

UNIT-IV**WINDOWS & COMPONENTS****Topics covered****Windows:**

- Characteristics
- Components
- Types
- Selection of device based and screen-based controls.

Components:

- Icons and images,
- Multimedia,
- Color and its uses

Window

A window is an area of the screen that contains a particular view of some area of the computer or some portion of a person's dialog with the computer.

Window Characteristics

- A name or title, allowing it to be identified
- A size in height and width (which can vary)
- Only active windows can have their contents altered
- A window may be partially or fully hidden behind another window
- Information within a window may extend beyond window's display area Presentation is arranged in relation to other windows (tiled, overlapping, or cascading)
- 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

- The value of windowing is best seen in the context of a task or job. A person performs a variety of tasks, often in a fairly unstructured manner. A person is asked to monitor and manipulate data from a variety of sources, synthesize information, summarize information, and reorganize information. Things are seldom completed in a continuous time frame. Outside events such as telephone calls, supervisor or customer requests, and deadlines force shifts in emphasis and focus. Tasks start, stop, and start again.
- Materials used in dealing with the tasks are usually scattered about one's desk, being strategically positioned in the workspace to make handling the task as efficient as possible. This spatial mapping of tools helps people organize their work and provides reminders of uncompleted tasks. As work progresses and priorities change, materials are reorganized to reflect the changes.
- Single-screen technology supports this work structure very poorly. Since only one screen of information can be viewed at one time, comparing or integrating information from different sources and on different screens often requires extensive use of one's memory. To support

memory, a person is often forced to write notes or obtain printed copies of screens. Switching between tasks is difficult and disruptive, and later returning to a task requires an extensive and costly restructuring of the work environment.

Presentation of Different Levels of Information

Information can be examined in increasing levels of detail. 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. Deeper levels are also possible in additional windows.

Presentation of Multiple Kinds of Information

- Variable information needed to complete a task can be displayed simultaneously in adjacent windows. An order-processing system window could collect a customer account number in one window and retrieve the customer's name and shipping address in another window.
- A third window could collect details of the order, after which another window could present factory availability of and shipping dates for the desired items. Significant windows could remain displayed so that details may be modified as needed prior to order completion. Low inventory levels or delayed shipping dates might require changing the order.

Sequential Presentation of Levels or Kinds of Information

- Steps to accomplish a task can be sequentially presented through windows. Successive windows are presented until all the required details are collected. 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. An insurance application, for example, will include different types of coverage.
- A requested type of coverage might necessitate the collection of specific details about that type of coverage. This information can be entered into a window presented to collect the unique data. The windows disappear after data entry, and additional windows appear when needed.

Access to Different Sources of Information

- Independent sources of information may have to be accessed at the same time. This information may reside in different host computers, operating systems, applications, files, or areas of the same file. It may be presented on the screen alongside the problem, greatly facilitating its solution. For instance, a writer may have to refer to several parts of a text being written at the same time. Or, a travel agent may have to compare several travel destinations for a particularly demanding client.

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.

Components of a Window

A typical window may be composed of up to a dozen or so elements. Some appear on all windows; others only on certain kinds of windows, or under certain conditions. For consistency purposes, these elements should always be located in the same position within a window. Most windowing systems provide consistent locations for elements in their own windows. Some inconsistencies do exist in element locations between different systems, however, as do some differences in what the elements are named, or what graphic images or icons are chosen to identify them. What follows is a description of typical window components and their purposes, with emphasis on the most popular windowing system, *Microsoft Windows*. Specifically reviewed will be primary windows, secondary windows, and a form of secondary window called the dialog box. An illustration of a primary window is found

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. Also, textual materials, which are usually read from left to right, fit most efficiently within this structure. The border comprises a line of variable thickness and color. This variation can be used as an aid in identifying the type of window being displayed. Windows filling an entire screen may use the screen edge as the border. If a window is resizable, it may contain control points for sizing it. If the window cannot be resized, the border coincides with the edge of the window.

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. In Microsoft Windows, the title bar may also possess, at the extreme left and right ends, control buttons (described below) for retrieving the system menu and performing window resizing. The title bar also serves as a control point for moving the window and as an access point for commands that apply to a window. For example, as an access point, when a user clicks on the title bar using the secondary mouse button, the pop-up or shortcut menu for the window appears. Pressing the Alt-Spacebar key combination also displays the shortcut menu for the window. Title bars are included on all primary and secondary windows. Title bar text writing guidelines are described in

Step 8 “Write Clear Text and Messages.” Microsoft recommends that one never place application commands or other controls in the title bar. Doing so may conflict with the special user controls Windows adds for configurations that support multiple languages.

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 × 16 version of the icon of the object being viewed. When clicked with the secondary mouse button, the commands applying to the object are presented. Microsoft suggests that:

If the window contains a tool or utility (that is, an application that does not create, load, and save its own data files), a small version of the application’s icon should be placed there instead

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. A system will typically provide a default set of menu actions that can be augmented by an application. In the past, some platforms have called the menu bar an *action bar*.

Menu bar design guidelines were presented in Step 4 “Develop System Menus and Navigation Schemes.” The contents of the menu bar and its pull-downs are determined by the application’s functionality and the context in which the user is interacting with it.

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*.

Microsoft Windows suggests using the status bar to display information about the current state of what is being viewed in the window, descriptive messages about a selected menu or toolbar button, or other noninteractive information. It may also be used to explain menu and control bar items as the items are highlighted by the user

Scroll Bar

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 area, extending its entire length. Horizontal scrolling is accomplished through a scrollbar located at the bottom of the work area. Scroll bars are more fully described in Step 7 "Choose the Proper Screen-Based Controls."

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*. Splitting a window permits multiple views of an object. A split window allows the user to:

- Examine two parts of a document at the same time.
- Display different, yet simultaneous, views of the same information.
- To support the splitting of a window that is not presplit by design, include a split box.
- The split box should be just large enough for the user to successfully target it with the pointer; the default size of a size handle, such as the window's sizing border, is a good guideline.

Tool Bar

Toolbars, illustrated in Figure 5.3, 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*. Each toolbar band includes a single-grip handle to enable the user to resize or rearrange the toolbars. When the user moves the pointer over the grip, it changes to a two-headed arrow. When the user drags the grip, the pointer changes to a split move pointer. To resize the toolbar to its maximum or minimum size, the user clicks the grip. Toolbars may occupy a fixed position or be movable. The design of toolbars is discussed in Step 7.

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.

If a horizontal scroll bar is included in the window, position the command area just below it. If a message area is included on the screen, locate the command area just above it.

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. If the window possesses a status bar, the grip is positioned at the bar's right end. Otherwise, it is located at the bottom of a vertical scroll bar, the right side of a horizontal scroll bar, or the junction point of the two bars.

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 consist of an open area for typing, or it may contain controls (such as text boxes and list boxes) or customized forms (such as spreadsheets). The work area may also be referred to as the *client area*.

Types of Windows

People's tasks must be structured into a series of windows. The type of window used will depend on the nature and flow of the task. Defining standard window types is again difficult across platforms because of the varying terminology and definitions used by different windowing systems, and changes in terminology for new versions of systems. For simplicity, the Microsoft Windows windowing scheme will be described. Summarized are a description of the window, its purpose, and its proper usage. Any other platform's windows may not behave exactly as presented, and some platform windows may exhibit characteristics common to more than one of the described window types.

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.

The *primary* window is the first one that appears on a screen when an activity or action is started. It is required for every function or application, possessing a menu bar and some basic action controls, as previously described. It should present the framework for the function's commands and data, and provide top-level context for dependent windows. 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.

The primary window is the main focal point of the user's activities and should represent an independent function. Avoid dividing an independent function into two or more primary windows, and avoid presenting unrelated functions in a single primary window. This tends to confuse people. Independent functions should begin in a primary window. A primary window should contain constantly used window components such as frequently used menu bar items and controls (for example, control bars) used by dependent windows. Also include in a primary window continually updated information such as the date and time.

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.

Secondary windows are supplemental windows. Secondary windows may be dependent upon a primary window or displayed independently of the primary window. They structurally resemble a primary window, possessing some of the same action controls (Close button) and possibly a What's This? button.

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. If necessary, it uses the primary window's menu bar. Most systems permit the use of multiple secondary windows to complete a task. In general, dependent secondary windows are closed when the primary window closes, and hidden when their primary window is hidden or minimized.

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.

An independent secondary window can typically be closed without regard to the state of any primary window unless there is an obvious relationship to the primary window.

Proper usage. Although secondary windows share many characteristics with primary windows, they also differ from primary windows in behavior and use. Secondary windows are used to perform supplemental or subordinate tasks, or tasks that are extended in nature. Frequently and occasionally used window components should also be presented in secondary windows. Microsoft Windows possesses several types of secondary windows called *dialog boxes*, *property sheets*, *property inspectors*, *message boxes*, *palette windows*, and *pop-up windows*.

Guidelines. A secondary window should typically not appear as an entry on the taskbar. Secondary windows obtain or display supplemental information that is usually related to the objects that appear in a primary window.

A secondary window is typically smaller than its associated primary window and smaller than the minimum display resolution. Microsoft recommends not displaying any secondary window larger than 263 dialog units \times 263 dialog units. Microsoft defines size and location of user-interface elements not in pixels but in *dialog units* (DLUs), a device-independent unit of measure.

One horizontal DLU is equal to one-fourth of the average character width for the current system font.

One vertical DLU is equal to one-eighth of the average character height for the current system font.

These sizes keep the window from becoming too large to display at most resolutions. However, they still provide reasonable space to display supportive information, such as Help information, that applies.

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.

A secondary window can be modal or modeless. Modal. Most secondary windows will be *modal*. Modal windows will not permit interaction with another window until the current dialog is completed. It remains displayed until the appropriate action is taken, after which it is removed from the screen. Modal dialog boxes typically request critical information or actions that must be reacted to before the dialog can continue. Since modal dialog boxes constrain what the user can do, limit their use to situations in which additional information is required to complete a command or when it is important to prevent any further interaction until satisfying a condition.

Modeless. A *modeless* dialog box permits the user to engage in parallel dialogs. Switching between the box and its associated window is permitted. Other tasks may be performed while a modeless dialog box is displayed, and it may be left on the screen after a response has been made to it. Actions leading to a modeless dialog box can be cancelled, causing the box to be removed from the screen. Use a modeless dialog box when interaction with a primary window or another secondary window must be permitted, for example, during the accessing of the Help function. Also, use a modeless dialog box when interaction with other windows must be repeated; for example, in a word search operation.

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.

Access to additional options can be accomplished by inclusion of a command button that opens another secondary window. These multiple secondary windows needed to complete a task may be presented in two forms, cascading or expanding.

Cascading. A *cascading* window keeps the original window displayed, with the dependent window displayed on top, offset slightly to the right and below the original secondary window. used when advanced options at a lower level in a complex dialog must be presented.

An indication that the dialog will be cascading is signaled by an ellipsis placed in the command button used to display the additional dialog box. Because of the confusion that can develop with too many cascades, restrict the number of cascades to no more than two in a given path. Do not cover information on the upper-level dialog boxes that may have to be referred to, such as box title bars and other critical or relevant information. If the cascaded window is independent in its operation, close the secondary window from which it was opened and display only the new window.

Unfolding. An *unfolding* secondary window expands to reveal additional options, a form of progressive disclosure. Unfolding windows, sometimes called *expanding* windows, are generally used to provide advanced options at the same level in a complex dialog. They are good alternatives when the interface contains a fixed set of options or controls that seldom need to be accessed. An unfolding window is an indication that the dialog will be expanding is signaled by a double arrow (>>) placed in the command button used to display the additional dialog box. Expand the box to right, preferably, or downward if screen space constraints exist. As an option, the same button can be used to “refold” the additional part of the window.

Selection of device based and screen based controls.

Device-based controls, often called input devices, are the mechanisms through which people communicate their desires to the system. Identify the characteristics and capabilities of device-based control

Identify the characteristics and capabilities of device-based control

- Trackball
- Joystick
- Graphic tablet
- Light pen
- Touch screen
- Voice
- Mouse
- Keyboard

Trackball

- Description – A ball that rotates freely in all directions in its socket

- **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 indirect, in plane different from screen
- Requires hand to be removed from keyboard keys
- Requires different hand movements
- May be difficult to control
- May be fatiguing to use over extended time

Joystick

- **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)

- **Disadvantage**

- Movement indirect, in plane different from screen
- Requires hand to be removed from keyboard keys
- Requires different hand movements
- May be difficult to control
- May be fatiguing to use over extended time
- May be slow and inaccurate

Graphic (Touch) 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 pencil

• Advantages

Direct relationship between hand and pointer movement in terms of direction and speed

- Does not obscure vision of screen
- More comfortable horizontal operating plane

• Disadvantage

- Movement is indirect, in a plane different from screen
- Requires hand to be removed from keyboard
- Requires different hand movements to use
- Finger may be too large for accuracy with small objects

Touch Screen

• Advantages

- Direct relationship between hand and pointer movement in terms of direction and speed
- Movement is direct, in the same plane as screen
- Requires no additional desk space

• Disadvantage

- 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 Damage the screen

Light Pen

• Description

- A special surface on a screen sensitive to the touch of a special stylus or pen

• Advantage

- 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

Disadvantage

- Hand may obscure part of screen
- Requires picking it 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

• **Advantage**

- Simple and direct
- Useful for people who cannot use a keyboard
- Useful when the user's hands are occupied

• **Disadvantage**

- 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 environment
- Impractical to use in quiet environment

Mouse

• **Advantage**

- Direct relationship between hand and pointer movement in terms of direction, distance, and speed
- Permit a comfortable hand resting position
- Selection mechanisms are included on mouse
- Does not obscure vision of the screen

• Disadvantage

- 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

Choose the Proper Screen Based Controls

Screen Based controls, often simply called controls and sometimes called widgets. 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.

Identify the characteristics and capabilities of the various screen-based controls, including:

- Buttons.
- Text entry/read-only controls.
- Selection controls.
- Combination entry/selection controls.
- Specialized operable controls.
- Custom controls
- Presentation controls.
- Web controls.
- Select the proper controls for the user and tasks

.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.
- 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.

Command Buttons (Scrolling and Button Activation)

- Use buttons to move between multi-page forms, not scroll bars Label buttons Next and Previous.
- Highlight the button in some visually distinctive manner when the point is resting on it and the button is available for selection

Text Entry/Read-Only Controls (Captions)

- For entry boxes Place a colon (:) immediately following the caption
- For single fields, caption can be located in front of upper-left corner of the box
- For multiple fields, position the caption upper left of the box For read-only boxes
- If the data field is long or about the same length, center the caption above the displayed text box
- If the data is alphanumeric, short, or quite variable in length, left-justify the caption above the displayed
- If the data field is numeric and variable in length, right-justify the caption above the displayed

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.

- Radio Buttons
- Check Boxes
- Palettes
- List Boxes
- List View Controls
- Drop-down/Pop-up List Boxes

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

Check Boxes

Each option acts as a switch and can be either “on” or “off”

When an option is selected, a mark (X) appears within the square box, or the box is highlighted in some other manner Otherwise the square is unselected or empty (off)

Each box can be switched on or off independently used alone or grouped in sets

Palettes:

- A control consisting of a series of graphical alternatives.
- The choices themselves are descriptive, being composed of colors, patterns, or images
- To set one of a series of mutually exclusive options presented graphically or pictorially
- Usually consume less screen space than textual equivalents
- 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
- Create boxes of equal size
- Position the boxes adjacent to, or butted up against another
- A columnar orientation is the preferred manner
- Top to bottom, Left to right ordering by expected order, frequency of occurrence, sequence of use or alphabetically
- Display it less brightly than the other choices, if a choice is not available
- Highlight the choice in some visually distinctive way when the pointer is resting
- When a choice is selected, distinguish it visually from the unselected choices

List Boxes:

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)
- Unlimited number of choices
- If the list content change, items will be hard to find
- Good for data that are
- Best represented textually
- Not frequently selected
- Large in number
- Fixed in list length
- Clearly and meaningfully
- Describe the choices available
- Present in mixed case
- Left-align into columns

- Require no more than 40 page-downs to search a list
- If more are required, provide a method for using criteria Must be long enough to display 6-8 choices

Spin Boxes:

A single line field followed by two small, vertically arranged buttons (pointing up and pointing down arrow)

Selection/entry is made by:

- Using the mouse to point at one of directional buttons
- Keying a value directly into field itself

Advantages:

- Consumes little screen spaces
- Flexible, permitting selection or typed entry

Disadvantages:

- Difficult to compare choices.
- Can be awkward to operate.
- Useful only for certain kinds of data

Slider:

- A scale exhibiting degrees of a quality on a continuum
- To make a setting when a continuous qualitative adjustment is acceptable
- Spatial representation of relative setting
- Not as precise as an alphanumeric indication

COMPONENTS**ICONS**

- Icons are most often used to represent objects and actions with which users can interact
- Icons may stand alone on a desktop or in a window, or be grouped together in a toolbar
- A secondary use of an icon is to reinforce important information, a warning icon in a dialog message box

Kinds of Icons

The use of icons to reflect objects, ideas, and actions is not new to mankind. We've been there before. Early humans (100,000 years or so ago) used pictographs and then ideographs to communicate. Some of these early communications can still be found today on rock walls and in caves around the world. Until recent times, this was also the only way to communicate in some cultures (Native Americans and Australian aborigines, for example). Word writing is traced back to Chinese writing from about 6000 BC and Egyptian hieroglyphics from about 3000 BC. This was followed by cuneiform (Babylonia and Assyria) from about 1900 BC, and the contemporary Chinese vocabulary (numbering about 50,000) around 1500 BC. In 1000 BC the Phoenicians developed a 22-sign alphabet that the Greeks adopted about 800-600 BC. The Greeks passed this alphabet on to the Romans about 400 BC, who then developed a 23-character alphabet. This

alphabet has been modified and embellished but has remained essentially the same for the last 2000 years.

- Pictorial representations, then, have played a prominent role in mankind's history. Word writing, however, unleashed much more flexibility and richness in communication. This has caused some skeptics to wonder why; after taking 2500 years to get rid of iconic shapes, we have now revived them on screens.
- Whatever the past, today, objects or actions *are* depicted on screens by icons. The term icon by itself, however, is not very specific and can actually represent very different things. An attempt has been made by some to define the actual types of icons that do exist.

CHARACTERISTICS OF ICONS

Syntactic refers to an icon's physical structure Shape, Color, Size Similar shapes and colors can be used to classify a group of related icons

Semantics is the icon's meaning what does it refer – a file, a waste basket, or some other objects?

Pragmatics is how the icons are physically produced and depicted Is the screen resolution sufficient to illustrate?

Syntactic, semantics and pragmatics determine an icon's effectiveness and usability

INFLUENCES ON ICON USABILITY

Provide icons that are

Familiar: How familiar is the object being depicted? Familiarity will reduce learning time. How familiar are the commonly seen icons in Figure 11.1? Lack of familiarity requires learning the icons' meanings. Very unfamiliar icons require a great deal of learning.

Experience often makes words and numbers more familiar to a person than symbols. Confusion matrices have been developed through extensive research for alphanumeric data (0 versus O, 1 versus I). Graphic symbols may be more visually similar to each other.

Clarity. Is the icon legible? Does the shape, structure, and formation technique on the screen permit a clear and unambiguous depiction of what it is? Screen resolution should be sufficiently fine to establish clear differences of form at the normal working distance. The resolution and pixel shapes for screens differ from one another.

Icons must appear correctly and consistently no matter what kind of screen is used. If color is used, it should contrast well with the background. Poor clarity will lead to identification errors and slower performance.

Simplicity. Is the icon simple? Is the shape clean and devoid of unnecessary embellishments? Too many parts will only confuse the screen viewer.

Consistency. Are families of icons consistent in structure and shape? Are the same icons displayed on different screens consistent in shape and structure? Are the same icons displayed in different sizes also consistent in structure and shape?

Directness. How "sign-like" is the icon; how well does it convey its intended meaning? For concrete objects and actions, direct links are more easily established. Adjectives, adverbs, conjunctions, and

prepositions can cause problems, however. Also, how does one easily convey concepts such as bigger, smaller, wider, or narrower?

Efficiency. In some situations, a graphics screen may be less efficient, consuming more screen display space than a word or requiring more physical actions by the user than text. A telephone directory of 50 names and numbers listed on an alphanumeric screen may consume the same screen space required for, and manipulation of, 15 file cards. Raising an arm or moving a mouse may be slower than simply typing. In other situations, icons can be more effective than words in communicating concepts in a smaller area of space. Icons' strength lies in situations where this occurs.

Discriminability. The symbols chosen must be visually distinguishable from other symbols. A person's powers of differentiation for shapes and other forms of codes have been experimentally determined over the years. The maximum number of codes that can be effectively differentiated by a human being, including geometric shapes, is summarized in Table 11.1. A person's ability to discriminate alphabetic or alphanumeric information is much more potent.

Context. The context of a symbol may change its meaning. Does the rabbit symbol illustrated in Figure 11.1, if seen on a road sign in a national park, mean, "go faster"? From this contextual perspective, icons are similar to words.

Expectancies. The symbol may be comprehended, but a false conclusion may be reached about the desired action because of an incorrect expectancy. A study of international road signs found that eight percent of all drivers never saw the "do not do" slash through a symbol on a road sign. Their expectancy was that they could do it, not "not do it."

Also consider the Context in which the icon is used Expectancies of users Complexity of task

Choosing Icons

- A Successful Icon
- Looks different from all other icons
- Is obvious what it does or represents
- Is recognizable when no larger than 16 pixels square
- Look as good in black and white as in color

Size

- 16x16, 24x24, 26x26, 32x32 pixels 16-and-256 color version
- Use colors from the system palette
- Provide as large a hot zone as possible
- With stylus or pen: 15 pixels square
- With mouse: 20 pixels square
- With finger: 40 pixels square

Creating Images

- Create familiar and concrete shapes
- Create visually and conceptually distinct shapes
- Incorporate unique features of an object
- Do not display within a border Clearly reflect object represented
- Simple reflect object represented, avoiding excessive detail

- Create as a set, communicating relationships to one another through common shapes
- Provide consistency in icon type
- Create shapes of the proper emotional tone
- Create familiar and concrete shapes
- Create visually and conceptually distinct shapes

Drawing Images

- Providing consistency in shape over varying sizes
- Do not use triangular arrows in design to avoid confusion with other system symbols
- When icons are used to reflect varying attributes, express these attributes as meaning meaningfully as possible
- Provide proper scale and orientation
- Use perspective and dimension whenever possible
- Accompany icon with a label to assure intended meaning

Multimedia

The graphical flexibility of the Web permits inclusion of other media on a screen, including images, photographs, video, diagrams, drawings, and spoken audio. The availability of these additional interface elements has, however, been a double-edged sword. On the one hand, the various media can be powerful communication and attention-getting techniques. Multimedia can hold the user's attention, add interest to a screen, entertain, and quickly convey information that is more difficult to present textually.

It can also make the Web much more accessible to people with disabilities. On the other hand, effective use of multimedia in design has been hindered by a lack of knowledge concerning how the various media may best be used, and a scarcity of applied design guidelines. (GUI guidelines relevant to Web page design have been available for years, but their existence was either unknown or ignored.) Effective multimedia use has also been hindered by the "let's use it because we have it" attitude exhibited by many designers. (To be fair, early GUI design has suffered from the same problem.) The resulting usability problems, user confusion and frustration, poor screen legibility, and slow downloads, and so on have created situations where the user was too often denied an efficient and meaningful Web experience.

As a result, recent studies (Spool et al., 1997, for example) have found that the most difficult to use Web sites were those that were graphically intense, and the top Web sites were characterized by little, if any, multimedia. Studies have also found that for users, text is currently a much more important Web site component than graphics. (At least at this stage in Web evolution.) Today, consequently, good interface design employs multimedia in a conservative and appropriate manner. The objective is good interaction design, not "sparkle." In the future, experts say, multimedia elements will be much better integrated with browsers, alleviating many of today's usability problems.

Graphics

■ Use graphics to:

- Supplement the textual content, not as a substitute for it.
- Convey information that can't be effectively accomplished using text

— Enhance navigation through:

- Presenting a site overview
- Identifying site pages.
- Identifying content areas.
- Limit the use of graphics that take a long time to load.
- Coordinate the graphics with all other page elements.

Graphics contained in Web pages serve several distinct purposes, which can be classified as follows:

Navigational. To identify links that may be followed.

Representational. To illustrate items mentioned in the text.

Organizational. To depict relationships among items mentioned in text.

Explanative. To show how things or processes work.

Decorative. To provide visual appeal and emphasis.

Graphics must always be used for a specific purpose. This purpose must be determined before designing or choosing the graphic itself. Graphics should only be used when they add to a Web site's message. Graphics that do not relate to a Web site's purpose, and do not strengthen the Web site's message should never be used.

Images

- Use standard images,
- image internationalization
- Provide descriptive text or labels with all images
- Distinguish navigational images from decorative images
- Minimize
- The number of presented images
- The size of presented images
- Image animation
- Number of colors
- GIF, JPEG is prefer

choosing proper colors

- Color adds dimension, or realism, to screen usability.
- Color draws attention because it attracts a person's eye.

Color—What Is It?

- Wavelengths of light themselves are not colored. What is perceived as actual color results from the stimulation of the proper receptor in the eye by a received light wave.

- The name that a color is given is a learned phenomenon, based on previous experiences and associations of specific visual sensations with color names. Therefore, a color can only be described in terms of a person's report of his or her perceptions.
- The visual spectrum of wavelengths to which the eye is sensitive ranges from about 400 to 700 millimicrons.
- Objects in the visual environment often emit or reflect light waves in a limited area of this visual spectrum, absorbing light waves in other areas of the spectrum.
- The dominant wavelength being "seen" is the one that we come to associate with a specific color name. The visible color spectrum and the names commonly associated with the various light wavelengths

Color Uses

- Use color to assist in formatting
- Relating elements into grouping
- Breaking apart separate groupings of information
- Highlighting or calling attention to important information
- Use color as visual code to identify
- Screen captions and data
- Information from different sources
- Status of information
- Use color to
- Realistically portray natural objects
- Increase screen appeal

Color, then, is a combination of hue, chroma, and value. In any one instance what we call "blue" may actually be one of several hundred thousand "blues." This problem has confounded color research over the years. A "blue" may be unacceptable in one situation because it is highly saturated and dark, but perfectly acceptable in another, being less saturated and light. The exact measures of a color are rarely reported in the literature.

RGB

Many color monitors use the three primary colors of light, in various combinations, to create the many colors we see on screens. By adjusting the amounts of red, green, and blue light presented in a pixel, millions of colors can be generated. Hence, color palette editors exist with labels R, G, and B (or the words spelled out).

HSV

- Some palette editors use a convention based on the Munsell method of color notation called HSV, for hue, saturation, and value (or HSL for hue, saturation, and lightness). Again, various combinations produce different colors.

Dithering

- The eye is never steady, instead trembling slightly as we see. If pixels of different colors are placed next to each other, this tremor combines the two colors into a third color. This is referred to as *dithering*, and sometimes *texture mapping*.

Taking advantage of this phenomena, an optical illusion, a third color can be created on a screen.

Dithering is

- often used to create a gray scale when only black and white pixels are available to work with. A difference of opinion exists on whether dithering should, or should not, be used on a screen. *The*

Macintosh Human Interface Guidelines (Apple Computer, 1992b) discourage its use, stating it creates unnecessary visual clutter.

Color in Context

- Color is subject to contextual effects
- Small adjacent colored images may appear to the eye to merge or mix
- A color on a dark background will look lighter and brighter than the same color on a light background
- Colors also change as light levels change

Choosing Colors for Categories of Information

- Color chosen to organize information or data on a screen must aid the transfer of information from the display to the user, some examples of using color code
- If decisions are made based on the status of information on the screen, color-code the types of status the information
- Screen searching is performed to locate information of particular kind, color-code for contrast
- If the sequence of information use is constrained or ordered, use color to identify the sequence
- If the information on a screen is crowded, use color to provide visual grouping