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User Interface Design

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PART 1

The importance of the user interface

Defining the User Interface

User interface design is a subset of a field of study called *human-computer interaction* (HCI). HCI is the study, planning, and design of how people computers work together so that a person's needs are satisfied. HCI designers must consider a variety of factors.

- What people wants and expects?
- What physical limitations and abilities people possess?
- How their perceptual and information processing systems work?
- What people find enjoyable and attractive?
- Technical characteristics and limitation of the computer hardware and software.

The user interface is the part of a computer and its software that people can see, hear, touch, talk to, or otherwise understand or direct. The user interface has essentially two components Input and Output.

- What are those Input and Output?
- What outputs in interface design that is still remain unexplored?

Proper interface design will provide a mix of well-designed input and output mechanisms that satisfy the user's needs, capabilities and limitations in the most effective way possible. The best interface is the one that is not noticed, one that permits user to focus on the information and task at hand and not the mechanisms used to present the information and perform task.

The Importance of Good Design

Well-designed interface and screen is important to users, because it is a window to view the capabilities of the system. A Screen's layout and appearance affect a person in a variety of ways. If they are confusing and inefficient, people will have greater difficulty in doing their jobs and will make more mistakes. Poor design may even chase some people away from a system permanently.

The Benefits of Good Design

Poor clarity forced screen user to spend extra second per screen

Additional second required per screen in seconds	Additional years required to process 4.8 million screens per year
1	.7
5	3.6
10	7.1
20	14.2

Introduction to Graphic User Interface (GUI)

1973 : First to pull together all the elements of the modern GUI
1981 : Widely introduced pointing, selection, and mouse
1983 : Apple introduce Pull-down menus and menu bars
1984 : Apple introduces the Macintosh
1985 : Microsoft Windows 1.0
1987 : IBM's Presentation manager- graphics OS replacement for dos
: The first color Macintosh
1989 : Unix-based GUIs released, Microsoft Windows 3.0 released
1992 : OS/2 Workplace Shell, Microsoft Windows 3.1 released
1993 : Microsoft Windows NT released
1995: Microsoft Windows 95 released
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.
2001: Microsoft Window XP released

In a graphical interface, the primary interaction mechanism is pointing device of some kind. What the user interact with is a collection of elements refer to as objects. Objects are always visible to the user and used to perform tasks. What people perform operations is called action. The operations include accessing and modifying objects by pointing, selecting, and manipulating.

The Popularity of Graphics

The reasons that a graphical screen replaces the text-based screen are:

- Information floated in the windows.
- Windows could also float above other windows.
- Information could appear and disappear as needed.
- In some cases text could be replaced by graphical images called icons.
- Icons could represent objects or actions.
- Screen navigation and commands are executed through menu bars and pull-downs.
- Screen objects and actions were selected through use of pointing mechanisms, such as the mouse or joystick.

Increased computer power and the improvement in the display enable the user's action to be reacted to quickly, dynamically and meaningfully. This new interface is characterized as representing one's desktop. Desktop contains scattered notes, papers and objects such as files, trays and trashcans arrayed around the screen it is sometimes referred to as the Windows, Icons, Menus and Pointing device (WIMP) interface.

Advantage of Graphical Systems

- Secondary Windows
- Symbols recognized faster than text.
- Faster learning.
- Faster use problem solving.
- Easier remembering.
- More natural.
- Utilize visual/spatial cues.
- Fosters more concrete thinking.
- Fewer errors.
- Increased feeling of control.
- Immediate feedback.
- Less anxiety concerning use (for new user).
- More attractive.
- May consume less space (not always the case).
- Replaces national languages.
- Easily augmented with text displays.
- Low typing requirements.
- Smooth transforming from command language system.

Disadvantage of Graphical Systems

- Secondary Windows
- Greater design complexity.
- Learning still necessary.
- Lack of experimentally-derived design guidelines.
- Inconsistencies in technique and terminology.
- Working domain is the present.
- Not always familiar.
- Human comprehension limitations.
- Window manipulation requirements.
- Few tested icons exist.
- Inefficient for touch typist.
- Inefficient for expert users.
- Not always the preferred style of interaction "Textual Captions".
- Not always fastest style of interaction.
- Increased chance of clutter and confusion.
- May consume more screen space.

- Hardware limitations.

Characteristics of the GUI

- Sophisticated Visual Presentation

The display of 16 million or more colors is possible. Graphics also permits animation and presentation of photographs and motion video. Meaningful interface presented to the user in a graphical system include windows (primary, secondary, or dialog boxes), menus (menu bar, pull-down, pop-up), icons to represent objects, assorted screen-based controls (setting, scroll bar, buttons), and a mouse and cursor. The objective is to reflect visually on the screen the real world of the user as realistically, meaning fully, simply and clearly as possible.

- Pick and Click Interaction

Activity required of a person to identify this element for a proposed action is commonly referred to as pick. The signal to perform an action is called click. Pick-and-Click is most often mouse and its buttons. The user moves the mouse pointer to the relevant element (pick) and the action is signaled (click).

- Restricted Set of Interface Options

The array of alternatives available to the user is what is presented on the screen or what may be retrieved through what is presented on the screen, nothing less, nothing more. This concept is WYSIWYG. But what is WYSIWYG?

- Visualization

Visualization is a cognitive process that allows people to understand information that is difficult to perceive (too voluminous or too abstract). The best visualization method for an activity depends on what people are trying to learn from the data. The goal is not necessarily to reproduce a realistic graphic image, but to produce one that express the most relevant information. Effective visualizations can help mental sights, increase productivity, and faster and more accurate use of data.

- Object Orientation

A graphical system consists of objects and actions. Objects are what people see on the screen. A well-designed system keeps users focused on objects not how to fulfill actions. Objects can be composed of sub-objects. Question: If a document is an object, what could be document’s sub-objects?

IBM breaks objects into three meaningful classes.

- Data objects: Objects that present information (text or graphic)
- Container objects: Objects that hold other objects
- Workplaces: Desktop
- Folders: Long-term storage of objects

- Work areas: Temporary storage folders used for storing multiple objects currently working on
- Device objects: physical object in the real world such as printer or trash baskets

Microsoft Windows specifies the characteristics of objects depending on the relationships that exist between them.

- A collection: objects sharing a common aspect (Ex. result of query or multiple selection of objects)
- A constraint: Changing an object in a set affects some other object in the set (Ex. A document being organized into pages)
- A composite: Significant relationship between objects (Ex. Collection of words organized into a paragraph)
- A container: Object in which other objects exist (Ex. Text in document or document in a folder

• Use of Recognition Memory

Continuous visibility of objects and actions encourage use of a person's more powerful recognition memory. The "Out of sight, out of mind" problem is eliminated.

• Concurrent Performance of Functions

Graphic systems may do two or more things at one time. Multiple programs may run simultaneously.

The Web User Interface

Web interface design is essentially the design of navigation and presentation of information. The design goal is to build a hierarchy of menus and pages that feel natural, is well structured, is easy to use, and is truthful. The Web is a navigation environment where people move between pages of information, not an application environment (It is also a graphically rich environment).

Web interface design is difficult for a number of reasons:

- HTML was limited in objects and interaction styles and did not provide a means for presenting information in the most effective way for people.
- Browser navigation is mostly confined to a "Back" and "Forward" concept which can destroy many minutes worth of work.
- "back-to-where" and "forward-to-where" is often unremembered or unknown.
- Navigation to destination unknown, Invisible navigation buttons, link jumps.

The popularity of the Web

Web allows millions of people scattered across the globe to communicate, access information, publish and be heard. It also allows people to control much

of the display and the rendering of Web pages. User control has had some decided disadvantages. Slow download times, confusing navigation, confusing page organization, disturbing animation, or undesirable site features

Principle of User Interface Design

- Aesthetically Pleasing

A design aesthetic is attractive to the eyes and draws attention. Visual appeal makes a computer system accessible and inviting. To provide visual appeal, we can follow these presentation and graphic design principles:

- Provide meaningful contrast between screen elements
- Create groupings
- Align screen elements and groups
- Provide three-dimensional representation
- Use color and graphics effectively and simply

Good design combines power, functionality, and simplicity with a pleasing appearance

- Clarity

The interface should be visually, conceptually, and linguistically clear including:

- Visual elements: understandable, relating to the user's real world, concepts and functions
- Metaphors: should be realistic and simple
- Word and Text: should be simple, unambiguous and free of technical term

- Compatibility
  - User compatibility
    Design must be appropriate and compatibility with the needs of the user or client. Common error is to assume that all users think feel and behave exactly like the developer.
  - Task and Job compatibility
    A system should match the tasks a person must do the perform job.
    The user must never be forced to navigate between applications or many screens to complete tasks.
  - Product compatibility
    User of the new system is often the user of other systems or earlier version of the new system ◊ Habits, expectations and level of knowledge have been established. Making new systems compatible with existing systems will take advantage of what users already know and reduce the necessity for new learning

- Comprehensibility

A system should be easily learned and understood. A user should know the following: What to look at, What to do, When to do it, Where to do it, Why to do it, How to do it?

- Configurability

Permit easy personalization, configuration, and reconfiguration setting.

- Consistency

A system should look, act, and operate the same throughout. Similar components should:

- Have a similar look
- Have similar uses
- Operate similarly
- The same action should always yield the same result.
- The function of elements should not change.
- The position of standard elements should not change

Consistency is important because it can reduce requirements for human learning.

- Control

Control is feeling in charge, feeling that system is responding to your action. Control is achieved when a person is able to determine:

- What to do
- How to do it
- Easily to get it done

Lack of control is signaled by:

- Long delays in system responses
- Surprising system actions
- Difficulties in obtaining necessary information

- Directness

Tasks should be performed directly. Also, available alternatives should be visible. The effect of actions on object should be visible.

- Efficiency

Minimize eye and hand movements, and other control actions. Transitions between various system controls should flow easily and freely. Navigation paths should be as short as possible. Eye movements through a screen should be obvious and sequential. Anticipate the user's wants and needs wherever possible. At each step in process, present to the user all the information and tools needed to complete the process. Do not require user to search for and gather necessary information and tools

- Familiarity

Employ familiar concepts and use languages that are familiar to the user. Keep the interface natural, mimicking the user's behavior patterns
Dialogs should mimic one's thought process and vocabulary. Use real-world metaphors

- Flexibility

A system must be sensitive to the differing needs of its users, enabling a level and type of performance based upon:

- Each user's knowledge and skills
- Each user's experience
- Each user's personal preference
- Each user's habits
- The condition's at that moment

Highly flexible can confuse inexperienced people, causing them to make more errors. Flexibility may not always be used, some people prefer to continue doing things in the way they first learned.

- Forgiveness

People will make mistakes; a system should tolerate those that are common and unavoidable. A forgiving system keeps people out of trouble. A system oversensitive to error inputs will discourage users from exploring and trying new things. Prevent errors from occurring whenever possible. When an error does occur, provide constructive message.

- Predictability

The user should be able to anticipate the natural progression of each task. Provide distinct and recognizable screen elements. Provide cues to the result of an action to be performed. Predictability is greatly enhanced by design consistency.

- Recovery

A person should be able to retract and action by issuing an undo command. Knowing that an action can be reversed reduces much of the worry of new users. The return point could be the previous action, previous screen, a recent closure point. The goal is stability, or returning easily to the right track when a wrong track has been taken.

- Responsiveness

The system must rapidly respond to the user's requests. Provide immediate acknowledgements for all user actions in term of Visual, Textual or Auditory. Also, never leave the screen blank for more than a moment, because the user may think the system has failed. If a request requires an unusually long processing time, or one that is longer than customary, provide an interim "in-progress" message.

- Simplicity

Provide as simple an interface as possible. Five ways to provide simplicity:

- User progressive disclosure, hiding things until they are needed by present common and necessary function first, prominently feature important functions, hide more sophisticated and less frequently used functions.
- Provide defaults.
- Minimize screen alignment points.
- Make common actions simple.
- Provide uniformity and consistency.

- Transparency

Permit the user to focus on the task or job, without concern for the mechanics of the interface. Workings and reminders of workings inside the computer should be invisibles to the user.

- Trade-Offs

Final design will be based on a series of trade-offs balancing often-conflicting design principles. People's requirements always have a higher priority than technical requirement.

PART 2

The User Interface Design Process

Usability

In 1979, Bennett used the term “usability” to describe the effectiveness of human performance. In 1991, Shackel simply defined usability as “the capability to be used by humans easily and effectively, where easily means to a specified level of subjective assessment and effectively means to a specified level of human performance.

Common Usability Problems

- Ambiguous menus and icons
- Language that permit only single-direction move through a system
- Input and direct manipulation limits
- Highlighting and selection limitations
- Unclear step sequences
- More steps to manage the interface than to perform tasks
- Complex linkage between and within applications
- Inadequate feedback and confirmation
- Lack of system anticipation and intelligence
- Inadequate error message, help, tutorials, and documentation

Web usability problems

- Visual clutter: Meaningless graphics, and unnecessary and wasteful decoration
- Impaired information readability: Using many fonts style in a page turn away the user’s focus on the content
- Incomprehensible components: Some design elements give the user no clue as to their function
- Annoying distractions
- Confusing navigation

Some Practical Measures of Usability

- Are people asking a lot of questions or often reaching for a manual?
- Are frequent exasperation response heard?
- Are there many irrelevant actions being performed?
- Are there many things to ignore?
- Do a number of people want to use product?

The User Interface Design Process: Step 1

Know Your User or Client

All the interface design and the screen design process must begin with an understanding of the system user, the *most important* part of any computer system. It is the user whose needs a system is built to serve. When you want to create a truly usable system, the designer must always do the following:

- Understand how people interact with computers
- Understand the human characteristics important in design
- Identify the user's level of knowledge and experience
- Identify the user's psychological characteristics
- Identify the user's physical characteristics
- Employ recommended methods for gaining understanding of users

10 most common usability problems in graphical systems

- Ambiguous menus and icons
- Language that permit only single-direction move through a system
- Input and direct manipulation limits
- Highlighting and selection limitations
- Unclear step of sequences
- More steps to manage the interface than to perform tasks
- Complex linkage between and within applications
- Inadequate feedback and confirmation
- Lack of system anticipation and intelligence
- Inadequate error message, help, tutorials, and documentation

Important Human Characteristics in Design

- Perception

Perception is our awareness and understanding of the elements of objects of our environment through the physical sensation of our various senses, including sight, sound, smell, and so forth.

- Memory

Memory is viewed as consisting of two components, long-term and short-term (or working) memory.

- Short-term or working memory receives information from either the senses or long term memory (not both at once). Memory is limited amount of information process. Also, Information stored last from 10-30 seconds
- Long-term memory contains the knowledge we process. Information received in short-term memory is transferred to it and encoded within it

(Learning) the learning process is improved if the information being transferred from short-term memory has structure and is meaningful and familiar. Long-term memory capacity is thought to be unlimited

- Visual acuity

It is the phenomenon that results in an object becoming more distinct as we turn our eyes toward it and rapidly losing distinctness as we turn our eyes away

- Foveal and peripheral vision

Foveal vision is used to focus directly on something. Peripheral vision senses anything in the area surrounding the location we are looking at Mori and Hayashi (1993) experimentally evaluated the effect of windows in both a foveal and peripheral relationship and found that performance on a foveal window deteriorates when there are peripheral windows. The performance degradation is even greater if the information in the peripheral is moving.

- Sensory storage

Sensory storage is the buffer where the automatic processing of information collected from our senses takes place. In a sense, it acts like radar, constantly scanning the environment for things that important to pass on to higher memory. Repeated and excessive stimulation can fatigue the sensory storage mechanism. Design the interface so that all aspects and elements serve a definite purpose. Eliminate interface noise will ensure that important things will be less likely to be missed

- Information processing

There are two levels of information processing. One level, the highest level, is identified with consciousness and working memory. It is limited, slow, and sequential, and is used for reading and understanding. In addition to this higher level, there is a lower level of information processing. The lower level processes familiar information rapidly, in parallel with the higher level, and without conscious effort.

- Mental Models

A mental model is simply an internal representation of a person’s current understanding of something. Mental models enable a person to predict the actions necessary to do things if the action has been forgotten or has not yet been encountered. A person already familiar with one computer system will bring to another system a mental model containing specific visual and usage expectations.

- Learning

Learning is the process of encoding in long-term memory information that is contained in short-term memory. A design developed to minimize human learning time can greatly accelerate human performance. People prefer to

stick with what they know. People are very sensitive to even minor changes in the user interface, and that such changes may lead to problems in transferring from one system to another.

- Movement Control

Movements include such activities as pressing keyboard keys, moving the screen point by pushing mouse or rotating a trackball or clicking a mouse button.

- Skill

The goal of human performance is to perform skillfully. The essence of skill is performance of actions or movements in the correct time sequence with adequate precision. Shortcut, increased speed, easier access information. Lower-order skills tend to become routine and may drop out of consciousness. System and screen design must permit development of increasingly skillful performance.

- Individual differences

In reality, there is no average user. Technology now offers the possibility of tailoring jobs to the specific needs of people with varying and changing learning or skill levels. Multiple versions of a system can easily be created. Design must provide for the needs of all potential users.

Human Considerations in Design

There are also a host of other human aspects in which people may vary greatly. These are also important and must be identified in the design process. The kinds of user/task characteristics are:

- The user's knowledge and experience

Computer Literacy, System Experience, Application Experience, Task Experience, Other Systems Use, Education, Reading Level, Typing Skill, Native Language or Culture

- The user's tasks and needs

Type of System Use: Mandatory or discretionary, Frequency of Use, Task or Need Importance, Task Structure, Social Interactions, Primary , Training, Turnover Rate, Job Category, Lifestyle

- The user's psychological characteristics

Attitude, Motivation, Patience, Expectations, Stress Level, Cognitive Style

- The user's physical characteristics

Age, Gender, Handedness: Left, right, Disabilities

Methods for Gaining Understanding of Users

There are suggestion about using the following kinds of techniques to gain and understanding of users, their tasks and needs, their organization where they work and the environment where the system may be used.

- Visit user locations, to gain user's work environment
- Talk with users about their problems, difficulties
- Observe users working or performing a task to see what they do
- Videotape users working or performing task
- Learn about the work organization
- Try the job yourself

The User Interface Design Process: Step 2

Understand Business Function

A thorough understanding of the user has been obtained, and the focus now shifts to the business function being addressed. Requirement must be determined and user activities being performed must be described through task analysis. From this, a conceptual model of the system will be formulated. Design standards must also be created, usability goals established, and training and documentation needs determined.

Business Definition and Requirements Analysis

The objective of this phase is to establish the need for a system. A requirement is an objective that must be met. There are many techniques for capturing information for determining requirements.

- Direct Methods:
  - Individual Fact-to-Face Interview.
  - Telephone Interview or Survey.
  - Focus Group.
  - Facilitated Team Workshop.
  - Observational Field Study.
  - Usability Laboratory Testing.
  - Card Sorting for website.

- Indirect Methods:
  - Paper survey or questionnaire.
  - Electronic Survey or questionnaire.
  - Electronic Focus Group.
  - Marketing and Sales.
  - Support Line.
  - E-Mail or Bulletin Board.
  - User Group.
  - Competitor Analyses.
  - Trade Show.
  - System Testing.

Determining Basic Business Functions
The process the developer will use is summarized as follows:

- Understanding the user's mental model:
  - A goal of task analysis, and a goal of understanding the user, is to gain a picture of the user's mental model.

- Performing a Task Analysis:
  - Involves breaking down the user's activities to the individual task level.

- To understand why and how people currently do the things.
- A listing of the user's current tasks.

Developing Conceptual Model

A conceptual model is the general conceptual framework through which the system's functions are presented. A conceptual model is based on the user's mental model. There are guidelines for designing conceptual models.

- Focus on the user's mental model, not the designer's.
- Replicate what is familiar and well-known, Duplicate actions that are already well learned.
- Create a system that builds on knowledge, habits, routines, and expectancies that already exist.
  - Color.
  - Use words and symbols in their customary ways.
  - Replicate the language of the user.
- Provide action-response compatibility.
- Make invisible parts of the system visible.
- Provide Proper and Correct Feedback:
  - Providing a continuous indication of status.
  - Provide visible results of actions.
  - Display action in progress (changing size of windows).
  - Present as much context information as possible.
  - Provide clear, constructive, and correct error message.
- Avoid the unnecessary or irrelevant.
- Provide design consistency.
- Provide documentation and a help system that will reinforce the conceptual model.
- Promote the development of both novice and expert mental models.

System Training and Documentation Needs

Training and documentation are also an integral part of any development effort.

- Training

System training will be based on user needs. Training may include such tools as formal or video training, manuals online tutorials.

- Documentation

Creating documentation during the development progress will uncover issues and reveal omissions that might not otherwise be detected until later in the design process.

The User Interface Design Process: Step 3

Understand the Principles of Good Screen Design

To accomplish a well-designed screen, the designer must first understand the principle of good screen design.

How to Distract the Screen User

There are a list of factors that, when poorly designed, hinder the use of paper forms. These factors certainly apply to electronics forms and screens as well, and include:

- Unclear captions and badly words
- Improper type and graphic emphasis
- Misleading headings
- Unnecessary or irrelevant Information
- Cluttered layout
- Poor quality of presentation, arrangement and appearance
- Visual inconsistency
- Overuse of three-dimensional presentations
- Over us of too man bright colors
- Poorly designed icons
- Bad typography
- Metaphors that are either overbearing or too cute

How to Distract the Web Screen User :

- Numerous visual and auditory interruptions
- Extensive visual clutter
- Poor information readability
- Incomprehensible screen components
- Confusing and inefficient components
- Confusing and inefficient navigation
- Inefficient operations and extensive waste of user time
- Excessive or inefficient page scrolling
- Information overload
- Design inconsistency
- Outdated information

What Screen Users Want

What are people looking for in the design of screens?

- An orderly, clean, clutter-free appearance.
- An obvious indication of what is being shown.

- Expected information located where it should be.
- A clear indication of what relates to what, including options, heading, captions, data and so forth.
- Plain, simple English.
- A simple way of finding out what is in system and how to get it out.
- A clear indication of when an action can make a permanent change in the data or system.

What Screen Users Do

When interacting with a computer, a person:

- Identifies a task to be performed or need to be fulfilled.
- Decides how the task will be completed or the need fulfilled.
- Manipulates the computer's controls.
- Gathers the necessary data.
- Forms judgments resulting in decisions relevant to the task or need.
- Identifies a task to be performed or need to be fulfilled.
- Decides how the task will be completed or the need fulfilled.
- Manipulates the computer's controls.
- Gathers the necessary data.
- Forms judgments resulting in decisions relevant to the task or need.

Interface Design Goals

To make an interface easy and pleasant to use, the goal is to:

- Reduce visual work.
- Reduce intellectual work.
- Reduce memory work.
- Reduce motor work.
- Minimize or eliminate any burdens or instructions imposed bye technology.

The Test for a Good Design

There is a simple test for good screen design. Call all screen elements (field captions, data, title…etc) be identified without reading the words that identify them? That is Can a component of a screen be identified through cues independent of its content? If this is so, a person's attention can quickly be drawn to the part of the screen that is relevant at that moment.

Organizing Screen Elements Clearly and Meaningfully

A clear and clean organization makes it easier to recognize screen's essential elements and to ignore its secondary information. Clarity is influenced by Consistency in design, Logical and sequential ordering, visually pleasing

composition, Presentation of the proper amount of information, Grouping and alignment of screen items.

Consistency should first provide a real-world consistency which will reflect a person's experience, expectation, work convention, and cultural convention. Secondly, it should provide internal consistency that is to observe the same conventions and rules for all aspects of an interface screen. Thirdly, it should follow the same conventions and rules across all related interfaces.

Ordering of Screen Data and Content can be done by the following:

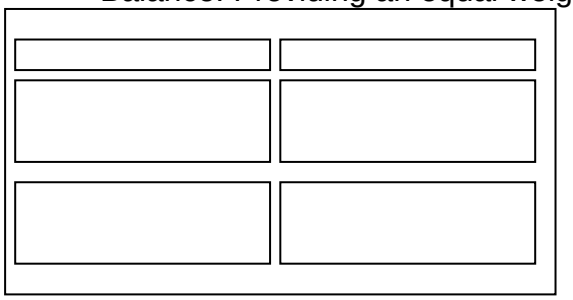
- Dividing information into units that are logical, meaningful and sensible.
- Organizing by the degree interrelationship between data or information.
- Provide and ordering of screen units of information that is prioritized according to the user's expectations and needs.
- Example of possible ordering schemes include:
  - Sequence of use.
  - Frequency of use.
  - Function.
  - Importance.
  - General to specific.

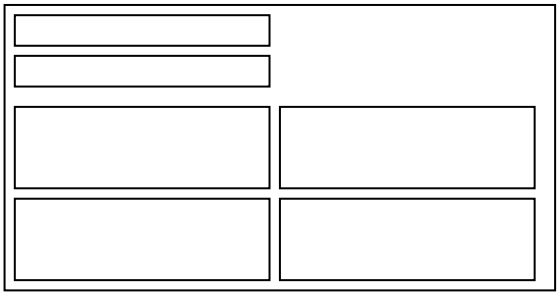
Screen navigation should be obvious and easy to accomplish:

- Locate the most important and most frequently use elements or controls at the top left.
- Maintain a top-down, left-right flow.
- Provide an ordering of screen information that:
  - Guiding a person's eye through the display.
  - Encourages natural movement sequences.
  - Minimizes pointer and eyes movement distances.
- Assist in navigation through a screen by:
  - Aligning elements.
  - Grouping elements.
  - Using of line borders.

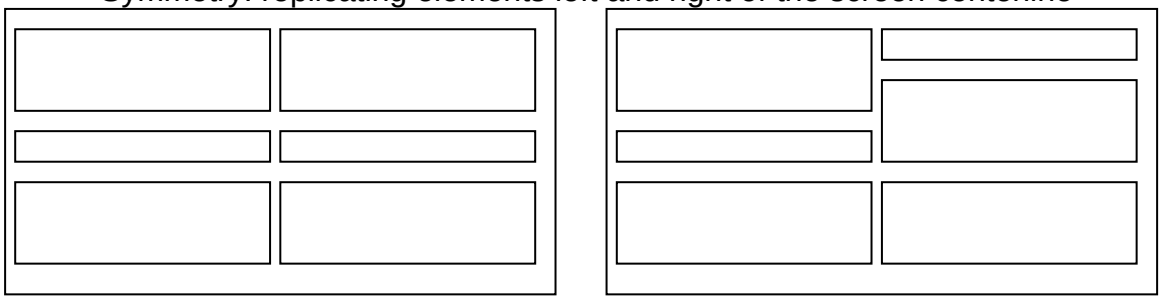
Visual Pleasing Composition:

- Balance: Providing an equal weight of screen elements.

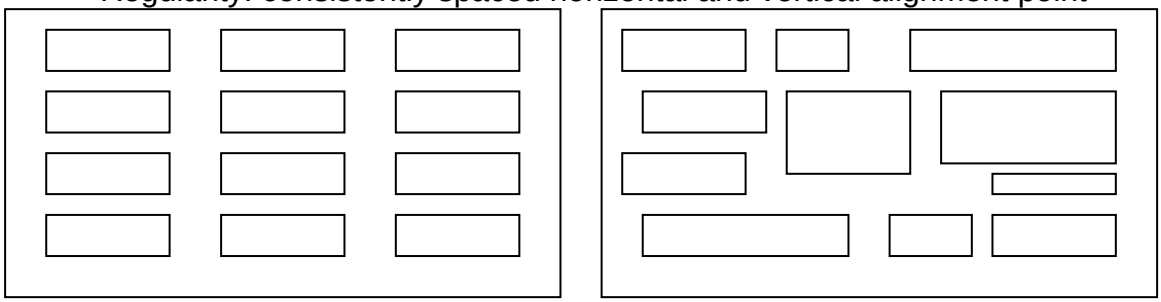




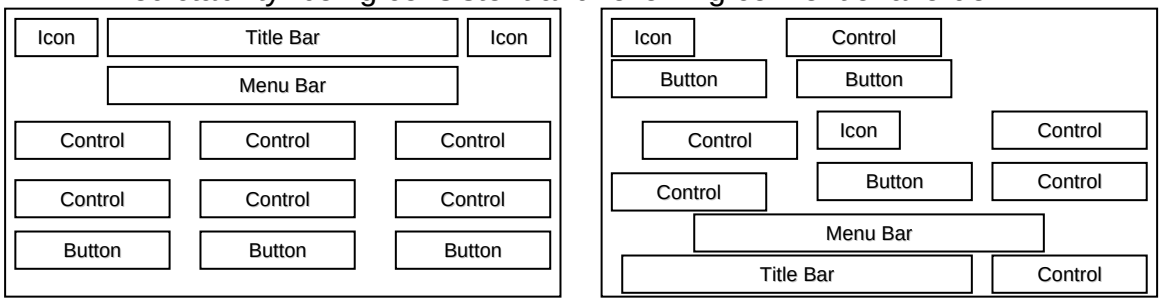
- Symmetry: replicating elements left and right of the screen centerline



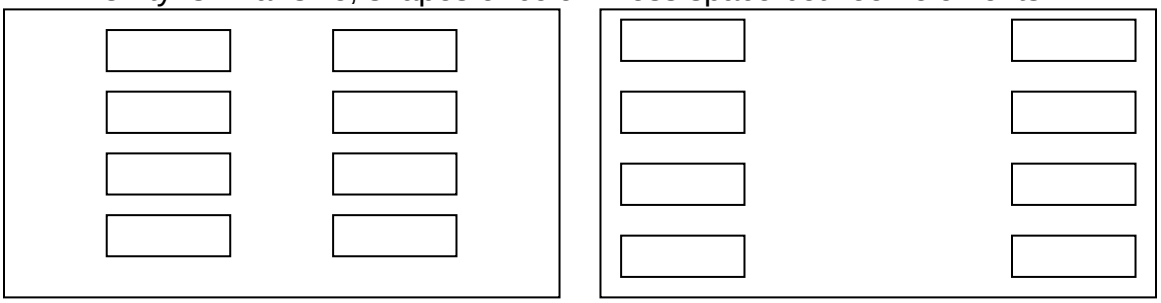
- Regularity: consistently spaced horizontal and vertical alignment point



- Predictability: being consistent and following conventional order

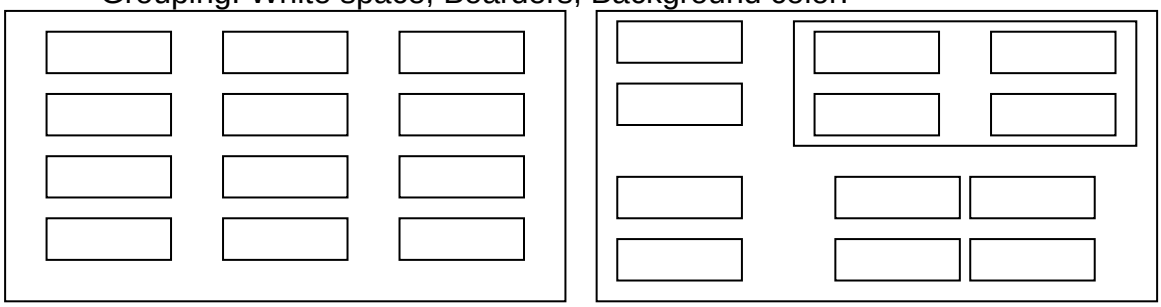


- Unity: similar size, shapes or color + less space between elements



- Simplicity: Optimize number of elements + horizontal and vertical line.

- Grouping: White space, Boarders, Background color.



- Sequentiality:
  - A brighter elements before less bright.
  - Isolated elements before elements in a group.
  - Graphic before text.
  - Color before black text.
  - Highly saturated colors before the less saturated.
  - Dark area before light area.
  - A big element before a small one.
  - An unusual shape before a usual one.
  - Economy: Using few styles, display techniques.

For Web Page

- Maintain a consistent and unified visual style of entire Web.
- Consider Amount of Information with a proper amount of information, present all necessary information, and screen density.
- Minimize page length and place the important information at the very top so it is always viewable.
- Avoid scrolling + minimize vertical scrolling, also avoid horizontal scrolling.

Focus and Emphasis

Apply a visual emphasis technique to highlight the most important or prominent parts of a screen. An emphasized element should contrast with the rest of the screen, calling the user's eyes to it

- Provide emphasis use techniques such as:
  - Higher brightness
  - Reverse Polarity or inverse video.
  - Larger and distinctive font.
  - Line ruling and surrounding boxes or frames.
  - Contrasting color.
  - Larger size.
  - Positioning.
  - Isolation.
  - Distinctive or unusual shape.

- White space

Presenting Information Simply and Meaningfully

The information should be noticeable, distinguishable, identifiable, interpretable and attractive. Translation, transpositions and references to documentation should not be required to understand the information. Create visual lines (implicit and explicit) to guide the eye.

Typography

In screen design, different fonts are used to organize information, establish importance, establish a reading order, and create a particular mood.

- Font Types and Families:
  - Use simple, common readable fonts (San serif such as Helvetica or Verdana, Times Roman.
  - Use no more than two families, compatible in terms of line thicknesses, capital letter height.
  - Assign a separate purpose to each family.
  - Allow one family to dominate.
- Font Styles and Weight:
  - Use no more than two styles of the same family (Standard and *italic*).
  - Use no more than two weight of the same family (Regular and **bold).**
  - Use *italics* to call attention.
  - Use **bold** to call attention or create a hierarchy.
- In Web Pages, use an underline only to indicate a link.
- Font Size:
  - No more than three sizes.
  - For graphical systems use: 12 points for menus, 10 points for windows.
  - For web: 12-14 points for body text, 18-36 points for titles and heading.
  - For line spacing, use 1 or 1.5 times font size.
- Font Case:
  - **Use mixed-case for**: Control captions, Data, Control choice description, Text, Informational message, Instructional information, and Menu + Button descriptions.
  - **Upper case for**: Title, Section heading, Subsection heading, Caution and warning messages, Word or phrases.

Screen Elements

Elements of a screen include control captions, the data or information displayed on the screen, headings and headlines, instructional information, and the screen's title. The following guidelines address these screen components.

- Captions/Labels
  - Identify controls with captions or labels.
  - Fully spell them out in a meaningful language.

- Capitalize the first letter of each significant word.
- End of each caption with a colon (:)

First Amount:		AMOUNT >>		First:	
Last Amount:				Last:	
This Amount:				This:	
That Amount:				That:	

- Data Fields:
  - For entry or modifiable data fields: display data within.
    - A line box.
  - For inquiry or display/read only screens: display data on the normal screen background.
  - Visually emphasized the data fields.

- Control Captions/Data Fields:
  - Differentiate caption from data fields by using
    - Contrasting features (Intensities, separating columns, boxes).
    - Consistent physical relationships.
  - For single data fields:
    - Place the caption to the left of the data field.
    - Alternately, place the caption above the data field.
    - Maintain consistent positional relations within a screen.
  - For multiple listing of columnar-oriented data:
    - Place the caption above the columnized data fields.

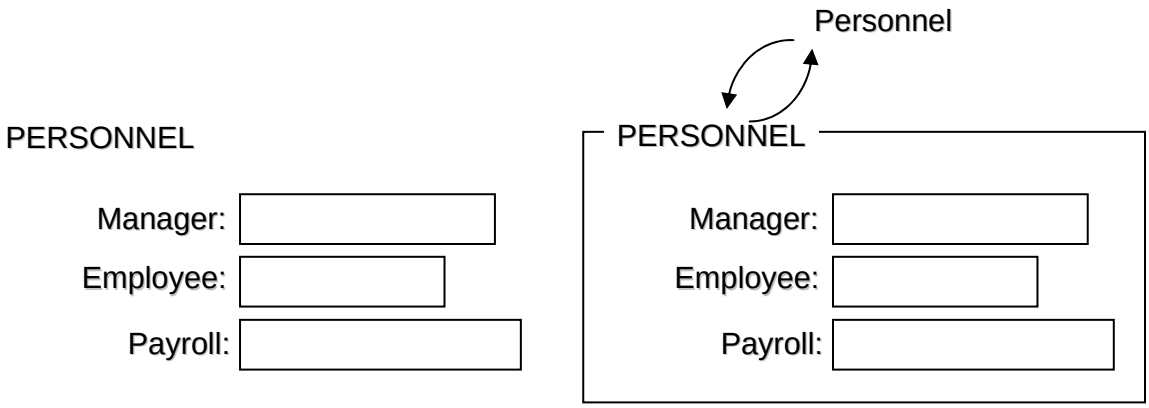
Sex:	Female	Relation:	Daughter	Names:
Relation:	Daughter	Relation:	Daughter	Somchai
				Orapan
				Krisada

Division:		Division:	
Department:		Department:	
Title:		Title:	

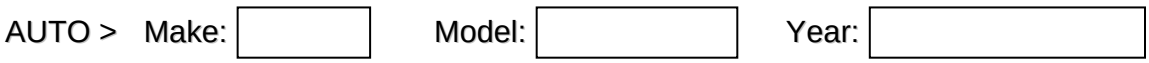
Heading

Heading are primarily incorporated to create a common identity. In addition to providing meaning, they foster the concept of grouping, create visual appeal, and aid screen learning.

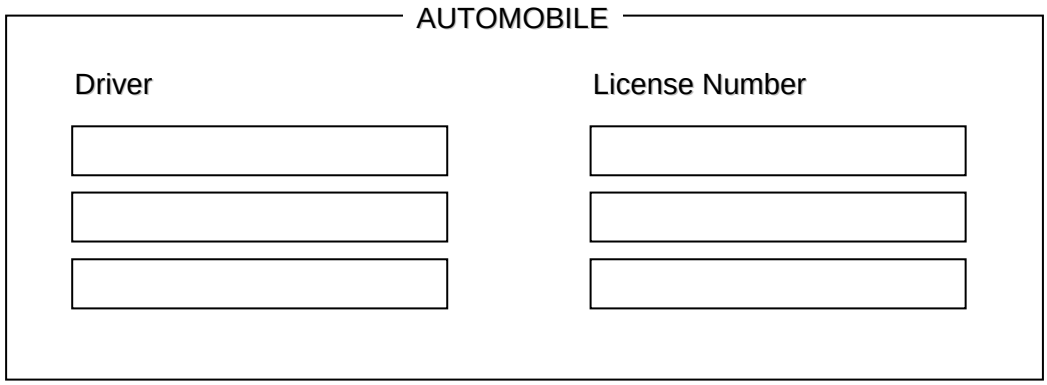
- Control Section Heading:
  - Locate section headings above their related screen controls, separated by one space.
  - Alternately, heading may be located within a border surrounding a grouping justified to the upper-left corner.
  - Indent the control captions to the right of the start of the heading.



- Control Subsection or row:
  - Locate to the left of the: Row of associated fields, Top most row of a group of associated fields.
  - Separate from the adjacent caption through the use of a unique symbol (>>, >).
  - Fully spell out in an uppercase font.



- Field Group Heading:
  - Center the field group heading above the caption to which it applies.
  - Relate it to the caption by a solid line.
  - Fully spell out in an uppercase font.



- Instructions:
  - Displaying them in a unique color and a unique type style.
  - Left-justifying the instruction and indenting the related field captions, heading, or text a minimum of three spaces to the right.
  - If possible, leaving a space line between the instructions and the related control, heading or text.
  - Using a mixed-case font.

Type for changes only

Manager:

Employee:

Payroll:

- Completion Aids:
  - In a position completion aids on a screen, as necessary.
  - Displaying them with a parentheses ().
  - Displaying them in a unique font style.
  - Far enough to the right so as to not detract from the readability of entry controls.
  - Close enough to the related control so that they easily maintain an association with the relate control.

Birthday: / / (MM/DD/YY)

How often: (D,W,M,Y)

Keying Procedures

For large-volume data entry applications substantial keying may still be required.

- For Keystrokes, do not focus on minimizing keystrokes without considering other factors such as:
  - The keying rhythm.
  - The goals of the system.
- For Tabbing, Initially, position the cursor in the first field or control in which information can be entered. Tab in the order in which the screen's information is organized.
- Manual Tab versus Auto Skip, define fields to permit manual tabbing.

Organization and Structure Guidelines

What follows is a series of organization and structure guidelines for specific kinds of screens. They are: Information Entry and Modification, Entry from a Dedicated Source Document, and Display/Read-Only screens.

Information entry and modification screens are used to collect and modify information, either by entry or selection:

- Organization should be Logical and clear. Also, the required information and most frequently used information are on the earliest screen or at the top of screens.
- Captions should be meaningful and consistently position such as:
  - Left-Right aligned.
- Create logical grouping.
- Heading should be an upper case or headline style mixed case.
- Arrangement should align into columns or organize for top-to-bottom completion.
- Distinguish between required and optional data input by Placing required and optional in different screens. Or identifying required information with a unique font or symbol.
- Instructions and completion aid can be included as necessary.

Text Entry from a Source Document may be necessary to key information directly from a source document or paper form into screen. The document may take the form of any application (bank loan, insurance…etc). The key issue for this function is that an entire screen should be capable of being completed without the keyer ever looking at the screen.

Display/read-only screens are used to display the results of an inquiry request or the contents of computer files. Their design objective is human ease in locating data or information.

- Organization should be logical, clear and be limit to what is necessary.
- Most frequently used information should be on earliest screens or at the top of screens.
- Captions should be meaningful, consistently positioned and left-or-right aligned.

- For text boxes, do not include a surrounding border or box.
- Heading should be an upper case or headline-style mixed case.
- Data arrangement should align into columns and organize for top-to-bottom scanning.
- For data justification, text and alphabet data should use left-justify and numeric data should use right justify.

Name:	Somchai
Street:	612 Pahonyothin Rd

Name:	Somchai
Street:	612 Pahonyothin Rd

Food:	230
Drink:	50
Dessert:	120
Total:	400

Food:	230
Drink:	50
Dessert:	120
Total:	400

- Do not display null data.

Somtams:	3	Somtams:	3	3	Somtams
Laabs:	2	Laabs:	2	2	Laabs
Sticky rices:	15	Sticky rices:	15	15	Sticky rices
Cokes:	0				

The User Interface Design Process: Step 4

Develop System Menus and Navigation Schemes

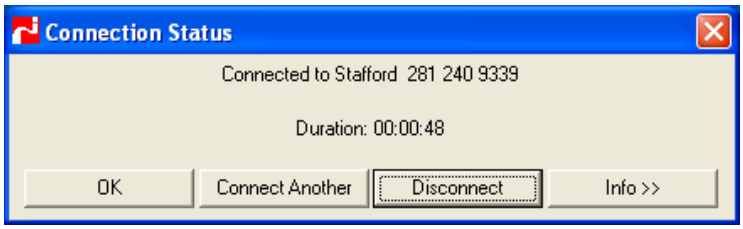
Menus are a major form of navigation through a system and, if properly designed, assist the user in developing a mental model of the system.

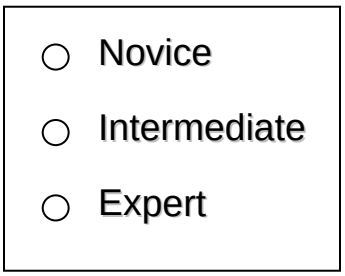
Structures of Menus

Menus vary in form from very simple to complex. A menu's structure defines the amount of control given to the user in performing a task. The most common structures are the following

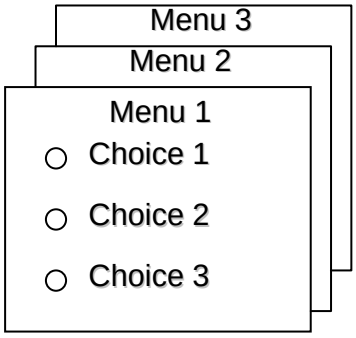
- Single Menus

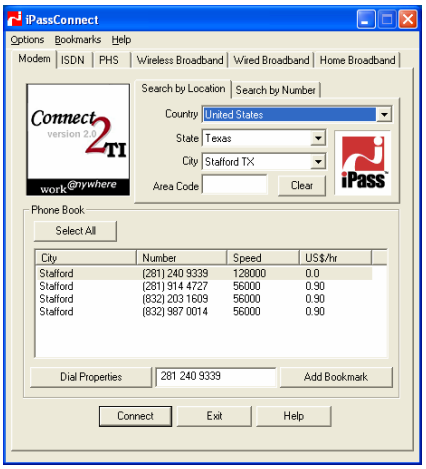
No other menus will follow necessitating additional user choices

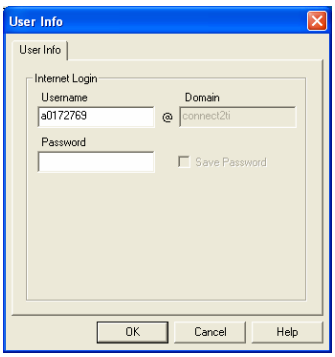




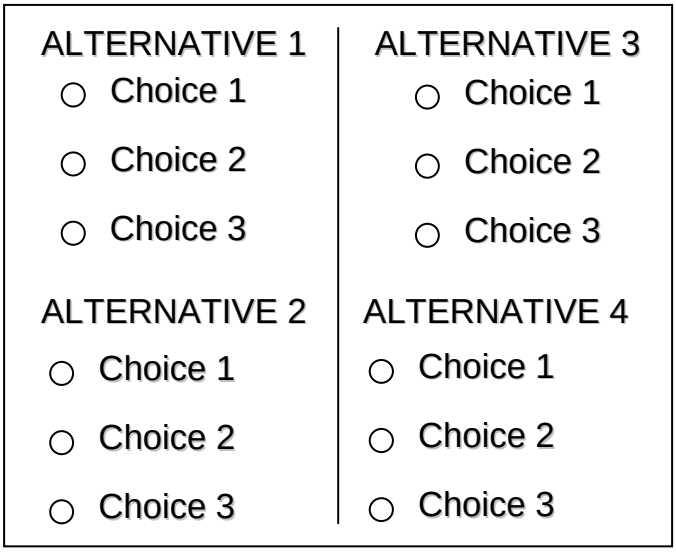
- Sequential Linear Menus





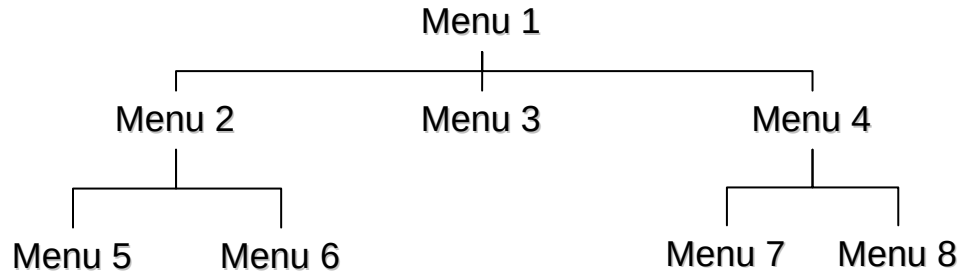


- Simultaneous Menus



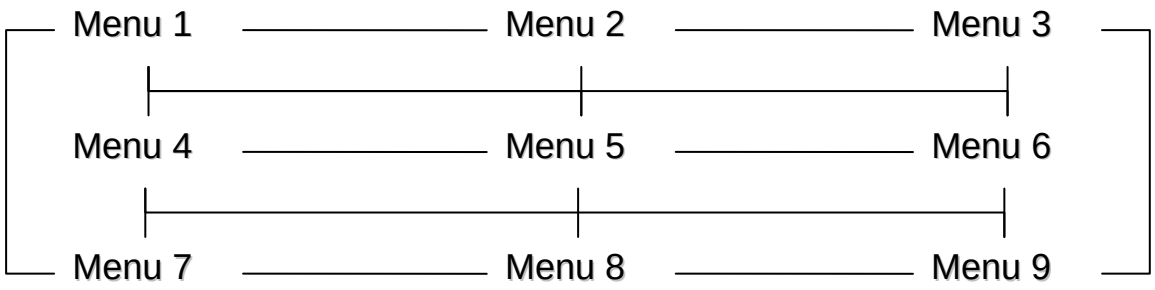
- Hierarchical Menus

When many relationships exist between menu alternatives, and some menu options are only appropriate depending upon a previous menu selection, a hierarchical structure is the best solution.



- Connected Menus

This menu gives you a full control over the navigation flow



- Event-Trapping Menus

Provide ever-present background of control over the system's state and parameters while the user is working on a foreground task. They serve three functions:

- Immediately change some parameter in the current environment (bold text)
- Take user out of current environment to perform function (spell check)
- Exit and allow user to go to new environment (exit)

Functions of Menus

From the user's perspective, a menu can be used to perform several functions, to navigate to a new menu, to execute an action or procedure, to display information, or to input data or parameters.

Contents of Menus

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

- Menu Context provides information to keep the user oriented. This kind of information is critical in complex or hierarchical menu systems.
- Menu Title provides the context for the current set of choices.
- Choice Descriptions can range from a mnemonic, numeric or alphabetized listing.
- Completion Instructions tell users how to indicate their choices.

Formatting of Menus

- Consistency: Should apply on organization, presentation, and choice ordering.
- Display: Permanently display the menu, if the continual or frequent references to menu options are necessary.
- Presentation: Should be obvious with a unique and consistent structure.
- Organization of the Menus:
  - Provide a main menu.
  - Display all relevant alternatives (gray-out inactive choices).
  - Minimize number of menu levels.
  - Number of menu choices presented on a screen.
    - 4-8 choices without logical grouping of elements.
    - 18-24 choices with logical groupings of elements with no more than 10 items within a group
  - Never require menus to be scrolled
- Provide both simple and complex menus
- Item Arrangement:
  - Orient for top-to-bottom reading
  - Left justify descriptions.

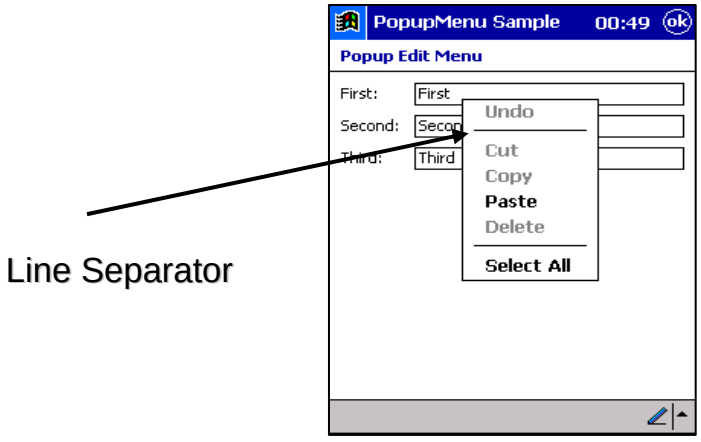
  - Organize for left to right reading.
- Ordering in term of:
  - Numeric order.
  - Sequence/Frequency of occurrence.
  - Importance.
  - Semantic similarity.

Grouping

- Create grouping of items that are logical, unique, meaningful and mutually exclusive.
- Present no more than six or seven groupings on screen.
- Separate grouping created through either wider spacing, or a thin ruled line.
- Provide immediate access to critical or frequently chosen items.

Line Separator

- Separate vertically arrayed grouping with subtle solid lines.
- Separate vertically arrayed sub-groupings with subtle dotted or dashed lines.
- For independent groupings, extend the line to the left and right menu borders.

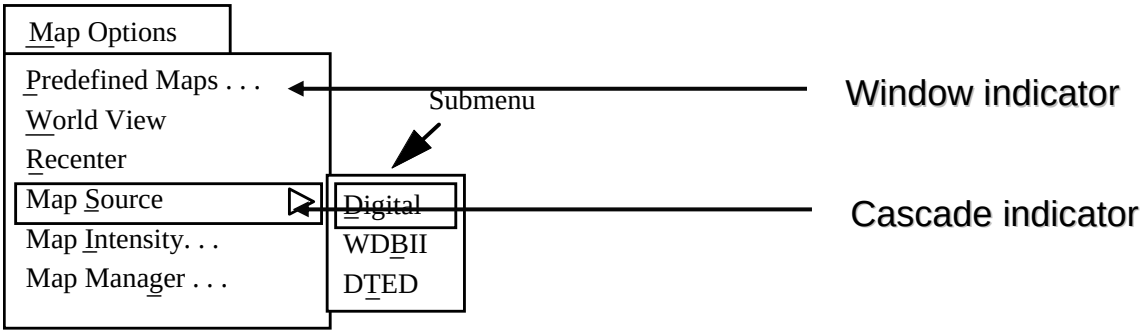


Phrasing the Menu

Writing the content of menu components is often made difficult because of the varying experience levels of the menu users. There are conflicts between the desire to explain everything in detail and limits on what people want to read. The following are guidelines for creating menu titles, choice descriptions, Web navigation links, and menu instructions.

- Menu Titles: Should be Short, Simple, Distinctive title
- Menu Choice Description:

  - Can be single, compound or multiple words.
  - Use task-oriented not data-oriented wording.
  - Must never use the same wording as its menu title.
  - Identical choices on different menus should be worded identically.
- Keyboard Accelerators:
  - Ctrl + B or (Ctrl + B).
- Keyboard Equivalents
  - Normal, Bold, Italic.
- Intent Indicators:
  - To Cascade indicator: place a triangle or right-pointing solid arrow following the choice
  - To a window indicator: place ellipsis (..) immediately follow the choice



Selecting Menu Choices

Menu items can be selected by pointing at the choice with a mechanical pointer.

- Initial Cursor Positioning
- Choice Selection:
  - Pointers.
  - Keyboards.
  - Selection/Execution.
  - Combining techniques.
- Defaults:
  - Provide a default whenever possible (as Bold Text)
- Unavailable Choices:
  - Should be dimmed or “grayed out”.

Mark Toggles or Settings

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

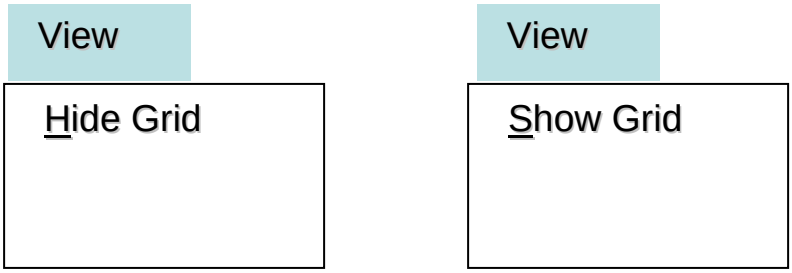
- Use to provider a reminder that an item or feature is active or inactive.
- Position the indicator to the left of the option.

- For situations where several nonexclusive choices may be selected, consider including one alternative that deselects all items revert the state to the normal condition.

Toggle Menus

Use to designate two opposite commands that are accessed frequently. Also use when the menu item displayed will clearly indicate that the opposite condition currently exists:

- Provide a meaningful, fully spelled-out description of action.
- Begin with a clear verb.
- Use mixed-case letter.



Kinds of Graphical Menus

Providing the proper kinds of graphical menus to perform system tasks is also critical to system success. The best kind of menu to use in each situation depends on several factors:

- Menu Bar
  - All primary windows must have a menu bar.
  - All menu bars must have an associated pull-down menu containing at least two choices.
  - Do not allow the user to turn off the display of the menu bar.
  - Locate at the top of the screen, just below the screen title.
  - Use single-word choices whenever possible.
  - Order choice left-to-right with.
  - Most frequent choices to left/ related information grouped together.
  - Help, when included should be located at the right side.
  - Layout: xFilexxxEditxxxOptions Helpx (Where x is a space).
  - Separate the bar from the remainder of the screen by a different background or Solid lines above and below.
  - Use reverse color selection cursor to surround the choice.

- Cascading Menu:
  - Place an arrow or right-pointing triangle to the right of each menu.
  - Leave the choice leading to the cascading menu highlighted.
  - Do not exceed three menu levels (two cascades).

- Pull-Down Menu

Use a pull-down menu with a small number of items. Items are best represented textually. And with items whose content rarely changes.

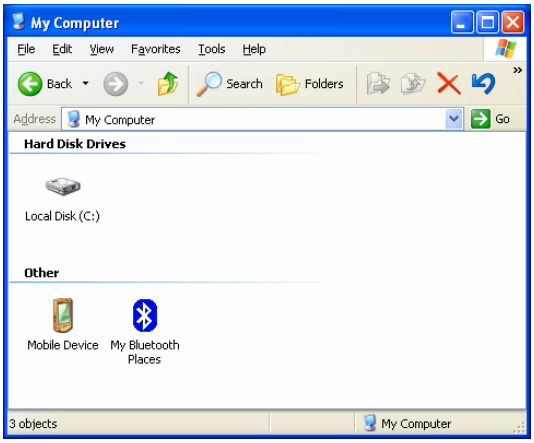
- Gray-out or dim items that can not be chosen
- Position the pull-down directly below the selected menu bar choice
- Restrict to no more than 5-10 choices.
- Place frequent or critical items at the top.
- Multicolumn menus are not desirable.
- Alight the first character of the pull-down descriptions under the second character of the applicable menu bar choice.

- Pop-Up Menu:
  - Choices may be also presents alternatives or choices within the context of the task.
  - Pop-up menus may be requested when the mouse pointer is positioned over a designated or hot area of screen (a window border) or over a designed icon.

- Iconic-Menu

Use to remind user of the functions, commands, application choices.

- Create icons that help enhance recognition and hasten option selection. Also create icons that are meaningful and clearly represent choices.



The User Interface Design Process: Step 5

Select the Proper Kinds of Windows

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 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 be varied).
- Only active windows can have their contents altered.
- A window may be partially or fully hidden behind another window.
- Information with in a window may extend beyond window's display area.
- Presentation is arranged in relation to other kinds of window.
- Methods for manipulation of the window on the screen.
- Its highlight, that is, the part that is selected.

Windows are useful in the following:

- Presentation of Different Levels of Information.
- Presentation of Multiple Kinds of Information.
- Sequential Presentation of Levels or Kinds of Information.
- Access to Different Sources of Information.
- Combining Multiple Sources of Information.
- Perform More Than One Task.
- Reminding.
- Monitoring.
- Multiple Representations of the Same Task.

Components of a Window

A typical window may be composed of up to a dozen or so elements:

- Frame (Border).
- Title Bar.
- Title Bar Icon.
- Window Sizing Buttons.
- What's This Buttons.
- Menu Bar.
- Status Bar.
- Scroll Bars.
- Split Box (Split Bar).
- Toolbar.
- Command Area.
- Size Grip.
- Work Area

Window Presentation Styles

The presentation style of a window refers to its spatial relationship to other windows.

- Tiled Windows

They are easier, according to studies, for novice or inexperienced people to learn. Yield better user performance for tasks where the data requires little window manipulation to complete the task. However, only a limited number can be displayed in the screen area available. And as windows are opened or closed, existing windows change in size. This can be annoying. Moreover, as the number of displayed windows increases, each window can get very tiny.

- Overlapped Windows

Visually, their look is 3-D, resembling the desktop that is familiar to the user. The advantages are that windows can maintain larger sizes, windows can maintain consistent sizes, position. However, they are operationally much more complex than tiled windows. More control functions require greater user attention and manipulation. And, windows themselves can be lost behind other windows and be resumed not to exist.

- Cascading Windows

It is actually a special type of overlapping window. The advantages are that no window is ever completely hidden. Bringing any window to the front is easier. It also provides simplicity in visual presentation and cleanness.

Picking a Presentation Style

- Use tiled window 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.

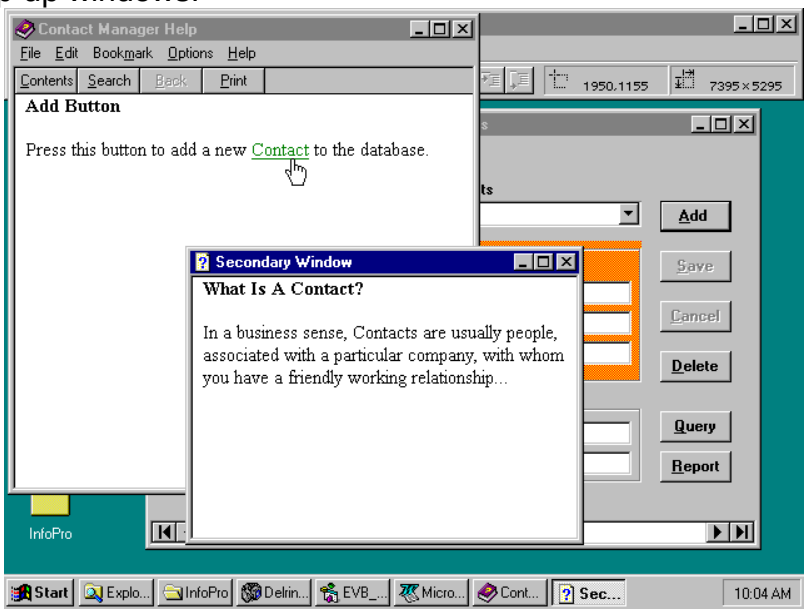
Type of Windows

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.

- Primary Window (Often called main window or application window):
  - Should represent an independent function or application.
  - Use to present constantly used window components and controls.

- Use for presenting information that is continually updated (Date and time).
- Do not divide independent function into two or more primary windows.

• Secondary Windows.
  - A dependent secondary.
    - o It can only be displayed from a command on the interface of its primary window.
  - A independent secondary
    - o Can be opened independently of a primary window (property sheet).
  - Microsoft Windows possesses several types of secondary type of secondary windows called:
    - o Dialog boxes.
    - o Property sheet.
    - o Property inspectors.
    - o Message boxes.
    - o Palette windows.
    - o Pop-up windows.



Modal and Modeless

Modal window is a window that will not permit interaction with another window until the current dialog is completed. It remain display until the appropriate action is taken after which it is removed. Modal dialog boxes typically request critical information or actions. For modeless window, the dialog box permits the user to engage in parallel dialogs. Switching between the box and its associated is permitted.

Cascading and Unfolding

Cascading window provides advanced options at a lower level in a complex dialog. Command button leading to the next dialog box should provide with symbol "…". However, do not provide more than two cascades in a given path.

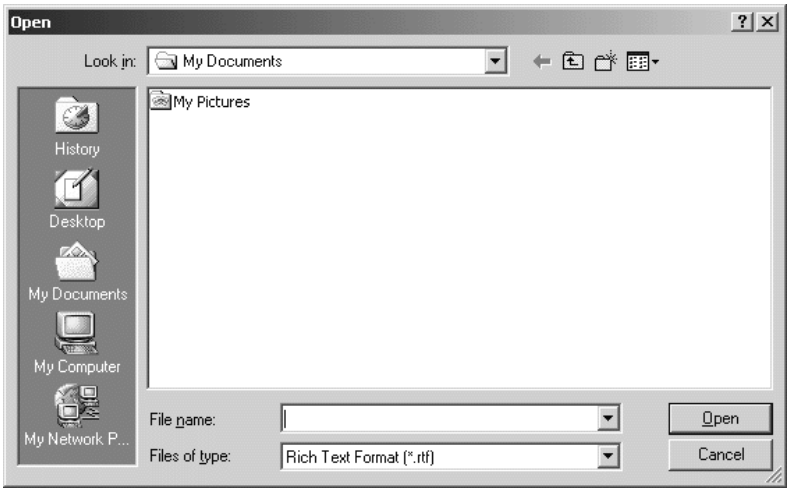
Unfolding window provides advanced options at the same level in a complex dialog. Command button with an expanding dialog symbol should provide symbol of ">>". The expansion should be left to right or downward.

Dialog Boxes

Dialog boxes are used for:

- Presenting brief messages.
- Requesting specific, temporary actions.
- Performing actions that:
  - Take a short time to complete.
  - Are not frequently changed.
- Those that do not occur frequently.

Command button to include are OK, Cancel and Others as necessary.



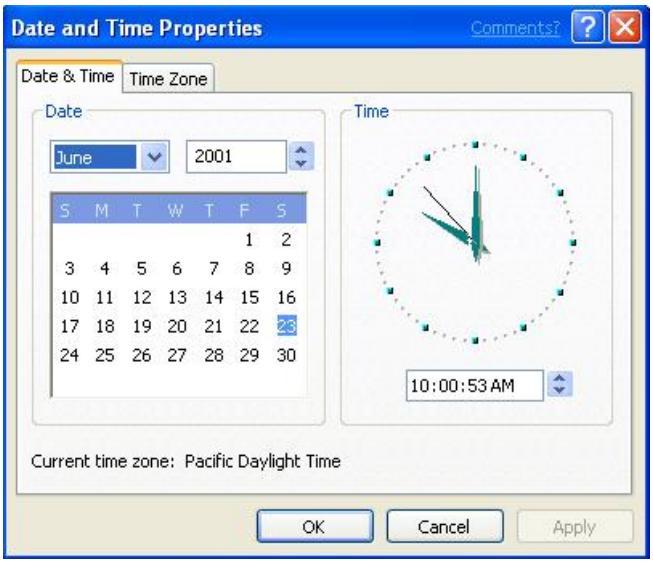
Property Sheets and Property Inspectors

The properties of an object in an interface can be displayed in a variety of ways, for example, the image and name of an icon on the desktop. 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.
  - Command buttons to include:
    - Ok.

- Cancel.
- Apply.
- Reset.
- Others as necessary

- For single property sheets, place the command on the sheet.
- For tabbed property pages, place the commands outside the tabbed pages

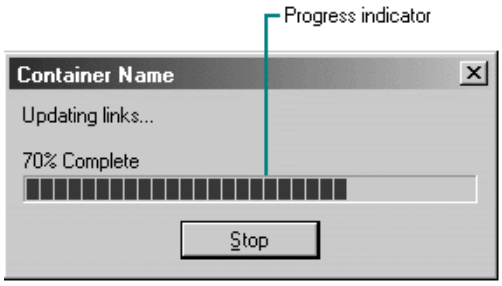


- Property Inspectors
  - Property inspector is used for displaying only the most common or frequently accessed object properties.
  - Properties of an object are displayed by using a dynamic viewer or browser that reflects the properties of the current selection.
  - Property value in the selected object should be changed as soon as the user makes the change in the related property control.

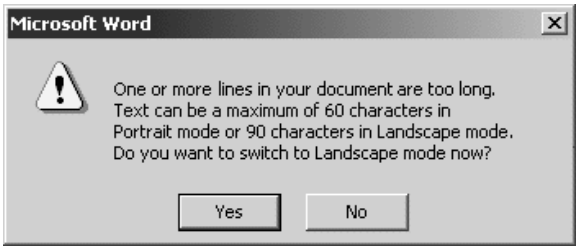
Message Boxes

Use for displaying a message about a particular situation or condition. If a message requires no choices to be made but only acknowledgement, include an ok button and optionally a help menu. However, if the message requires the user to make a choice, include a command button for each option. Include OK and Cancel buttons only when the user has the option of continuing or stopping the action. Use Yes and No buttons when the user must decide how to continue. If

the choices are too ambiguous, label the command buttons with the names of specific actions, for example, SAVE and DELETE.



Progress message box

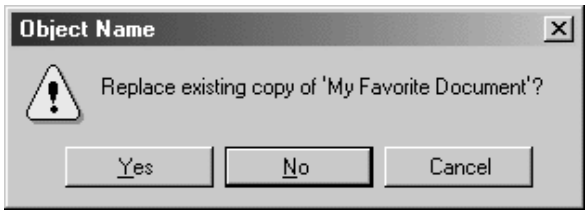


Yes No message box

Information

Warning

Critical

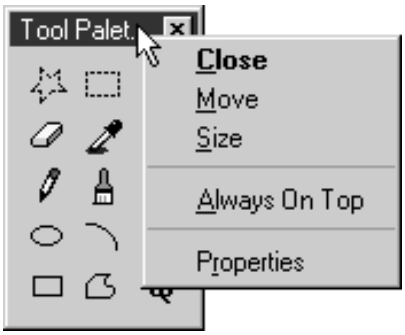


Message box choices

Palette and Pop-Up Windows

Palette windows are modeless secondary windows that present a set of controls. Palette windows are distinguished by their visual appearance, a collection of images, colors or patterns. The title bar for a palette window is shorter and includes only a close button. For 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.
- Pop-up windows do not contain standard secondary widow components such as a title bar and close button.



The User Interface Design Process: Step 6

Choose the Proper Screen Based Controls

Device-based controls, often called input devices, are the mechanisms through which people communicate their desires to the system. A good fit between user and control will lead to fast, accurate performance. A poor fit will result in lower productivity, produce more errors, and increase user fatigue.

Trackball

- 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.

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).
- 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.
  - May be slow and inaccurate.

Graphic tablet

Pressure-, heat-, light-, or light-blockage-sensitive horizontal surfaces that lie on the desktop or keyboard. It 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.
- Disadvantages:
  - 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 fro 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.
- 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 Damage the screen.

Light pen

It is a stylus or pen that is used to touch on special surface on a sensitive screen.

- 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 to use.
  - Requires moving the hand far from the keyboard to use.
  - Very fatiguing to use for extended period of time.

Voice

An automatic speech recognition technology is required.

- Advantages:
  - Simple and direct.
  - Useful for people who cannot use a keyboard.

  - Useful when the user's hands are occupied.
- Disadvantages:
  - High error rates.
  - 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

- Advantages:
  - 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.
- 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 co ordination.
- Mouse Usage Guidelines

Designer should provide a "hot zone" around small or thin objects that might require extremely fine mouse positioning. Also, never use double-clicks or double-drags as the only means of carrying out essential operations. Furthermore, do not use mouse plus keystroke combinations.

Keyboard

- 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.
- 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.

- 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 key or key combination used with out 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.
  - Provide window navigation through use of keyboard keys.

Selecting the Proper Device-Based Control

Selection of the proper device for an application, then, depends on a host of factors.

- Provide keyboards for tasks involving:
  - Heavy text entry and manipulation.
  - Movement through structured arrays consisting of few discrete objects.
- Provide an alternative pointing device for graphical or drawing tasks:
  - 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.
- Minimize eye and hand movements between devices.

Pointer Guidelines

The focus of the user’s attention in most device operations is most often the pointer. Therefore, the pointer image should be used to provide feedback concerning the function being performed, the mode of operation, and the state of the system.

- The pointer:

  - Should be visible at all times.
  - Should contrast well its background.
  - Should maintain its size across all screen locations and during movement.
- Shape of 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
- Use only as many shapes as necessary to inform the user about current location and status.
- Animation should not distract.

The User Interface Design Process: Step 7

Choose the Proper Screen Based Controls

Screen Based controls, often simply called controls and sometimes called widgets. By definitions, they are graphic objects that represent the properties or operations of other objects.

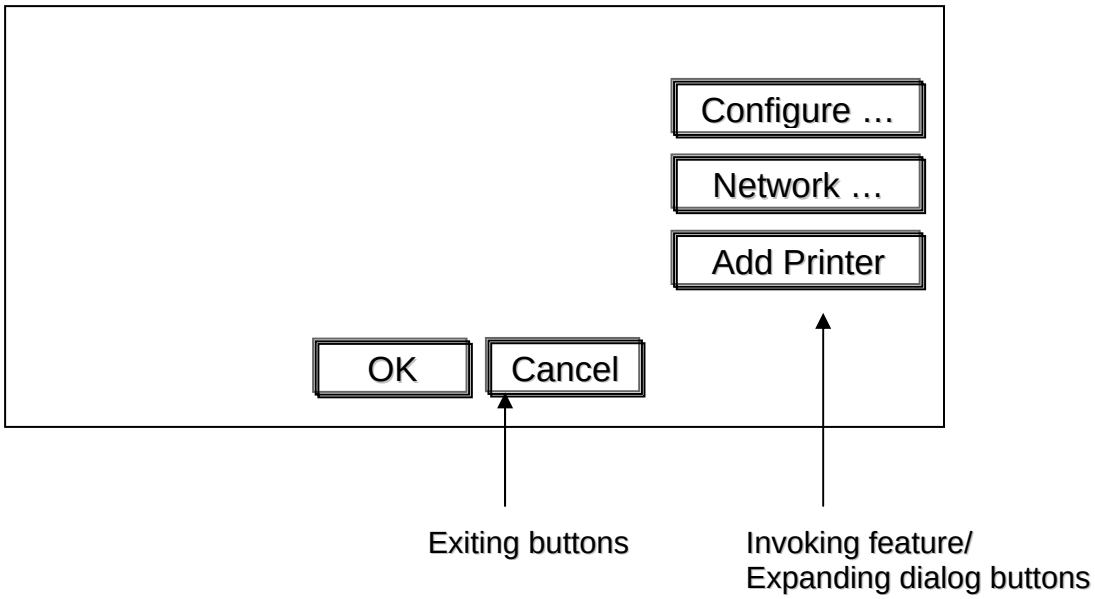
Operable Controls

Operable controls are those that permit the entry, selection, changing, or editing of a particular value, or cause a command to be performed. There are three main operable controls: Buttons and toolbars, text entry/read-only, selection, combination entry/selection and specialized controls.

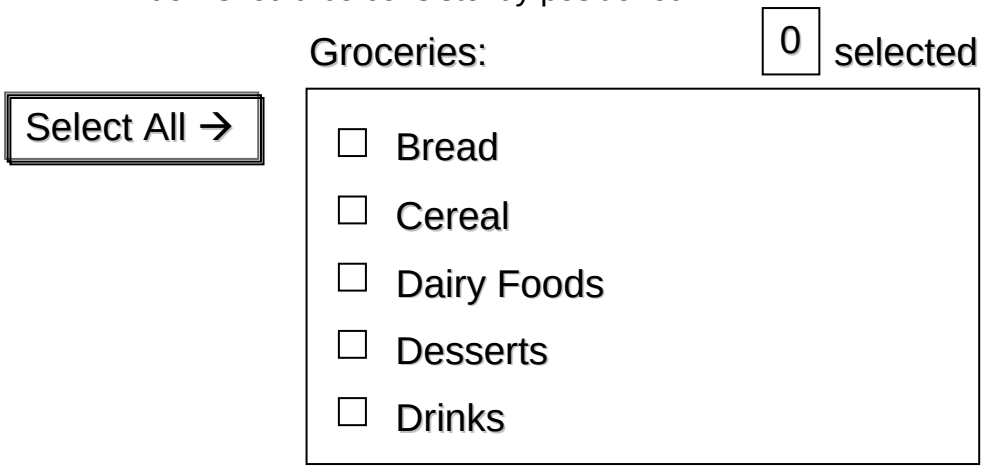
- Buttons

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. Button is classified in two Command Buttons and Toolbars. Buttons provide fast access to frequently used or critical commands (for windows with a menu bar). Also provide access to all necessary commands (for windows without a menu bar).

- Labeling and Size:
  - Use single-word labels whenever possible (Use two-three words for clarity, if necessary).
  - Label of the buttons should be mixed-case letters with the first letter of each significant label word capitalized. Number in the buttons is not preferred.
  - In each window, the number of buttons on a window should restrict to six or fewer.
  - Also, provide as large as button as feasible and maintain consistent button heights and widths.
- Location and Layout:
  - Buttons that are used for exiting a dialog, and usually closing the window, should be positioned horizontally and centered across the lower part of the window.
  - For a button invokes a dialog or expands the dialog, position it centered and aligned vertically along the right side of the window.
  - Do not provide alignment with other screen controls. Maintain alignment and spacing only within the buttons themselves. Also try to position the buttons within windows before locate the other window controls.



- If a button has a *contingent* relationship to another control, position it adjacent to the related control. Buttons found on more than one window should be consistently positioned.



- Organization:
  - Most frequent actions to the left or top.
  - Keep related buttons grouped together.
  - Exception: Buttons containing excessively long labels may be wider.
  - Windows Recommends:
    - Should be visible at all times.
    - An affirmative action the left or above.
    - The default first.
    - OK and Cancel next to each other.

        - Help should be located on the last,
- Expansion and Defaults:
    - When a window is first displayed, provide a default action, if practical. A default should be the most likely action:
        - A confirmation.
        - An application of the activity being performed.
        - A positive action such as OK.
    - If a destructive action is performed (such as a deletion) the default should be Cancel. Indicate the default action by displaying the buttons with a bold or double border.

• Toolbars

Provide easy and fast access to most frequently used commands or options across multiple screens.

- Usage, Structure and Size:
    - Provide buttons of equal size.
    - Create a meaningful and unique icon.
    - Center the image within the button.
    - Create a meaningful label.
- Organization and Location:
    - Place the most frequently used actions to the left or the top
    - Keep related buttons grouped together.
    - Separate potentially destructive buttons from frequently chosen selections.
    - 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.
- Active items, Button Activation and Customization:
    - Make only currently available toolbar items available.
    - Temporarily not available items by displaying grayed out.
    - Highlight the button in some visually distinctive manner when the pointer is resting on it.
    - Call attention to the button in another visually distinctive manner when it has been activated or pressed.
    - Permit toolbars to be turned off by user.
    - Allow the customizing of toolbars.

• Text Entry/Read-Only Controls

A Text Entry/Read-Only controls contains text that is exclusively entered or modified through the keyboard.

- Caption (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.
- Caption (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.

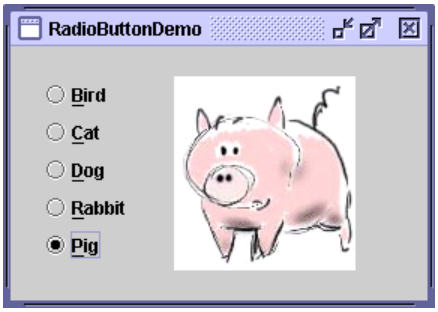
- Fields:
  - To visually indicate that it is an enterable field, present the box in a recessed manner.
  - Present read-only text boxes on the window background.
  - Break up long text boxes through incorporation of slashes (/), dashes (-), spaces, or common delimiters.
  - Call attention to text box data through a highlighting technique.
  - Gray-out temporarily unavailable text boxes.

• Selection Controls

A selection control presents on the screen all the possible alternativ4es, conditions, or choices that may exist for an entity, property, or value. Selection controls include radio buttons, check boxes, list boxes, drop-down/pop-up list boxes, and palettes.

- Radio Buttons

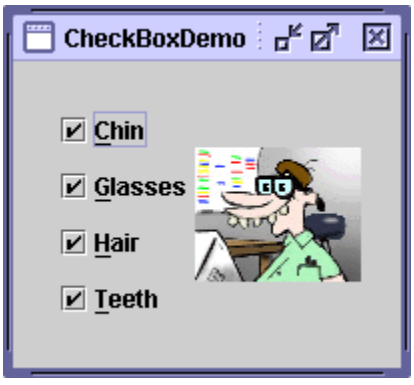
  Use for mutually exclusive choices (that is, only can be selected). It is useful for data and choices that are discrete, small and fixed in number, not easily remembered, most easily understood when the alternatives can be seen together and compared to one another, never change in content and it is not recommended for commands.



  - Defaults and Structure:
    - If there is a default selection, designate it as the default and display its button filled in. Else, display all the buttons without setting a dot.
    - Left-align the buttons and choice descriptions.
    - A columnar orientation is the preferred unless vertical space on the screen is limited.
    - Enclose the buttons in a border to visually strengthen the relationship.
  - Organization, Related Control:

        - Arrange selection in expected order or follow other patterns (frequency of occurrence, sequence of use, or importance)
        - Position any control related to a radio button immediately to the right of the choice description. End the label with an arrow
    - Captions:
        - Display full 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.
                - Alternatively, to the left of the topmost choice description with (:).
            - Without a control border position the caption:
                - Left-justified above the choice description with (:).
                - Alternatively, the caption may be located to the left of the topmost choice description with (:).
        - Horizontal orientation:
            - Position the caption to the left of the choice.
            - Alternatively, with a control border, left-justified within the border.
    - Keyboard Equivalents and Selection and Indication:
        - Assign a keyboard mnemonic to each choice description by underlining the applicable letter in the choice description.
        - Highlight the selection choice in some visually distinctive way when the cursor's resting on it.
        - When a choice is selected, distinguish it visually from the unselected choices.
        - If there is a default choice, display the selected choice as set in the control.

- 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.

!!<u>Other properties are similar to the radio button's properties!!</u>

- Palettes

A control consists of a series of graphical alternatives. The choices themselves are descriptive, being composed of colors, patterns, or images:

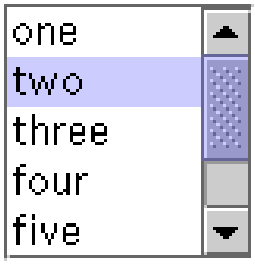
- Position the boxes adjacent to, or butted up against another.
- A columnar orientation is the preferred manner.
- Top to button, Left to right ordering by expected order, frequency of occurrence, sequence of use or alphabetically.
- Display it less brightly than the other choices, if a choice is not 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):

- 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.

- Single Selection List Boxes.



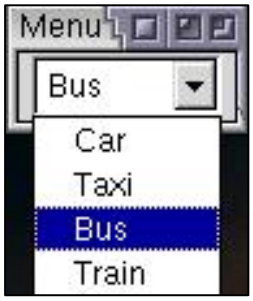
  - If presented with an associated text box control:
    - Position the list box below and as close as possible to the text box.
    - The list box caption should be worded similarly to the text box caption.
    - If the related text box and the list box are very close, the caption may be omitted from the list box.
  - When the list box is first displayed:
    - Present the currently active choice highlighted or marked with a circle or 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.

- Multiple Selection List Boxes:

  - 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 color for 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.
  - Provide command buttons for *Select All* and *Deselect All*.
  - When the list box is first displayed:
    - Display the currently active choices
    - Mark with and X or check mark to the left of the entry

- Drop-Down/Pop-up List Boxes

Provide a visual cue that a box is hidden by including a downward pointing arrow, or other meaningful image



!!Other properties are similar to the List Box's properties!!

• Combination Entry/Selection Controls

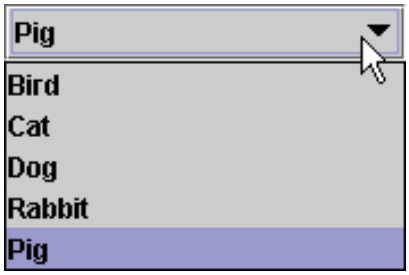
It is possible for a control to possess the characteristics of both a text filed and a selection field. In this type of control, information may either be keyed into the field or selected and placed within it. The types of combination entry/selection fields are spin boxes, combination boxes, and drop down/pop-up combination boxes.

- Spin Boxes.

  - Selection/entry is made by:
    - Using the mouse to point at one of directional buttons
    - Keying a value directly into field itself
- It consumes little screen spaces.
- It is useful only for certain kinds of data.
- Proper usage for:
  - For mutually exclusive choices.
  - Where screen is space is limited.
  - Small in number.
  - Infrequently changed, selected.
  - To reduce the size of potentially long lists, break the listing into subcomponents (For example, break a date into dd mm yy).
  - When first displayed, present a default choice in the box.
  - Caption is mixed-case letters.
  - Position the caption to the left of the box.
  - Alternatively, left-justified above the box.
  - For numeric values:
    - Show a larger value using the up arrow.

- Combination Boxes

A single rectangular text box entry field, beneath which is a larger rectangular list box (resembling a drop-down list box). The text box permits a choice to be keyed within it. As text is typed into the text box, the list scrolls to the nearest match. Also, when an item in the list box is selected, that item is placed within the text box.



- Drop-Down/Pop-up Combo Boxes

It is a single rectangular text box with a small button to the side and an associated hidden list of options. Selections are made by using the mouse or keyboard.

- o Flexible, permitting selection or typed entry
- o Requiring scrolling
- o Proper usage:
  - Where screen is limited.
  - For data and choices that are:
    - Best represented textually.
    - Frequently changed.
    - Large in number.
- o Provide a visual cue that a list box is hidden by including a downward-pointing.

!!Other properties are similar to the Drop-down/Pop-up List Box!!

Selecting the Proper Controls

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

Suggested Uses for Graphical Controls

IF:	USE:
Mutually exclusive alternative 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

IF:	USE:
OR: Type entry may be necessary Content can change Adequate screen space is not available	Drop-down/Pop-up Combo Box
IF:	USE:
Mutually exclusive alternative Best represented graphically Content rarely changes Small or large number of items	Palette
IF:	USE:
Mutually exclusive alternatives Not frequently selected Content does not change Predictable, consecutive data Typed entry sometimes desirable	
And: Adequate screen space is not available	Spin Box
OR: Adequate screen space is not available	Combo Box

IF:	USE:
Nonexclusive alternatives 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

The User Interface Design Process: Step 8

Write Clear Text and Message

Wording of the interface and its screens is the basic form of communication with the user. Clear and meaningfully crafted words, messages, and text lead to greatly enhanced system usability and minimize user confusion that leads to errors and possibly even system rejection.

Words

- Do not use technical words, made-up words or terms.
- Do not use abbreviations or acronyms. Always use the fully spelled-out form the first time it is encountered in the interface.
- Consider the usage of contradictions or short forms (won't vs. will not, un- , -ness), Complete words is preferred.
- Positive terms (avoid the prefix "ir-" "in-" "dis-" and "un-").
- Simple action words ("Project status listing" → "List").
- Words should be consistency throughout the system.

Sentences and Messages

- Should be Brief, simple, directly and immediately usable (Should not search through reference).
- Affirmative statement is easier to understand than negative statements.
- Active voice is usually easier to understand than passive voice.
- Use the same grammatical structure for elements of sentences
- Imply that the system is awaiting the user's direction, not that the system is directing the user.
- Negative tones or actions, or threats are not very friendly ("Numbers are illegal"→ "Months must be entered by name").
- Encouraging message would be better than insulting message.
- Should remain factual and informative, and should not attempt humor or punishment.

Messages

- System messages:
  - Status messages: It provides information concerning the progress of a lengthy operation. Usually contains a progress indicator and a short message.
  - Informational messages (notification messages): This kind of message is usually identified by an "i" icon to the left of the message.

- Warning messages: They are usually identified by an “!”. The user must determine whether the situation is in fact a problem and may be asked to advise the system whether or not to proceed (A deletion request by a user is any action that commonly generates a warning messages).
- Critical messages (Action messages): It uses to call attention to conditions that require a user action before the system can proceed. Some products use a “Do Not” symbol while others use a “Stop” sign or an X in a circle used by Microsoft Windows.
- Question messages: A question message asks a question and offers a choice of options for selection. It is designated by a “?” icon proceeding the message.

- Writing Message Box Text:
  - Title bar: Clearly identify the source of the message:
    - The name of the object to which it refers
    - The name of the application to which it refers
    - Do not include an indication of message type
    - Use mixed case in the headline style
  - Message box: Provide a clear and concise description of the condition of the condition causing the message box to be displayed:
    - Use complete sentences with ending punctuation.
    - Show only message box about the cause of condition in single message.
    - Make the solution an option offered in the message.
    - Use the word “Please” conservatively.
- Do not exceed two or three lines.
- Center the message text in window.
- Include the relevant icon identifying the type of message.

• Instructional messages (prompting message):
  Provide instructional information at the depth of detail needed by the user. Instruction is accessed through a *Help* function is the best solution.
  - Location it at strategic position on the screen.
  - Display it in a manner that visually differentiates it from other screen elements.
  - In writing, follow all relevant writing guideline for words, sentences, and messages.
  - The example of instructional messages:
    - “ERROR PLEASE HIT YOUR BACK BUTTON AND ENTER A SEARCH”.
    - “THE SEARCH FIELD DID NOT CONTAIN AN ENTRY. PLEASE CLICK THE BACK BUTTON AND TYPE A SEARCH VALUE”.

Text for Web Pages

- Words
  - Avoid using words that are specific to the Web (A few Web-specific terms are “This Web site”, “Click here” and “Follow this link”).
  - A good testing of this guideline is to print out a page, read it, and see if it makes as much sense on paper as it does on screen.

- Error Messages
  - Provide helpful error messages for:
    - Incomplete or incorrectly keyed, entered, or selected data.
    - Requests for documents that do not exist or cannot be found.
  - Present them in a visually distinctive and noticeable manner.

- Instructions:
  - Make sure instruction are detailed enough to be understood without being specific to one browser version or brand
  - Don’t use “Return To”.
  - Describe where an “Up” button leads where the user will go.

- Writing
  - Be concise, using only about half the number of words of conventional text.
  - Each paragraph should be short and contain only one main idea.
  - Make text more scan able by using bulleted listings, tables, headings and bold types.
  - Too many links within text can disrupt reading continuity and content understanding.
  - Test for readability by printing out text to carefully proofread it.
- Link Titles
  - A short explanation of a link before the user selects the link
  - Provide link titles that describes:
    - The name of site the link will lead to.
    - The name of subsection the link will lead to.
    - The kind of information to be found at the destination.
    - Warning about possible problems to be encountered at the other end.
  - Restrict them to no more than 60 characters.

Some Words to Forget

AVOID	**USE**
Abend	End, Cancel, Stop
Abort	End, Cancel, Stop
Access	Get, Ready, Display
Available	Ready
Boot	Start, Run

Error	-
Execute	Complete
Hit	Press, Depress
Implement	Do, use, Put Into
Invalid	Not Correct, Not Good, Not Valid
Key	Type Enter
Kill	End, Cancel
Output	Report, List, Display
Return Key	Enter, Transmit
Terminate	End, Exit

The User Interface Design Process: Step 9

Choose the Proper Colors

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

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.

Choosing Colors for Categories of Information

- Color is chosen to organize information or data on a screen. Color itself 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 codes the types of status of the information.
  - Screen searching is performed to locate information of particular kind, color codes 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.
- Never rely on color as the only way of identifying a screen element.
- Always consider how spatial formatting, highlighting, and messages may also be useful.

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.

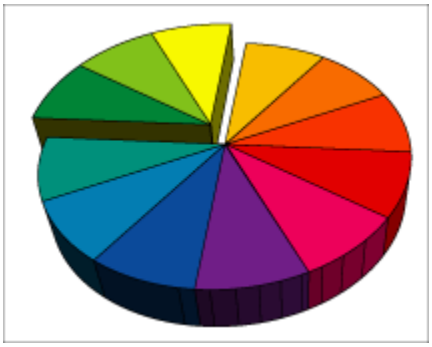
- Colors also change as light levels change.

Usage

- Design for monochrome first or in shades of black, white and gray.
- Doing this will permit the screen to be effectively used:
  - By people with a color-viewing deficiency.
  - On monochrome displays.
  - In conditions where ambient lighting distorts the perceived color
  - If the color ever fails.
- Use colors conservatively
  - Do not use color where other identification techniques, such as location, are available.

Discrimination and Harmony

- Select 4-5 colors for best absolute discrimination (Red, yellow, green, blue, and brown).
- Select 6-7 colors for best comparative discrimination (Orange, yellow-green, cyan, violet, and magenta).



- Choose harmonious colors:
  - One color plus two colors on either side of its complement.
  - Three colors at equidistant point around the color circle.
- For extended viewing or older viewers, use brighter colors.

Emphasis

- To draw attention or to emphasize elements, use bright or highlighted colors or use less bright colors for deemphasize:
  - The perceived brightness of colors from most to least is white, yellow, green, blue and red.
- To emphasize separation, use contrasting colors:
  - Red and green, blue and yellow.
- To convey similarity, use similar colors:
  - Orange and yellow, blue and violet.

Common Meanings

Warm colors (Red, orange, yellow) indicate actions and Cool colors (Green, blue, violet, purple) provide status or background.

- Conform to human expectation:
  - Red: Stop, fire, hot, danger
  - Yellow: Caution, slow, test
  - Green: Go, OK, clear, vegetation, safety
  - Blue: Cold, water, calm, sky, neutrality
  - Gray, White: Neutrality
  - Warm colors: Action, response required, spatial closeness
  - Cool colors: Background information, spatial remoteness

- Typical implications of color with dramatic portrayal are:
  - High illumination: Hot, active, comic situations
  - Low illumination: Emotional, tense, tragic, romantic situations
  - High saturation: Emotional, tense, hot, comic situations
  - Warm colors: Active, leisure, recreation, comic situations
  - Cool colors: Efficiency, tragic and romantic situations

Foregrounds and Backgrounds

- Foregrounds:
  - Use colors that highly contrast with the background color.
  - For text or data:
    - Black on light-color background of low intensity (no bright white).
    - Desaturated spectrum colors such as white, yellow, or green on dark background.
    - Warmer more active colors.
  - In order to emphasize an element, highlight it in a light value of the foreground color, pure white, or yellow.
  - In order to deemphasize and element, lowlight it in a dark value of the foreground color.
- Backgrounds:
  - Use colors that do not compete with the foreground
  - Use:
    - Light-colored backgrounds of low intensity: Off-white or light gray.
    - Desaturated colors.
    - Cool, dark colors such as blue or black.
    - Colors on the spectral extreme end:
      - Blue, black, gray, brown, red, green, and purple.

Gray Scale

- For fine discrimination use a black-gray-white scale.
- Recommend values:
  - White: Screen background, text located in any black area.

- Light gray: Background of a Pushbutton area.
- Medium gray: Icon background area, menu drop shadow, window drop shadow, inside area of system icons, filename bar.
- Dark gray: Window boarder.
- Black: Text, window title bar, icon border, icon elements, ruled lines.

Text in Color

- Text in color is not as visible as it is in black.
- When switching text from black to color:
  - Double the width of lines.
  - Use bold or larger type:
    - If originally 8 to 12 points, increase by 1 to 2 points.
    - If originally 14 to 24 points, increase by 2 to 4 points.
- Check legibility by squinting at text:
  - Too-light type will recede or even disappear.

Color to Avoid

- Avoid relying exclusively on color. Do not underestimate the value and role of other techniques such as spatial formatting and component locations.
- Avoid too many colors at one time. Because it will reduce color benefits.
- Avoid highly saturated, spectrally extreme colors together:
  - Red/blue and yellow/purple.
  - Yellow/blue, green/blue and red/green.
- Avoid low-brightness color for extended viewing or older viewer. Brighter colors are needed to prevent reading problems.
- Avoid colors of equal brightness and lacking contrast because they can not be easily distinguished.
- Avoid fully saturated colors for frequently read screen components.
- Avoid pure blue for text, thin lines, and small shapes. Because the eyes will have difficulty to create a clear and legible image of small blue shapes.
- Avoid colors in small areas.
- Avoid colors for fine details. Black, gray and white will provide much better solution. Or reverse other colors for large area or attracting attention.
- Avoid non-opponent colors:
  - Red/yellow or green/blue.
  - Recommend: Red/green or yellow/blue.
- Avoid using adjacent colors that are only different in the amount of blue they posses.
- Avoid using colors in unexpected ways.
- Avoid using color to improve readability of densely packed text
  - Recommend to use space lines.

The User Interface Design Process: Step 10

Organize and Layout Windows and Pages

Proper screen presentation and structure will encourage quick and correct information comprehension, the fastest possible execution of tasks and functions, and enhanced user acceptance

Organizing and Laying Out Screens

- Amount of information:
  - Present the proper amount of information on each screen.
  - Present all information necessary for perform an action or making decision on one screen.
- Organization
  - Provide an ordering that:
    - Is logical and sequential?
    - Is rhythmic, guiding a person's eye through the display?
    - Encourages natural movement sequences.
    - Minimizes pointer and eye movement distances.
- Control placement:
  - Position the most important and frequently used controls at the top left.
  - Maintain a top-to-bottom, left-to-right flow.
  - If one control enables or affects another, the enabling control should be above or to the left of the enabled control.
  - Place the command buttons that affect the entire window horizontally, and centered, at the window's button.
- Navigation:
  - The flow of interaction should require as little cursor and pointer, minimize number of times a person's hand has to travel between mouse and keyboard.
  - Assist user in navigation through a screen by aligning, grouping, line Borders.
- Aesthetics:
  - Provide a visually pleasing composition by using balance of white space, balance, grouping, alignment of elements.
- Visual clutter:
  - Avoid visual clutter by maintaining low screen density levels and maintaining distinctiveness of elements.
- Focus and emphasis:
  - Sequentially, direct attention to items that are 1. Critical, 2. Important, 3. Secondary, 4. Peripheral.
- Consistency:
  - Provide consistency.

Creating Groupings

- White space:
  - Provide adequate separation of groupings through the liberal use of white space.
  - Leave adequate space around groups of related controls or between groupings and window borders.
  - The space between groupings should be greater than the space between fields with a grouping.
- Heading:
  - Provide section headings and subsection headings for multiple control groupings. Heading should meaningfully and concisely describe the nature of the group of related fields.
- Borders:
  - Enhance groupings through incorporation of borders around elements of a single control or groups of related controls.
  - Provide a border consisting of a thin line around single controls.
  - Provide a boarder consisting of slightly thicker line around groups of fields or controls.
  - Do not place borders around command buttons.

Control Borders

It is a thin single-line around the elements of a section control. Thin line borders may be used to surround some boxed-in controls, particularly radio buttons and check boxes.

- For vertically, leave one line space above and below.
- For horizontally, leave at least 2 spaces between the border and the right.
- Locate the control caption in the top border, indented one character position from the left border.
  - Alternately, locate the caption at the upper left of the box.

Section Borders

It is a thicker single-line border around groups of related entry or selection controls. Locate the section heading in the top border, indented two character positions from the left border.

- For spacing:
  - For vertical, leave one line space.
  - For horizontally, leave at least four character positions to the left and right.

Dependent Controls

- Position a conditional control, or controls to the right of control to which it relates. Alternately, position it below the control to which it relates.
  - Inscribe a filled-in arrow between the selected control and its dependent controls to visually relate them to each other.

Vertical Orientation and Vertical Alignment

- Radio buttons/ check boxes:
  - Left-align choice descriptions, selection indicators, and borders.
  - Caption:
    - Those inscribed within borders must be left-aligned.
    - Those located at the left may be left-or right-aligned.
- Text boxes:
  - Left-align the boxes. If the screen will be used for inquiry or display purposes, numeric fields should be right-aligned.
- List boxes:
  - Left-align fixed list boxes.
  - Caption:
    - Those located above the boxes must be left-aligned.
    - Those located at the left may be left-or right-aligned.
- Drop-down/ Pop-up boxes, spin boxes, combo boxes:
  - Left-align control boxes.
  - Field captions may be left or right-aligned.
- Mixed controls:
  - Left-align vertically arrayed:
    - Text boxes.
    - Radio buttons.
    - Check box boxes.
    - Drop-down/ pop-up list boxes.
    - Spin boxes.
    - Combination control boxes.
    - List boxes.
  - Captions may be left or right-aligned.

Horizontal Orientation and Vertical Alignment

- Radio buttons/check boxes selecting controls:
  - Align leftmost radio buttons and/or check boxes.
  - Field captions may be left- or right aligned.
- Text boxes:
  - Left-align text boxes into columns.
  - Captions may be left or right-aligned.
  - Numeric data should be right-aligned.
- Mixed text boxes and selection controls.
  - Align leftmost radio buttons and/or check boxes.
  - Align the leftmost text box under the leftmost choice description button or box.
  - Captions may be left or right-aligned.

Horizontal Alignment

- Text boxes:

  - Align by their tops horizontally adjacent text boxes.
- Radio buttons/ check boxes / fixed list boxes:
  - Align by their tops horizontally adjacent radio button and/or check box controls / fixed list boxes.
- Dropdown/popup list box, spin box, combo boxes:
  - Align by their tops horizontally adjacent entry/selection fields.

Balancing Elements

Balance can be created by equally distributing controls, spatially, within a window or aligning borders whenever possible.

- If more than one control with a border is incorporated within a column on a screen:
  - Align the controls following the guidelines for multiple-control alignment.
  - Align the left and right borders of all groups.
  - Establish the left and right border positions according to the spacing required for the widest element within the groups.
- With multiple grouping and multiple columns, create a balanced screen by:
  - Maintaining equal column widths as much as practical.
  - Maintaining equal column heights as much as practical.
- If more than one section with borders is incorporated within a column on a screen:
  - Align the left and right borders of all groups.
  - Establish the left and right border positions according to the spacing required by the widest elements within the groups.

Control Navigation

- Tab/Arrow keys:
  - Use the tab key to move between operable window controls, in the logical order of the controls.
  - For radio buttons, use arrow keys to move through.
  - For check boxes:
    - If they are independent controls, use the tab key.
    - Within a border or group box, use arrow keys to move.
  - List boxes:
    - Use arrow keys to navigate within list box choices.

Windows Guidelines

- Use Primary windows to:
  - Begin an interaction and provide top-level context for dependent windows or 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 and.
  - “Nice-to-know” information.
- Minimize the number of windows to accomplish an objective.
- Provide large enough windows to:
  - Present all relevant and expected information for task.
  - Not hide important information.
  - Not cause crowding or visual confusion.
  - Minimize the need for scrolling.
  - Less than the full size of the entire screen.

Webpage Guidelines

- Page layout:
  - Provide a layout that is Efficient, Logical, Consistent, Self-explanatory, Scan able.
  - Strike a proper balance between text, graphics and links.
  - Create and use a layout grid.
  - Minimize page length + Anticipate page breaks.
  - Avoid horizontal scrolling.
  - Place critical or important information at the very top.
  - Position remaining elements according to importance.
  - Reduce graphic complexity and textual density.
- Homepage:
  - Limit to one screen. All important elements should be viewable without scrolling.
  - Clearly identify the Web site’s content and purpose.
  - Elements to include:
    - Site overview or map.
    - Navigation links to most of the site or major sections.
    - Some useful content.

The User Interface Design Process: Step 11

Test, Test and Retest

To wait until after a system has been implemented to uncover and correct any system usability deficiencies can be aggravating, costly, and time-consuming. What follows is an overview of the testing process and the role it plays in design. Its purpose is to provide an awareness of the testing procedures and methods, and to summarize some basic testing guidelines.

Testing steps to be reviewed

- Identifying the purpose and scope of testing.
- Understanding the importance of testing.
- Developing a prototype.
- Developing the right kind of test plan.
- Designing a test to yield relevant data.
- Soliciting, selecting and scheduling users to participate.
- Providing the proper test facility.
- Conducting tests and collecting data.
- Analyzing the data and generating design recommendation.
- Modifying the prototype as necessary.
- Testing the system again.
- Evaluating the working system.

Scope of Testing

- Testing should begin in the earliest stages of product development and continue throughout the development process.
- Always involve all members of the design team in the testing to ensure a common reference point for all.
- Involving all permits multiple insights the test results from the different perspective of team members.

Prototypes

- A prototype is a simulation of an actual system that can be quickly created.
- A prototype may be a rough approximation, such as hand-drawn sketch, or it may be interactive.
- Need not to be perfectly realistic, but accurate and understandable.
- A prototype should include as many features as possible to present concepts and overall organization.
- Or it might have more depth, including more detail on a given feature or task to focus on individual design aspects.

Hand Sketches and Scenarios

Screen sketches created by hand. The focus is on the design, not the interface mechanics.

- Can be used very early in development process.
- Suited for use by entire design team.
- Can be used to define requirements.

However,

- Limited in providing and understanding of navigation and flow.
- A demonstration, not an exercise.
- Limited usefulness for a usability test.
- A poor detailed specification for writing the code.
- Usually restricted to most common tasks.

Sketch Creation Process

- Sketch (Storyboard) the screens while determining:
  - The source of the screen's information.
  - The content and structure of individual screens.
  - The overall order of screens and windows.
- Use an erasable medium.
- Sketch the screens needed to complete each workflow task.
- First, storyboard common/critical/frequent scenarios.
  - Follow them from beginning to end.
  - Then, go back and build in exceptions.
  - Don't get too detailed, just overall order and flow.
- Only develop online prototypes when everyone agrees that a complete set of screens has been satisfactorily sketched.

Interactive Paper Prototypes

Interface components (menus, windows, and screens) constructed of common paper technologies (Post-It notes, transparencies). The components are manually manipulated to reflect the dynamics of the software.

- More illustrative of program dynamics than sketches.
- Can be used to demonstrate the interaction.
- Otherwise, generally the same as for hand-drawn sketches and scenarios.

However,

- Only a rough approximation.
- A demonstration, not an exercise.
- Limited usefulness for usability testing.

Programmed Facades

They are examples of finished dialogs and screens for some important aspects of the systems which are created by prototyping tools.

- Provide a good detailed specification for writing tools.
- A channel for data collection.

However,

- More time-consuming to create.
- Not effective for requirements gathering.
- Not all of the functions demonstrated may be used because of cost, schedule limitations, or lack of user interest.

Prototype-Oriented Languages

They are used to present an example of completed dialogs and screens for some parts of the system. Prototypes can be constructed using programming languages that support the actual programming process.

- May include the final code.
- Otherwise, generally the same as those of programmed facades.

Kind of Tests

- Conformance with a requirement.
- Conformance with guideline for good design.
- Identification of design problems.
- Ease of system learning.
- Speed of task completion.
- Speed of need fulfillment.
- Error rates.
- Subjective user satisfaction.

Heuristic Evaluation

It is a detailed evaluation of a system by interface design specialists to identify problems. The evaluation requires 3 to 5 expert evaluators who are knowledgeable people who are familiar with the project situation and possess a long-term relationship with the organization.

- Doesn’t waste user’s time.
- Can identify many problems.

However,

- Evaluators must possess interface design expertise.
- Evaluators may not possess an adequate understanding of the tasks and user communities.
- Difficult to identify system-wide structural problems.

Web Page Heuristics

- Speak the user's language:
  - Use familiar words, phrases, and concepts.
  - Present information in a logical and natural order.
- Be consistent:
  - Indicate similar concepts through identical terminology and graphics.
  - Adhere to uniform conventions for layout, formatting, typefaces, labeling, and so on.
- Minimize the user's memory load:
  - Take advantage of recognition rather than recall.
  - Do not force users to remember key information across documents.
- Build flexible and efficient systems:
  - Accommodate a range of user sophistication and diverse user goals.
  - Provide instructions where useful.
  - Lay out screens so that frequently accessed information is easily found.
- Design aesthetic and minimalist systems:
  - Create visually pleasing displays.
  - Eliminate information that is irrelevant or distracting.
- Use chunking:
  - Write materials so that documents are short and contain only one topic.
  - Do not force the user to access multiple documents to complete a single thought.
- Provide progressive levels of detail:
  - Organize information hierarchically, with more general information appearing before more specific detail.
  - Encourage the user to delve as deeply as needed, but to stop whenever sufficient information has been obtained.
- Give navigational feedback:
  - Facilitate jumping between related topics.
  - Allow the user to determine his/her current position in the document structure.
  - Make it easy to return to an initial state.
- Don't lie to the user:
  - Eliminate erroneous or misleading links.
  - Do not refer to missing information.

Cognitive Walkthroughs

Developers walk through an interface in the context of representative user tasks. Individual task actions are examined and the evaluators try to establish a logical reason why the user would perform each examined action. Each session is limited to 60-90 minutes.

- Permit a clear evaluation of the task flow early in design process.
- The early design flaw can be detected.
- More structured than a heuristic evaluation.
- Tedious to perform.

- Needed to conduct the walkthrough are:
  - A general description of proposed system users and what relevant knowledge they posses.
  - A specific description of one or more core or representative tasks to be performed.
  - A list of the correct actions required to complete each of the tasks.
- Review:
  - Several core or representative task across a range of functions.
  - Proposed tasks of particular concern.
- Start with simple tasks.

Think-Aloud Evaluations

Users perform specific tasks while thinking out loud. Those comments are recorded and analyzed. Time should be limited to 60-90 minutes.

- Utilizes actual representative tasks.
- Provides insights into the user's reasoning.

However,

- May be difficult to get users to think out loud.

Classic Experiment

Two or more prototypes are constructed, identical in all aspects except for the design issue (type of control, wording of an instruction). Speed and accuracy measures user preferences are collected.

- Permitting better-informed section of the best alternative.
- Requires a strictly controlled experiment to conduct the evaluation.
- Requires creation of multiple prototype.
- Guideline:
  - State a clear and testable hypothesis.
  - Specify a small number of independent variables to be manipulated.
  - Control for biasing factors.
  - Collect the data in a controlled environment.
  - Apply statistical methods to data analysis.
  - Resolve the problem that led to conducting the experiment.

Focus Groups

Small group of knowledgeable users and a moderator are brought together to discuss an interface design prototype. It is easy to set up.

- Must be focused on a specific topic or topics.
- Useful for trying out ideas, obtaining initial user thoughts.
- Requires experienced moderator.
- Guidelines:
  - Restrict group size 8 to 12.
  - Limit to 90 to 120 minutes in length.

- Record session for later detailed analysis.

Choosing a Testing Method

- Using a good pairing is cognitive walkthroughs followed by think- aloud evaluations.
- Use cognitive walk through early in the development process permits the identification and correction of the most serious problems.
- Later, when a functioning prototype is available, the remaining problems can be identified using a think-aloud evaluation.