M.KUMARASAMY
COLLEGE OF ENGINEERING
NAAC Accredited Autonomous Institution
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Thalavapalayam, Karur – 639 113.

DEPARTMENT OF INFORMATION TECHNOLOGY

18ITE02IT -USER INTERFACE DESIGN

Unit – I Introduction

Objective

- To Understand the definition and importance of User Interface Design
- To know about the concept, advantages and applications of GUI and Web interface User Interface Design

Definition

- User interface design is a subset of a field of study called human-computer interaction (HCI). Human-computer interaction is the study, planning, and design of how people and computers work together so that a person's needs are satisfied in the most effective way.
- 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
- Input is how people communicate his needs to the system using keyboard or any pointing device and output is how the system returns processing result to user through screen or sound.
- The best interface is one which has proper design with combination of effective input and output mechanisms.

Importance of Good Design

- In spite of today's rich technologies and tools we are unable to provide effective and usable screen because lack of time and care.
- A well-designed interface and screen is terribly important to our users. It is their window to view the capabilities of the system and it is also the vehicle through which complex tasks can be performed.
- 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. It can also lead to aggravation, frustration, and increased stress.

Benefits of Good Design

- The benefits of a well-designed screen have also been under experimental scrutiny for many years. One researcher, for example, attempted to improve screen clarity and readability by making screens less crowded. The result: screen users of the modified screens completed transactions in 25 percent less time and with 25 percent fewer errors than those who used the original screens.
- Another researcher has reported that reformatting inquiry screens following good design principles reduced decision-making time by about 40 percent, resulting in a savings of 79 person-years in the affected system.
- Other benefits also accrue from good design (Karat, 1997). Training costs are lowered because training time is reduced, support line costs are lowered because fewer assist calls are necessary, and employee satisfaction is increased because aggravation and frustration are reduced.
- Another benefit is, ultimately, that an organization's customers benefit because of the improved service they receive.
- Identifying and resolving problems during the design and development process also has significant economic benefits.

GUI Definition

- In brief, a graphical user interface can be defined as follows. A user interface, as recently described, is a collection of techniques and mechanisms to interact with something. In a graphical interface, the primary interaction mechanism is a pointing device of some kind.
- What the user interacts with is a collection of elements referred to as objects. They can be seen, heard, touched, or otherwise perceived. Objects are always visible to the user and are used to perform tasks. They are interacted with as entities independent of all other objects.
- People perform operations, called actions, on objects. The operations include accessing and modifying objects by pointing, selecting, and manipulating.

Popularity of Graphics

- Graphics revolutionized design and the user interface. Graphics assumes three dimensional look whereas text based system assumes one dimensional look.
- Information can appear or disappear through floating windows and navigation and commands can be done through menu or pull downs or screen controls
- Increased computer power and the vast improvement in the display enable the user's actions to be reacted to quickly, dynamically, and meaningfully.
- If properly used graphics can reduce mental and perceptional load and increases information transfer between men and machine because of visual comparisons and simplification of the perception of structure.

Concept of Direct Manipulation

The term used to describe this style of interaction for graphical systems was first used by Shneiderman (1982). He called them "direct manipulation" systems, suggesting that they possess the following characteristics:

- **The system is portrayed as an extension of the real world**: A person is allowed to work in a familiar environment and in a familiar way, focusing on the data, not the application and tools. The physical organization of the system, which most often is unfamiliar, is hidden from view and is not a distraction.
- **Continuous visibility of objects and actions**: objects are continuously visible. Reminders of actions to be performed are also obvious. Nelson (1980) described this concept as "virtual reality," a representation of reality that can be manipulated. Hatfield (1981) is credited with calling it "WYSIWYG" (what you see is what you get) and Rutkowski (1982) described it as "transparency,"
- **Actions are rapid and incremental with visible display of results** : the results of actions are immediately displayed visually on the screen in their new and current form. Auditory feedback may also be provided. The impact of a previous action is quickly seen, and the evolution of tasks is continuous and effortless.
- **Incremental actions are easily reversible**: Finally, actions, if discovered to be incorrect or not desired, can be easily undone.

Indirect Manipulation

- In practice, direct manipulation of all screen objects and actions may not be feasible because of the following:
    - The operation may be difficult to conceptualize in the graphical system.
    - The graphics capability of the system may be limited.
    - The amount of space available for placing manipulation controls in the window border may be limited.
    - It may be difficult for people to learn and remember all the necessary operations and actions.
- When this occurs, indirect manipulation is provided. Indirect manipulation substitutes words and text, such as pull-down or pop-up menus, for symbols, and substitutes typing for pointing.

Graphical system advantages

The success of graphical systems has been attributed to a host of factors. The following have been commonly referenced in literature and endorsed by their advocates as advantages of these systems.

- **Symbols recognized faster than text**: symbols can be recognized faster and more accurately than text. An example of a good classification scheme that speeds up recognition is the icons. These icons allow speedy recognition of the type of message being presented.

- **Faster learning**: a graphical, pictorial representation aids learning, and symbols can also be easily learned.
- **Faster use and problem solving**: Visual or spatial representation of information has been found to be easier to retain and manipulate and leads to faster and more successful problem solving.
- **Easier remembering**: Because of greater simplicity, it is easier for casual users to retain operational concepts.
- **More natural**: symbolic displays are more natural and advantageous because the human mind has a powerful image memory.
- **Fewer errors**: Reversibility of actions reduces error rates because it is always possible to undo the last step. Error messages are less frequently needed.
- **Increased feeling of control**: The user initiates actions and feels in control. This increases user confidence
- **Immediate feedback**: The results of actions furthering user goals can be seen immediately. If the response is not in the desired direction, the direction can be changed quickly.
- **Predictable system responses**: Predictable system responses also speed learning.
- Easily reversible actions: This ability to reverse unwanted actions also increases user confidence
- **More attractive**: Direct-manipulation systems are more entertaining, cleverer, and more appealing.
- **May consume less space**: Icons may take up less space than the equivalent in words but this is not the case always.
- **Replaces national languages**: Icons possess much more universality than text and are much more easily comprehended worldwide.
- **Easily augmented with text displays**: Where graphical design limitations exist, direct-manipulation systems can easily be augmented with text displays. The reverse is not true.
- **Low typing requirements**: Pointing and selection controls, such as the mouse or trackball, eliminate the need for typing skills.

Graphical system disadvantages

The body of positive research, hypotheses, and comment concerning graphical systems is being challenged by some studies, findings, and opinions that indicate that graphical representation and interaction may not necessarily always be better. Indeed, in some cases, it may be poorer than pure textual or alphanumeric displays. Sometimes arcane, and even bizarre. Among the disadvantages put forth are these:

- **Greater design complexity**: Controls and basic alternatives must be chosen from a pile of choices numbering in excess of 50. This design potential may not necessarily result in better design unless proper controls and windows are selected. Poor design can undermine acceptance.
- **Learning still necessary**: The first time one encounters many graphical systems, what to do is not immediately obvious. A severe learning and remembering requirement is imposed on many users because meanings of icons or using pointing device have to be learned.

- **Lack of experimentally-derived design guidelines:** today there is a lack of widely available experimentally-derived design guidelines. Earlier only few studies to aid in making design decisions were performed and available for today now. Consequently, there is too little understanding of how most design aspects relate to productivity and satisfaction.
- **Inconsistencies in technique and terminology**: Many differences in technique, terminology, and look and feel exist among various graphical system providers, and even among successive versions of the same system. So the user has to learn or relearn again while shifting to next terminology.
- **Not always familiar**: Symbolic representations may not be as familiar as words or numbers. Numeric symbols elicit faster responses than graphic symbols in a visual search task.
- **Window manipulation requirements**: Window handling and manipulation times are still excessive and repetitive. This wastes time
- **Production limitations**: The number of symbols that can be clearly produced using today's technology is still limited. A body of recognizable symbols must be produced that are equally legible and equally recognizable using differing technologies. This is extremely difficult today.
- **Few tested icons exist**: Icons must be researched, designed, tested, and then introduced into the marketplace. The consequences of poor or improper design will be confusion and lower productivity for users.
- **Inefficient for touch typists**: For an experienced touch typist, the keyboard is a very fast and powerful device.
- **Not always the preferred style of interaction**: Not all users prefer a pure iconic interface. User will also prefer alternatives with textual captions.
- **Not always fastest style of interaction:** graphic instructions on an automated bank teller machine were inferior to textual instructions.
- **May consume more screen space**: Not all applications will consume less screen space. A listing of names and telephone numbers in a textual format will be more efficient to scan than a card file.
- **Hardware limitations**: Good design also requires hardware of adequate power, processing speed, screen resolution, and graphic capability.

Characteristics of the Graphical User Interface

Sophisticated Visual Presentation

- Visual presentation is the visual aspect of the interface. It is what people see on the screen. The sophistication of a graphical system permits displaying lines, including drawings and icons. It also permits the displaying of a variety of character fonts, including different sizes and styles.
- The meaningful interface elements visually presented to the user in a graphical system include windows (primary, secondary, or dialog boxes), menus (menu bar, pulldown, pop-up, cascading), icons to represent objects such as programs or files, assorted screen-based controls (text boxes, list boxes, combination boxes, settings, scroll bars, and buttons), and a mouse pointer and cursor. The objective

is to reflect visually on the screen the real world of the user as realistically, meaningfully, simply, and clearly as possible.

Pick-and-Click Interaction

- To identify a proposed action is commonly referred to as pick, the signal to perform an action as click.
- The primary mechanism for performing this pick-and-click is most often the mouse and its buttons and the secondary mechanism for performing these selection actions is the keyboard.

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, and nothing more. This concept fostered the acronym WYSIWYG.

Visualization

- Visualization is a cognitive process that allows people to understand information that is difficult to perceive, because it is either too voluminous or too abstract.
- The goal is not necessarily to reproduce a realistic graphical image, but to produce one that conveys the most relevant information. Effective visualizations can facilitate mental insights, increase productivity, and foster 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 as a single unit.
- Objects can be composed of subobjects .For example, an object may be a document and its subobjects may be a paragraph, sentence, word, and letter.
- Objects are divided into three meaningful classes as Data objects, which present information, container objects to hold other objects and Device objects, represent physical objects in the real world.
- Objects can exist within the context of other objects, and one object may affect the way another object appears or behaves. These relationships are called collections, constraints, composites, and containers.
- **Properties or Attributes of Objects :** Properties are the unique characteristics of an object. Properties help to describe an object and can be changed by users.
- **Actions :** People take actions on objects. They manipulate objects in specific ways (commands) or modify the properties of objects (property or attribute specification).
- The following is a typical property/attribute specification sequence*:*
  - The user selects an object—for example, several words of text.
  - The user then selects an action to apply to that object, such as the action BOLD.

- The selected words are made bold and will remain bold until selected and changed again.

- **Application versus Object or Data Orientation** An application-oriented approach takes an action: object approach, like this:

  Action> 1. An application is opened (for example, word processing).
  Object> 2. A file or other object selected (for example, a memo).

  An object-oriented object:action approach does this:

  Object> 1. An object is chosen (a memo).
  Action> 2. An application is selected (word processing).

- **Views :** Views are ways of looking at an object's information. IBM's SAA CUA describes four kinds of views: composed, contents, settings, and help.

Use of Recognition Memory

- Continuous visibility of objects and actions encourages to eliminate "out of sight, out of mind" problem

Concurrent Performance of Functions

- Graphic systems may do two or more things at one time. Multiple programs may run simultaneously.
- It may process background tasks (cooperative multitasking) or preemptive multitasking.
- Data may also be transferred between programs. It may be temporarily stored on a "clipboard" for later transfer or be automatically swapped between programs.

The Web User Interface

- Web interface design is essentially the design of navigation and the presentation of information.
- Proper interface design is largely a matter of properly balancing the structure and relationships of menus, content, and other linked documents or graphics. The design goal is to build a hierarchy of menus and pages that feels 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. First, its underlying design language, HTML. Next, browser navigation retreated to the pre-GUI era.
- Web interface design is also more difficult because the main issues concern information architecture and task flow, neither of which is easy to standardize. It is more difficult because of the availability of the various types of multimedia, and the desire of many designers to use something simply because it is available. It is more difficult because users are ill defined, and the user's tools so variable in nature.

The popularity of Web

- While the introduction of the graphical user interface revolutionized the user interface, the Web has revolutionized computing. It allows millions of people scattered across the globe to communicate, access information, publish, and be heard. It allows people to control much of the display and the rendering of Web pages.
- Web usage has reflected this popularity. The number of Internet hosts has risen dramatically.
- Users have become much more discerning about good design. Slow download times, confusing navigation, confusing page organization, disturbing animation, or other undesirable site features often results in user abandonment of the site for others with a more agreeable interface.

Characteristics of Web Design

- A Web interface possesses a number of characteristics, some similar to a GUI interface, and, as has already been shown, some different.

GUI versus Web Design

Characteristics	GUI	WEB
Devices	User hardware variations limited. User hardware characteristics well defined Screens appear exactly as specified.	User hardware variations enormous. Screen appearance influenced by hardware being used.
User Focus	Data and applications.	Information and navigation.
Data	Typically created and used by known and trusted	Full of unknown content.
Information	Sources are trusted. Properties generally known. Typically placed into system by users or known people and organizations.	Source not always trusted. Often not placed onto the Web by users or known people and organizations. Highly variable organization.
User Tasks	Install, configure, personalize, start, use, and Open, use, and close data files. Familiarity with applications often achieved.	Link to a site, browse or read pages, fill out forms, upgrade programs. register for services, participate in transactions, download and save things.

		Familiarity with many sites not established.
Presentation	Windows, menus, controls, data, toolbars Presented as specified by designer. Generally standardized by toolkits and style specifications. guides.	Two components, browser and page Within page, any combination of text, images, audio, video, and animation. May not be presented as specified by the designer— dependent on browser, monitor, and user Little standardization.
Navigation	Through menus, lists, trees, dialogs, and wizards.	Through links, bookmarks, and typed URLs.
Interaction	Interactions such as clicking menu choices, pressing buttons, selecting list choices, and cut/copy/paste occur within context of active program.	Basic interaction is a single click. This can cause extreme changes in context, which may not be noticed.
Response Time	Nearly instantaneous	Quite variable, depending on transmission speeds, page content, and so on. Long times can upset the user.
System Capability	Unlimited capability proportional to sophistication of hardware and software.	Limited by constraints imposed by the hardware, browser, software, client support, and user willingness to allow features because of response time, security, and privacy concerns.
Task Efficiency	Targeted to a specific audience with specific tasks. Only limited by the amount of programming undertaken to support it.	Limited by browser and network capabilities. Actual user audience usually not well understood. Often intended for anyone and everyone.

Consistency	Major objective exists within and across applications. Aided by platform toolkit and design guidelines. Universal consistency in GUI products generally	Sites tend to establish their own identity. Frequently standards set within a site. Frequent ignoring of GUI guidelines for identical created through toolkits and design guidelines. components, especially controls.
User Assistance	Integral part of most systems and applications. Documentation, both online and offline, Customer service support, if provided, usually provided. Personal support desk also usually provided.	No similar help systems. Accessed through standard mechanisms. The little available help is built into the page oriented to product or service offered.
Integration	Seamless integration of all applications into the platform environment is a major objective.	Apparent for some basic functions within most Web sites (navigation, printing, and so on.) in accomplishing this objective Sites tend to achieve individual distinction rather than integration.
Security	Tightly controlled, proportional to degree of willingness to invest resources and effort. Not an issue for most home PC users.	Renowned for security exposures. Browser-provided security options typically understood by average users. When employed, may have function-limiting side effects
Reliability	Tightly controlled in business systems,	Susceptible to disruptions caused by user, telephone proportional to degree of willingness line and cable providers, Internet service providers, to invest resources and effort. hosting servers, and remotely accessed sites.

Printed Pages versus Web Pages

- **Page size:** Printed pages are generally larger than their Web counterparts. They are also fixed in size, not variable like Web pages. The visual impact of the printed page is maintained in hard-copy form, while on the Web all that usually exists are snapshots of page areas. The visual impact of a Web page is substantially degraded, and the user may never see some parts of the page because their existence is not known or require scrolling to bring into view. The design implications: the top of a Web page is its most important element, and signals to the user must always be provided that parts of a page lie below the surface.
- **Page rendering:** Printed pages are immensely superior to Web pages in rendering. Printed pages are presented as complete entities, and their entire contents are available for reading or review immediately upon appearance. Web pages elements are often rendered slowly, depending upon things like line transmission speeds and page content. Design implications: Provide page content that downloads fast, and give people elements to read immediately so the sense of passing time is diminished.
- **Page layout:** With the printed page, layout is precise with much attention given to it. With Web pages layout is more of an approximation, being negatively influenced by deficiencies in design toolkits and the characteristics of the user's browser and hardware, particularly screen sizes. Design implication: Understand the restrictions and design for the most common user tools.
- **Page resolution:** the resolution of displayed print characters still exceeds that of screen characters, and screen reading is still slower than reading from a document. Design implication: Provide an easy way to print long Web documents.
- **Page navigation:** Navigating printed materials is as simple as page turning. Navigating the Web requires innumerable decisions concerning which of many possible links should be followed. Design implications are similar to the above—provide overviews of information organization schemes and clear descriptions of where links lead.
- **Interactivity:** Printed page design involves letting the eyes traverse static information, selectively looking at information and using spatial combinations to make page elements enhance and explain each other. Web design involves letting the hands move the information (scrolling, pointing, expanding, clicking, and so on) in conjunction with the eyes.
- **Page independence:** Because moving between Web pages is so easy, and almost any page in a site can be accessed from anywhere else, pages must be made freestanding. Every page is independent. Printed pages, being sequential, fairly standardized in organization, and providing a clear sense of place, are not considered independent. Design implication: Provide informative headers and footers on each Web page.

Merging Graphical business system and Web

- Strength of the Web lies in its ability to link databases and processing occurring on a variety of machines within a company or organization. The graphical

business system and the Web will merge into a common entity. These Web systems are called intranets.

Intranet versus the Internet

They differ, however, in some important ways as

- **Users:** The users of intranets, being organization employees, know a lot about the organization, its structure, its products, its jargon, and its culture. Customers use Internet sites and others who know much less about the organization, and often care less about it.
- **Tasks:** An intranet is used for an organization's everyday activities, including complex transactions, queries, and communications. The Internet is mainly used to find information, with a supplementary use being simple transactions.
- **Type of information:** An intranet will contain detailed information needed for organizational functioning. Information will often be added or modified. The Internet will usually present more stable information: marketing and customer or client information, reports, and so forth.
- **Amount of information:** Typically, an intranet site will be much larger than an organization's Internet site. It has been estimated that an intranet site can be ten to one hundred times larger than its corresponding public site.
- **Hardware and software:** Since intranets exist in a controlled environment, the kinds of computers, monitors, browsers, and other software can be restricted or standardized. The need for cross-platform compatibility is minimized or eliminated, upgraded communications also permit intranets to run from a hundred to a thousand times faster than typical Internet access can. This allows the use of rich graphics and multimedia, screen elements that contribute to very slow download times for most Internet users.
- **Design philosophy:** Implementation on the intranet of current text-based and GUI applications will present a user model similar to those that have existed in other domains. This will cause a swing back to more traditional GUI designs—designs that will also incorporate the visual appeal of the Web, but eliminate many of its useless, promotional, and distracting features. The resulting GUI hybrids will be richer and much more effective.

Extranets

- An extranet is a special set of intranet Web pages that can be accessed from outside an organization or company.
- Typical examples include those for letting customers check on an order's status or letting suppliers view requests for proposals. An extranet is a blend of the public Internet and the intranet, and its design should reflect this.

Principles of User Interface Design

- It should be useful, accomplishing some business objectives faster and more efficiently than the previously used method or tool did. It must also be easy to learn, for people want to do, not learn to do.
- The interface itself should serve as both a connector and a separator: a connector in that it ties the user to the power of the computer, and a separator in that it minimizes the possibility of the participants damaging one another. We will begin with the first set of published principles, those for the Xerox STAR.

Principles for the Xerox STAR

- The illusion of manipulable objects: Displayed objects that are selectable and manipulable must be created. A design challenge is to invent a set of displayable objects that are represented meaningfully and appropriately for the intended application. It must be clear that these objects can be selected,
- Visual order and viewer focus: Effective visual contrast between various components of the screen is used to achieve this goal. Animation is also used to draw attention, as is sound. Feedback must also be provided to the user.
- Revealed structure: The distance between one's intention and the effect must be minimized. The relationship between intention and effect must be tightened and made as apparent as possible to the user.
- Consistency: Consistency aids learning. Consistency is provided in such areas as element location, grammar, font shapes, styles, and sizes, selection indicators, and contrast and emphasis techniques.
- Appropriate effect or emotional impact: The interface must provide the appropriate emotional effect for the product and its market. Is it a corporate, professional, and secure business system? Should it reflect the fantasy, wizardry, and bad puns of computer games?
- A match with the medium: The interface must also reflect the capabilities of the device on which it will be displayed. Quality of screen images will be greatly affected by a device's resolution and color-generation capabilities.

General Principles

The design goals in creating a user interface are described below. They are fundamental to the design and implementation of all effective interfaces, including GUI and Web ones. These principles are general characteristics of the interface, and they apply to all aspects.

- Aesthetically Pleasing
  - — Provide visual appeal by following 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.
- Clarity
  - — The interface should be visually, conceptually, and linguistically clear, including:

        - Visual elements
        - Functions
        - Metaphors
        - Words and text
- Compatibility
    - Provide compatibility with the following:
        - The user
        - The task and job
        - The product
    - Adopt the user's perspective.
- 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
    - The flow of actions, responses, visual presentations, and information should be in a sensible order that is easy to recollect and place in context.
- Configurability
    - Permit easy personalization, configuration, and reconfiguration of settings.
        - Enhances a sense of control.
        - Encourages an active role in understanding.
- 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.
    - In addition to increased learning requirements, inconsistency in design has a number of other prerequisites and by-products, including:
    - More specialization by system users.
    - Greater demand for higher skills.
    - More preparation time and less production time.
    - More frequent changes in procedures.
    - More error-tolerant systems (because errors are more likely).
    - More kinds of documentation.
    - More time to find information in documents.
    - More unlearning and learning when systems are changed.
    - More demands on supervisors and managers.
    - More things to do wrong.

- Control

- The user must control the interaction.
  - Actions should result from explicit user requests.
  - Actions should be performed quickly.
  - Actions should be capable of interruption or termination.
  - The user should never be interrupted for errors.
- The context maintained must be from the perspective of the user.
- The means to achieve goals should be flexible and compatible with the user's skills, experiences, habits, and preferences.
- Avoid modes since they constrain the actions available to the user.
- Permit the user to customize aspects of the interface, while always providing a proper set of defaults.

- Directness
  - Provide direct ways to accomplish tasks.
    - Available alternatives should be visible.
    - The effect of actions on objects 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 movement through a screen should be obvious and sequential.
  - Anticipate the user's wants and needs whenever possible.
- Familiarity
  - Employ familiar concepts and use a language that is familiar to the user.
  - Keep the interface natural, mimicking the user's behavior patterns.
  - 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 conditions at that moment.
- Forgiveness
  - Tolerate and forgive common and unavoidable human errors.
  - Prevent errors from occurring whenever possible.
  - Protect against possible catastrophic errors.
- 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.
  - All expectations should be fulfilled uniformly and completely.
  - When an error does occur, provide constructive messages.
- Recovery
  - A system should permit:
    - Commands or actions to be abolished or reversed.
    - Immediate return to a certain point if difficulties arise.

- Ensure that users never lose their work as a result of:
    - An error on their part.
    - Hardware, software, or communication problems.

- Responsiveness
  - The system must rapidly respond to the user's requests.
  - Provide immediate acknowledgment for all user actions:
    - Visual.
    - Textual.
    - Auditory.

- Simplicity
  - Provide as simple an interface as possible.
  - Five ways to provide simplicity:
    - Use progressive disclosure, hiding things until they are needed.
  - Present common and necessary functions first.
  - Prominently feature important functions.
  - Hide more sophisticated and less frequently used functions.
    - Provide defaults.
    - Minimize screen alignment points.
    - Make common actions simple at the expense of uncommon actions being made harder.
    - 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 invisible 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 take precedence over technical requirements.

Question Bank

Part –A

1. Define UID
2. Is UID Important? Why?
3. What are the benefits of Good Design?
4. Difference between direct and indirect Manipulation.
5. Explain the three types of Objects in UID
6. List and define the relationship between objects in UID
7. What is an Intranet and Extranet?

Part –B

1. Define UID and Explain its importance
2. Discuss in detail the need and essential features of direct manipulation graphical system and its applications?
3. Elaborate the characteristics and principles of User Interface Design.
4. Give the Characteristics of Web User Interface.
5. Explain the difference between GUI and Web Interface.
6. Give the characteristics of
    a. Intranet vs. Internet
    b. Printed vs. Webpage

UNIT – II

Design Process

Objectives

- To know the characteristics of Human Beings
- To understand human considerations and common usability problems in interface
- To understand the methods to analyze business requirements
- To get knowledge about design standards and style guidelines

Obstacles and Pitfalls in the Development Path

- Gould (1988) has made these general observations about design:
    - Nobody ever gets it right the first time.
    - Development is chock-full of surprises.
    - Good design requires living in a sea of changes.
    - Making contracts to ignore change will never eliminate the need for change.
    - Even if you have made the best system humanly possible, people will still make mistakes when using it.
    - Designers need good tools.
    - You must have behavioral design goals like performance design goals.

- The first five conditions listed will occur naturally because people are people, both as users and as developers. These kinds of behavior must be understood and accepted in design. User mistakes, while they will always occur, can be reduced.
- Pitfalls in the design process exist because of a flawed design process, including a failure to address critical design issues, an improper focus of attention, or development team organization failures. Common pitfalls are:
    - No early analysis and understanding of the user's needs and expectations.
    - A focus on using design features or components that are "neat" or "glitzy."
    - Little or no creation of design element prototypes.
    - No usability testing.
    - No common design team vision of user interface design goals.
    - Poor communication between members of the development team.

Designing for People: The Five Commandments

- The complexity of a graphical or Web interface will always magnify any problems that do occur. Pitfalls can be eliminated if the following design commandments remain foremost in the designer's mind.
    - Gain a complete understanding of users and their tasks: The users are the customers. Today, people expect a level of design sophistication from all interfaces, including Web sites. The product, system or Web site must be geared to people's needs, not those of the developers.

    - Solicit early and ongoing user involvement: Involving the users in design from the beginning provides a direct conduit to the knowledge they possess about jobs, tasks, and needs. Involvement also allows the developer to confront a person's resistance to change, a common human trait. People dislike change for a variety of reasons, among them fear of the unknown and lack of identification with the system.
    - Perform rapid prototyping and testing: Prototyping and testing the product will quickly identify problems and allow you to develop solutions. Prototyping and testing must be continually performed during all stages of development to uncover all potential defects. If thorough testing is not performed before product release, the testing will occur in the user's office. Encountering a series of problems early in system use will create a negative first impression in the customer's mind, and this may harden quickly, creating attitudes that may be difficult to change. It is also much harder and more costly to fix a product after its release.
    - Modify and iterate the design as much as necessary: While design will proceed through a series of stages, problems detected in one stage may force the developer to revisit a previous stage.. Establish user performance and acceptance criteria and continue testing and modifying until all design goals are met.

- Integrate the design of all the system components: The software, the documentation, the help function, and training needs are all important elements of a graphical system or Web site and all should be developed concurrently. Time will also exist for design trade-offs to be thought out more carefully.

Usability

- The term usability used to describe the effectiveness of human performance. The term usability is defined as "the capability to be used by humans easily and effectively, where,
  easily = to a specified level of subjective assessment,
  effectively = to a specified level of human performance."

Common Usability Problems

- Mandel (1994) lists the 10 most common usability problems in graphical systems as reported by IBM usability specialists. They are:
  1. Ambiguous menus and icons.
  2. Languages that permit only single-direction movement through a system.
  3. Input and direct manipulation limits.
  4. Highlighting and selection limitations.
  5. Unclear step sequences.
  6. More steps to manage the interface than to perform tasks.
  7. Complex linkage between and within applications.
  8. Inadequate feedback and confirmation.
  9. Lack of system anticipation and intelligence.
  10. Inadequate error messages, help, tutorials, and documentation.

Some Practical Measures of Usability

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

Some Objective Measures of Usability

- Shackel (1991) presents the following more objective criteria for measuring usability.
- How effective is the interface? Can the required range of tasks be accomplished:
  - At better than some required level of performance (for example, in terms of speed and errors)?
  - By some required percentage of the specified target range of users?
  - Within some required proportion of the range of usage environments?
- How learnable is the interface? Can the interface be learned:

    - Within some specified time from commissioning and start of user training?
    - Based on some specified amount of training and user support?
    - Within some specified relearning time each time for intermittent users?
- How flexible is the interface? Is it flexible enough to:
    - Allow some specified percentage variation in tasks and/or environments beyond those first specified?
    - What are the attitudes of the users? Are they: Within acceptable levels of human cost in terms of tiredness, discomfort, frustration, and personal effort?
    - Such that satisfaction causes continued and enhanced usage of the system?

The Design Team

- Provide a balanced design team, including specialists in:
    - Development
    - Human factors
    - Visual design
    - Usability assessment
    - Documentation
    - Training

Know your user or client

- 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 characteristics of the user's needs, tasks, and jobs.
    - Identify the user's psychological characteristics.
    - Identify the user's physical characteristics.
    - Employ recommended methods for gaining understanding of users.

Why People Have Trouble with Computers

- What makes a system difficult to use in the eyes of its user? Listed below are several contributing factors that apply to traditional business systems.
    - Use of jargon.
    - Non-obvious design.
    - Non-obvious design.
    - Disparity in problem-solving strategies.
    - Design inconsistency.

Responses to Poor Design

- Errors are a symptom of problems. The magnitude of errors in a computer-based system has been found to be as high as 46 percent for commands, tasks, or

transactions. Errors, and other problems that befuddle one, lead to a variety of psychological and physical user responses.

Psychological

Confusion.
Annoyance.
Frustration.
Panic or stress.
Boredom.

Physical

Abandonment of the system.
Partial use of the system.
Indirect use of the system.
Modification of the task.
Compensatory activity.
Misuse of the system.
Direct programming.

Important Human Characteristics in Design

Perception

- Perception is our awareness and understanding of the elements and objects of our environment through the physical sensation of our various senses, including sight, sound, smell, and so forth. Perception is influenced, in part, by experience.
- Other perceptual characteristics include the following:
    - Proximity. Our eyes and mind see objects as belonging together if they are near each other in space.
    - Similarity. Our eyes and mind see objects as belonging together if they share a common visual property, such as color, size, shape, brightness, or orientation.
    - Matching patterns. We respond similarly to the same shape in different sizes. The letters of the alphabet, for example, possess the same meaning, regardless of physical size.
    - Succinctness. We see an object as having some perfect or simple shape because perfection or simplicity is easier to remember.
    - Closure. Our perception is synthetic; it establishes meaningful wholes. If something does not quite close itself, such as a circle, square, triangle, or word, we see it as closed anyway.
    - Unity. Objects that form closed shapes are perceived as a group.
    - Continuity. Shortened lines may be automatically extended.
    - Balance. We desire stabilization or equilibrium in our viewing environment. Vertical, horizontal, and right angles are the most visually satisfying and easiest to look at.
    - Expectancies. Perception is also influenced by expectancies; sometimes we perceive not what is there but what we expect to be there. Missing a spelling mistake in proofreading something we write is often an example of a perceptual expectancy error; we see not how a word is spelled, but how we expect to see it spelled.
    - Context. Context, environment, and surroundings also influence individual perception. For example, two drawn lines of the same length may look the

same length or different lengths, depending on the angle of adjacent lines or what other people have said about the size of the lines.

- Signals versus noise. Our sensing mechanisms are bombarded by many stimuli, some of which are important and some of which are not. Important stimuli are called signals; those that are not important or unwanted are called noise.

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, but usually cannot receive both at once, the senses being processed separately. Within short-term memory a limited amount of information processing takes place. Information stored within it is variously thought to last from 10 to 30 seconds, with the lower number being the most reasonable speculation. Knowledge, experience, and familiarity govern the size and complexity of the information that can be remembered.

- Long-term memory contains the knowledge we possess. Information received in short-term memory is transferred to it and encoded within it, a process we call learning. It is a complex process requiring some effort on our part. The learning process is improved if the information being transferred from short-term memory has structure and is meaningful and familiar. Learning is also improved through repetition. Unlike short-term memory, with its distinct limitations, long-term memory capacity is thought to be unlimited. An important memory consideration, with significant implications for interface design, is the difference in ability to recognize or recall words.

Sensory Storage

- Sensory storage is the buffer where the automatic processing of information collected from our senses takes place. It is an unconscious process, large, attentive to the environment, quick to detect changes, and constantly being replaced by newly gathered stimuli. In a sense, it acts like radar, constantly scanning the environment for things that are important to pass on to higher memory.
- Repeated and excessive stimulation can fatigue the sensory storage mechanism, making it less attentive and unable to distinguish what is important (called habituation). Avoid unnecessarily stressing it.
- Design the interface so that all aspects and elements serve a definite purpose. Eliminating interface noise will ensure that important things will be less likely to be missed.

Visual Acuity

- The capacity of the eye to resolve details is called 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—that is, as the visual angle from the point of fixation increases.

- It has been shown that relative visual acuity is approximately halved at a distance of 2.5 degrees from the point of eye fixation
- The eye's sensitivity increases for those characters closest to the fixation point (the "0") and decreases for those characters at the extreme edges of the circle (a 50/50 chance exists for getting these characters correctly identified). This may be presumed to be a visual "chunk" of a screen

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, but what is there cannot be clearly resolved because of the limitations in visual acuity just described.
- Foveal and peripheral vision maintain, at the same time, a cooperative and a competitive relationship. Peripheral vision can aid a visual search, but can also be distracting.
- In its cooperative nature, peripheral vision is thought to provide clues to where the eye should go next in the visual search of a screen.
- In its competitive nature, peripheral vision can compete with foveal vision for attention. What is sensed in the periphery is passed on to our information-processing system along with what is actively being viewed foveally.

Information Processing

- The information that our senses collect that is deemed important enough to do something about then has to be processed in some meaningful way.
- There are two levels of information processing going on within us. 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 exists a lower level of information processing, and the limit of its capacity is unknown. This lower level processes familiar information rapidly, in parallel with the higher level, and without conscious effort.
- Both levels function simultaneously, the higher level performing reasoning and problem solving, the lower level perceiving the physical form of information sensed.

Mental Models

- A mental model is simply an internal representation of a person's current understanding of something. Usually a person cannot describe this mental mode and most often is unaware it even exists.
- Mental models are gradually developed in order to understand something, explain things, make decisions, do something, or interact with another person. Mental

models also 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. If the new system complies with already-established models, it will be much easier to learn and use.
- The key to forming a transferable mental model of a system is design consistency and design standards.

Movement Control

- Particularly important in screen design is Fitts' Law (1954). This law states that:
- The time to acquire a target is a function of the distance to and size of the target.
- This simply means that the bigger the target is, or the closer the target is, the faster it will be reached. The implications in screen design are:
    - Provide large objects for important functions.
    - Take advantage of the "pinning" actions of the sides, top, bottom, and corners of the screen.

Learning

- Learning, as has been said, is the process of encoding in long-term memory information
- A design developed to minimize human learning time can greatly accelerate human performance. People prefer to stick with what they know, and they prefer to jump in and get started that is contained in short-term memory.
- Learning can be enhanced if it:
    - Allows skills acquired in one situation to be used in another somewhat like it. Design consistency accomplishes this.
    - Provides complete and prompt feedback.
    - Is phased, that is, it requires a person to know only the information needed at that stage of the learning process.

Skill

- The goal of human performance is to perform skillfully. To do so requires linking inputs and responses into a sequence of action. The essence of skill is performance of actions or movements in the correct time sequence with adequate precision.
- Skills are hierarchical in nature, and many basic skills may be integrated to form increasingly complex ones. Lower-order skills tend to become routine and may drop out of consciousness.

Individual Differences

- In reality, there is no average user. A complicating but very advantageous human characteristic is that we all differ—in looks, feelings, motor abilities, intellectual abilities, learning abilities and speed, and so on.
- Individual differences complicate design because the design must permit people with widely varying characteristics to satisfactorily and comfortably learn the task or job, or use the Web site.
- Multiple versions of a system can easily be created. Design must provide for the needs of all potential users.

Human Considerations in Design

- The kinds of user/task characteristics that must be established are summarized in Table

KNOWLEDGE/EXPERIENCE

Knowledge/Experience	
Computer Literacy	Highly technical or experienced, moderate computer experience, or none.
System Experience	High, moderate, or low knowledge of a particular system and its methods of interaction.
Application Experience	High, moderate, or low knowledge of similar systems.
Task Experience	Level of knowledge of job and job tasks.
Other Systems	Use Frequent or infrequent use of other systems in doing job.
Education	High school, college, or advanced degree.
Reading Level	Less than 5th grade, 5th–12th, more than 12th grade.
Typing Skill	Expert (135 WPM), skilled (90 WPM), good (55 WPM), average (40 WPM), or "hunt and peck" (10 WPM).
Native Language or Culture	English, another, or several.
JOB/TASK/NEED	
Type of System	Use Mandatory or discretionary use of the system.
Frequency of Use	Continual, frequent, occasional, or once-in-a-lifetime use of system.
Task or Need Importance	High, moderate, or low importance of the task being performed.
Task Structure	Repetitiveness or predictability of tasks being automated, high,moderate, or low.
Social Interactions	Verbal communication with another person required or not required.
Primary Training	Extensive or formal training, self-training through manuals, or no training.
Turnover Rate	High, moderate, or low turnover rate for jobholders.
Job Category	Executive, manager, professional, secretary, clerk.
Lifestyle	For Web e-commerce systems, includes hobbies, recreational pursuits, and economic status.
PSYCHOLOGICAL CHARACTERISTICS	
Attitude	Positive, neutral, or negative feeling toward job or system.
Motivation	Low, moderate, or high due to interest or fear.
Patience	Patience or impatience expected in accomplishing goal.

Expectations	Kinds and reasonableness.
Stress Level	High, some, or no stress generally resulting from task performance.
Cognitive Style	Verbal or spatial, analytic or intuitive, concrete or abstract.

PHYSICAL CHARACTERISTICS

Age	Young, middle aged, or elderly.
Gender	Male or female.
Handedness	Left, right, or ambidextrous.
Disabilities	Blind, defective vision, deafness, motor handicap.

The User's Knowledge and Experience

- The following kinds of knowledge and experiences should be identified.

Computer Literacy

- Are the users highly technical such as programmers or experienced data entry clerks or vice versa?

System Experience

Novice Vs Experts

- Words to describe the new, relatively new, or infrequent user have included naive, casual, inexperienced, or novice. At the other end of the experience continuum lie terms such as experienced, full-time, frequent, power, or expert. In between these extremes is a wide range of intermediate or intermittent users.
- In business systems, novice users have been found to:
    - Depend on system features that assist recognition memory: menus, prompting information, and instructional and help screens.
    - Need restricted vocabularies, simple tasks, small numbers of possibilities, and very informative feedback.
    - View practice as an aid to moving up to expert status.
- Experts, on the other hand:
    - Rely upon free recall.
    - Expect rapid performance.
    - Need less informative feedback.
    - Seek efficiency by bypassing novice memory aids, reducing keystrokes, chunking and summarizing
- Novice users often have difficulties:
    - Dragging and double-clicking using the mouse. Distinguishing between double-clicks and two separate clicks is particularly confusing
    - In window management. That overlapping windows represent a three-dimensional space is not always realized. Hidden windows are assumed to be gone and no longer exist.
    - In file management. The organization of files and folders nested more than two levels deep is difficult to understand. Structure is not as apparent as with physical files and folders.
- Experts possess the following traits:
    - They possess an integrated conceptual model of a system.

    - They possess knowledge that is ordered more abstractly and more procedurally.
    - They organize information more meaningfully, orienting it toward their task.
    - They structure information into more categories.
    - They are better at making inferences and relating new knowledge to their objectives and goals.
    - They pay less attention to low-level details.
    - They pay less attention to surface features of a system.
- Novices exhibit these characteristics:
    - They possess a fragmented conceptual model of a system.
    - They organize information less meaningfully, orienting it toward surface features of the system.
    - They structure information into fewer categories.
    - They have difficulty in generating inferences and relating new knowledge to their objectives and goals.
    - They pay more attention to low-level details.
    - They pay more attention to surface features of the system.

Application Experience

- Have users worked with a similar application (for example, word processing, airline reservation, and so on)? Are they familiar with the basic application terms? Or does little or no application experience exist?

Task Experience

- Are users experienced with the task being automated? Or do users possess little or no knowledge of the tasks the system will be performing?

Other System Use

- Will the user be using other systems while using the new system?

Education

- What is the general educational level of users? Do they generally have high school degrees, college degrees, or advanced degrees?

Reading Level

- For textual portions of the interface, the vocabulary and grammatical structure must be at a level that is easily understood by the users.

Typing Skill

- Is the user a competent typist or of the hunt-and-peck variety? Is he or she familiar with the standard keyboard layout or other newer layouts?

Native Language and Culture

- Do the users speak English, another language, or several other languages? Will the screens be in English or in another language? Other languages often impose different screen layout requirements.
- Are there cultural or ethnic differences between users?

The User's Tasks and Needs

- The user's tasks and needs are also important in design. The following should be determined:

Mandatory Vs Discretionary Use

- Users of the earliest computer systems were mandatory or nondiscretionary. That is, they required the computer to perform a task that, for all practical purposes, could be performed no other way.
- This newer kind of user is the office executive, manager, or other professional, whose computer use is completely discretionary.

Characteristics of mandatory use can be summarized as follows:

- The computer is used as part of employment.
- Time and effort in learning to use the computer are willingly invested.
- High motivation is often used to overcome low usability characteristics.
- The user may possess a technical background.
- The job may consist of a single task or function.

Common general characteristics of the discretionary user are as follows:

- Use of the computer or system is not absolutely necessary.
- Technical details are of no interest.
- Extra effort to use the system may not be invested.
- High motivation to use the system may not be exhibited.
- May be easily disenchanted.
- Voluntary use may have to be encouraged.
- Is from a heterogeneous culture.

Frequency of Use

- Is system use a continual, frequent, occasional, or once-in-a-lifetime experience? Frequency of use affects both learning and memory.
- Occasional or infrequent users prefer ease of learning and remembering,

Task or Need Importance

- How important is the task or need for the user?
- People are usually willing to spend more time learning something if it makes the task being performed or need being fulfilled more efficient.

Task Structure

- How structured is the task being performed? Is it repetitive and predictable or not so?

Social Interactions

- Will the user, in the normal course of task performance, be engaged in a conversation with another person, such as a customer, while using the system? If so, design should not interfere with the social interaction.
- Neither the user nor the person to whom the user is talking must be distracted in any way by computer interaction requirements. The design must accommodate the social interaction.

Job Category

- In a business system, is the user an executive, manager, professional, secretary, or clerk? While job titles have no direct bearing on design per se, they do enable one to predict some job characteristics when little else is known about the user.
- For example, executives and managers are most often discretionary users, while clerks are most often mandatory ones.

The User's Psychological Characteristics

- A person's psychological characteristics also affect one's performance of tasks requiring motor, cognitive, or perceptual skills.

Attitude and Motivation

- Is the user's attitude toward the system positive, neutral, or negative? Is motivation high, moderate, or low?
- While all these feelings are not caused by, and cannot be controlled by, the designer, a positive attitude and motivation allows the user to concentrate on the productivity qualities of the system.

Patience

- Is the user patient or impatient?
- They are exhibiting less tolerance for Web use learning requirements, slow response times, and inefficiencies in navigation and locating desired content.

Stress Level

- Will the user be subject to high levels of stress while using the system? Interacting with an angry boss, client, or customer, can greatly increase a person's stress level.

- System navigation or screen content may have to be redesigned for extreme simplicity in situations that can become stressful.

Expectations

- What are user's expectations about the system or Web site? Are they realistic?
- Is it important that the user's expectations be realized?

Cognitive Style

- People differ in how they think about and solve problems.
- Some people are better at verbal thinking, working more effectively with words and equations.
- Others are better at spatial reasoning—manipulating symbols, pictures, and images.
- Some people are analytic thinkers, systematically analyzing the facets of a problem.
- Others are intuitive, relying on rules of thumb, hunches, and educated guesses.
- Some people are more concrete in their thinking, others more abstract.

The User's Physical Characteristics

- The physical characteristics of people can also greatly affect their performance with a system.

Age

- Are the users children, young adults, middle-aged, senior citizens, or very elderly? Age can have an affect on both computer and system usage.

Young Adults VS Older Adults

Young adults (aged 18–36), in comparison to older adults (aged 64–81)

- Use computers and ATMs more often.
- Read faster.
- Possess greater reading comprehension and working memory capacity.
- Possess faster choice reaction times.
- Possess higher perceptual speed scores.
- Complete a search task at a higher success rate.
- Use significantly less moves (clicks) to complete a search task.
- Are more likely to read a screen a line at a time.

Older adults, as compared to young adults:

- Are more educated.
- Possess higher vocabulary scores.
- Have more difficulty recalling previous moves and location of previously viewed information.
- Have more problems with tasks that require three or more moves (clicks).
- Are more likely to scroll a page at a time

- Respond better to full pages rather than long continuous scrolled pages.

Methods for Gaining an Understanding of Users

- Visit user locations, particularly if they are unfamiliar to you, to gain an understanding of the user's work environment.
- Talk with users about their problems, difficulties, wishes, and what works well now. Establish direct contact; avoid relying on intermediaries.
- Observe users working or performing a task to see what they do, their difficulties, and their problems.
- Videotape users working or performing a task to illustrate and study problems and difficulties.
- Learn about the work organization where the system may be installed.
- Have users think aloud as they do something to uncover details that may not otherwise be solicited.
- Try the job yourself. It may expose difficulties that are not known, or expressed, by users.
- Prepare surveys and questionnaires to obtain a larger sample of user opinions.
- Establish testable behavioral target goals to give management a measure for what progress has been made and what is still required.

Hearing

- As people age, they require louder sounds to hear, a noticeable attribute in almost any everyday activity.

Age in Years	Sound Level in dB
25	57
45	65
65	74
85	85

Vision

- Older adults read prose text in smaller type fonts more slowly than younger adults
- (Charness and Dijkstra, 1999). For older adults they recommend:
    - 14-point type in 4-inch wide columns.
    - 12-point type in 3-inch wide columns.
- Ellis and Kurniawan (2000) recommend the following fonts for older users:
    - San serif (Arial, Helvetica, and Verdana).
    - Black type on a white background.
- Ellis and Kurniawan (2000) and Czaja (1997) suggest Web links should be:
    - Distinct and easy to see.
    - Large (at least 180 × 22 pixels for a button).
    - Surrounded by a large amount of white space.

Cognitive Processing

- Brain processing also appears to slow with age. Working memory, attention capacity, and visual search appear to be degraded.
- Tasks where knowledge is important show the smallest age effect and tasks dependent upon speed show the largest effect

Gender

- A user's sex may have an impact on both motor and cognitive performance because
    - Women are not as strong as men,
    - Women also have smaller hands than men, and
    - Significantly more men are color-blind than women

Handedness

- A user's handedness, left or right, can affect ease of use of an input mechanism, depending on whether it has been optimized for one or the other hand.

Disabilities

- Blindness, defective vision, color-blindness, poor hearing, deafness, and motor handicaps can affect performance on a system not designed with these disabilities in mind.
- People with special needs must be considered in design especially for systems like web design.

Human Interaction Speeds

- The speed at which people can perform using various communication methods has been studied by a number of researchers. The following, are summarized as table below

Reading	
Prose text:	250–300 words per minute.
Proofreading text on paper:	200 words per minute.
Proofreading text on a monitor:	180 words per minute.
Listening:	150–160 words per minute.
Speaking to a computer:	105 words per minute.
After recognition corrections:	25 words per minute.
Keying	
Typewriter	
Fast typist:	150 words per minute and higher.
Average typist:	60–70 words per minute.
Computer	
Transcription:	33 words per minute.
Composition:	19 words per minute.
Two finger typists	
Memorized text:	37 words per minute.
Copying text:	27 words per minute.
Hand printing	
Memorized text:	31 words per minute.
Copying text:	22 words per minute.

Methods for Gaining an Understanding of Users

- Gould (1988) suggests using the following kinds of techniques to gain an understanding of users, their tasks and needs, the organization where they work, and the environment where the system may be used.
    - Visit user locations, particularly if they are unfamiliar to you, to gain an understanding of the user's work environment.
    - Talk with users about their problems, difficulties, wishes, and what works well now. Establish direct contact; avoid relying on intermediaries.
    - Observe users working or performing a task to see what they do, their difficulties, and their problems.
    - Videotape users working or performing a task to illustrate and study problems and difficulties.
    - Learn about the work organization where the system may be installed.
    - Have users think aloud as they do something to uncover details that may not otherwise be solicited.
    - Try the job yourself. It may expose difficulties that are not known, or expressed, by users.
    - Prepare surveys and questionnaires to obtain a larger sample of user opinions.
    - Establish testable behavioral target goals to give management a measure for what progress has been made and what is still required.

Understand the Business Function

The general steps to be performed are:

- Perform a business definition and requirements analysis.
- Determine basic business functions.
- Describe current activities through task analysis.
- Develop a conceptual model of the system.
- Establish design standards or style guides.
- Establish system usability design goals.
- Define training and documentation needs.

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.
- A product description is developed and refined, based on input from users or marketing. There are many techniques for capturing information for determining requirements.

DIRECT METHODS

Advantages

- The significant advantage of the direct methods is the opportunity they provide to hear the user's comments in person and firsthand.
- Person-to-person encounters permit multiple channels of communication (body language, voice inflections, and so on) and provide the opportunity to immediately follow up on vague or incomplete data.

Here are some recommended direct methods for getting input from users.

Individual Face-to-Face Interview

- A one-on-one visit with the user to obtain information. It may be structured or somewhat open-ended.
- A formal questionnaire should not be used, however. Useful topics to ask the user to describe in an interview include:
- The activities performed in completing a task or achieving a goal or objective.
- The methods used to perform an activity.
- What interactions exist with other people or systems?
- It is also very useful to also uncover any:
    - Potential measures of system usability
    - Unmentioned exceptions to standard policies or procedures.
    - Relevant knowledge the user must possess to perform the activity.
- **Advantages**
    - Advantages of a personal interview are that you can give the user your full attention, can easily include follow-up questions to gain additional information, will have more time to discuss topics in detail, and will derive a deeper understanding of your users, their experiences, attitudes, beliefs, and desires.
- **Disadvantages**
    - Disadvantages of interviews are that they can be costly and time-consuming to conduct, and someone skilled in interviewing techniques should perform them.

Telephone Interview or Survey

- A structured interview conducted via telephone.
- **Advantages**
    - Arranging the interview in advance allows the user to prepare for it.
    - Telephone interviews are less expensive and less invasive than personal interviews.
    - They can be used much more frequently and are extremely effective for very specific information.
- **Disadvantage**
    - It is impossible to gather contextual information, such as a description of the working environment, replies may be easily influenced by the interviewer's comments, and body language cues are missing.
    - Also, it may be difficult to contact the right person for the telephone interview.

Traditional Focus Group

- A small group of users and a moderator brought together to verbally discuss the requirements.
- The purpose of a focus group is to probe user's experiences, attitudes, beliefs, and desires, and to obtain their reactions to ideas or prototypes
- Setting up focus group involves the following:
    - Establish the objectives of the session.
    - Select participants representing typical users, or potential users.
    - Write a script for the moderator to follow.
    - Find a skilled moderator to facilitate discussion, to ensure that the discussion remains focused on relevant topics, and to ensure that everyone participates.
    - Allow the moderator flexibility in using the script.
    - Take good notes, using the session recording for backup and clarification

Facilitated Team Workshop

- A facilitated, structured workshop held with users to obtain requirements information. Similar to the traditional Focus Group
- Like focus groups, they do require a great deal of time to organize and run.

Observational Field Study

- Users are observed and monitored for an extended time to learn what they do.
- Observation provides good insight into tasks being performed, the working environment and conditions, the social environment, and working practices
- Observation, however, can be time-consuming and expensive.
- Video recording of the observation sessions will permit detailed task analysis.

Requirements Prototyping

- A demo, or very early prototype, is presented to users for comments concerning functionality.

User-Interface Prototyping

- A demo, or early prototype, is presented to users to uncover user-interface issues and problems

Usability Laboratory Testing

- Users at work are observed, evaluated, and measured in a specially constructed laboratory to establish the usability of the product at that point in time.
- Usability tests uncover what people actually do, not what they think they do a common problem with verbal descriptions
- The same scenarios can be presented to multiple users, providing comparative data from several users.

Card Sorting for Web Sites

- A technique to establish groupings of information for Web sites.
- Briefly, the process is as follows:
    - From previous analyses, identify about 50 content topics and inscribe them on index cards. Limit topics to no more than 100.
    - Provide blank index cards for names of additional topics the participant may want to add, and colored blank cards for groupings that the participant will be asked to create.
    - Number the cards on the back.
    - Arrange for a facility with large enough table for spreading out cards.
    - Select participants representing a range of users. Use one or two people at a time and 5 to 12 in total.
    - Explain the process to the participants, saying that you are trying to determine what categories of information will be useful, what groupings make sense, and what the groupings should be called.
    - Ask the participants to sort the cards and talk out loud while doing so. Advise the participants that additional content cards may be named and added as they think necessary during the sorting process.
    - Observe and take notes as the participants talk about what they are doing. Pay particular attention to the sorting rationale.
    - Upon finishing the sorting, if a participant has too many groupings ask that they be arranged hierarchically.
    - Ask participants to provide a name for each grouping on the colored blank cards, using words that the user would expect to see that would lead them to that particular grouping.
    - Make a record of the groupings using the numbers on the back of each card.
    - Reshuffle the cards for the next session.
    - When finished, analyze the results looking for commonalities among the different sorting sessions.

INDIRECT METHODS

- An indirect method of requirements determination is one that places an intermediary between the developer and the user. This intermediary may be electronic or another person

Problems of Indirect Method

- First, there may be a filtering or distortion of the message, either intentional or unintentional.
- Next, the intermediary may not possess a complete, or current, understanding of user's needs, passing on an incomplete or incorrect message.
- Finally, the intermediary may be a mechanism that discourages direct user-developer contact for political reasons.

MIS Intermediary

- A company representative defines the user's goals and needs to designers and developers.
- This representative may come from the Information Services department itself, or he or she may be from the using department.

Paper Survey or Questionnaire

- A survey or questionnaire is administered to a sample of users using traditional mail methods to obtain their needs.
- **Advantage**
    - Questionnaires have the potential to be used for a large target audience located most anywhere, and are much cheaper than customer visits.
    - They generally, however, have a low return rate
- **Disadvantage**
    - They may take a long time to collect and may be difficult to analyze.
- Questionnaires should be composed mostly of closed questions
- Questionnaires should be relatively short and created by someone experienced in their design.

Electronic Survey or Questionnaire

- A survey or questionnaire is administered to a sample of users using e-mail or the Web to obtain their needs.
- In creating an electronic survey:
    - Determine the survey objectives.
    - Determine where you will find the people to complete the survey.
    - Create a mix of multiple choice and open-ended questions requiring short answers addressing the survey objectives.
    - Keep it short, about 10 items or less is preferable.
    - Keep it simple, requiring no more than 5–10 minutes to complete
- **Iterative survey**
    - Consider a follow-up more detailed survey, or surveys, called *iterative surveys*. Ask people who complete and return the initial survey if they are willing to answer more detailed questions. If so, create and send the more detailed survey.
    - A third follow-up survey can also be designed to gather additional information about the most important requirements and tasks
    - Iterative surveys, of course, take a longer time to complete.

Electronic Focus Group

- A small group of users and a moderator discuss the requirements online using workstations.
- advantages

    - advantages of electronic focus groups over traditional focus groups are that the discussion is less influenced by group dynamics; has a smaller chance of being dominated by one or a few participants; can be

anonymous, leading to more honest comments and less caution in proposing new ideas

- **Disadvantages**
    - The depth and richness of verbal discussions does not exist and the communication enhancement aspects of seeing participant's body language are missing.

Marketing and Sales

- Company representatives who regularly meet customers obtain suggestions or needs, current and potential.

Support Line

- Information collected by the unit that helps customers with day-to-day problems is analyzed (Customer Support, Technical Support, Help Desk, etc.).

E-Mail or Bulletin Board

- Problems, questions, and suggestions from users posted to a bulletin board or through e-mail are analyzed.

User Group

- Improvements are suggested by customer groups who convene periodically to discuss software usage. They require careful planning.

Competitor Analyses

- A review of competitor's products or Web sites is used to gather ideas, uncover design requirements and identify tasks.

Trade Show

- Customers at a trade show are presented a mock-up or prototype and asked for comments.

Other Media Analysis

- An analysis of how other media, print or broadcast, present the process, information, or subject matter of interest.

System Testing

- New requirements and feedback are obtained from ongoing product testing

Requirements Collection Guidelines

- Establish 4 to 6 different developer-user links.
- Provide most reliance on direct links.

Determining Basic Business Functions

- A detailed description of what the product will do is prepared. Major system functions are listed and described, including critical system inputs and outputs. A flowchart of major functions is developed. The process the developer will use is summarized as follows:
    - Gain a complete understanding of the user's mental model based upon:
        - The user's needs and the user's profile.
        - A user task analysis.
    - Develop a conceptual model of the system based upon the user's mental model.
      This includes:
        - Defining objects.
        - Developing metaphors.

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. A mental model is an internal representation of a person's current conceptualization and understanding of something.
- Mental models are gradually developed in order to understand, explain, and do something. Mental models enable a person to predict the actions necessary to do things if the actions have been forgotten or have not yet been encountered.

Performing a Task Analysis

- User activities are precisely described in a task analysis. Task analysis involves breaking down the user's activities to the individual task level. The goal is to obtain an understanding of why and how people currently do the things that will be automated.
- Knowing why establishes the major work goals; knowing how provides details of actions performed to accomplish these goals. Task analysis also provides information concerning workflows, the interrelationships between people, objects, and actions, and the user's conceptual frameworks. The output of a task analysis is a complete description of all user tasks and interactions.
- One result of a task analysis is a listing of the user's current tasks. This list should be well documented and maintained. Changes in task requirements can then be easily incorporated as design iteration occurs. Another result is a list of objects the users see as important to what they do. The objects can be sorted into the following categories:
    - Concrete objects—things that can be touched.

- People who are the object of sentences—normally organization employees, customers,
- for example.
- Forms or journals—things that keep track of information.
- People who are the subject of sentences—normally the users of a system.
- Abstract objects—anything not included above.

Developing Conceptual Models

- The output of the task analysis is the creation, by the designer, of a conceptual model for the user interface. A conceptual model is the general conceptual framework through which the system's functions are presented. Such a model describes how the interface will present objects, the relationships between objects, the properties of objects, and the actions that will be performed.
- The goal of the designer is to facilitate for the user the development of useful mental model of the system. This is accomplished by presenting to the user a meaningful conceptual model of the system. When the user then encounters the system, his or her existing mental model will, hopefully, mesh well with the system's conceptual model.

Guidelines for Designing Conceptual Models

- **Reflect the user's mental model not the designer's:** A user will have different expectations and levels of knowledge than the designer. So, the mental models of the user and designer will be different. The user is concerned with the task to be performed, the business objectives that must be fulfilled.

- **Draw physical analogies or present metaphors:** Replicate what is familiar and well known. Duplicate actions that are already well learned. A metaphor, to be effective, must be widely applicable within an interface.

- **Comply with expectancies, habits, routines, and stereotypes:** Use familiar associations, avoiding the new and unfamiliar. With color, for example, accepted meanings for red, yellow, and green are already well established. Use words and symbols in their customary ways.

- **Provide action-response compatibility:** All system responses should be compatible with the actions that elicit them. Names of commands, for example, should reflect the actions that will occur.

- **Make invisible parts and process of a system visible:** New users of a system often make erroneous or incomplete assumptions about what is invisible and develop a faulty mental model. As more experience is gained, their mental models evolve to become more accurate and complete. Making invisible parts of a system visible will speed up the process of developing correct mental models.

- **Provide proper and correct feedback:** Be generous in providing feedback. Keep a person informed of what is happening, and what has happened, at all times, including:

    - Provide visible results of actions.
    - Display actions in progress.
    - Provide a continuous indication of status.
    - Present as much context information as possible.
    - Provide clear, constructive, and correct error messages.

- **Avoid anything unnecessary or irrelevant:** Never display irrelevant information on the screen. People may try to interpret it and integrate it into their mental models, thereby creating a false one.

- **Provide design consistency:** Design consistency reduces the number of concepts to be learned. Inconsistency requires the mastery of multiple models. If an occasional inconsistency cannot be avoided, explain it to the user.
- **Provide documentation and a help system that will reinforce the conceptual model:** Do not rely on the people to uncover consistencies and metaphors themselves. The help system should offer advice aimed at improving mental models.

- **Promote the development of both novice and expert mental models :** Novices and experts are likely to bring to bear different mental models when using a system.

Defining Objects

- Determine all objects that have to be manipulated to get work done. Describe:
  — The objects used in tasks.
  — Object behavior and characteristics that differentiate each kind of object.
  — The relationship of objects to each other and the people using them.
  — The actions performed.
  — The objects to which actions apply.
  — State information or attributes that each object in the task must preserve, display, or allow to be edited.
- Identify the objects and actions that appear most often in the workflow.
- Make the several most important objects very obvious and easy to manipulate.

Developing Metaphors

- A metaphor is a concept where one's body of knowledge about one thing is used to understand something else. Metaphors act as building blocks of a system, aiding understanding of how a system works and is organized.
- Real-world metaphors are most often the best choice. Replicate what is familiar and well known. A common metaphor in a graphical system is the desktop and its components,
    - Choose the analogy that works best for each object and its actions.
    - Use real-world metaphors.
    - Use simple metaphors.

- Use common metaphors.
- Multiple metaphors may coexist.
- Use major metaphors, even if you can't exactly replicate them visually.
- Test the selected metaphors.

Design Standards or Style Guides

- A design standard or style guide documents an agreed-upon way of doing something. It also defines the interface standards, rules, guidelines, and conventions that must be followed in detailed design.

Value of Standards and Guidelines

- Developing and applying design standards or guidelines achieve design consistency.
- This is valuable to users because the standards and guidelines:
  - Allow faster performance.
  - Reduce errors.
  - Reduce training time.
  - Foster better system utilization.
  - Improve satisfaction.
  - Improve system acceptance.
- They are valuable to system developers because they:
  - Increase visibility of the human-computer interface.
  - Simplify design.
  - Provide more programming and design aids, reducing programming time.
  - Reduce redundant effort.
  - Reduce training time.
  - Provide a benchmark for quality control testing.

Document Design

- Include checklists to present principles and guidelines.
- Provide a rationale for why the particular guidelines should be used.
- Provide a rationale describing the conditions under which various design alternatives are appropriate.
- Include concrete examples of correct design.
- Design the guideline document following recognized principles for good document design.
- Provide good access mechanisms such as a thorough index, a table of contents, glossaries, and checklists.

Design Support and Implementation

- Use all available reference sources in creating the guidelines.

- Use development and implementation tools that support the guidelines.
- Begin applying the guidelines immediately.

System Training and Documentation Needs

Training

- System training will be based on user needs, system conceptual design, system learning goals, and system performance goals.
- Training may include such tools as formal or video training, manuals, online tutorials, reference manuals, quick reference guides, and online help.
- Any potential problems can also be identified and addressed earlier in the design process, reducing later problems and modification costs.

Documentation

- System documentation is a reference point, a form of communication, and a more concrete design—words that can be seen and understood based on user needs, system conceptual design, and system performance goals.

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

Understand the Principles of Good Screen Design

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

How to Distract the Screen User

- Unclear captions and badly worded questions. These cause hesitation, and rereading, in order to determine what is needed or must be provided. They may also be interpreted incorrectly, causing errors.
- Improper type and graphic emphasis. Important elements are hidden. Emphasis is drawn away from what is important to that which is not important.
- Misleading headings. These also create confusion and inhibit one's ability to see existing relationships.
- Information requests perceived to be irrelevant or unnecessary. The value of what one is doing is questioned, as is the value of the system.
- Information requests that require one to backtrack and rethink a previous answer, or look ahead to determine possible context. Inefficiency results, and mistakes increase.

- Cluttered, cramped layout. Poor layout creates a bad initial impact and leads to more errors. It may easily cause system rejection.
- Poor quality of presentation, legibility, appearance, and arrangement. Again, this degrades performance, slowing the user down and causing more errors.
- Visual inconsistency in screen detail presentation and with the operating system.
- Lack of restraint in the use of design features and elements.
- Overuse of three-dimensional presentations.
- Overuse of too many bright colors.
- Poorly designed icons.
- Bad typography
- Metaphors that are either overbearing or too cute, or too literal thereby restricting design options.

What Screen Users Want

- An orderly, clean, clutter-free appearance.
- An obvious indication of what is being shown and what should be done with it.
- Expected information located where it *should* be.
- A clear indication of what relates to what, including options, headings, captions, data, and so forth.
- Plain, simple English.
- A simple way of finding out what is in a 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: The task may be very structured or semi structured or structured with free form activities.

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

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

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

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

Interface Design Goals

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

The Test for a Good Design

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

Screen Meaning and Purpose

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

Organizing Screen Elements Clearly and Meaningfully

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

Consistency

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

Ordering of Screen Data and Content

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

Upper-Left Starting Point

- Provide an obvious starting point in the screen's upper-left corner.

Screen Navigation and Flow

- Provide an ordering of screen information and elements that:
  — Is rhythmic, guiding a person's eye through the display.
    - In establishing eye movement through a screen, also consider that the eye tends to move sequentially, for example:

- From dark areas to light areas.
- From big objects to little objects.
- From unusual shapes to common shapes.
- From highly saturated colors to unsaturated colors.

— Encourages natural movement sequences.
— Minimizes pointer and eye movement distances.

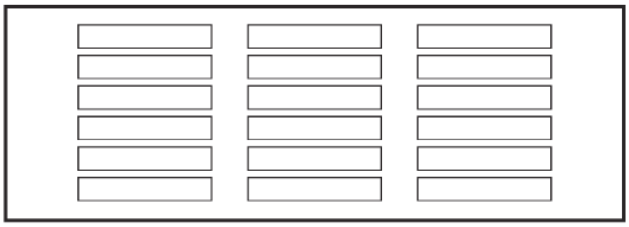
- Locate the most important and most frequently used elements or controls at the top left.
- Maintain a top-to-bottom, left-to-right flow.
- Assist in navigation through a screen by:
  — Aligning elements.
  — Grouping elements.
  — Using of line borders.
- Through focus and emphasis, sequentially, direct attention to items that are:
  1. Critical.
  2. Important.
  3. Secondary.
  4. Peripheral.
- Tab through window in logical order of displayed information.
- Locate command buttons at end of the tabbing order sequence.
- When groups of related information must be broken and displayed on separate screens, provide breaks at logical or natural points in the information flow.

Visually Pleasing Composition

- Provide visually pleasing composition with the following qualities:
  - Balance
  - Symmetry
  - Regularity.
  - Predictability.
  - Sequentially.
  - Economy.
  - Unity.
  - Proportion.
  - Simplicity.
  - Groupings.

Regularity

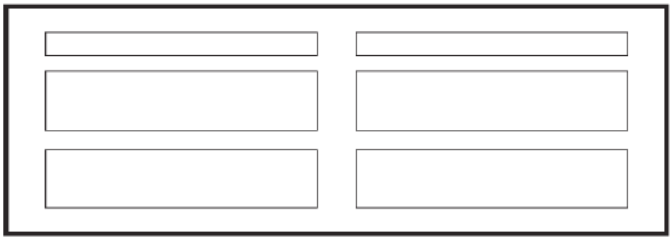
- Create regularity by establishing standard and consistently spaced horizontal and vertical alignment points.
- Also, use similar element sizes, shapes, colors, and spacing.



Regularity

Balance

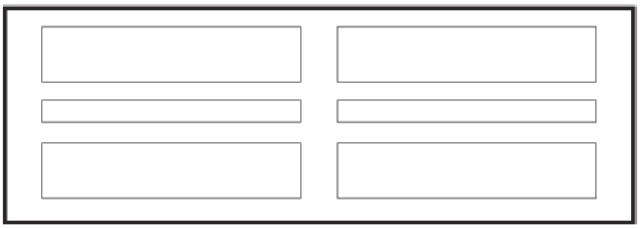
- Create screen balance by providing an equal weight of screen elements, left and right, top and bottom.



Balance

Symmetry

- Create symmetry by replicating elements left and right of the screen centerline.



Symmetry

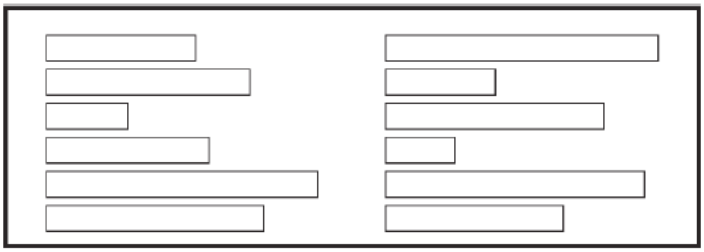
Predictability

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

Sequentiality

- Provide sequentiality by arranging elements to guide the eye through the screen in an obvious, logical, rhythmic, and efficient manner.
- The eye tends to be attracted to:
  — A brighter element before one less bright.
  — Isolated elements before elements in a group.
  — Graphics before text.
  — Color before black and white.
  — Highly saturated colors before those less saturated.
  — Dark areas before light areas.

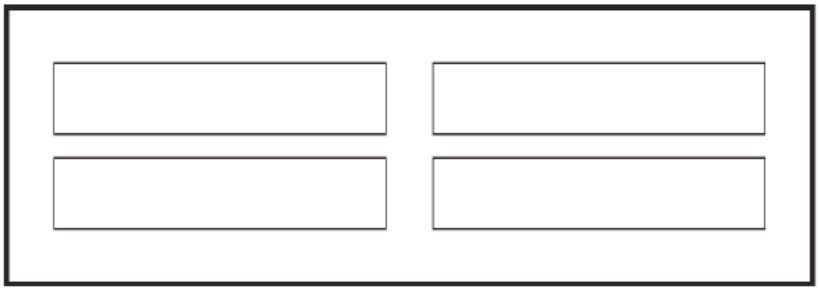
— A big element before a small one.
— An unusual shape before a usual one.
— Big objects before little objects.



Sequentiality

Unity

- Create unity by:
  — Using similar sizes, shapes, or colors for related information.
  — Leaving less space between elements of a screen than the space left at the margins.



Unity

Proportion

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

Pleasing proportions.

Square	1:1
Square-root of two	1:1.414
Square-root of three	1:1.732
Double square	1:2
Golden rectangle	1:1.618

Simplicity (Complexity)

- Optimize the number of elements on a screen, within limits of clarity.
- Minimize the alignment points, especially horizontal or columnar.
  - Provide standard grids of horizontal and vertical lines to position elements.
- complexity guidelines:

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

Groupings

- Provide functional groupings of associated elements.
- Create spatial groupings as closely as possible to five degrees of visual angle (1.67 inches in diameter or about 6 to 7 lines of text, 12 to 14 characters in width).
- Evenly space controls within a grouping, allowing 1/8 to 1/4 inch between each.
- Visually reinforce groupings:
  — Provide adequate separation between groupings through liberal use of white space.
  — Provide line borders around groups.
- Provide meaningful titles for each grouping.

Perceptual Principles and Functional Grouping

- Use visual organization to create functional groupings.
  — Proximity: 000 000 000
  — Similarity: AAABBBCCC
  — Closure: [ ] [ ] [ ]
  — Matching patterns: >> < >
- Combine visual organization principles in logical ways.

— Proximity and similarity:	AAA	BB	CCC
— Proximity and closure:	[ ]	[ ]	[ ]
— Matching patterns and closure:	( )	< >	{ }
— Proximity and ordering:	1234	1	5
	5678	2	6
	3	7	
	4	8	

- Avoid visual organization principles that conflict.

— Proximity opposing similarity:	AAA	ABB	BBC	CCC
— Proximity opposing closure:	]	[ ]	[ ]	[
— Proximity opposing ordering:	1357	1	2	
	2468	3	4	
	5	6		
	7	8		

Grouping Using White Space

- Provide adequate separation between groupings through liberal use of white space.
- For Web pages, carefully consider the trade-off between screen white space and the requirement for page scrolling.

Grouping Using Borders

- Incorporate line borders for:
  — Focusing attention on groupings or related information.
  — Guiding the eye through a screen.

- Do not exceed three line thicknesses or two line styles on a screen, however.
  — Use a standard hierarchy for line presentation.
- Create lines consistent in height and length.
- Leave sufficient padding space between the information and the surrounding borders.
- For adjacent groupings with borders, whenever possible, align the borders left, right, top, and bottom.
- Use rules and borders sparingly.
- In Web page design:
  — be cautious in using horizontal lines as separators between page sections.
  — Reserve horizontal lines for situations in which the difference between adjacent areas must be emphasized.

Grouping Using Backgrounds

- Consider incorporating a contrasting background for related information.
  — The background should not have the "emphasis" of the screen component that should be attended to. Consider about a 25 percent gray screening.
  — Reserve higher contrast or "emphasizing" techniques for screen components to which attention should be drawn.

Visual Style in Web Page Design

- Maintain a consistent and unified visual style throughout the pages of an entire Web site.
- Base the visual style on:
  — The profile and goals of the Web site owner.
  — The profile, tastes, and expectations of the Web site user.

Amount of Information

- Present the proper amount of information for the task.
  — Too little is inefficient.
  — Too much is confusing.
- Present all information necessary for performing an action or making a decision on one screen, whenever possible.
  — People should not have to remember things from one screen to the next.
- Restrict screen or window density levels to no more than about 30 percent.

Web Page Size

- Minimize page length.
  — Restrict to two or three screens of information.
- Place critical or important information at the very top so it is always viewable when the page is opened.
  — Locate it within the top 4 inches of page.
- Determining an optimum page length will require balancing these factors. Arguments for shorter pages and against longer pages are that longer pages:

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

Deciding on Long versus Short Pages

- To find specific information quickly:
  — Create many links to short pages.
- To understand an entire concept without interruption:
  — Present the entire concept in one page with internal links to subtopics.
- To print all or most of the content to read offline:
  — Use one long page or prepare a version that uses one page.
- If page will be loading over slow modems and all pages are not needed:
  — Create a comprehensive contents page with links to many short pages.

Scrolling and Paging

- Scrolling:
  — Avoid scrolling to determine a page's contents.
  — Minimize vertical page scrolling.
  — When vertical scrolling is necessary to view an entire page:
- Provide contextual cues within the page that it must be scrolled to view its entire contents.
- Provide a unique and consistent "end of page" structure.
  — Avoid horizontal page scrolling.
- Paging:
  — Encourage viewing a page through "paging."
  — Create a second version of a Web site, one consisting of individual screens that are viewed through "paging."

Distinctiveness

- Individual screen controls, and groups of controls, must be perceptually distinct.
  — Screen controls:

    - Should not touch a window border.
    - Should not touch each other.
  — Field and group borders:
    - Should not touch a window border.
    - Should not touch each other.
  — Buttons:
    - Should not touch a window border.
    - Should not touch each other.
- A button label should not touch the button border.
- Adjacent screen elements must be displayed in colors or shades of sufficient contrast with one another.

Focus and Emphasis

- Visually emphasize the:
  — Most prominent element.
  — Most important elements.
  — Central idea or focal point.
- To provide emphasis use techniques such as:
  — Higher brightness.
  — Reverse polarity or inverse video.
  — Larger and distinctive font.
  — Underlining.
  — Blinking.
  — Line rulings and surrounding boxes or frames.
  — Contrasting color.
  — Larger size.
  — Positioning.
  — Isolation.
  — Distinctive or unusual shape.
  — White space.
- De-emphasize less important elements.
- To ensure that emphasized screen elements stand out, avoid:
  — Emphasizing too many screen elements.
  — Using too many emphasis techniques.
  — Screen clutter.
- In Web page design:
  — Call attention to new or changed content.
  — Ensure that page text is not overwhelmed by page background.

Presenting Information Simply and Meaningfully

- Provide legibility.
  — Information is noticeable and distinguishable.
- Provide readability.
  — Information is identifiable, interpretable, and attractive.
- Present information in usable form.

— Translations, transpositions, and references to documentation should not be required to interpret and understand information.

- Utilize contrasting display features.
  — To attract and call attention to different screen elements.
- Create visual lines.
  — Implicit and explicit, to guide the eye.
- Be consistent.
  — In appearance and procedural usage.

Typography

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

Font Types and Families

- Use simple, common, readable fonts.
  — Any sans serif such as Helvetica or Verdana.
  — Times Roman.
- Use no more than two families, compatible in terms of line thicknesses, capital letter height, and so on.
  — Assign a separate purpose to each family.
  — Allow one family to dominate.

Font Size

- Use no more than three sizes.
  — Consider "X" height.
- For graphical systems use:
  — 12 point for menus.
  — 10 point for windows.
- For Web pages use:
  — 12–14 points for body text.
  — 18–36 points for titles and headings.
- For line spacing use one to one and one-half times font size.
- Never change established type sizes to squeeze in more text.

Font Styles and Weight

- Use no more than:
  — Two styles of the same family.
    • Standard and italic.
    • Italic is best presented in a serif font.
  — Two weights.
    • Regular and bold.

    - Bold is best presented in a sans serif font.
- Use italics when you want to call attention.
- Use bold when you want to call attention or create a hierarchy.
- In Web pages, use an underline only to indicate a navigation link.

Font Case

- Use mixed-case for:
  — Control captions.
  — Data.
  — Control choice descriptions.
  — Text.
  — Informational messages.
  — Instructional information.
  — Menu descriptions.
  — Button descriptions.
- Consider using upper case or capitalization for:
  — Title.
  — Section headings.
  — Subsection headings.
  — Caution and warning messages.
  — Words or phrases small in point size.
- Use all lower case with caution.

Defaults

- For graphical operating systems, use the standard system fonts.
- For Web pages design for the default browser fonts.
- Consider that the user may change the fonts.

Consistency

- Establish a consistent hierarchy and convention for using typefaces, styles, and sizes.
  — Decide on a font for each different level of importance in the hierarchy.
  — Communicate hierarchy with changes in:
    - Size.
    - Weight.
    - Color.

Other

- Always consider the visual capabilities of the user.(Age Considerations)
- Always verify that the design has succeeded using the selected fonts.

Captions/Labels

- Identify controls with captions or labels.

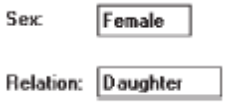
- Fully spell them out in a language meaningful to the user.
- Display them in normal intensity.
- Use a mixed-case font.
- Capitalize the first letter of each significant word.
- End each caption with a colon (:).
- Choose distinct captions that can be easily distinguished from other captions.
  — Minimal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

Data Fields

- For entry or modifiable data fields, display data within:
  — A line box.
  — A reverse polarity box.
- For inquiry or display/read-only screens, display data on the normal screen background.
- Visually emphasize the data fields.

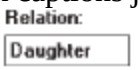
Control Captions/Data Fields

- Differentiate captions from data fields by using:
  — Contrasting features, such as different intensities, separating columns, boxes, and so forth.
  — Consistent physical relationships.



- For single data fields:
  — Place the caption to left of the data field.

  — Align the caption with the control's data.
  — Alternately, place the caption above the data field.
  —Align captions justified, upper left to the data field.



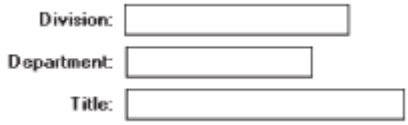
  — Maintain consistent positional relations within a screen, or within related screens, whenever possible.
- For multiple listings of columnar-oriented data, place the caption above the columnized data fields.

Control Caption/Data Field Justification

- First Approach

— Left-justify both captions and data fields.
— Leave one space between the longest caption and the data field column.

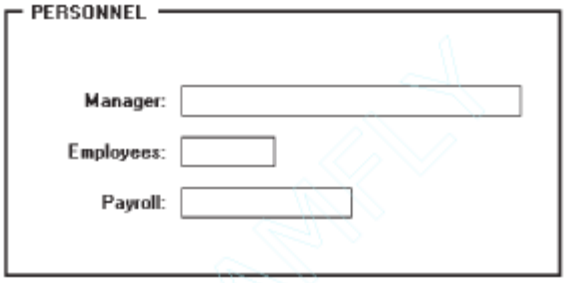
- 2. Second Approach
  — Left-justify data fields and right-justify captions to data fields.
  — Leave one space between each.



Control Section Headings

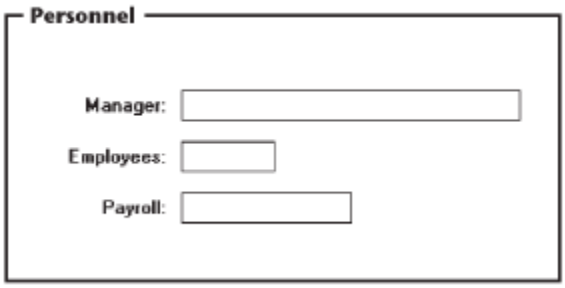
- Provide a meaningful heading that clearly describes the relationship of the grouped controls.
- Locate section headings above their related screen controls, separated by one space line.

— Alternately, headings 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.
- Fully spell out in an uppercase font.
- Display in normal intensity.

— Alternately, if a different font size or style exists, the heading may be displayed in mixed case, using the headline style.

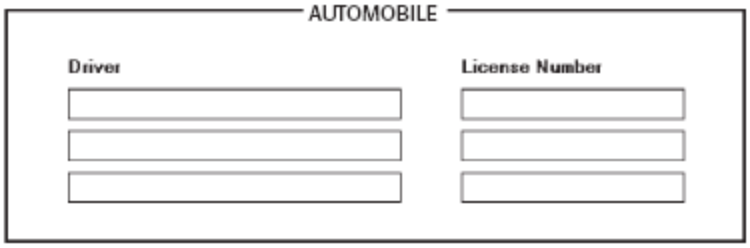


Control Subsection or Row Headings

- Provide a meaningful heading that clearly describes the relationship of the grouped controls.
- Locate to the left of the:
  — Row of associated fields.
  — Topmost row of a group of associated fields.
- Separate from the adjacent caption through the use of a unique symbol, such as one or two greater than signs or a filled-in arrow.
- Separate the symbol from the heading by one space and from the caption by a minimum of three spaces.
- Subsection or row headings may be left- or right-aligned.
- Fully spell out in an uppercase font.
- Display in normal intensity.
  — Alternately, if a different font size or style exists, the heading may be displayed in mixed-case using the headline style.

Field Group Headings

- Provide a meaningful heading that clearly describes the relationship of the grouped controls.
- Center the field group heading above the captions to which it applies.
- Relate it to the captions by a solid line.
- Fully spell it out in an uppercase font.
- Display it in normal intensity.
  — Alternately, if a different font size or style exists and is used, the heading may be displayed in mixed-case, using the headline style.

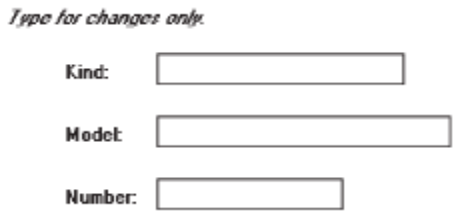


Web Page Headings

- Control Headings:
  — For groupings of controls, follow the control heading guidelines.
- Page and Text Headings:
  — Provide a meaningful page heading that clearly describes the content and nature of the page that follows.
  — Provide meaningful text headings and subheadings that clearly describe the content and nature of the text that follows.
  — Establish a hierarchy of font styles, sizes, and weights dependent upon the organization created and the importance of the text content.
  — Settle on as few sizes and styles as necessary to communicate page content and organization to the user.
  — Do not randomly mix heading levels or skip heading levels.

Instructions

- Incorporate instructions on a screen, as necessary:
  — In a position just preceding the part, or parts, of a screen to which they apply.
  — In a manner that visually distinguishes them, such as:
    • Displaying them in a unique type style.
    • Displaying them in a unique color.
  — In a position that visually distinguishes them by:
    • Left-justifying the instruction and indenting the related field captions, headings, or text a minimum of three spaces to the right.
    • Leaving a space line, if possible, between the instructions and the related control, heading, or text.



  — Using a mixed-case font.

Completion Aids

- Incorporate completion aids on a screen, as necessary:
  — In a position to the right of the text entry control to which they apply.
  — In a manner that visually distinguishes them, including:
    • Displaying them within a parentheses ( ).
    • Possibly displaying them in a unique font style.
  — If the controls are arrayed on the screen in a columnar format, position the completion aid, or aids:
    • Far enough to the right so as to not detract from the readability of the entry controls within the column.
    • But close enough to the related control so that they easily maintain an association with the related control.

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

Information Entry and Modification (Conversational) Screens

- Organization:
  — Logical and clear.
  — Most frequently used information:
    • On the earliest screens.
    • At the top of screens.
  — Required information:
    • On the earliest screens.
    • At the top of screens.
- Captions:
  — Meaningful.
  — Consistently positioned in relation to data field controls.
  — Left- or right-aligned.
  — Mixed case using headline style.
- Text boxes/selection controls:
  — Designate by boxes.
- Spacing and groupings:
  — create logical groupings.
  — Make them medium in size, about 5 to 7 lines.
- Headings:
  — Upper case or headline-style mixed case.
  — Set off from related controls.
- Control arrangement:
  — Align into columns.
  — Organize for top-to-bottom completion.
- Required and optional input:
  — Consider distinguishing between required and optional data input through:
    • Placing required and optional information within different screens, windows, or groups.
    • Identifying information as required or optional in a completion aid.
    • Identifying required information with a unique font or symbol.
- Instructions and completion aids:
  — Include as necessary.
    • Position instructions before the controls to which they apply.
    • Position completion aids to the right of the controls to which they apply.

Grids

- Usage:
  — To enter large amounts of related data or information.
- Design guidelines:

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

- Do not include colons (:) after the headings.
  — Justify column headings according to the data presented in the table cells.
    • Left-justify headings for columns containing text.
    • Right-justify headings for columns containing numbers.
  — Left-justify row headings.
  — Organize the data or information to be entered logically and clearly.
    • Place similar information together.
    • Place most important or frequently used information at the top.
    • Arrange information chronologically or sequentially.
  — Use light backgrounds.
  — Provide consistent spacing between columns and rows.
  — If more than seven rows are presented, insert white space after every fifth row.

Data Presentation

- Provide visual emphasis to the data.
- Give the data a meaningful structure.
  — Spell out any codes in full.
  — Include natural splits or predefined breaks in displaying data.

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

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

~~K349612094~~	K349 612 094

Data Display

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

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

Elephants:	612
Lions:	123
Giraffes:	361

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

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

Tables

- Usage:
  — To present and/or compare large amounts of data or information.
- Design guidelines:
  — Provide descriptive headings and, where appropriate, subheadings for columns and rows.
    • Do not include colons (:) after the headings.
  — Justify column headings according to the data presented in the table cells.
    • Left-justify for columns containing text.
    • Right-justify for columns containing numbers.
  — Left-justify row headings.
  — Organize the presented data or information logically and clearly.
    • Place similar information together.
    • Place most important or frequently used at the top.
    • Arrange chronologically or sequentially.
  — Justify the data presented in a column according to its content.
    • Left-justify textual data.
    • Right-justify numeric data.
  — Length should not exceed the depth of a screen.
  — Use light backgrounds.
    • Highlight a particular cell, column, or row using a contrasting display technique.
  — Provide consistent spacing between columns and rows.
  — If more than seven rows are presented, insert white space after every fifth row.
  — Use caution in placing borders around cells.

Intranet Design Guidelines

- Provide a single home page containing at least:
  — A directory hierarchy.
  — A search facility.
  — Current news.
- Present a visual style that is:
  — Different.
  — Distinguishing.
  — Unified.
- Orient the intranet Web site toward tasks.
- Include many options and features.
- Develop a strong navigational system.

Extranet Design Guidelines

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

— Visual style.
— Navigation.

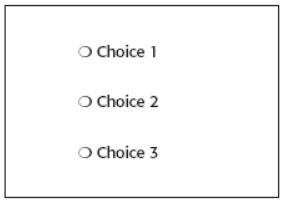
- Provide links to the public Internet site

Develop System Menus and Navigation Schemes

Structures of Menus

Single Menus

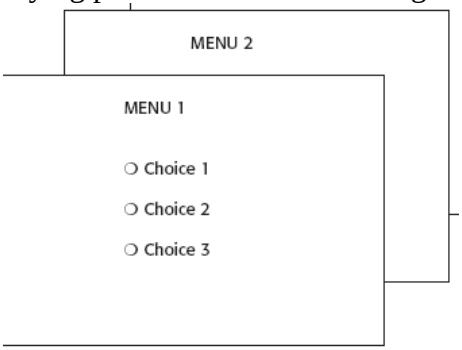
- In this simplest form of menu, a single screen or window is presented to seek the user's input or request an action to be performed



- A single menu may be iterative if it requires data to be entered into it and this data input is subject to a validity check that fails. The menu will then be represented to the user with a message requesting reentry of valid data.

Sequential Linear Menus

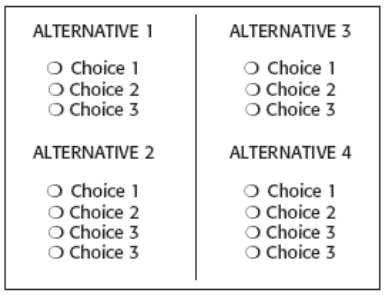
- Sequential linear menus are presented on a series of screens possessing only one path.
- The menu screens are presented in a preset order, and, generally, their objective is for specifying parameters or for entering data.



- Sequential path menus have several shortcomings. A long sequence may become tedious as menu after menu is presented.

Simultaneous Menus

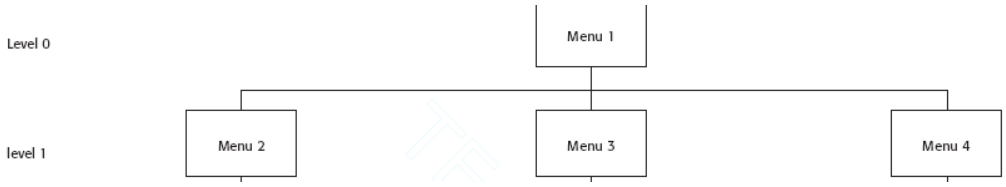
- Instead of being presented on separate screens, all menu options are available simultaneously



- Problems with simultaneous menus are that for large collections of menu alternatives screen clutter can easily occur, and screen paging or scrolling may still be necessary to view all the choices.
- Presenting many menu dependencies and relationships on a screen, especially if poorly indicated, can also be very confusing

Hierarchical Menus

- A hierarchical structure results in an increasing refinement of choice as menus are stepped through, for example, from options, to suboptions, from categories to subcategories, from pages to sections to subsections, and so on
- A hierarchical structure can best be represented as an inverse tree, leading to more and more branches as one moves downward through it.
- Common examples of hierarchical design today are found in menu bars with their associated pull-downs

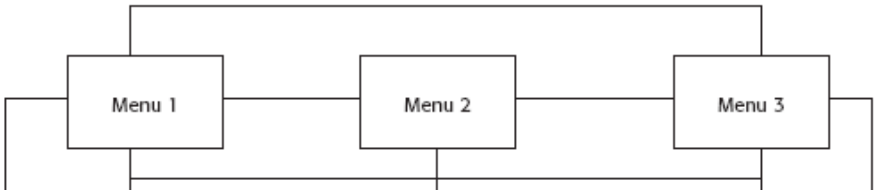


- A disadvantage of a hierarchical scheme is that the defined branching order may not fit the users conception of the task flow.
- If users are not familiar with the hierarchical menu, or are unable to predict what suboptions lie below
- a particular choice, they may go down wrong paths and find it necessary to go back up the tree to change a choice, or perhaps even return to the top-level menu

Connected Menus

- Connected menus are networks of menus all interconnected in some manner. Movement through a structure of menus is not restricted to a hierarchical tree, but is permitted between most or all menus in the network.

- A connected menu system may be cyclical, with movement permitted in either direction between menus, or acyclical, with movement permitted in only one direction. These menus also vary in connectivity, the extent to which menus are linked by multiple paths.



- The biggest advantage of a connected menu network is that it gives the user full control over the navigation flow. Its disadvantage is its complexity,

Event-Trapping Menus

- Event Trapping menus provide an ever-present background of control over the F

Functions of Menus

- 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

Navigation to a New Menu

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

Execute an Action or Procedure

- A user selection directs the computer to implement an action or perform a procedure.
- The action may be something like opening or closing a file, copying text, or sending a message.
- Accidental selection of critical irreversible actions must be prevented in interface design.

Displaying Information

- The main purpose of selecting a menu choice may simply be to display information.

- The user may be searching for specific information in a database or browsing the Web. The content material and the user's interests will determine the paths followed.
- The user's focus is primarily on the information desired and less on the selection function. Wrong turns in the process will again cost time and perhaps aggravation, but these errors are nondestructive and usually undoable.

Data or Parameter Input

- Each selection specifies a piece of input data for the system or provides a parameter value. Data or values may be input on a single menu or spread over a hierarchy of menus.

Content of Menus

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

Menu Context

- A menu's context provides information to keep the user oriented.
- Feedback is necessary that tells users where they are in a process, what their past choices were, and possibly how much farther they still have to navigate
- Verbal linkage, spatial linkage, or both may be used to provide navigation feedback.
- Verbal linkage involves providing, on the current menu screen, a listing of choices made on previous menus that have led to this position. It also involves assuring the user that the displayed menu is the menu desired
- Spatial linkage can be accomplished by graphic methods. Each succeeding menu screen can be displayed overlapping the previous menu screen so a succession of choices can be seen in a single view.

Menu Title

- A menu's title provides the context for the current set of choices. The title must reflect the choice selected on the previously displayed menu.

Choice Descriptions

- Choice descriptions are the alternatives available to the user.
- These descriptions can range from a mnemonic, numeric, or alphabetized listing of choices to single words or phrases to full sentences or more.

Completion Instructions

- Completion instructions tell users how to indicate their choices
- Explicit instructions may be needed for first time or casual users of a system. Experienced users will find overly verbose instructions unnecessary.

- The needs of all system users, and the nature of the system, must again be considered in creating this kind of on-screen guidance.

Formatting of Menus

- What follows is a series of guidelines for formatting menus.

Consistency

- Provide consistency with the user's expectations.
- Provide consistency in menu:
  — Formatting, including organization, presentation, and choice ordering.
  — Phrasing, including titles, choice descriptions, and instructions.
  — Choice selection methods.
  — Navigation schemes.

Display

- If continual or frequent references to menu options are necessary, permanently display the menu in an area of the screen that will not obscure other screen data.
- If only occasional references to menu options are necessary, the menu may be presented on demand.
  — Critical options should be continuously displayed, however.

Presentation

- Ensure that a menu and its choices are obvious to the user by presenting them with a unique and consistent structure, location, and/or display technique.
- Ensure that other system components do not possess the same visual qualities as menu choices.

Organization

- Provide a general or main menu.
- Display:
  — All relevant alternatives.
  — Only relevant alternatives.
    • Delete or gray-out inactive choices.
- Match the menu structure to the structure of the task.
  — Organization should reflect the most efficient sequence of steps to accomplish a person's most frequent or most likely goals.
- Minimize number of menu levels within limits of clarity.
  — For Web sites, restrict it to two levels (requiring two mouse clicks) for fastest performance.
- Be conservative in the number of menu choices presented on a screen:
  — Without logical groupings of elements, limit choices to 4 to 8.
  — With logical groupings of elements, limit choices to 18 to 24.
- Provide decreasing direction menus, if sensible.

- Never require menus to be scrolled.
- Provide users with an easy way to restructure a menu according to how work is accomplished.
- In general, the more choices contained on a menu (greater breadth), the less will be its depth; the fewer choices on a menu (less breadth), the greater will be its depth.
- The advantages of a menu system with greater breadth and less depth are:
    - Fewer steps and shorter time to reach one's objective.
    - Fewer opportunities to wander down wrong paths.
    - Easier learning by allowing the user to see relationships of menu items.
- A broad menu's disadvantages are:
    - A more crowded menu that may reduce the clarity of the wording of choices.
    - Increased likelihood of confusing similar choices because they are seen together.
- The advantages of greater depth are:
    - Less crowding on the menu.
    - Fewer choices to be scanned.
    - Easier hiding of inappropriate choices.
    - Less likelihood of confusing similar choices since there is less likelihood that they will be seen together.
- Greater depth disadvantages are:
    - More steps and longer time to reach one's objective.
    - More difficulties in learning since relationships between elements cannot always be seen.
    - More difficulties in predicting what lies below, resulting in increased likelihood of going down wrong paths or getting lost.
    - Higher error rates.

Complexity

- Provide both simple and complex menus.
- Simple: a minimal set of actions and menus.
- Complex: a complete set of actions and menus.

Item Arrangement

- Align alternatives or choices into single columns whenever possible.
  — Orient for top-to-bottom reading.
  — Left-justify descriptions.
- If a horizontal orientation of descriptions must be maintained:
  — Organize for left-to-right reading.

Ordering

- Order lists of choices by their natural order, or
- For lists associated with numbers, use numeric order.

- For textual lists with a small number of options (seven or less), order by:
  — Sequence of occurrence.
  — Frequency of occurrence.
  — Importance.
  — Semantic similarity.
- Use alphabetic order for:
  — Long lists (eight or more options).
  — Short lists with no obvious pattern or frequency.
- Separate potentially destructive actions from frequently chosen items.
- If option usage changes, do not reorder menus.
- Maintain a consistent ordering of options on all related menus.
  — For variable-length menus, maintain consistent relative positions.
  — For fixed-length menus, maintain consistent absolute positions.
- A meaningful ordering is necessary to:
  - Facilitate search for an item.
  - Provide information about the structure and relationships among items.
  - Provide compatibility with the user's mental model of the item structure.
  - Enhance the user's ability to anticipate a choice's location.

Groupings

- Create groupings of items that are logical, distinctive, meaningful, and mutually exclusive.
- Categorize them in such a way as to:
  — Maximize the similarity of items within a category.
  — Minimize the similarity of items across categories.
- Present no more than six or seven groupings on a screen.
- Order categorized groupings in a meaningful way.
- If meaningful categories cannot be developed and more than eight options must be displayed on a screen, create arbitrary visual groupings that:
  — Consist of about four or five but never more than seven options.
  — Are of equal size.
- Separate groupings created through either:
  — Wider spacing, or
  — A thin ruled line.
- Provide immediate access to critical or frequently chosen items.

Line Separators

- Separate vertically arrayed groupings with subtle solid lines.
- Separate vertically arrayed subgroupings with subtle dotted or dashed lines.
- For subgroupings within a category:
  — Left-justify the lines under the first letter of the columnized choice descriptions.
  — Right-justify the lines under the last character of the longest choice description.
- For independent groupings:
  — Extend the line to the left and right menu borders.

Phrasing the Menu

- A menu must communicate to the user information about:
    - The nature and purpose of the menu itself.
    - The nature and purpose of each presented choice.
    - How the proper choice or choices may be selected.

Menu Titles

- Main menu:
  — Create a short, simple, clear, and distinctive title, describing the purpose of the entire series of choices.
- Submenus:
  — Submenu titles must be worded exactly the same as the menu choice previously selected to display them.
- General:
  — Locate the title at the top of the listing of choices.
  — Spell out the title fully using either an:
    • Uppercase font.
    • Mixed-case font in the headline style.
  — Superfluous titles may be omitted.

Menu Choice Descriptions

- Create meaningful choice descriptions that are familiar, fully spelled out, concise,and distinctive.
- Descriptions may be single words, compound words, or multiple words or phrases.
  — Exception: Menu bar items should be a single word (if possible).
- Place the keyword first, usually a verb.
- Use the headline style, capitalizing the first letter of each significant word in the choice description.
- Use task-oriented not data-oriented wording.
- Use parallel construction.
- A menu choice must never have the same wording as its menu title.
- Identical choices on different menus should be worded identically.
- Choices should not be numbered.
  — Exception: If the listing is numeric in nature, graphic, or a list of varying items, it may be numbered.
- If menu options will be used in conjunction with a command language, the capitalization and syntax of the choices should be consistent with the command language.
- Word choices as commands to the computer.

Menu Instructions

- For novice or inexperienced users, provide menu completion instructions.

— Place the instructions in a position just preceding the part, or parts, of the menu to which they apply.

• Left-justify the instruction and indent the related menu choice descriptions a minimum of three spaces to the right.

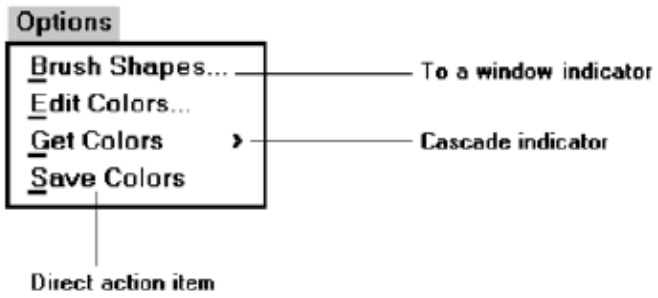
• Leave a space line, if possible, between the instructions and the related menu choice descriptions.

— Present instructions in a mixed-case font in sentence style.

- For expert users, make these instructions easy to ignore by:
  — Presenting them in a consistent location.
  — Displaying them in a unique type style and/or color.

Intent Indicators

- Cascade indicator:
  — To indicate that selection of an item will lead to a submenu, place a triangle or right-pointing solid arrow following the choice.
  — A cascade indicator must designate every cascaded menu.
- To a window indicator:
  — For choices that result in displaying a window to collect more information, place an ellipsis (. . .) immediately following the choice.
    • Exceptions—do not use when an action:
      – Causes a warning window to be displayed.
      – May or may not lead to a window.
- Direct action items:
  — For choices that directly perform an action, no special indicator should be placed on the menu.

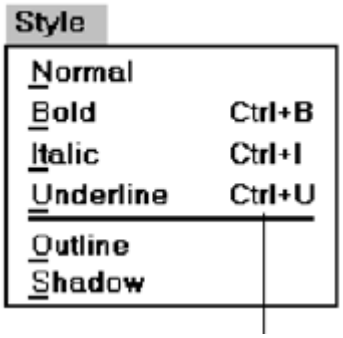


Keyboard Equivalents

- To facilitate keyboard selection of a menu choice, each menu item should be assigned a keyboard equivalent mnemonic.
- The mnemonic should be the first character of the menu item's description.
  — If duplication exists in first characters, use another character in the duplicated item's description.
  — Preferably choose the first succeeding consonant.
- Designate the mnemonic character by underlining it.
- Use industry-standard keyboard access equivalents when they exist.

Keyboard Accelerators

- For frequently used items, provide a keyboard accelerator to facilitate keyboard selection.
- The accelerator may be one function key or a combination of keys.
  — Function key shortcuts are easier to learn than modifier plus letter shortcuts.
- Pressing no more than two keys simultaneously is preferred.
  — Do not exceed three simultaneous keystrokes.
- Use a plus (+) sign to indicate that two or more keys must be pressed at the same time.
- Accelerators should have some associative value to the item.
- Identify the keys by their actual key top engraving.
- If keyboard terminology differences exist, use:
  — The most common keyboard terminology.
  — Terminology contained on the newest PCs.
- Separate the accelerator from the item description by three spaces.
- Right-align the key descriptions.
- Do not use accelerators for:
  — Menu items that have cascaded menus.
  — Pop-up menus.
- Use industry-standard keyboard accelerators



Selecting Menu Choices

Initial Cursor Positioning

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

Choice Selection

- Pointers:
  — Select the choice by directly pointing at it with a mechanical device such as a mouse or trackball pointer, or light pen, or pointing with one's finger.
  — Visually indicate:
    • Which options can be selected.
    • When the option is directly under the pointer and can be selected.
  — Visually distinguish single- and multiple-choice menu alternatives.
  — If pointing with a mechanical device is the selection method used:
    • The selectable target area should be at least twice the size of the active area of the pointing device or displayed pointer. In no case should it be less than 6 millimeters square.
    • Adequate separation must be provided between adjacent target areas.
  — If finger pointing is the selection method used:
    • The touch area must be a minimum of 20 to 30 millimeters square.
    • The touch area must encompass the entire caption plus one character around it.
- Keyboard:
  — If moving the cursor to a menu choice:
    • The up and down arrow keys should move the cursor up or down vertically oriented menu options.
    • The left and right cursor keys should move the cursor left or right between horizontally oriented menu options.
  — If keying a choice identifier value within an entry field:
    • Locate the entry field at the bottom of the last choice in the array of choices.
    • Uppercase, lowercase, and mixed -case typed entries should all be acceptable.
- Selection/execution:
  — Provide separate actions for selecting and executing menu options.
  — Indicate the selected choice through either:
    • Highlighting it with a distinctive display technique.
    • Modifying the shape of the cursor.
  — Permit unselecting choice before execution.
    • If a menu is multiple choice, permit all options to be selected before execution.
- Combining techniques:
  — Permit alternative selection techniques, to provide flexibility.

Defaults

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

Unavailable Choices

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

Mark Toggles or Settings

- Purpose:
  — Use to designate that an item or feature is active or inactive over a relatively long period of time.
  — Use to provide a reminder that an item or feature is active or inactive.
- Guidelines:
  — Position the indicator directly to the left of the option.
    — For situations where several nonexclusive choices may be selected, consider including one alternative that deselects all the items and reverts the state to the "normal" condition.

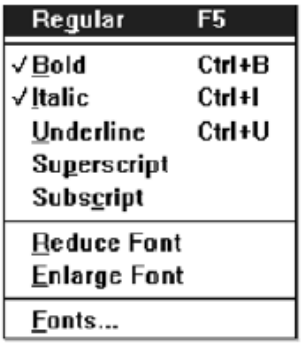


Figure 4.11 Mark toggles.

Toggled Menu Items

- Purpose:
  — Use to designate two opposite commands that are accessed frequently.
  — Use when the menu item displayed will clearly indicate that the opposite condition currently exists.
- Guidelines:
  — Provide a meaningful, fully spelled-out description of the action.
  — Begin with a verb that unambiguously represents the outcome of the command.
  — Use mixed-case letters, with the first letter of each word capitalized.

Kinds of Graphical Menus

- The best kind of menu to use in each situation depends on several factors. The following must be considered:
  - The number of items to be presented in the menu.
  - How often the menu is used.
  - How often the menu contents may change.

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Menu Bar

- Proper usage:
  — To identify and provide access to common and frequently used application actions that takes place in a wide variety of different windows.
  — A menu bar choice by itself should not initiate an action.
- The advantages of menu bars are that they:
  - Are always visible, reminding the user of their existence.
  - Are easy to browse through.
  - Are easy to locate consistently on the screen.
  - Usually do not obscure the screen working area.
  - Usually are not obscured by windows and dialog boxes.
  - Allow for use of keyboard equivalents.
- The disadvantages of menu bars are that:
  - They consume a full row of screen space.
  - They require looking away from the main working area to find.
  - They require moving pointer from the main working area to select.
  - The menu options are smaller than full-size buttons, slowing selection time.
  - Their horizontal orientation is less efficient for scanning.
  - Their horizontal orientation limits number of choices that can be displayed.

Display

- All primary windows must have a menu bar.
- All menu bars must have an associated pull-down menu containing at least two choices.
- Do not allow the user to turn off the display of the menu bar.
- If all the items in its associated pull-down menu are disabled, then disable the menu bar item.
  — Display the disabled item in a visually subdued manner.
  — However, the disabled pull-down menu must always be capable of being pulleddown so that the choices may be seen.

Location

- Position choices horizontally over the entire row at the top of the screen, just below the screen title.
- A large number of choices may necessitate display over two rows.

Title

- The window title will be the menu bar title.

Item Descriptions

- The menu item descriptions must clearly reflect the kinds of choices available in the associated pull-down menus.

- Menu item descriptions will be the “titles” for pull-down menus associated with them.
- Use mixed-case letters to describe choices.
- Use single-word choices whenever possible.
- Do not display choices that are never available to the user.

Organization

- Follow standard platform ordering schemes where they exist.
  — Place application-specific choices where they fit best.
- Order choices left-to-right with:
  — Most frequent choices to the left.
  — Related information grouped together.
- Choices found on more than one menu bar should be consistently positioned.
- Left-justify choices within the line.
- When choices can be logically grouped, provide visual logical groupings, if possible.
- Help, when included, should be located at the right side of the bar.

Layout

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

Separation

- Separate the bar from the remainder of the screen by:
  — A different background, or
  — Solid lines above and below.

Other Components

- Keyboard equivalent mnemonics should be included on menu bars.
- Keyboard accelerators, to a window indicators, and cascade indicators need not be included.

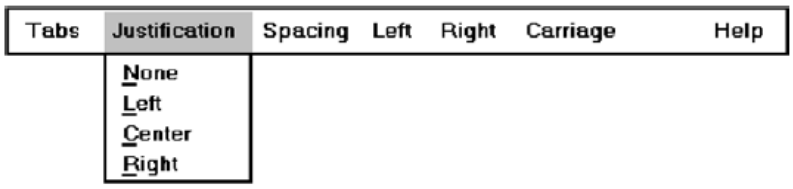
Selection Indication

- Keyboard cursor:
  — Use a reverse video, or reverse color, selection cursor to surround the choice.
  — Cover the entire choice, including one blank space before and after the choice word.

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

Pull-Down Menu

- Proper usage:
  — To initiate frequently used application actions that take place on a wide variety of different windows.
  — A small number of items.
  — Items best represented textually.
  — Items whose content rarely changes.
- The advantages of pull-down menus are:
  - The menu bar cues a reminder of their existence.
  - They may be located relatively consistently on the screen.
  - No window space is consumed when they are not used.
  - They are easy to browse through.
  - Their vertical orientation is most efficient for scanning.
  - Their vertical orientation is most efficient for grouping.
  - Their vertical orientation permits more choices to be displayed.
  - They allow for display of both keyboard equivalents and accelerators.
- The disadvantages of pull-down menus are:
  - They require searching and selecting from another menu before seeing options.
  - They require looking away from main working area to read.
  - The require moving the pointer out of working area to select (unless using keyboard equivalents).
  - The items are smaller than full-size buttons, slowing selection time.
  - The may obscure the screen working area.



Display

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

Location

- Position the pull-down directly below the selected menu bar choice.

Size

- Must contain a minimum of two choices.
- Restrict to no more than 5 to 10 choices, preferably 8 or less.

Title

- Not necessary on a pull-down menu. The title will be the name of the menu bar item chosen.

Item Descriptions

- Use mixed-case, headline-style words to describe choices.
  — If the choices can be displayed graphically, for example, as fill-in patterns, shades, or colors, textual descriptions are not necessary.
- Do not:
  — Identify a menu item by the same wording as its menu title.
  — Change the meaning of menu items through use of the Shift key.
  — Use scrolling in pull-downs.
  — Place instructions in pull-downs.

Organization

- Follow standard platform ordering schemes when they exist.
  — Place application-specific choices where they fit best.
- Place frequent or critical items at the top.
- Separate destructive choices from other choices.
- Align choices into columns, with:
  — Most frequent choices toward the top.
  — Related choices grouped together.
  — Choices found on more than one pull-down consistently positioned.
- Left-align choice descriptions.
- Multicolumn menus are not desirable. If necessary, organize top-to-bottom, then left-to-right.

Layout

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

— The right-side border should extend, at minimum, to the right side of its highlighted menu bar choice.
— Pull-downs for choices on the far right side of the menu bar, or long pull-down descriptions, may require alignment to the left of their menu bar choice to maintain visibility and clarity.

Groupings

- Provide groupings of related pull-down choices:
  — Incorporate a solid line between major groupings.
  — Incorporate a dotted or dashed line between subgroups.
  — Left-justify the lines under the first letter of the columnized choice descriptions.
  — Right-justify the lines under the last character of the longest choice description.
  — Display the solid line in the same color as the choice descriptions.

Mark Toggles or Settings

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

Pull-Downs Leading to Another Pull-Down

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

Pull-Downs Leading to a Window

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

Keyboard Equivalents and Accelerators

- Provide unique mnemonic codes by which choices may be selected through the typewriter keyboard.

— Indicate the mnemonic code by underlining the proper character.

- Provide key accelerators for choice selection.
  — Identify the keys by their actual key-top engravings.
  — Use a plus (+) sign to indicate that two or more keys must be pressed at the same time.
  — Enclose the key names within parentheses ( ).
  — Right-align the key names, beginning at least three spaces to the right of the longest choice description.
  — Display the key alternatives in the same color as the choice descriptions.

Separation

- Separate the pull-down from the remainder of the screen, but visually relate it to the menu bar by:
  — Using a background color the same as the menu bar.
  — Displaying choice descriptions in the same color as the menu bar.
  — Incorporating a solid-line border completely around the pull-down in the same color as the choice descriptions.
- A drop shadow (a heavier shaded line along two borders that meet) may also be included.

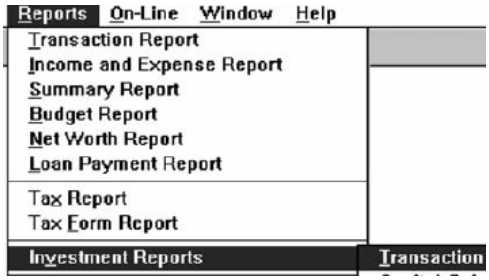
Selection Cursor

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

Cascading Menus

- Proper usage:
  — To reduce the number of choices presented together for selection (reduce menu breadth).
  — When a menu specifies many alternatives and the alternatives can be grouped in meaningful related sets on a lower-level menu.
  — When a choice leads to a short, fixed list of single-choice properties.
  — When there are several fixed sets of related options.
  — To simplify a menu.
  — Avoid using for frequent, repetitive commands.
- The advantages of cascading menus are that:
  - The top-level menus are simplified because some choices are hidden.
  - More first-letter mnemonics are available because menus possess fewer alternatives.
  - High-level command browsing is easier because subtopics are hidden.
- The disadvantages of cascading menus are:
  - Access to submenu items requires more steps.
  - Access to submenu items requires a change in pointer movement direction.

- Exhaustive browsing is more difficult; some alternatives remain hidden as pull downs become visible.



Cascade Indicator

- Place an arrow or right-pointing triangle to the right of each menu choice description leading to a cascade menu.
- Separate the indicator from the choice description by one space.
- Display the indicator in the same color as the choice descriptions.

Location

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

Levels

- Do not exceed three menu levels (two cascades).
  — Only one cascading menu is preferred.

Title

- Not necessary on the cascading menu.
  — The title will be the name of the higher-level menu item chosen.

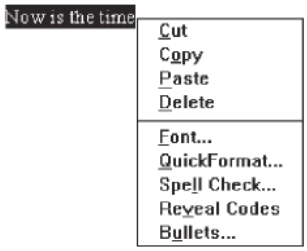
Other Guidelines

- Follow the organization, content, layout, separation, and selection cursor guidelines for the kind of menu from which the menu cascades.

Pop-up Menus

- Use to present alternatives or choices within the context of the task.
- The advantages of pop-up menus are:
  - They appear in the working area.
  - They do not use window space when not displayed.
  - No pointer movement is needed if selected by button.

    - Their vertical orientation is most efficient scanning.
    - Their vertical orientation most efficient for grouping.
    - Their vertical orientation allows more choices to be displayed.
    - They may be able to remain showing ("pinned") when used frequently.
    - They allow for display of both keyboard equivalents and accelerators.
- The disadvantages of pop-up menus are:
    - Their existence must be learned and remembered.
    - Means for selecting them must be learned and remembered.
    - They require a special action to see the menu (mouse click).
    - Items are smaller than full-size buttons, slowing selection time.
    - They may obscure the screen working area.
    - Their display locations may not be consistent.



Display

- Provide a pop-up menu for common, frequent, contextual actions.
  — If the pointer is positioned over an object possessing more than one quality (for example, both text and graphics), at minimum present actions common to all object qualities.
- Items that cannot be chosen due to the current state of an application should not be displayed.
- Continue to display a pop-up until:
  — A choice is selected.
  — An action outside the pop-up is initiated.
  — The user removes the pop-up.

Location

- Position the pop-up:
  — Centered and to the right of the object from which it was requested.
  — Close enough to the pointer so that the pointer can be easily moved onto the menu.
  — But not so close that the pointer is positioned on an item, possibly leading to accidental selection.
- If the pointer is positioned in such a manner that the pop-up would appear offscreen or clipped, position the menu:
  — As close as possible to the object, but not covering the object.
  — So that it appears fully on the screen.

Size

- Restrict the pop-up to no more than 5 to 10 choices, preferably 8 or less.

Title

- Not necessary on a pop-up menu.
- If included, clearly describe the menu's purpose.
- Locate in a centered position at the top.
- Display in uppercase or mixed-case letters.
- Separate it from the menu items by a line extending from the left menu border to the right border.

Other Guidelines

- Arrange logically organized and grouped choices into columns.
- If items are also contained in pull-down menus, organize pop-up menus in the same manner.
- Left-align choice descriptions.
- Use mixed-case headline-style words to describe choices.
- Separate groups with a solid line the length of the longest choice description.
- If the choice leads to a pop-up window, place an ellipsis after the choice description.
- To separate the pop-up from the screen background:
  — Use a contrasting, but complementary background.
  — Incorporate a solid line border around the pull-down.

Tear-off Menus

- It may also be called a pushpin, detachable, or roll-up menu. Its purpose is to present alternatives or choices to the screen user that are needed infrequently at some times
- Follow all relevant guidelines for pull-down menus.
- Advantages/disadvantages. No space is consumed on the screen when the menu is not needed. When needed, it can remain continuously displayed. It does require extra steps to retrieve, and it may obscure the screen working area.

Iconic Menus

- Use to remind users of the functions, commands, attributes, or application choices available.
- Create icons that:
  — Help enhance recognition and hasten option selection.
  — Are concrete and meaningful.
    — Clearly represent choices.
    —

Advantages/disadvantages.

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

Pie Menus

- Consider using for:
  — Mouse-driven selections, with one- or two-level hierarchies, short lists, and choices conducive to the format.

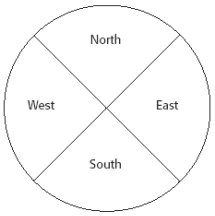


Table 4.4 Menu Proper Usage Summary

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

Default Menu Items

File

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

Edit

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

View

An optional element, the View menu provides commands that affect the perspective, details, and appearance of the application. They affect the view, not the data itself. The view functions are application-specific and include the following:
Toolbars Status Bar Magnify Zoom In Zoom Out Grid Points

Window

The Window menu, an optional element, provides commands to manipulate entire windows. Included are items such as:
New Window Arrange All Hide Show

Help

The Help menu, a standard element, provides Help commands, including:
Contents Search for Help on How to Use Help About (Application)

Functions Not Represented by Default Items

Labels

- General:
  — Provide a label for each command.
  — Use labels that indicate:
    • The purpose of the command, or
    • The result of what happens when the command is selected.
  — Use familiar, short, clear, concise words.
  — Use distinctive wording.
  — Use mixed case, with the first letter capitalized.
  — Begin commands with verbs or adjectives, not nouns.
  — Preferably, use only one word.
    • If multiple words are required for clarity, capitalize the first letter of each significant word.
    • Do not use sentences as labels.
  — Provide an ellipsis (. . .) to indicate that another window will result from selection of a command.
    • Do not use the ellipsis when the following window is a confirmation or warning.
- Dynamic labels:
  — As contexts change, dynamically change the label wording to make its meaning clearer in the new context.
    • For example, after a cut operation, Undo may be changed to Undo Cut.

Disabled Commands

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

Navigation and Selection

- General:

— Permit multiple methods for selecting commands.

- Keyboard equivalents:
  — Assign a mnemonic for each command.
  — A mnemonic should be as meaningful as possible. Use:
    - The first letter of the command, or if duplications exist,
    - The first letter of another word in the command, or
    - Another significant consonant in the command.
  — For standard commands, use mnemonics provided by the tool set.
- Keyboard accelerators:
  — Assign keyboard accelerators for frequently used commands.
  — For standard commands, use keyboard accelerators provided by the tool set.

Question Bank

Part – A

1. List common obstacles and pitfalls in interface design
2. Give the five commandments for the people to give a good design
3. Define Usability
4. List Down common Usability Problems
5. List the team members of design process
6. Difference between the characteristics of Novice and experienced user?
7. Difference between the characteristics of Young and old Adults
8. List out various average human interaction speed.
9. List down the general steps to be performed during business analysis.
10. Difference between direct and indirect method.
11. Define Metaphor.
12. Give the values of design and standards.
13. List the features of graphical menu

Part – B

1. Explain the importance of usability with its measures.
2. What are the obstacles encountered in user interface design process? Discuss the impact of human characteristics in design with suitable example.
3. Is human considerations in design is important. Justify.
4. Write a detailed note on requirement analysis with regard to user interface.
5. Is guidelines and standard important to good design? Explain.
6. Explain why human characteristics are considered in screen design.
7. Discuss in detail about structure and functions of menu with suitable illustrations.
8. Explain about content and types of menu.