclusive* alternatives. • Discrete data. • Best represented verbally. • Typed entry is never necessary. • Content can never change. • Adequate screen space is available. *AND:* • Very limited in number (2 to 8).	Check Boxes
OR: • Potentially large in number (9 or more).	Multiple-Selection List Box

IF THE COMMANDS:	USE:
Are standard commands provided by a tool set.	Commands provided by the tool set
Total seven or more, and can be arranged hierarchically into groups.	Menu bar and pull-downs
Total six or fewer, are selected frequently, and affect an entire window.	Buttons in a window
Total seven or more, are selected frequently, and affect an entire window.	Buttons in a toolbar
Are used with other controls, or are complicated commands and need to be simplified.	Buttons in a dialog box
Are sometimes used frequently and are sometimes used infrequently.	Buttons in a dialog box
Are frequently accessed and have only two conditions.	Toggled menu item

Choosing between Buttons and Menus for Commands

- Determining the proper way to present a command also depends on several factors.
- The following considerations are involved in choosing the correct command form:
    - Whether or not the command part of a *standard tool set*.
    - The total *number* of commands in the application.
    - The *complexity* of the commands.
    - The *frequency* with which commands are used.
    - Whether or not the command is used in association *with another control*.