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QUESTION BANK (DESCRIPTIVE)

Subject with Code: HUMAN COMPUTER INTERACTION (20CS0534)

Course & Branch: B.Tech & CSE

Year & Sem: III & II **Regulation:** R20

UNIT –I

Introduction: User Interface, GUI, Web User

1. a) What is HCI and Observe the Various goal of HCI? [L1][CO1][6M]

Definition:

- "Human-computer interaction is a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them".
- Human–computer interaction (HCI), alternatively **man–machine interaction (MMI)** or **computer–human interaction (CHI)** is the study of **interaction between people (users) and computers**.

Goals:

- A basic goal of HCI is
  - to improve the interactions between users and computers.
  - by making computers more usable and receptive to the user's needs.
- A long term goal of HCI is
  - to design systems that minimize the barrier between the human's cognitive model of what they want.
  - to accomplish and the computer's understanding of the user's

Why HCI?

- In the past, computers were expensive & used by technical people only.
- Now, computers are cheap and used by non technical people (different backgrounds, needs, knowledge, Skills).
- Computer and software manufacturers have noticed the importance of making computers user friendly: easy to use, save people time etc.

HCI Scope contents:

- **Use & Context:** Find application areas of computers.
  - **Human:** Study psychological & physiological aspects, e.g., study how a user learns to use a new product, study human typing speed.
  - **Computer:** Hardware & Software offered, e.g., input & output devices, speed, interaction styles, computer graphics.
  - **Development:** Design, Implementation & evaluation.

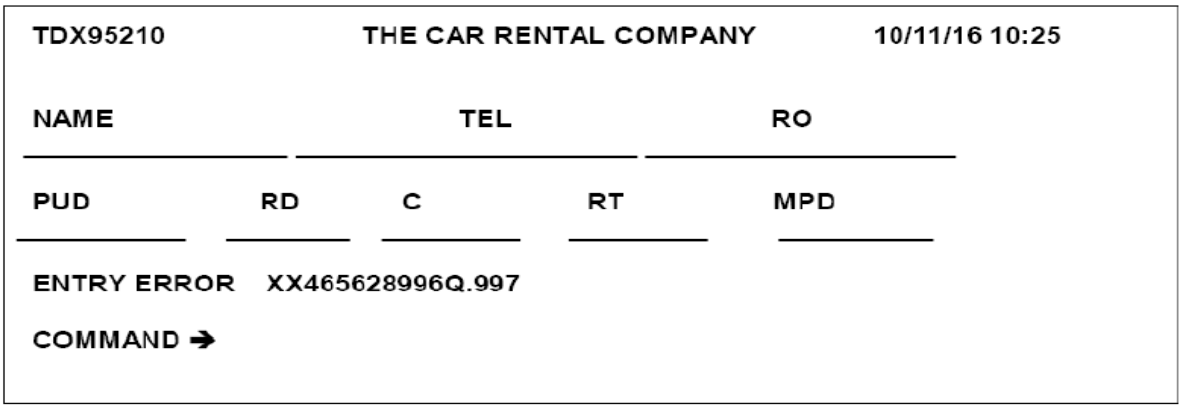
Components of HCI:

- The goal of HCI is to improve the interaction between users and computers by making computers more user-friendly and receptive to the user's needs.
    - Human
    - Computer Interaction

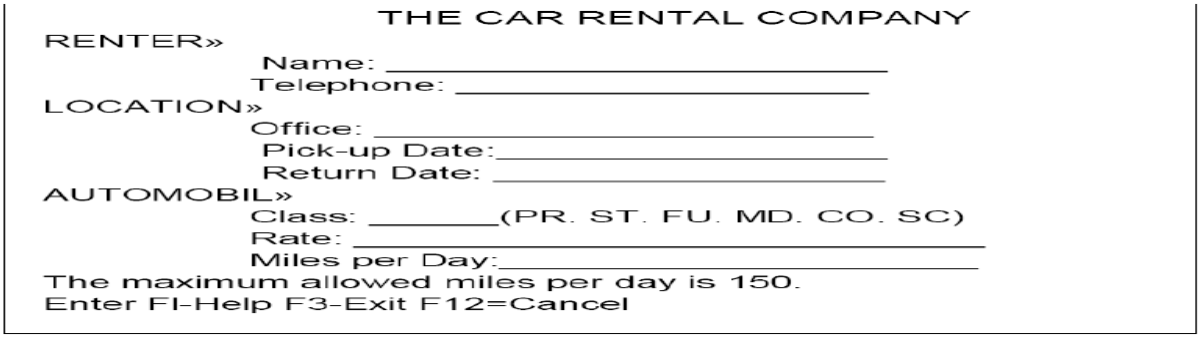
1. b) Summarize history of the Screen design. [L2][CO1][6M]

A brief history of screen design:

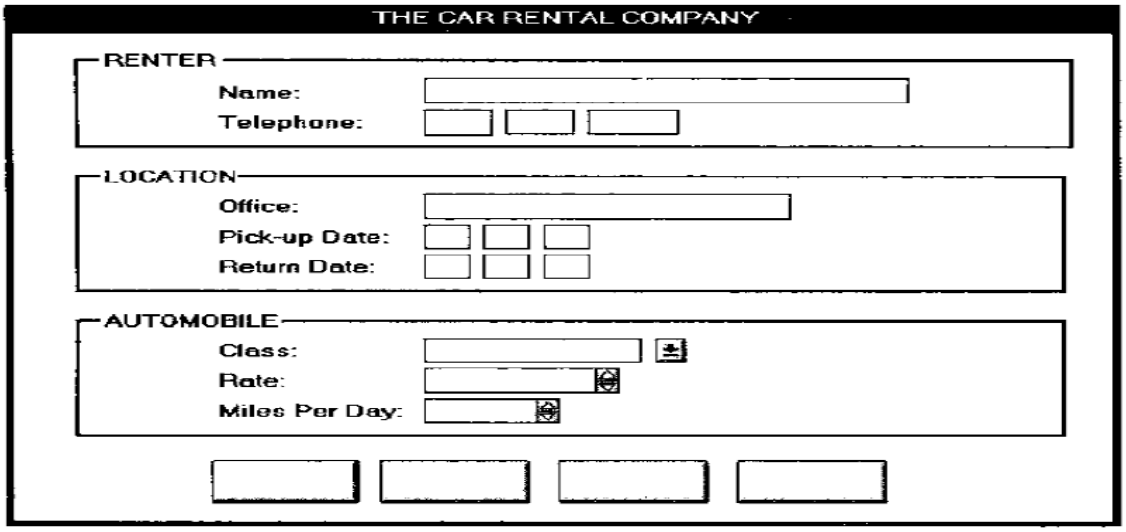
- While developers have been designing screens since a cathode ray tube display was first attached to a computer, more widespread interest in the application of good design principles to screens did not begin to emerge until the early 1970s, when IBM introduced its 3270 cathode ray tube text-based terminal.
- A 1970s screen often resembled the one pictured in Figure.
- It usually consisted of many fields (more than are illustrated here) with very cryptic and often unintelligible captions.



- It was visually cluttered, and often possessed a command field that challenged the user to remember what had to be keyed into it.
- Ambiguous messages often required referral to a manual to interpret.
- Effectively using this kind of screen required a great deal of practice and patience.
- Most early screens were monochromatic, typically presenting green text on black backgrounds.
- At the turn of the decade guidelines for text-based screen design were finally made widely available and many screens began to take on a much less cluttered look through concepts such as grouping and alignment of elements.
- User memory was supported by providing clear and meaningful field captions and by listing commands on the screen, and enabling them to be applied, through function keys. Messages also became clearer.
- These screens were not entirely clutter-free, however. Instructions and reminders to the user had to be inscribed on the screen in the form of prompts or completion aids such as the codes PR and Sc.
- Not all 1980s screens looked like this, however. In the 1980s, 1970s-type screens were still being designed, and many still reside in systems today.



- The advent of graphics yielded another milestone in the evolution of screen design, as illustrated in Figure above.
- While some basic "design principles did not change, groupings and alignment, for example, Borders were made available to visually enhance groupings and buttons and menus for implementing commands replaced function keys.



- Multiple properties of elements were also provided, including many different font sizes and styles, line thicknesses, and colors.
- The entry field was supplemented by a multitude of other kinds of controls, including list boxes, drop-down combination boxes, spin boxes, and so forth.
- These new controls were much more effective in supporting a person's memory, now simply allowing for selection from a list instead of requiring a remembered key entry.
- Completion aids disappeared from screens, replaced by one of the new listing controls.
- Screens could also be simplified, the much more powerful computers being able to quickly present a new screen.
- In the 1990s, our knowledge concerning what makes effective screen design continued to expand. Coupled with ever-improving technology, the result was even greater improvements in the user-computer screen interface as the new century dawned.

2. a) Explain in detail the concept of direct Manipulation. [L2][CO1][6M]

- The term used to describe graphical systems with this style of interaction 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.

- It is assumed that a person is already familiar with the objects and actions in his or her environment of interest.
- The system simply replicates them and portrays them on a different medium, the screen.
- A person has the power to access and modify these objects, including windows.
- 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.

Objects and actions are continuously visible.

- Reminders of actions to be performed are also obvious, where labeled buttons replace complex syntax and command names.
- Cursor action and motion occurs in physically obvious and intuitively natural ways.
- **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).
- **Rutkowski (1982)** described it as *transparency*, where one's intellect is applied to the task, not the tool.

Actions are rapid and incremental with visible display of results.

- Because tactile feedback is not yet possible, 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.

Earlier Direct Manipulation Systems

- The concept of direct manipulation actually preceded the first graphical system. The earliest full-screen text editors possessed similar characteristics.
- Screens of text resembling a piece of paper on one's desk could be created (extension of real world) and then reviewed in their entirety (continuous visibility).
- Editing or restructuring could be easily accomplished (through rapid incremental actions) and the results immediately seen. Actions could be reversed when necessary. It took the advent of graphical systems to crystallize the direct manipulation concept, however.

2. b) Examine the important of good design? [L3][CO1][6M]

- With today's technology and tools, and our motivation to create really effective and usable interfaces and screens, why do we continue to produce systems that are inefficient and confusing or, at worst, just plain unusable? Is it because:
    - We don't care?
    - We don't possess common sense?
    - We don't have the time?

    - We still don't know what really makes good design?
- A well-designed interface and screen is important to our users. It is their window to view the capabilities of the system.
- It is also the vehicle through which many critical tasks are presented.
- 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.

The benefits of good design:

- Good design
    - Screen Clarity
    - Readability
    - Screens less crowded
    - 20% more productive
- Proper formatting of information
    - Positive effect on performance
- Training costs, time are reduced.
- Support line costs are reduced.
- Employee satisfaction increased, frustration decreased.
- Ultimately customers benefit.
- Significant economic benefits and development.

3 a) Illustrate in detail about Graphical User Interface. [L2][CO1][6M]

The graphical user interface

- A ***user interface***, is a collection of techniques and mechanisms to interact with something.
- In a *graphical* interface, the primary interaction mechanism is a pointing device. This device is the electronic equivalent to the human hand.
- What the user interacts with is a collection of elements referred to as ***objects***.
- People perform operations, called **actions**, on objects. The operations include **accessing** and **modifying objects by pointing, selecting, and manipulating**.

Popularity of graphics:

- Older text - based screen possessed a one dimensional.
- Graphic screens assumed a three - dimensional look.
- Controls appeared to rise above the screen and move when activated.
- Information could appear, and disappear, as needed.
- Text could be replaced by graphical images called icons.
- These icons could represent objects or actions.
- Selection fields such as radio buttons, check boxes, list boxes, and palettes coexisted with the reliable old text entry field.
- More sophisticated text entry fields with attached or dropdown menus of.
- Objects and actions were selected through use of pointing mechanisms.
- Increased computer power.
- User's actions to be reacted quickly, dynamically, and meaningfully
- **WIMP interface:** windows, icons, menus, and pointers.

- Graphic presentation is much more effective than other presentation methods.
- It permits faster information transfer between computers and people by permitting more visual comparisons of amounts, trends, or relationships; more compact representation of information.

Advantages

- Symbols recognized faster than text
- Faster learning
- Faster use and problem solving
- Easier remembering
- More natural
- Exploits visual/spatial cues.
- Fosters more concrete thinking
- Provides context
- Fewer errors
- Immediate feedback
- Predictable system responses
- Easily reversible actions.
- Less anxiety concerning use.
- More attractive
- May consume less space
- Easily augmented with text displays
- Smooth transition from command language system

Disadvantages

- Greater design complexity.
- Learning still necessary
- Lack of experimentally-derived design guidelines
- Use a pointing device may also have to be learned
- Human comprehension limitations
- Window manipulation requirements
- Production limitations
- Few tested icons exist
- Inefficient for touch typists
- Inefficient for expert users
- Not always the preferred style of interaction
- Not always fastest style of interaction
- Increased chances of clutter and confusion
- May consume more screen space
- Hardware limitations

3. b) Assess the importance of user interface design in HCI. [L4][CO1][6M]

The importance of the user interface

- A well-designed interface and screen is terribly important to our users. It is their window to view the capabilities of the system.
- It is also the vehicle through which many critical tasks are presented. These tasks often have a direct impact on an organization's relations with its customers, and its profitability.
- 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.

4. Distinguish between GUI and Web page design. **[L4][CO1][12M]**

	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/ Information	Typically created and used by known and trusted sources. Properties generally known. Typically placed into system by users or known people and organizations. Typically organized in a meaningful fashion. A notion of private and shared data exists.	Full of unknown content. Source not always trusted. Often not placed onto the Web by users or known people and organizations. Highly variable organization. Privacy often suspect.
User Tasks	Install, configure, personalize, start, use, and upgrade programs. Open, use, and close data files. Fairly long times spent within an application. Familiarity with applications often achieved.	Link to a site, browse or read pages, fill out forms, register for services, participate in transactions, download and save things. Movement between pages and sites very rapid. Familiarity with many sites not established.
User's Conceptual Space	Controlled and constrained by program.	Infinite and generally unorganized.
Presentation Elements	Windows, menus, controls, data, toolbars, messages, and so on. Many transient, dynamically appearing and disappearing. Presented as specified by designer. Generally standardized by toolkits and style 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 specifications. Little standardization.

	GUI	WEB
Navigation	Through menus, lists, trees, dialogs, and wizards. Not a strong and visible concept. Constrained by design. Generally standardized by toolkits and style guides.	Through links, bookmarks, and typed URLs. Significant and highly visible concept. Few constraints, frequently causing a lost "sense of place." Few standards. Typically part of page design, fostering a lack of consistency.
Context	Enables maintenance of a better sense of context. Restricted navigation paths. Multiple viewable windows.	Poorer maintenance of a sense of context. Single-page entities. Unlimited navigation paths. Contextual clues become limited or are difficult to find.
Interaction	Interactions such as clicking menu choices, pressing buttons, selecting list choices, and cutting/copying/pasting 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.
Visual Style	Typically prescribed and constrained by toolkits. Visual creativity allowed but difficult. Little significant personalization.	Fosters a more artistic, individual, and unrestricted presentation style. Complicated by differing browser and display capabilities, and bandwidth limitations. Limited personalization available.
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. Limited only 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 everyone.

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

5. Discuss the popularity of web user interfaces. **[L2][CO1][12M]**

The Popularity of the Web

- While the introduction of the graphical user interface revolutionized the user interface, the Web revolutionized computing.
- It enables millions of people scattered across the globe to communicate, access information, publish, and be heard.
- It enables people to control much of the display and the rendering of Web pages. People can also change aspects such as typography and colors, turn off graphics, decide whether or not to transmit certain data over non-secure channels, and accept or refuse cookies.

- Nowhere in the history of computing has the user been given so much control. Web usage has reflected this popularity.
- The number of Internet hosts has risen dramatically. In 1984 hosts online exceeded 1,000; in 1987, 10,000; in 1989, 100,000; in 1990, 300,000; in 1992 hosts exceeded one million.
- Commercialization of the Internet saw even greater expansion of the growth rate. In 1993, Internet traffic was expanding at a 341,634 percent annual growth rate.
- In 1996, there were nearly 10 million hosts online and 40 million connected people (PBS Timeline). In 2005 the number of Internet hosts exceeded 350 million (Zakon.org, 2006), the number of users one billion (Nielsen, 2005g).
- The largest percentage of Internet users are in the Asia/Pacific region (36%) according to Morgan Stanley (2005).
- Percentage of users in other world regions are Europe (24%), North America (23%), South America (5%), and the rest of the world (12%).
- User control has had some decided disadvantages for some Web site owners as well. 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 result in user abandonment of the site for others with a more agreeable interface.
- People are quick to vote with their mouse, and these warnings should not go unheeded.

6. Write any five important principles to be considered in designing user Interface

[L1][CO1][12M]

- An interface must really be just an extension of a person. This means that the system and its software must reflect a person's capabilities and respond to his or her specific needs.
- The interface 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.
- Many principles are based on research, others on the collective thinking of behaviorists working with user interfaces.

Principles for the Xerox STAR:

- The design of the Xerox STAR was guided by a set of principles that evolved over its lengthy development process (Smith, et al., 1982; Verplank, 1988). These principles established the foundation for graphical interfaces and are as follows:

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.
- Verplank called this "graphics with handles on it."

Visual order and viewer focus.

- Attention must be drawn, at the proper time, to the important and relevant elements of the display.
- Effective visual contrast between various components of the screen is used to achieve this goal

Revealed structure.

- The distance between one's intention and the effect must be minimized.

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.

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

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.
  - "Know the user" is the fundamental principle in interface design.

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.

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.
- When an error does occur, provide constructive messages.

Predictability:

- The user should be able to anticipate the natural progression of each task.
  - Provide distinct and recognizable screen elements.
  - Provide clues to the result of an action to be performed.
- All expectations should be fulfilled uniformly and completely.

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.

7. List and explain various characteristics of the GUI? [L1][CO1][12M]

Characteristics of the graphical user interface

- A graphical system possesses a set of defining concepts. Included are sophisticated visual Presentation, pick-and click interaction, a restricted set of interface options, visualization, object orientation, extensive use of a person's recognition memory, and concurrent performance of functions

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 display of 16 million or more colors is possible on some screens.
- Graphics also permit animation and the presentation of photograph and motion video.
- The meaningful interface elements visually presented to the user in a graphical System include windows (primary, secondary, or dialog boxes), menus (menu bar, pull down, popup, cascading), icons to represent objects such as programs or files, assorted screen-based controls (text boxes, list boxes, combination boxes, settings, scroll bar and buttons), and a mouse pointer and cursor.
- The objective is to reflect visually on screen the real world of the user as realistically, meaningfully, simply, and clearly possible.
- A graphical system possesses a set of defining concepts. Included are sophisticated visual presentation, pick-and click interaction, a restricted set of interface options, visualization, object orientation, extensive use of a person's recognition memory, and concurrent performance of functions.

Restricted Set of Interface Options:

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

Pick-and-Click Interaction:

- Elements of a graphical screen upon which some action is to be performed must first identified.
- The motor activity required of a person to identify this element for a proposed action is commonly referred to as pick, the signal to perform an action as cue.

- The primary mechanism for performing this pick-and-click is most often the mouse and its buttons.
- The user moves the mouse pointer to the relevant element (pick) and the action is signaled (click).
- Pointing allows rapid selection and feedback. The hand and mind seem to work smoothly and efficiently together.
- The secondary mechanism for performing these selection actions is the keyboard most systems permit pick-and-click to be performed using the keyboard as well.

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. Presenting specialized graphic portrayals facilitates visualization.
- The best visualization method for an activity depends on what people are trying to learn from the data.
- The goal is not necessarily to reproduce a really graphical image, but to produce one that conveys the most relevant information.
- Effective visualizations can facilitate mental insights, increase productivity, and for faster and more accurate use of data.

Object Orientation:

- A graphical system consists of objects and actions. Objects are what people see on screen. They are manipulated as a single unit.
- Objects can be composed of sub objects. For example, an object may be a document. The document's sub objects may be a paragraph, sentence, word, and letter.
- A collection is the simplest relationship-the objects sharing a common aspect.
- A collection might be the result of a query or a multiple selection of objects. Operations can be applied to a collection of objects.
- A constraint is a stronger object relationship. Changing an object in a set affects some other object in the set.
- A document being organized into pages is an example of a constraint. A composite exists when the relationship between objects becomes so significant that the aggregation itself can be identified as an object.
- Examples include a range of cells organized into a spreadsheet, or a collection of words organized into a paragraph.
- A container is an object in which other objects exist. Examples include text in a document or documents in a folder.
- A container often influences the behavior of its content. It may add or suppress certain properties or operations of objects placed within it, control access to its content, or control access to kinds of objects it will accept. These relationships help define an object's type. Similar traits and behaviors exist in objects of the same object type.
- Another important object characteristic is persistence. Persistence is the maintenance of a state once it is established. An object's state (for example, window size, cursor location, scroll position, and so on) should always be automatically preserved when the user changes it.

Use of Recognition Memory:

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

8 a) Compare and Contrast the advanantages and disadvantages of Graphical Systems?

[L4][CO1][6M]

Advantages

- Symbols recognized faster than text
- Faster learning
- Faster use and problem solving
- Easier remembering
- More natural
- Exploits visual/spatial cues.
- Fosters more concrete thinking
- Provides context
- Fewer errors
- Immediate feedback
- Predictable system responses
- Easily reversible actions.
- Less anxiety concerning use.
- More attractive
- May consume less space
- Easily augmented with text displays
- Smooth transition from command language system

Disadvantages

- Greater design complexity.
- Learning still necessary
- Lack of experimentally-derived design guidelines
- Use a pointing device may also have to be learned
- Human comprehension limitations
- Window manipulation requirements
- Production limitations
- Few tested icons exist
- Inefficient for touch typists
- Inefficient for expert users
- Not always the preferred style of interaction
- Not always fastest style of interaction
- Increased chances of clutter and confusion
- May consume more screen space
- Hardware limitations

8. b) What are the benefits of a well - designed interface **[L1][CO1][6M]**

The importance of the user interface

- A well-designed interface and screen is terribly important to our users. It is their window to view the capabilities of the system.
- It is also the vehicle through which many critical tasks are presented. These tasks often have a direct impact on an organization's relations with its customers, and its profitability.
- 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.

9. Analyze Xerox STAR's general principle? [L4][CO1][12M]

Principles for the Xerox STAR:

- The design of the Xerox STAR was guided by a set of principles that evolved over its lengthy development process (Smith, et al., 1982; Verplank, 1988). These principles established the foundation for graphical interfaces and are as follows:

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.

- Verplank called this "graphics with handles on it."

Visual order and viewer focus.

- Attention must be drawn, at the proper time, to the important and relevant elements of the display.

- Effective visual contrast between various components of the screen is used to achieve this goal

Revealed structure.

- The distance between one's intention and the effect must be minimized.

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.

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.

10. Explain the general principle of User Interface design? [L1][CO1][12M]

General Principles

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.
  - "Know the user" is the fundamental principle in interface design.

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.

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.
- When an error does occur, provide constructive messages.

Predictability:

- The user should be able to anticipate the natural progression of each task.
  - Provide distinct and recognizable screen elements.
  - Provide clues to the result of an action to be performed.
- All expectations should be fulfilled uniformly and completely.

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.

UNIT –II
DESIN PROCESS, SCREEN DESIGNING

1. a) Discuss about interaction of people with computers. [L2][CO2][6M]

Why People Have Trouble with Computers

Use of jargon.

- Systems often speak in a strange language. Words that are completely alien to the office or home environment or used in different contexts, such as **filespec, abend, segment, and boot**.
- Learning to use a system often requires learning a new language.

Non-obvious design

- Operations may have prerequisite conditions that must be satisfied before they can be accomplished, or outcomes may not always be immediate, obvious, or visible.
- The overall framework of the system may be invisible, with the effect that results cannot always be related to the actions that accomplish them.

Fine distinctions.

- Different actions may accomplish the same thing, depending upon when they are performed, or different things may result from the same action.
- Often these distinctions are minute and difficult to keep track of

Disparity in problem-solving strategies.

- People learn best by doing. They have trouble following directions and do not always read instructions before taking an action.
- Human problem solving can best be characterized as **"error-correcting" or "trial and error,"** whereby a tentative solution is formulated based on the available evidence and then tried.
- This tentative solution often has a low chance of success, but the action's results are used to modify one's next attempt and so increase the chance of success.

Design inconsistency.

- The same action may have different names: for example, **"save"** and **"keep," "write"** and **"list."** The same command may cause different things to happen.
- The same result may be described differently: for example, **"not legal"** and **"not valid."**

Responses to Poor Design:

Psychological:

- Typical psychological responses to poor design are as follows:
  - Confusion.
  - Annoyance.
  - Frustration.
  - Panic or stress.
  - Boredom.

Physical:

- When effort and the psychological responses exceed the perceived benefits, the results are often the following physical reactions:
  - 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.

1. b) What are the human considerations in design? Explain [L1][CO2][6M]

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.

2. a) Write any five human characteristics in design and explain. [L1][CO2][6M]

- People are complex organisms with many attributes that have an important influence on interface design.
- Of particular importance in design are **perception, memory, visual acuity, foveal and peripheral vision, sensory storage, information processing, learning, skill, and individual differences**.

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
  - Similarity
  - Matching patterns
  - Succinctness
  - Closure
  - Unity.
  - Continuity
  - Balance.
  - Expectancies
  - Context
  - Signals versus noise.

Memory:

- Memory is not the most stable of human attributes. Today, memory is viewed as consisting of two components: long-term and short-term (or working) memory.
- **Short-term memory**, or working memory, receives information from either the senses or long- term memory, but usually cannot receive both at once because the senses are processed separately.
- 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.
- 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 and deep analysis.
- An important memory consideration, with significant implications for interface design, is the difference in ability to recognize or recall.
- Our power of recognition, therefore, is much greater than our power of recall, and this phenomenon should be utilized in design.
- To do this, one should present, whenever possible, lists of alternatives to remind people of the choices they have.
- Other general ways to reduce user memory loads:
  - Presenting information in an organized, structured, familiar, and meaningful way.
  - Giving the user control over the pace of information presentation.
  - Placing all required information for task performance in close physical proximity.

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.
- Design the interface so that all aspects and elements serve a definite purpose. Eliminating interface noise will ensure that important things are less likely to be missed.

Visual Acuity:

- The capacity of the eye to resolve details is called *visual acuity*.
- The important principle to keep in mind is that fairly small visual chunks will exist on screens and these chunks should be considered in design.
- The eye is also never perfectly steady as it sees; it trembles slightly. This tremor improves the detection of edges of objects being looked at, thus improving acuity

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.
- 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. Patterns, shapes, and alignments peripherally visible can guide the eye in a systematic way through a screen.
- Care should be exercised in design to utilize peripheral vision in its positive nature, avoiding its negative aspects.

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. We look rather than see, perceive rather than read.
- Repetition and learning results in a shift of control from the higher level to the lower level.
- Both levels function simultaneously, the higher level performing reasoning and problem solving, the lower level perceiving the physical form of information sensed.

Mental Models:

- As a result of our experiences and culture, we develop mental models of things and people we interact with.
- 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

Movement Control:

- Once data has been perceived and an appropriate action decided upon, a response must be made; in many cases the response is a movement.
- In computer systems, movements include such activities as pressing keyboard keys, moving the screen pointer by pushing a mouse or rotating a trackball, or clicking a mouse button
- 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 is the process of encoding in long-term memory information that is contained in short- term memory. It is a complex process requiring some effort on our part. Our ability to learn is important-it clearly differentiates people from machines.
- Given enough time people can improve the performance in almost any task. Too often, however, designers use our learning ability as an excuse to justify complex design.
- 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. Unproductive time spent learning is something frequently avoided.

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. It is characterized by consistency and economy of effort.
- Economy of effort is achieved by establishing a work pace that represents optimum efficiency. It is accomplished by increasing mastery of the system through such things as progressive learning of shortcuts, increased speed, and easier access to information or data.
- 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.
- System and screen design must permit development of increasingly skillful performance.

2. b) Explain in detail about determining basic business functions. [L4][CO2][6M]

- 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 Work

- The technique used to gain an understanding of what the computer system must do is called *task analysis*. Another object of task analysis is to gain a picture of the user's *mental model*.

Mental Models

- A mental model is an internal representation of a person's current conceptualization and understanding of something.
- Mental models are gradually developed through experience, training, and instruction. 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, the way in which people perform tasks, 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.
- The output of a task analysis is a complete description of all user tasks and interactions.
- One result of a task analysis is a description of the user's current tasks, called a *scenario*. Scenarios are narrative descriptions of what people do in the course of completing a task.
- Scenarios 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.
- The goal of the designer is to facilitate for the user the development of a useful mental model of the system.
- Mental models will be developed regardless of the particular design of a system, and then they will be modified with experience.
- What must be avoided in design is creating for the user a conceptual model that leads to the creation of a false mental model of the system, or that inhibits the user from creating a meaningful or efficient mental model.
- Guidelines for Designing Conceptual Models
    - Reflect the user's mental model, not the designer's.
    - Draw physical analogies or present metaphors.
    - Comply with expectancies, habits, routines, and stereotypes.
    - Provide action-response compatibility.
    - Make invisible parts and processes of a system visible.
    - Provide proper and correct feedback.
    - Avoid anything unnecessary or irrelevant.
    - Provide design consistency.

- Provide documentation and a help system that will reinforce the conceptual model.
- Promote the development of both novice and expert mental models.

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.
  - 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
  - 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.

3. a) Explain about business definition and requirement analysis. [L2][CO2][6M]

- Direct methods
- Indirect methods
- Requirements collection guidelines

DIRECT METHODS

Individual Face-to-Face Interview
- A one-on-one visit with the user to obtain information. It may be structured or somewhat open-ended.

Telephone Interview or Survey
- A structured interview conducted via telephone.

Traditional Focus Group
- A small group of users and a moderator brought together to verbally discuss the requirements.

Facilitated Team Workshop
- A facilitated, structured workshop held with users to obtain requirements information. Similar to the Traditional Focus Group.

Observational Field Study
- Users are observed and monitored for an extended time to learn what they do.

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.

Card Sorting for Web Sites
- A technique to establish groupings of information for Web sites.

INDIRECT METHODS

MIS Intermediary
- A company representative defines the user's goals and needs to designers and developers.

Paper Survey or Questionnaire
- A survey or questionnaire is administered to a sample of users using traditional mail methods to obtain their needs.

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.

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

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.

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.

3. b) Illustrate in detail User's knowledge and experience. [L3][CO2][6M]

KNOWLEDGE/EXPERIENCE	
Computer Literacy	Highly technical or experienced, moderate computer experience, or none.
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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.
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Native Language or Culture	English, another, or several.

4. a) Explain about screen navigation and flow. [L2][CO2][6M]

- Provide an ordering of screen information and elements that
  - Is rhythmic, guiding a person's eye through the display.
  - 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 line borders.
- Through focus and emphasis, sequentially, direct attention to items that are
  1. Critical.
  2. Important.
  3. Secondary.
  4. Peripheral.
- Tab through windows 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.
- 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.
- These techniques can be used initially to focus a person's attention to one area of the screen and then direct it elsewhere.
- Top-to-bottom orientation is recommended for information entry for the following reasons:
- Eye movements between items will be shorter.
- Control movements between items will be shorter.
- Groupings are more obvious perceptually.
- When one's eye moves away from the screen and then back, it returns to about the same place it left, even if it is seeking the next item in a sequence (a visual anchor point remains).

4. b) Explain how the ordering of screen data and content affects the performance.

[L5][CO2][6M]

- Divide information into units that are logical, meaningful, and sensible.
- Organize by the degree of 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.

Ordering Web Pages

- Establish levels of importance.
- Place critical information near the top of the Web site.
- Place important items at the top of a page.
- Organize information clearly.
- Place important items consistently.
- Facilitate scanning.
- Structure for easy comparison.

5. a) Write about the five important interface design goals. [L1][C02][6M]

- 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 result will always be improved user productivity and increased satisfaction

5. b) Justify amount of information in screen designing. [L5][CO2][6M]

- 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.

Scrolling and Paging:

Scrolling:

- Avoid scrolling to determine a page's subject and what it contains.
- 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 short pages if people are looking for specific pieces of information.
- Facilitate fast scrolling by highlighting major page items.
- Provide a unique and consistent "end of page" structure.
- Avoid horizontal page scrolling.
- Use longer scrolling pages when people are reading for comprehension.

- Use paging rather than scrolling if system response times are reasonably fast.

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."

6. a) Discuss about focus and emphasis in screen designing. [L2][CO2][6M]

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

6. b) How information retrieval is done from web in screen designing. [L1][CO2][6M]

- The Web has an almost unlimited supply of information. Web users access a site for different reasons: a focused search for a piece of information or an answer, a less focused browsing, or simply to surf.

- Easy information scanning is very important. People seldom read more than a few words as they seek items of interest.
- So, the user is impatient, with little time to waste. Things like a slow download, pages that are not easily scannable, and confusing navigation, will quickly drive people away from a Web site.

Initial Focus of Attention:

- When a Web page is presented, like most screens, it will be scanned in a clockwise direction, people being influenced by its balance and the weight of its title, graphics, headings, and text.
- Studies of Web users indicate that attention is then immediately directed to the page's content.

Page Perusal:

- Focusing on the page's content, the user's eyes are first drawn to the page's text, particularly headings, captions, summaries, and notes. Individual words and phrases are read for meaning and relevance.
- Studies find that the most frequent method used in perusing a page is scanning or skimming, concentrating less on detail and word for word reading.

Scanning Guidelines:

- A Web page must be structured to facilitate scanning, its key points made very obvious.
- Organization:
  - Minimize eye movement.
  - Provide groupings of information.
  - Organize content in a logical and obvious way.
- Writing:
  - Provide a meaningful title.
  - Provide meaningful headings and subheadings.
  - Concisely write the text.
  - Write short paragraphs containing only one idea.
  - Use the inverted pyramid style of writing.
  - Use bulleted and numbered lists.
  - Array information in tables.
  - Provide concise summaries.
- Presentation:
  - Highlight: Key information-carrying words or phrases and important concepts.

Browsing Guidelines:

- Facilitate scanning.
- Provide multiple layers of structure.
- Make navigation easy.
- Respect the user's desire to leave.
- Upon returning, help the users reorient themselves.

Searching:

- People search on the Web when they have a specific goal or need for which they seek an answer.
- Their focus may be directed toward something specific, a fact, document, or product; toward gaining an understanding of some more general topic; or the search may be directed toward collecting multiple pieces of information (not necessarily looking for one particular piece), or to evaluate multiple products or answers in order to make a decision.
- Currently, the design of a Web site is the most effective searching tool, not a search facility itself.

Know Your Search User

- Identify the level of expertise of the user.
- Anticipate:
  - The nature of every possible query.
  - The kind of information desired.
  - The type of information being searched.
  - How much information will result from the search.
- Plan for the user's switching purposes during the search process.
- Plan for flexibility in the search process.

Express the Search

- What:
  - For insite facilities, structure the searching function to the Web site's information and the user's needs.
  - Integrate searching and browsing.
- Where:
  - Make the search facility prominent on the home page.
  - Include a search facility on every page.
- How:
  - Permit users to specify the extent of searches.
    - Within a section.
    - Across a site.

- Within specified sources.
- Globally.

- Provide methods of specifying search parameters, including:
  - Keywords: For large sites include an internal glossary of terms and a thesaurus.
  - Phrases.
  - Variants. Case insensitivity, Partial matches, Synonyms.
- Provide a spell checker.
- Provide search controls, including:
  - A text box
  - Size: Large enough to enter a minimum of 20 characters.
  - Font: Arial. ; – Font size: 10 points.
- Structured controls.
  - Check boxes.
  - List boxes or drop-down list boxes
- A command button.
  - Label: Search.
  - Location: to right of search text box.
- Provide separate interfaces for simple and advanced search.
  - Place “Advanced Search” link under text search box.
- Provide guidance and assistance.
  - Present clear instructions.
  - Offer online help.
  - Offer a search wizard.

7. a) Illustrate screen meaning and purpose **[L2][CO2][6M]**

- Each 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 users.
  - Serve a purpose in performing tasks.

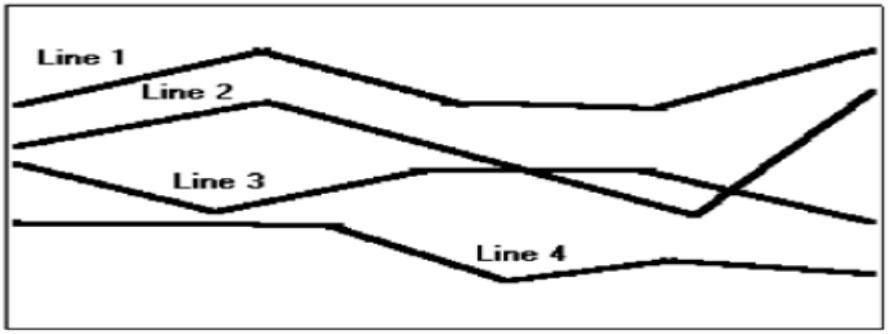
7. b) What are various types of statistical graphics? Explain it in detail. [L1][CO2][6M]

Types of Statistical Graphics

- Statistical graphics take many forms. There are curves and line graphs, surface charts, scatterplots, bar graphs, histograms, segmented or stacked bars, and pie charts.

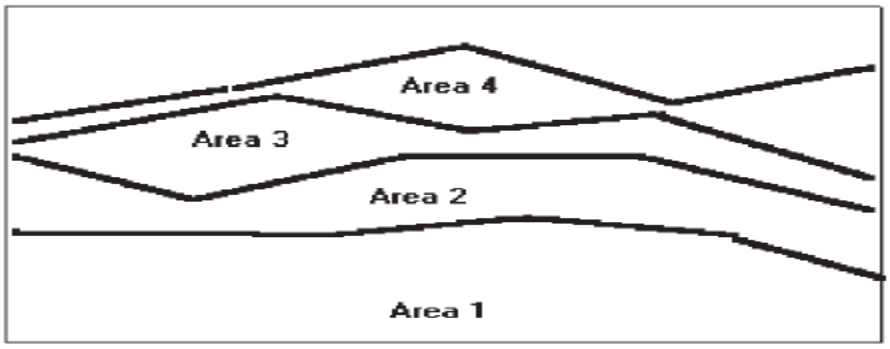
Curve and Line Graphs:

- Display data curves or lines that must be compared in a single graph.
- Display no more than four or five curves in a single graph.
- Identify each curve or line with an adjacent label whenever possible.
- If a legend must be included, order the legend to match the spatial ordering of the lines.
- For tightly packed curves or lines, provide data differentiation with a line-coding technique, such as different colors or different line composition types.
- Highlight curves or lines representing important or critical data.
- When comparing actual to projected data:
  - Use solid curves or lines for actual data.
  - Use broken curves or lines for projected data.
- Display a reference index if the displayed data must be compared to a standard or critical value.
- Display differences between two data sets as a curve or line itself.



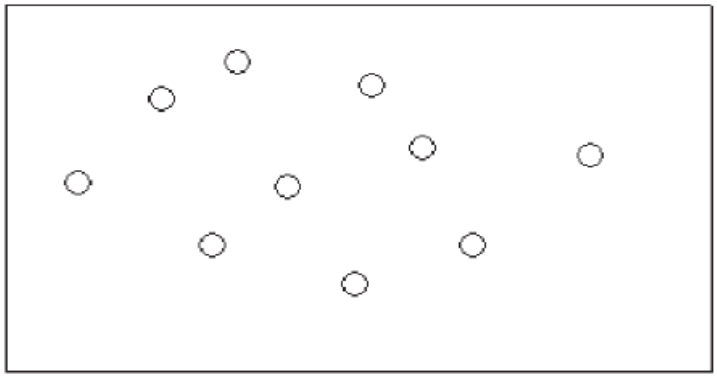
Surface Charts:

- Order the data categories so that: The least variable is at the bottom, and the most variable at the top. The largest is at the bottom and the smallest at the top.
- Use different texture or shading coding schemes to differentiate the areas below each curve
- Incorporate labels within the bands of data.



Scatterplots:

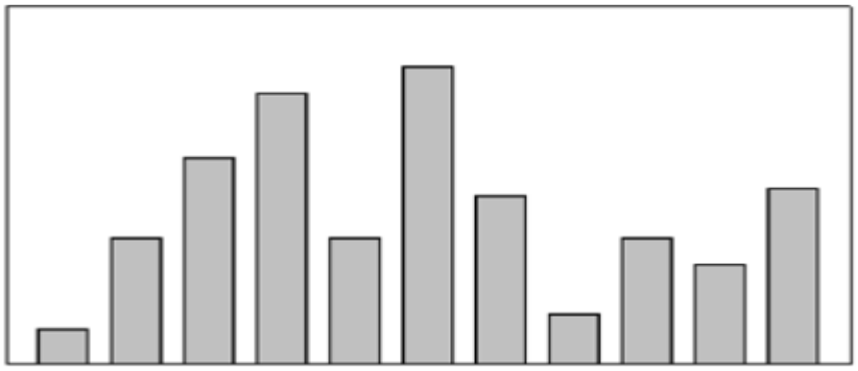
- Limit use to two-dimensional displays of data.
- Maintain consistent scale size intervals.
- Provide distinguishable, equal-sized plot points.
- If there is more than one set of data on the plot, use different symbols for each data set's points.
- Visually distinguish points of particular significance through a highlighting technique.



Bar Graphs:

- Orient bars consistently, either horizontally or vertically.
- Use vertical bars when the item being counted is of greatest interest.
- Use horizontal bars:
  - When the data labels are long.
  - To highlight the information rather than the count.
- Use a meaningful organizing principle. If none exists, arrange the bars so that the length of bars is in ascending or descending order.
- Make the spacing between bars equal to one-half the width of the bars or less. If groupings of bars are presented, leave space between the groupings only.

- If different kinds of bars must be easily distinguished, provide differentiation through a coding technique. If possible, use a pattern or color that reinforces the data.
- Highlight bars representing important or critical data.
- Provide a consistent ordering for related groups of bars.
- Display a reference index if displayed data must be compared to a standard or critical value.
- Identify each bar with an adjacent label. Place labels below, or to the left of, the baseline.
- When a great many pieces of data must be compared, consider using histograms or step charts.



Pie Charts:

- Pie charts should be used with caution.
- If pie charts are used:
  - They must add up to 100 percent.
  - Use five segments or fewer.
  - Each segment should take up at least 5 percent (18 degrees) of the circle.
  - Place the largest segment starting at 12:00.
  - Directly label each segment in the normal reading orientation. If leaders for labels in small segments are necessary, orient them in as few angles as possible.
  - Include numbers with segment labels to indicate percentages of absolute values.
  - Texture- or color-coding selected for segments should not emphasize one segment over another (unless it is intended).
  - Highlight segments requiring particular emphasis through a contrasting display technique or by “exploding” it.
  - Never tilt a pie.

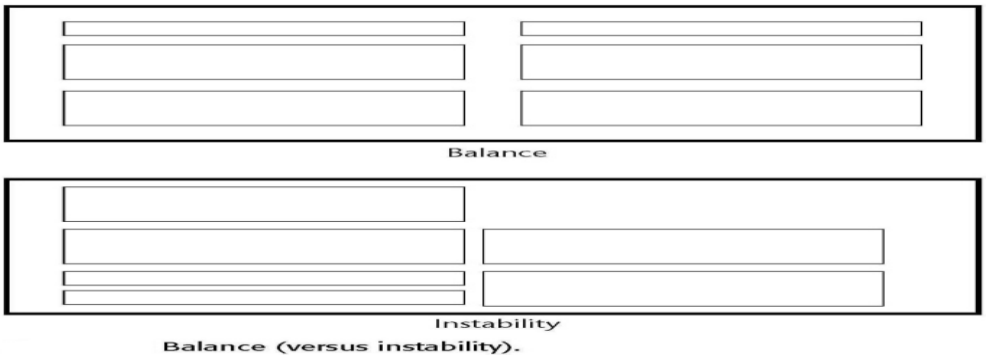
8. Discuss in detail about visually pleasing composition [L2][CO2][12M]

- Provide a visually or aesthetically pleasing composition possessing the following qualities:

- Balance
- Symmetry
- Regularity
- Predictability
- Sequentiality
- Economy
- Unity
- Proportion
- Simplicity
- Groupings

Balance:

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

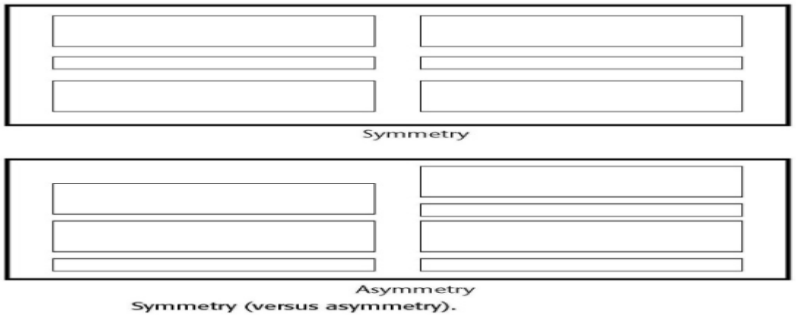


Balance (versus instability).

- Dark colors, unusual shapes, and larger objects are “heavier,” whereas light colors, regular shapes, and small objects are “lighter.”
- Balance on a screen is accomplished through centering the display itself, maintaining an equal weighting of components on each side of the horizontal and vertical axis, and centering titles and illustrations.
- Web pages are often scrollable, thereby shifting the horizontal, or top-to-bottom, balance point as the screen is scrolled. Horizontal balance is therefore more difficult to maintain.

Symmetry:

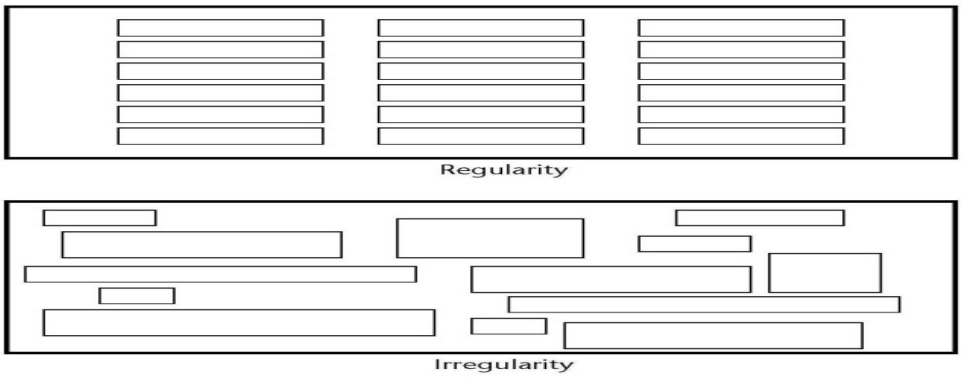
- Create symmetry by replicating elements left and right of the screen centerline.



Symmetry (versus asymmetry).

Regularity:

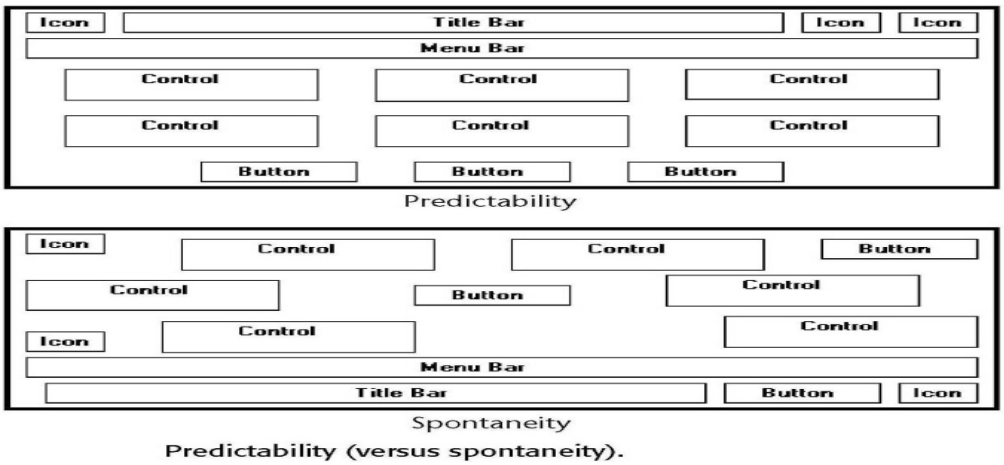
- Create regularity by establishing standard and consistently spaced horizontal and vertical alignment points.
- Also, use similar element sizes, shapes, colors, and spacing.



Regularity (versus irregularity).

Predictability:

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

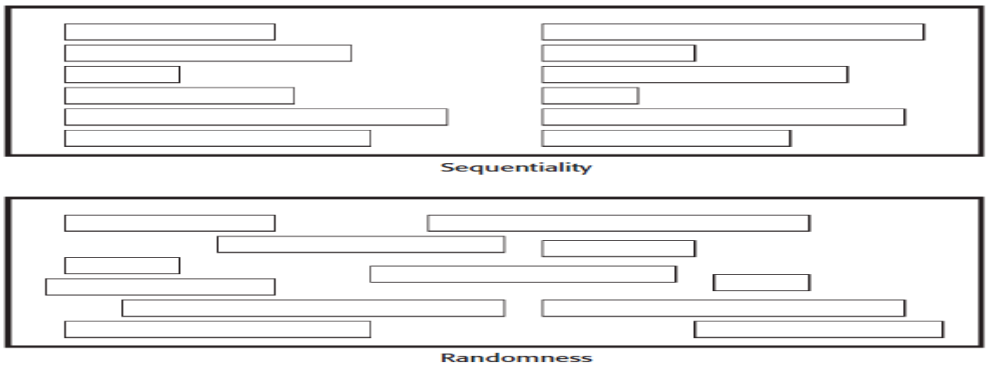


Predictability (versus spontaneity).

Sequentiality:

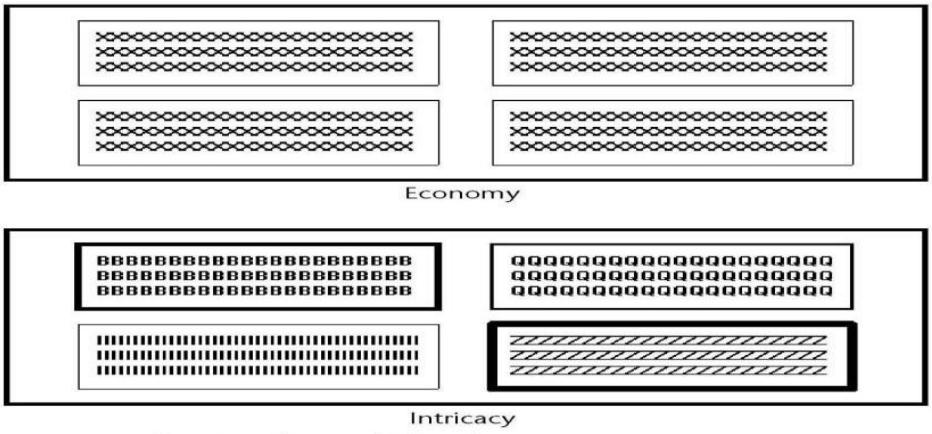
- Provide sequentiality by arranging elements to guide the eye through the screen in an obvious, logical, rhythmic, and efficient manner.
- The eye tends to be attracted to
  - A brighter element before one less bright.
  - Isolated elements before elements in a group.
  - Graphics before text.
  - Color 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.



Economy:

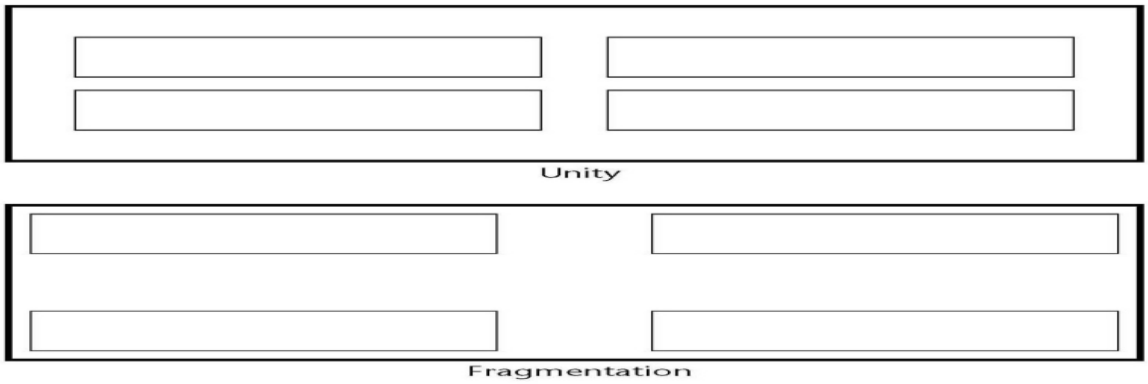
- Provide economy by using as few styles, display techniques, and colors as possible.
- *Economy*, is the frugal and judicious use of display elements to get the message across as simply as possible. The opposite is intricacy, the use of many elements just because they exist.



Economy (versus intricacy).

Unity:

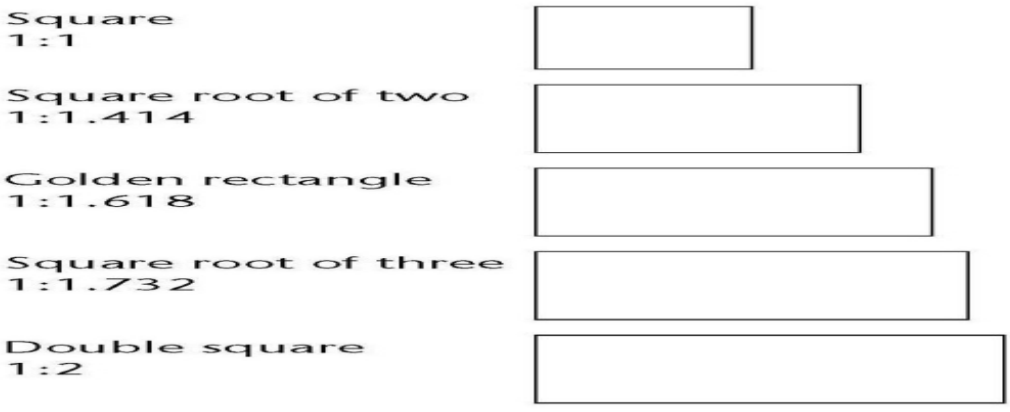
- Create unity by
- Using similar sizes, shapes, or colors for related information.
- Leaving less space between elements of a screen than the space left at the margins.



Unity (versus fragmentation).

Proportion

- Create windows and groupings of data or text with aesthetically pleasing proportions.
- **Marcus (1992)** describes the following shapes, as aesthetically pleasing.
  - Square (1:1)
  - Square root of two (1:1.414)
  - Golden rectangle (1:1.618)
  - Square root of three (1:1.732)
  - Double square (1:2).



Pleasing proportions.

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.
- The measure of complexity involves the following steps:

1. Draw a rectangle around each element on a screen, including captions, controls, headings, data, title, and so on.

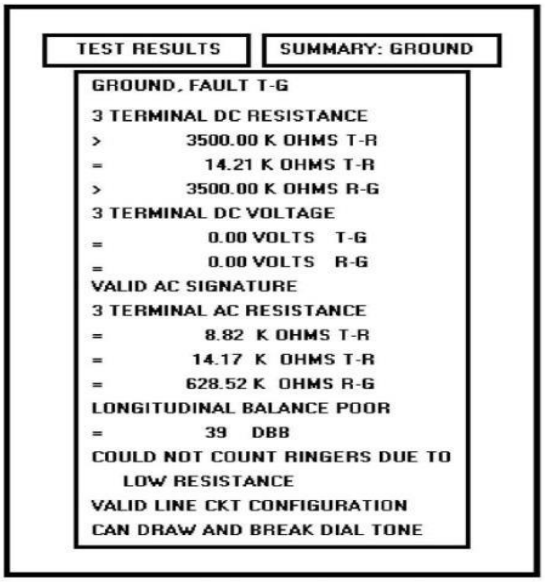
2. Count the number of elements and horizontal alignment points (the number of columns in which a field, inscribed by a rectangle, starts).

3. Count the number of elements and vertical alignment points (the number of rows in which an element, inscribed by a rectangle, starts).

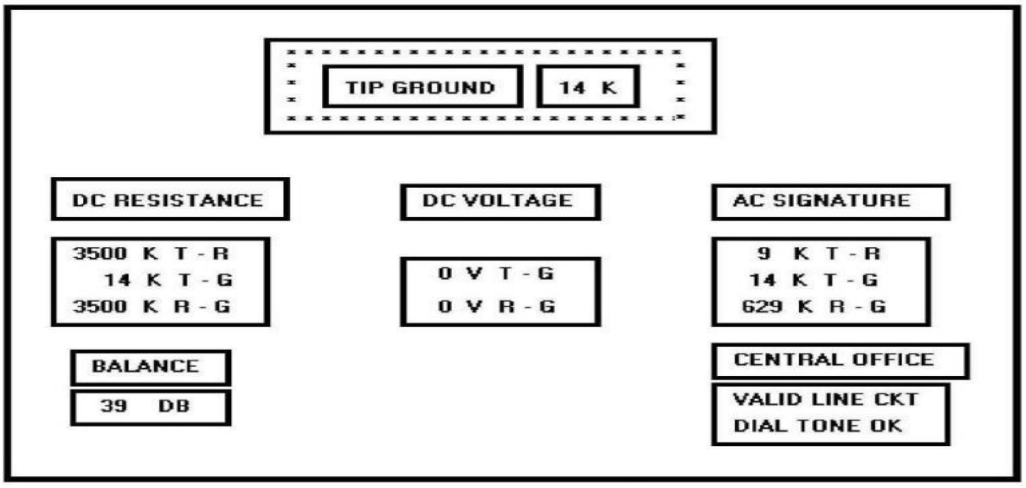
- A complexity calculation using information theory for each screen is as follows: Figure (original):
    - 22 fields with 6 horizontal (column) alignment points = 41 bits.
    - 22 fields with 20 vertical (row) alignment points = 93 bits.
    - Overall complexity = 134 bits. Figure (redesigned):
    - 18 fields with 7 horizontal (column) alignment points = 43 bits.
    - 18 fields with 8 vertical (row) alignment points = 53 bits.
    - Overall complexity = 96 bits.

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.



Original screen, from Tullis (1981), with grouping indicated by bold boxes.



Redesigned screen, from Tullis (1981), with grouping indicated by bold boxes.

9. How to presenting the information simply and meaningfully? [L1][CO2][12M]

- 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 font type, such as Times New Roman, Arial, Verdana, or Helvetica.
- A font has several qualities, including size (Times New Roman 16-point or Arial 12-point) and other characteristics, including case (upper, lower, and mixed), type (serif and sans serif), and styles such as bold, italic, outline or shadow.
- In screen design font's characteristics can be used as a tool to
  - Communicate the organization of screen elements.
  - Identify the most important screen elements.
  - Establish a reading order.
  - Create a particular mood.

Font Types and Families

- Use simple, common, and familiar fonts to achieve the best reading speed.
  - Arial or Verdana Sans Serif.
  - Times New Roman or Georgia Serif.
  - Avoid specialty or “cool” fonts.
- 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.
- For graphical systems use
  - 12 point for menus.
  - 10 point for windows.
- For Web pages use
  - 12 to 14 points for body text.
  - 18 to 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 lowercase with caution.

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.

Text Backgrounds

- For rapid reading and understanding present black text on plain, high-contrast backgrounds

Other

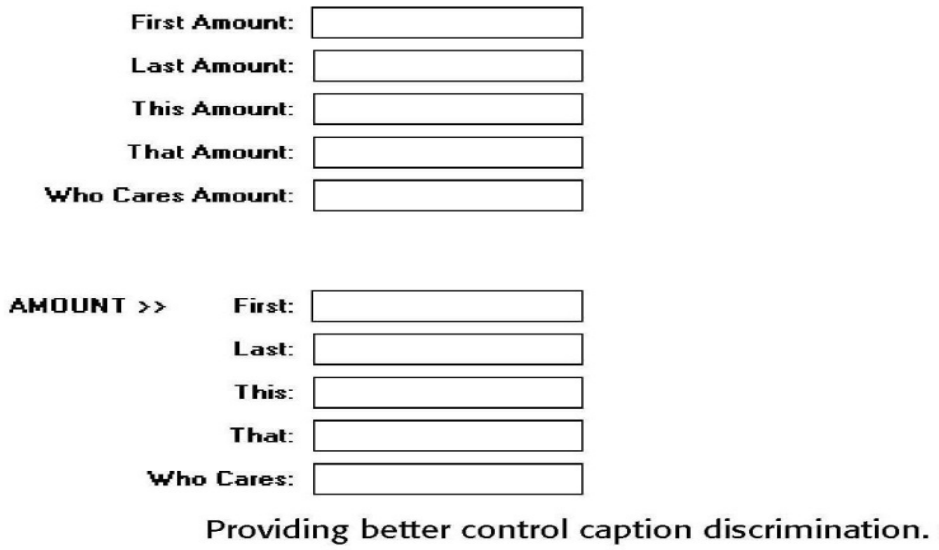
- Always consider the visual capabilities of the user.
- Always verify that the design has succeeded using the selected fonts.

Screen Elements:

- Elements of a screen include control captions, the data or information displayed on the screen, heading and headlines, instructional information, and the screen's title.

Captions/Labels:

- Identify controls with captions or labels.
- Fully spell captions out in a language meaningful to the user.
- 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.
- Provide consistency.

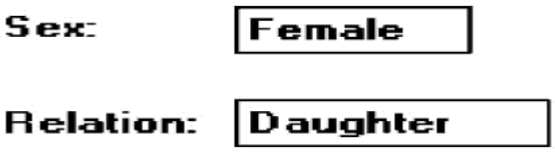


Data Fields

- For entry or modifiable data fields:
  - Display data within
    - A line box.
- A box with a contrasting light-colored background.
  - Break long structured data items into logical pieces.
  - Provide a field length commensurate with the size of the entry.
- For inquiry or display/read-only screens containing non-changeable data display the data on the normal screen background with no borders.
- For temporarily inactive data fields display the data content of the data field lighter than active fields.
- Visually emphasize the data fields.

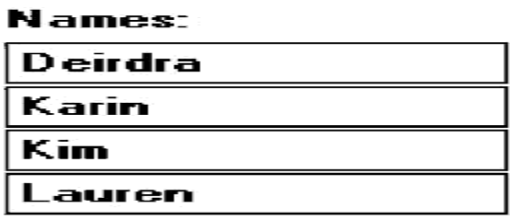
Control Caption — Data Field Differentiation

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



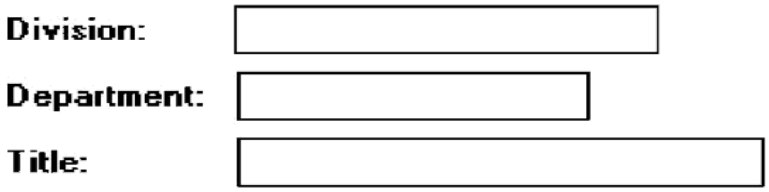
- For single data fields
  - Place the caption to left of the data field.

- 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.

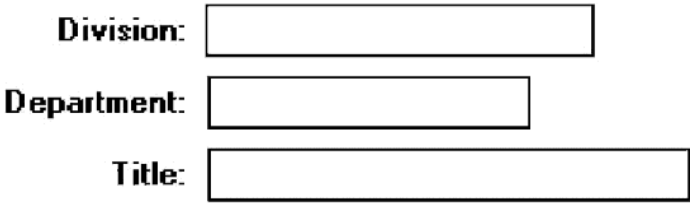


Control Caption — Data Field Justification

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



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



10. Discuss various technological considerations involved in designing an interface.

[L2][CO2][12M]

- Interface design is also affected by the physical characteristics of the display device itself and the characteristics of the interfaces controlling software.

Graphical Systems

- Screen design must be compatible with the capabilities of the system, including:
  - System power.
  - Screen size.

- Screen resolution.
- Display colors.
- Other display features.

- Screen design must be compatible with the capabilities of the:
  - System platform being used.
  - Development and implementation tools being used.
  - Platform style guide being used.

Web Systems

- Understand the current level of Web technology.
- Design for system configuration used by most users.
- Refrain from haphazard use of leading-edge technology.

Browsers

- Compatibility:
  - Make the Web site accessible to all users' browsers.
  - Use browser defaults as much as possible.
- Monitor size and resolution:
  - Design within the boundaries of an image-safe area for all browsers.
  - Present images at a resolution appropriate for all users' monitors.
- Fonts:
  - Use fonts that can be displayed on a variety of browsers.
- Colors:
  - Use colors that succeed on a variety of browsers and platforms. A palette of 216 colors.
- Bandwidth:
  - Design for the most commonly used bandwidth.
  - A 56-kbps modem is most common for home users.
- Versions
  - Create multiple versions that support multiple browsers.
    - Always provide a text-only version.
    - Make use of browser sniffers.

Other Web Considerations

- Downloading:
- Provide fast page download times, no more than 8 to 10 seconds per page. Minimize the use of design techniques that cause longer download times.
  - Long pages.
  - Large chunky headings.
  - Numerous or large graphics and images.
  - Animation.

- Excessive amount of color.
- Excess use of frames.

- Provide enough information to the user so that whether or not to request a download can be determined, including:
- Program or document description.
- Type of download.
- Size of download.
- Download version.
- Estimated loading time.
- Special operating requirements.
- Currency:
  - Keep Web site information current.
- Page printing:
  - Provide a means to print:
  - Groups of related pages.
  - Individual pages.
  - Sections of pages.
- Maintainability:
  - Ensure easy Web site maintainability.

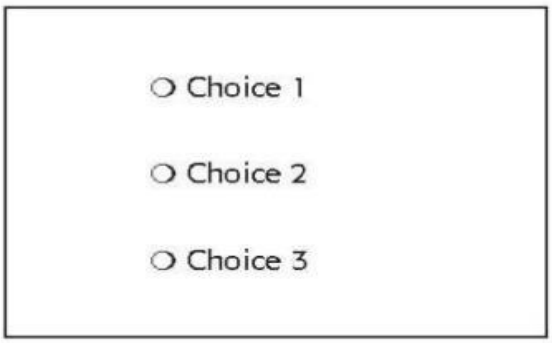
UNIT –III
SYSTEM MENUS, WINDOWS, CONTROLS

1. a) Outline the structures of Menus with appropriate sketches. [L2][CO3] [6M]

- Menus vary in form from very simple to very complex. They may range from small dialog boxes requesting the user to choose between one of two alternatives, to hierarchical tree schemes with many branches and level of depth.
- A menu's structure defines the amount of control given to the user in performing a task. The most common structures are the following.

Single Menus:

- 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, as illustrated in Figure.
- Single menus conceptually require choices from this single menu only, and no other menus will follow necessitating additional user choices.
- The user need only consider the immediate consequences of the item being chosen and need not be concerned with any other additional system menus.
- 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.

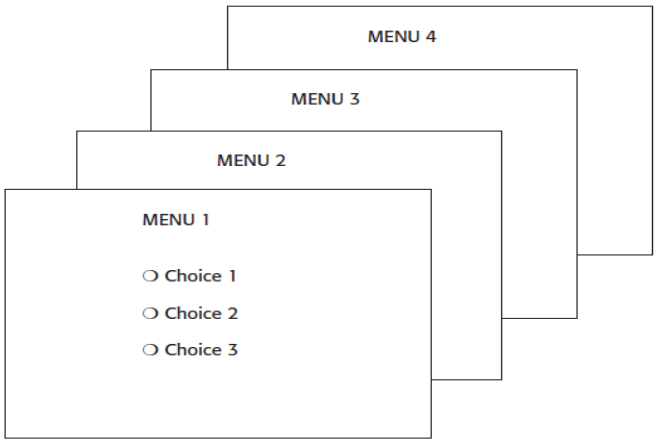


Single menu.

Sequential Linear Menus:

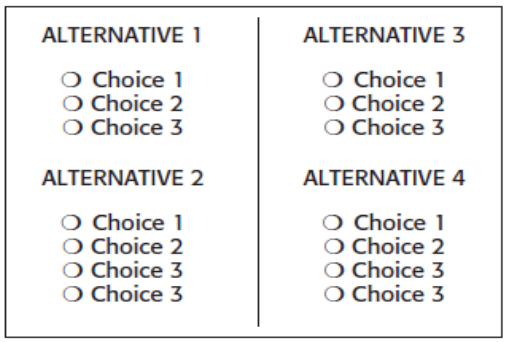
- Sequential linear menus are presented on a series of screens possessing only one path. The menu screens are presented in a preset order, and, generally, their objective is for specifying parameters or for entering data.
- The length of the path may be short, or long, depending upon the nature of the information being collected.
- Sequential path menus have several shortcomings. A long sequence may become tedious as menu after menu is presented. The user may not remember an answer to a previous question, a question important to the currently presented choices.

- The user may also want to return to a previous menu to change an answer or look at an answer, an awkward process that must be allowed.
- Finally, the user may, conceptually, want to complete the menus in a different order than which they are being presented.



Simultaneous Menus:

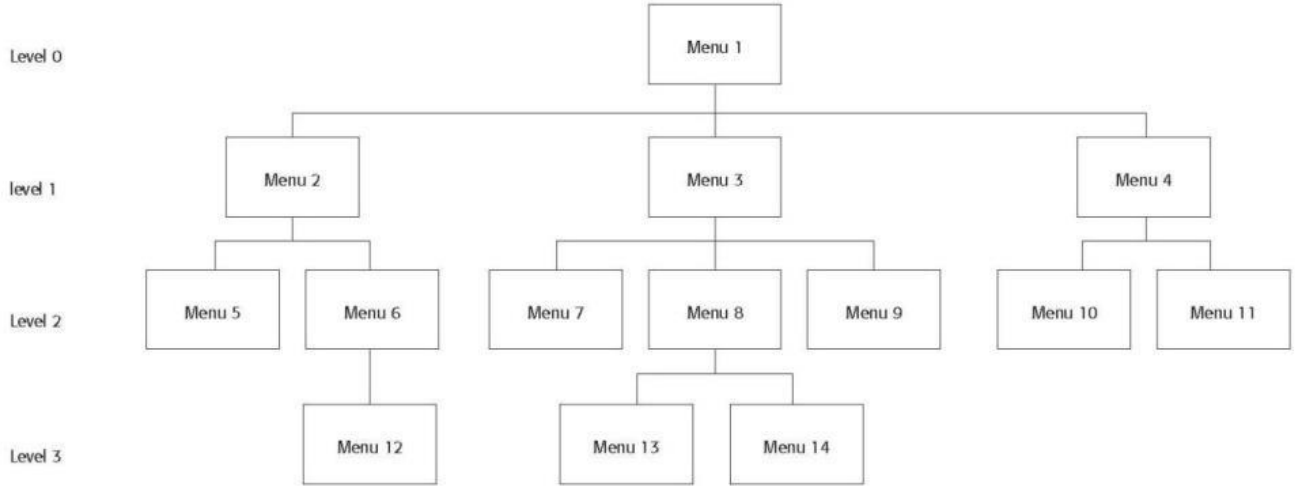
- Instead of being presented on separate screens, all menu options are available simultaneously, as illustrated in Figure.
- The menu may be completed in the order desired by the user, choices being skipped and returned to later. All alternatives are visible for reminding of choices, comparing choices, and changing answers. The tedium associated with a long series of sequential menus is greatly reduced.
- 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 for a novice user.



Hierarchical Menus:

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

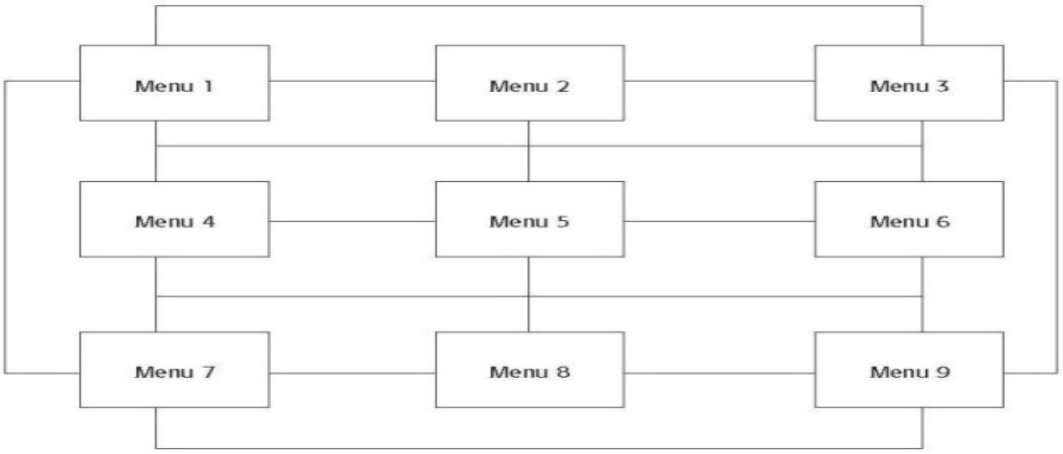
- A hierarchical structure results in an increasing refinement of choice as menus are stepped through, for example, from options, to sub options, from categories to subcategories, from pages to sections to subsections, and so on.
- A hierarchical structure can best be represented as an inverse tree, leading to more and more branches as one moves downward through it. Hierarchical structures are characterized by depth and breadth, depth being the number of choice levels one must traverse to reach the destination, breadth being the number of alternatives found at each level.
- Common examples of hierarchical design today are found in menu bars with their associated pull-downs, and in Web sites with their navigation links. The order and structure of branching in a hierarchy is preset and the normal order of flow one-way, top down.



Hierarchical menus.

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.
- From the user's perspective there is no top-down traversal of the menu system but an almost unhindered wandering between any two menus of interest.
- A connected menu system may be cyclical, with movement permitted in either direction between menus, or acyclical, with movement permitted in only one direction.
- These menus also vary in connectivity, the extent to which menus are linked by multiple paths.
- 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, and its navigation may be daunting for an inexperienced user.



Connected menus.

Event-Trapping Menus:

- Event Trapping menus provide an ever-present background of control over the system's state and parameters while the user is working on a foreground task.
- Event-trapping menus generally serve one of three functions.

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

(2) They may take the user out of the current environment to perform a function without leaving the current environment (perform a spell check), or

(3) They may exit the current environment and allow the user to move to a totally new environment (Exit).

- These menus can also change content based upon the system state, or an event, existing at that moment. A Paste option in a word-processing application, for example, will only function if there is something in a clipboard to paste.

1. b) Explain in detail various Window characteristics. [L2][CO3] [6M]

- A window is seen to possess the following characteristics:
  - A name or title, allowing it to be identified.
  - A size in height and width (which can vary).
  - A state, accessible or active, or not accessible.
  - Visibility—the portion that can be seen.
  - A location, relative to the display boundary.
  - Presentation, that is, its arrangement in relation to other windows. It may be tiled, overlapping, or cascading.
  - Management capabilities, methods for manipulation of the window on the screen.
  - Its highlight, that is, the part that is selected.
  - The function, task, or application to which it is dedicated.

The Attraction of Windows:

- The value of windowing is best seen in the context of a task or job.

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

Presentation of Different Levels of Information:

- Information can be examined in increasing levels of detail. A document table of contents can be presented in a window. A chapter or topic selected from this window can be simultaneously displayed in more detail in an adjoining window. Deeper levels are also possible in additional windows.

Presentation of Multiple Kinds of Information:

- Variable information needed to complete a task can be displayed simultaneously in adjacent windows. An order-processing system window could collect a customer account number in one window and retrieve the customer's name and shipping address in another window. A third window could collect details of the order, after which another window could present factory availability of and shipping dates for the desired items.

Sequential Presentation of Levels or Kinds of Information:

- Steps to accomplish a task can be sequentially presented through windows. Successive windows are presented until all the required details are collected. Key windows may remain displayed, but others appear and disappear as necessary. This sequential preparation is especially useful if the information-collection process leads down various paths.

Access to Different Sources of Information:

- Independent sources of information may have to be accessed at the same time. This information may reside in different host computers, operating systems, applications, files. It may be presented on the screen alongside the problem, greatly facilitating its solution.
- For instance, a writer may have to refer to several parts of a text being written at the same time.

Combining Multiple Sources of Information:

- Text from several documents may have to be reviewed and combined into one. Pertinent information is selected from one window and copied into another.

Performing More Than One Task:

- More than one task can be performed at one time. While waiting for a long, complex procedure to finish, another can be performed. Tasks of higher priority can interrupt less important ones. The interrupted task can then be resumed without the necessity to "close down" and "restart."

Reminding:

- Windows can be used to remind the viewer of things likely to be of use in the near future. Examples might be menus of choices available, a history of the path followed or the command choices to that point, or the time of an important meeting.

Monitoring:

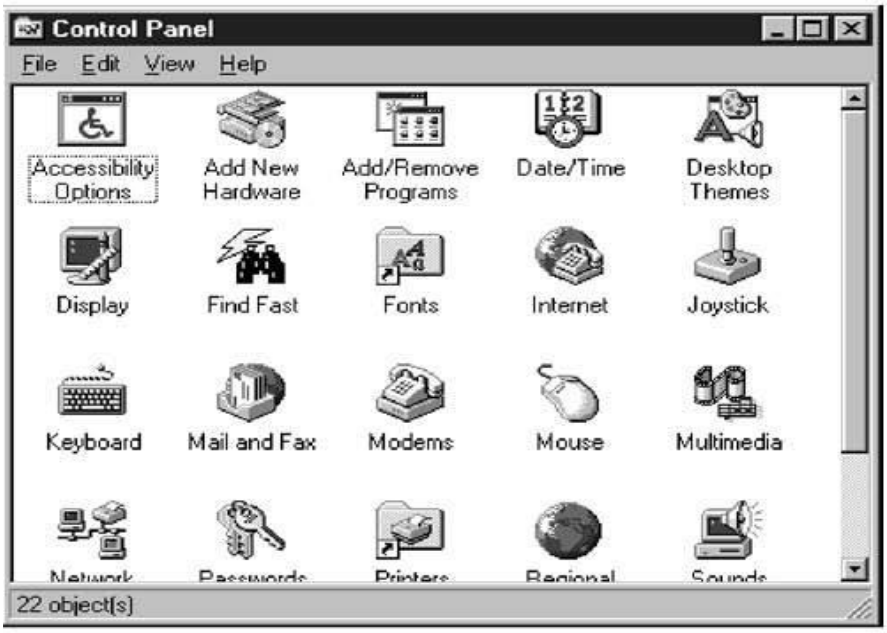
- Changes, both internal and external, can be monitored. Data in one window can be modified and its effect on data in another window can be studied.

Multiple Representations of the Same Task:

- The same thing can be looked at in several ways—for example, alternate drafts of a speech, different versions of a screen, or different graphical representations of the same data.

2. a) Discuss elaborately various components of a Window. [L2][CO3] [6M]

- A typical window may be composed of so many elements. Some appear on all windows; others only on certain kinds of windows, or under certain conditions.



Microsoft Windows primary window.

Frame

- A window will have a frame or border, usually rectangular in shape, to define its boundaries and distinguish it from other windows. While a border need not be rectangular, this shape is a preferred shape for most people. Also, textual materials, which are usually read from left to right, fit most efficiently within this structure.

Title Bar

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

Title Bar Icon

- Located at the left corner of the title bar in a primary window, this button is used in Windows to retrieve a pull-down menu of commands that apply to the object in the window.
- When clicked with the secondary mouse button, the commands applying to the object are presented. Microsoft suggests that:
    - If the window contains a tool or utility (that is, an application that does not create, load, and save its own data files), a small version of the application's icon should be placed there instead.
    - If the application creates, loads, and saves documents or data files and the window represents the view of one of its files, a small version of the icon that represents its document or data file type should be placed there.
    - Even if the user has not yet saved the file, display the data file icon rather than the application icon, and again display the data file icon after the user saves the file.

Window Sizing Buttons

- Located at the right corner of the title bar, these buttons are used to manipulate the size of a window. The leftmost button, the *minimize* button— inscribed with a short horizontal line toward the bottom of the button—is used to reduce a window to its minimum size, usually an icon. It also hides all associated windows.
- The *maximize* button—typically inscribed with a large box—enlarges a window to its maximum size, usually the entire screen.
- When a screen is maximized, the *restore* button replaces the maximize button, since the window can no longer be increased in size. The restore button—typically inscribed with a pair overlapping boxes—returns a window to the size it had before a minimize or maximize action was performed. A *close* button—typically inscribed with an X—closes the window
- Sizing buttons are included on primary windows only.
- When these buttons are displayed, use the following guidelines:
    - When a window does not support a command, do not display its command button.
    - The *Close* button always appears as the rightmost button. Leave a gap between it and any other buttons.
    - The *Minimize* button always precedes the *Maximize* button.
    - The *Restore* button always replaces the *Maximize* button or the *Minimize* button when that command is carried out.

What's This? Button

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

objects displayed within a secondary window. When provided, it is located in the upper-right corner of the title bar, just to the left of the close button.

- On a primary window this command is accessed from the Help drop-down menu.

What's This? button.

Menu Bar

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

Status Bar

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

Scroll Bars

- When all display information cannot be presented in a window, the additional information must be found and made visible. This is accomplished by scrolling the display's contents through use of a scroll bar.
- A scroll bar is an elongated rectangular container consisting of a scroll area or shaft, a slider box or elevator, and arrows or anchors at each end.
- For vertical scrolling, the scroll bar is positioned at the far right side of the work area, extending its entire length.
- Horizontal scrolling is accomplished through a scroll bar located at the bottom of the work area.

Split Box

- A window can be split into two or more pieces or panes by manipulating a *split box* located above a vertical scroll bar or to the left of a horizontal scroll bar. A split box is sometimes referred to as a *split bar*. A window can be split into two or more separate viewing areas that are called *panes*.
- Splitting a window permits multiple views of an object. A split window allows the user to:
- Examine two parts of a document at the same time.
- Display different, yet simultaneous, views of the same information.

Toolbar

- They are sometimes called *command bars*. Toolbars are designed to provide quick access to specific commands or options. Specialized toolbars are sometimes referred to as *ribbons, toolboxes, rulers,* or *palettes.*

Command Area

- In situations where it is useful for a command to be typed into a screen, a command area can be provided. The desired location of the command area is at the bottom of the window.
- If a horizontal scroll bar is included in the window, position the command area just below it.

Size Grip

- A size grip is a Microsoft Windows special handle included in a window to permit it to be resized. When the grip is dragged the window resizes, following the same conventions as the sizing border.
- Three angled parallel lines in the lower-right corner of a window designate the size grip.
- If the window possesses a status bar, the grip is positioned at the bar's right end.
- Otherwise, it is located at the bottom of a vertical scroll bar, the right side of a horizontal scroll bar, or the junction point of the two bars.

Work Area

- The work area is the portion of the screen where the user performs tasks. It is the open area inside the window's border and contains relevant peripheral screen components such as the menu bar, scroll bars, or message bars.
- The work area may consist of an open area for typing, or it may contain controls (such as text boxes and list boxes) or customized forms (such as spreadsheets).
- The work area may also be referred to as the *client area*.

2. b) What is window in GUI? Explain various types of Windows. [L1][CO3] [6M]

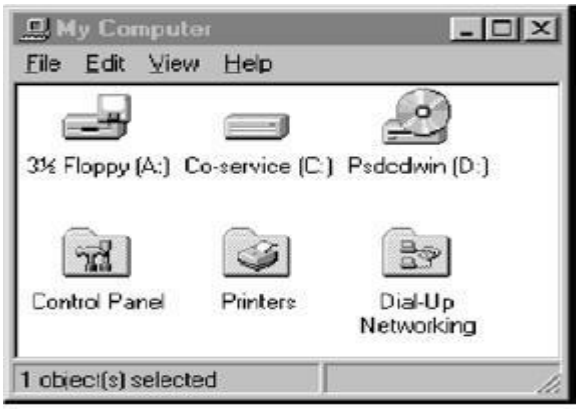
- A window is an area of the screen, usually rectangular in shape, defined by a border that contains a particular view of some area of the computer or some portion of a person's dialog with the computer.

TYPES OF WINDOWS

- The Microsoft Windows windowing scheme will have the following types of windows:

Primary Window

- Proper usage:
  - Should represent an independent function or application.
  - Use to present constantly used window components and controls.
- Menu bar items that are:
  - Used frequently.
  - Used by most, or all, primary or secondary windows.
- Controls used by dependent windows.
  - Use for presenting information that is continually updated.
- For example, date and time.
  - Use for providing context for dependent windows to be created.
  - Do not:
    - Divide an independent function into two or more primary windows.
    - Present unrelated functions in one primary window.



Microsoft Windows primary window.

Secondary Windows

- Secondary windows are supplemental windows. Secondary windows may be dependent upon a primary window or displayed independently of the primary window.

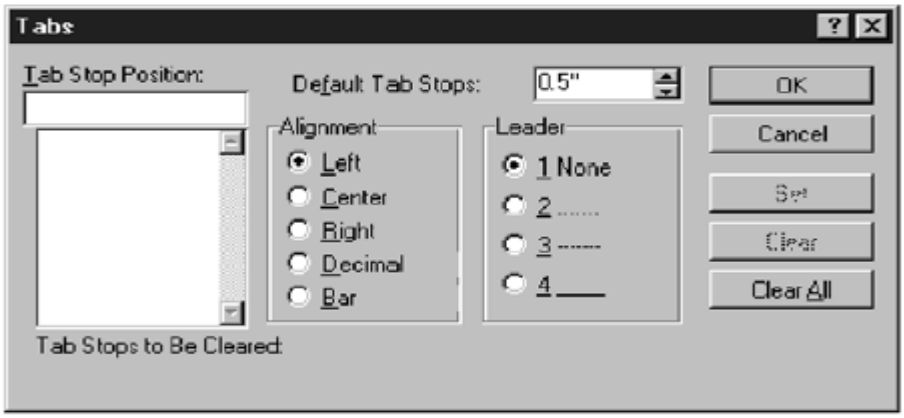


Figure 5.8 Microsoft Windows secondary window.

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

Modal:

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

Modeless:

- Use when interaction with other windows must be permitted.
- Use when interaction with other windows must be repeated.
- Access to additional options can be accomplished by inclusion of a command button that opens another secondary window. These multiple secondary windows needed to complete a task may be presented in two forms, cascading or expanding.

Cascading:

- Purpose: To provide advanced options at a lower level in a complex dialog.
- Guidelines:

- Provide a command button leading to the next dialog box with a "To a Window" indicator, an ellipsis (. . .).
- Present the additional dialog box in cascaded form.
- Provide no more than two cascades in a given path.

- Do not cover previous critical information.
  - Title Bar.
  - Relevant displayed information.
- If independent, close the secondary window from which it was opened.

Unfolding:

- Purpose: To provide advanced options at the same level in a complex dialog.
- Guidelines:
  - Provide a command button with an expanding dialog symbol (>>).
  - Expand to right or downward.

Dialog Boxes

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

Property Sheets

- Use for presenting the complete set of properties for an object.
- Categorize and group within property pages, as necessary.
  - Use tabbed property pages for grouping peer-related property sets.
  - The recommended sizes for property sheets are:
    - 252 DLUs wide x 218 DLUs high
    - 227 DLUs wide x 215 DLUs high
    - 212 DLUs wide x 188 DLUs high
  - Command buttons to include:
    - OK.
    - Cancel.
    - Apply.
    - Reset.
    - Others as necessary.
  - For single property sheets, place the commands on the sheet.
  - For tabbed property pages, place the commands outside the tabbed pages.

Property Inspectors

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

Message Boxes

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

Palette Windows

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

Microsoft Windows palette window.

Pop-up Windows

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

Microsoft Windows pop-up window.

3. a) What is a Menu? Why menus are important? Explain the functions of menus.

[L1][CO3] [6M]

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

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.
- In some cases execution may only occur after a hierarchical menu tree is navigated. In other cases actions may be performed as successive hierarchical menus are encountered and traversed.
- Selection errors may or may not have serious consequences, depending upon the nature of the action. Accidental selection of critical irreversible actions must be prevented in interface design.

Displaying Information:

- The main purpose of selecting a menu choice may simply be to display information. The user may be searching for specific information in a database or browsing the Web.
- The user's focus is primarily on the information desired and less on the selection function.
- In many cases, information retrieval may occur only after a hierarchical menu tree is navigated. The content material and the user's interests will determine the paths followed.
- Users may spend considerable time and effort understanding and processing uncovered information in order to evaluate subsequently displayed menu choices.

- Wrong turns in the process will again cost time and perhaps aggravation, but these errors are nondestructive and usually undoable.

Data or Parameter Input:

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

3. b) Discuss about various operable controls in HCI. [L2][CO3] [6M]

- Operable controls are those that permit the entry, selection, changing, or editing of a particular value, or cause a command to be performed.

Buttons

- Description:
  - A square or rectangular-shaped control with a label inside that indicates action to be accomplished. The label may consist of text, graphics, or both.

Command buttons.

Toolbar buttons without labels.

A symbol button.

- Purpose:
  - To start actions.
  - To change properties.
  - To display a pop-up menu.
- Proper usage:
  - Use for frequently used actions that are specific to a window.
    - To cause something to happen immediately.
    - To display another window.
    - To display a menu of options.
    - To set a mode or property value.

Command Buttons

- Command button guidelines include the following.

Usage

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

Structure

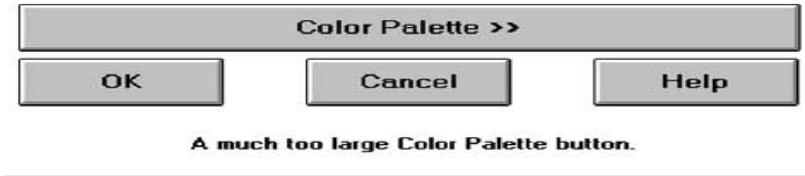
- Provide a rectangular shape with the label inscribed within it.
- Give the button a raised appearance.
- Maintain consistency in style throughout an application.

Labels

- Use standard button labels when available.
- Provide meaningful descriptions of the actions that will be performed.
- Use single-word labels whenever possible.
  - Use two-three words for clarity, if necessary.
- Use mixed-case letters with the first letter of each significant label word capitalized.
- Display labels:
  - In the regular system font and the same size font.
- Do not number labels.
- Center the label within the button borders, leaving at least two pixels between the text and the button border.
- Provide consistency in button labeling across all screens.
- Common button functions should have standard names and uses. Microsoft windows, for example, provides these standard names and definitions:
  - **OK:** Any changed information in the window is accepted and the window is closed.
  - Cancel: Closes window without implementing unsubmitted changes.
  - **Reset:** Resets defaults and cancels any changed information that has not been submitted.
  - **Apply**: Any changed information in the window is accepted and again displayed in the window that remains open.
  - **Close:** Closes the window.
  - **Help:** Opens online Help.

Size

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



A much too large Color Palette button.

A properly sized Color Palette button.

Number

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

Toolbars

- *Toolbars* are compilations of commands, actions, or functions, usually graphical in structure but sometimes textual, grouped together for speedy access.
- Microsoft Windows defines a toolbar as a panel that contains a *set* of controls. Toolbars may also be called *button bars, control bars,* or *access bars*.

Usage

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

Structure

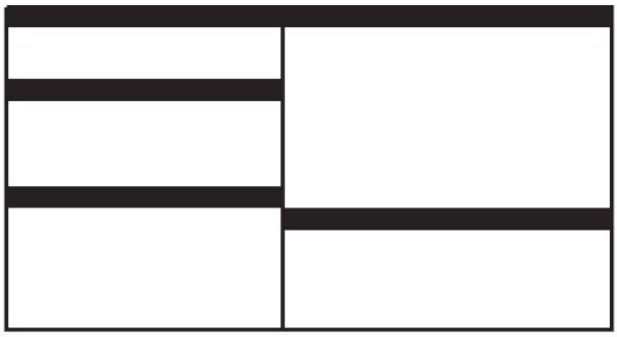
- Images:
  - Provide buttons of equal size.
  - Create a meaningful and unique icon.
  - Design them using icon design guidelines.
  - Center the image within the button.
  - Give the button a raised appearance.
  - Ensure that toolbar images are discernible from Web page graphical images.
- Text:
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

4. a) Compile various window presentation styles in HCI. [L6][CO3] [6M]

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

Tiled Windows:

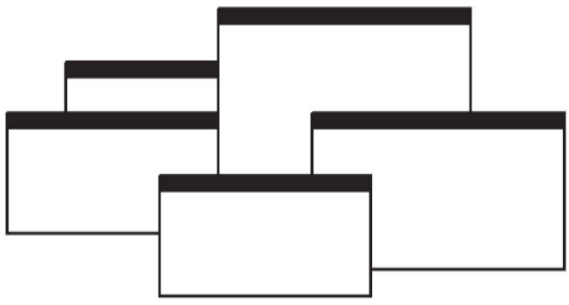
- Tiled windows appear in one plane on the screen and expand or contract to fill up the display surface, as needed. Most systems provide two-dimensional tiled windows, adjustable in both height and width.



Tiled windows.

Overlapping Windows:

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



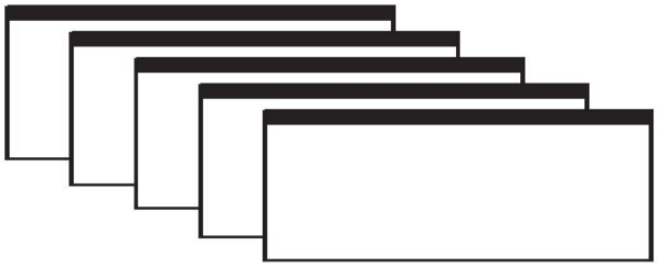
Overlapping windows.

- Most systems today normally use this style of window. They have the following advantages:
    - Visually, their look is three-dimensional, resembling the desktop that is familiar to the user.
    - Greater control allows the user to organize the windows to meet his or her needs.
    - Windows can maintain larger sizes.

- Windows can maintain consistent sizes.
- Windows can maintain consistent positions.
- Screen space conservation is not a problem, because windows can be placed on top of one another.
- There is less pressure to close or delete windows no longer needed.
- The possibility exists for less visual crowding and complexity. Larger borders can be maintained around window information, and the window is more clearly set off against its background. Windows can also be expanded to fill the entire display.
- They yield better user performance for tasks where the data requires much window manipulation to complete the task.

Cascading Windows:

- A special type of overlapping window has the windows automatically arranged in a regular progression.



Cascading windows.

Picking a Presentation Style

- Use tiled windows for:
  - Single-task activities.
  - Data that needs to be seen simultaneously.
  - Tasks requiring little window manipulation.
  - Novice or inexperienced users.
- Use overlapping windows for:
  - Switching between tasks.
  - Tasks necessitating a greater amount of window manipulation.
  - Expert or experienced users.
  - Unpredictable display contents.

4. b) Explain about the selection of proper device-based controls. [L2][CO3] [6M]

Guidelines for Selecting the Proper Device-Based Control

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

- Provide an alternative pointing device for graphical or drawing tasks. The following are some suggested best uses:
  - Mouse—pointing, selecting, drawing, and dragging.
  - Joystick—selecting and tracking.
  - Trackball—pointing, selecting and tracking.
  - Touch screen—pointing and selecting.
  - Graphic tablet—pointing, selecting, drawing, and dragging.
- Provide touch screens under the following conditions:
  - The opportunity for training is minimal.
  - Targets are large, discrete, and spread out.
  - Frequency of use is low.
  - Desk space is at a premium.
  - Little or no text input requirement exists.
- Consider user characteristics and preferences.
  - Provide keyboards for touch typists.
- Consider the characteristics of the environment.
- Consider the characteristics of the hardware.
- Consider the characteristics of the device in relation to the application.
- Provide flexibility.
- Minimize eye and hand movements between devices.

5. a) Discuss about the content of menus. [L2][CO3] [6M]

- 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. This kind of information is critical in complex or hierarchical menu systems, where loss of position or disorientation can easily occur.
- 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.
- Its title should mirror the option selected on the previous menu, and its content should reflect its title.
- Spatial linkage can be accomplished by graphic methods. Each succeeding menu screen can be displayed overlapping the previous menu screen so a succession of choices can be seen in a single view. A sense of progress and distance can then be easily ascertained.

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.
- The style chosen will reflect the experience of the user (novice or expert), the nature of the choices (well-learned alternatives or not), the nature of the selection mechanism (keyboard or mouse), and the nature of the system (business system application or Web page).

Completion Instructions

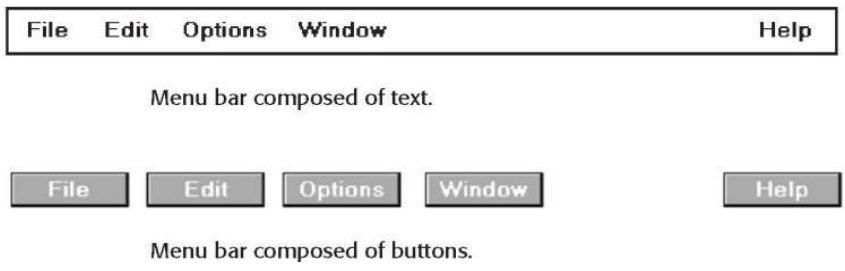
- Completion instructions tell users how to indicate their choices. They may include the rationale for why the user is being asked to make this choice and the impact the choice will have on subsequent processes.
- Explicit instructions may be needed for first time or casual users of a system.
- Experienced users will find 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.

5. b) Recall different kinds of graphical menus. Explain it in detail. [L1][CO3] [6M]

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

Menu Bar

- The highest-level graphical system menu is commonly called the menu bar. A menu bar consists of a collection of descriptions that serve as headings or titles for a series of actions on an associated pull-down menu. A menu bar choice by itself should not initiate an action.
- Menu bars often consist of a series of textual words. Some products have placed the choices within buttons.



- Each menu bar item is the top level of a hierarchical menu. It will have a pull-down menu associated with it, detailing the specific actions that may be performed.
- Menu bars are used to present application alternatives or choices to the screen user. Each system provides a default set of menu bar commands (for ex: File, Edit, View, Window, Help).

Display

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

Location

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

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.

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.

Menu bar pull-down.

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

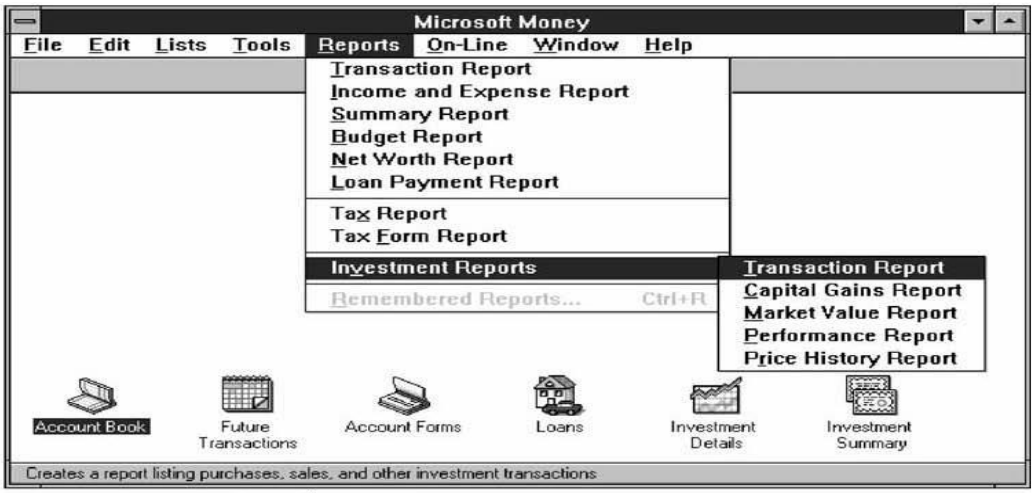
- Must contain a minimum of two choices.
- Restrict to no more than 5 to 10 choices, preferably 8 or less.

Title

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

Cascading Menus

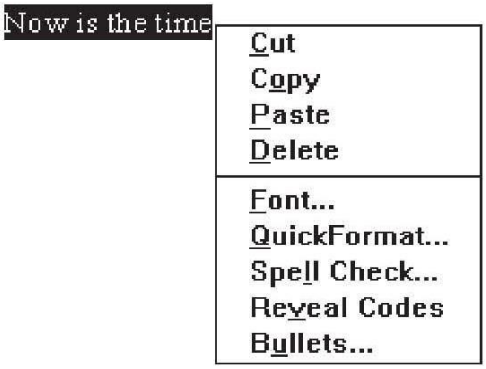
- Proper usage:
  - To reduce the number of choices presented together for selection (reduce menu breadth).
  - When a menu specifies many alternatives and the alternatives can be grouped in meaningful related sets on a lower-level menu.
  - When a choice leads to a short, fixed list of single-choice properties.
  - When there are several fixed sets of related options.
  - To simplify a menu.
  - Avoid using for frequent, repetitive commands.



Cascading menu.

Pop-up Menus

- Use to present alternatives or choices within the context of the task.



Pop-up menu.

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.

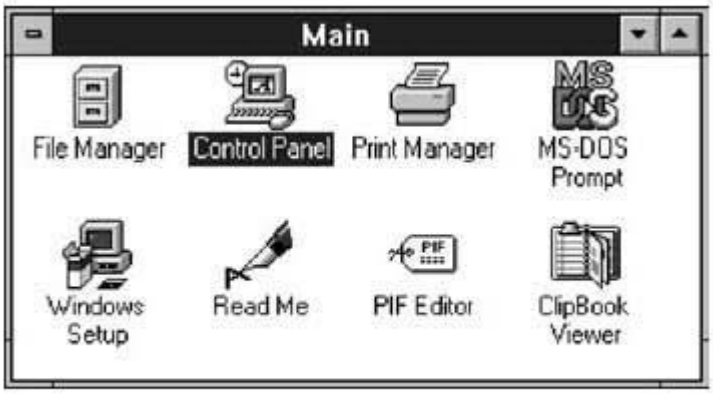
Tear-off Menus

- A tear-off menu is a pull-down menu that can be positioned anywhere on the screen for constant referral. As such, it possesses all the characteristics of a pull-down. It may also be called a *pushpin, detachable,* or *roll-up* menu.
- Its purpose is to present alternatives or choices to the screen user that are needed infrequently at some times and heavily at other times.

Iconic Menus

- Use to remind users of the functions, commands, attributes, or application choices available.
- Create icons that:

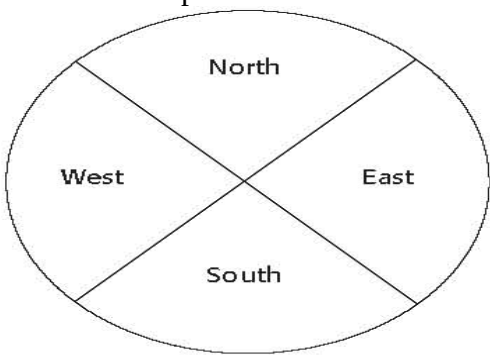
- Help enhance recognition and hasten option selection.
- Are concrete and meaningful.
- Clearly represent choices.



Iconic menu (from Microsoft Windows).

Pie Menus

- Consider using for:
  - Mouse-driven selections, with one- or two-level hierarchies, short lists, and choices conducive to the format.
- A pie menu is a circular representation of menu items, as illustrated in Figure.



Pie menu.

- Research has found that this style of menu yields higher performance than the typical vertical array, especially when the menu tasks are unrelated.

Default Menu Items

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

File

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

- Exit

Edit

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

View

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

Window

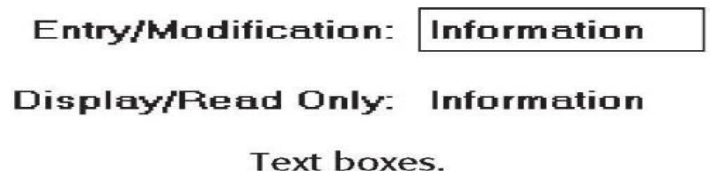
- The Window menu, an optional element, provides commands to manipulate entire windows. Included are items such as:
  - New Window
  - Arrange All
  - Hide
  - Show

Help

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

6. a) Illustrate about Text entry/Read Only Controls in user interface design. [L3][CO4] [6M]

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



Text boxes.

Text Boxes

Description:

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

- Text may be entered or edited.
- Text may be displayed for read-only purposes.

- Usually possesses a caption describing the kind of information contained within it.
- An outline field border:
  - Is included for enterable/editable text boxes.
  - Is not included for read-only text boxes.
- Two types exist:
  - Single line.
  - Multiple line.
- When first displayed, the box may be blank or contain an initial value.

Purpose:

- To permit the display, entering, or editing of textual information.
- To display read-only information.

Proper usage:

- Most useful for data that is:
  - Unlimited in scope.
  - Difficult to categorize.
  - Of a variety of different lengths.
- When using a selection list is not possible.

Single-Line and Multiple-Line Text Boxes

Single line:

Description:

- A control consisting of no more than one line of text.

Purpose:

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

Typical uses:

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

Multiple line:

Description:

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

Purpose:

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

Typical uses:

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

6. b) Examine various characteristics of device based controls. [L3][CO4] [6M]

- Device-based controls, often called input devices, are the mechanisms through which people communicate their desires to the system.
- Several specific tasks are performed using graphical systems.
  - To point at an object on the screen.

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

- The various devices vary in how well they can perform these actions. Consider two very important factors. First, is the mechanism a direct or indirect pointing device? Second, in terms of *direction, distance*, and *speed,* what is the relationship between movement of the hand-operated device and the corresponding pointer movement on the screen? Does the pointer movement track control movement exactly or does it not?

7. a) Give the guidelines for selecting the proper device based controls [L1][CO4] [6M]

Guidelines for Selecting the Proper Device-Based Control

- Consider the characteristics of the task.
  - Provide keyboards for tasks involving:
    - Heavy text entry and manipulation.
    - Movement through structured arrays consisting of a few discrete objects.
  - Provide an alternative pointing device for graphical or drawing tasks. The following are some suggested best uses:
    - Mouse—pointing, selecting, drawing, and dragging.
    - Joystick—selecting and tracking.
    - Trackball—pointing, selecting and tracking.
    - Touch screen—pointing and selecting.
    - Graphic tablet—pointing, selecting, drawing, and dragging.
  - Provide touch screens under the following conditions:
    - The opportunity for training is minimal.
    - Targets are large, discrete, and spread out.
    - Frequency of use is low.
    - Desk space is at a premium.
    - Little or no text input requirement exists.
  - Consider user characteristics and preferences.
    - Provide keyboards for touch typists.
  - Consider the characteristics of the environment.
  - Consider the characteristics of the hardware.
  - Consider the characteristics of the device in relation to the application.
  - Provide flexibility.
  - Minimize eye and hand movements between devices.

7. b) Define the combination of Entry/Selection controls. [L1][CO4] [6M]

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

Spin Boxes

Description:

- A single-line field followed by two small, vertically arranged buttons.

- The top button has an arrow pointing up.
- The bottom button has an arrow pointing down.

- Selection/entry is made by:
  - Using the mouse to point at one of the directional buttons and clicking. Items will change by one unit or step with each click.
  - Keying a value directly into the field itself.

Purpose:

- To make a selection by either scrolling through a small set of meaningful predefined choices or typing text.

Spin boxes.

Combo Boxes

Description:

- A single rectangular text box entry field, beneath which is a larger rectangular list box (resembling a drop-down list box) displaying a list of options.
- The text box permits a choice to be keyed within it.
- The larger box contains a list of mutually exclusive choices from which one may be selected for placement in the entry field.
- Selections are made by using a mouse to point and click.
- As text is typed into the text box, the list scrolls to the nearest match.
- When an item in the list box is selected, it is placed into the text box, replacing the existing content.
- Information keyed may not necessarily have to match the list items.

Purpose:

- To allow either typed entry in a text box or selection from a list of options in a permanently displayed list box attached to the text box.

Combo boxes.

Drop-down/Pop-up Combo Boxes

Description:

- A single rectangular text box with a small button to the side and an associated hidden list of options.
- The button provides a visual cue that an associated selection box is available but hidden.
- When requested, a larger associated rectangular box appears, containing a scrollable list of choices from which one is selected.
- Selections are made by using the mouse to point and click.
- Information may also be keyed into the field.
- As text is typed into the text box, the list scrolls to the nearest match.
- When an item in the list box is selected, it is placed into the text box, replacing the existing content.
- The information keyed does not necessarily have to match list items.
- Combines the capabilities of both a text box and a drop-down/pop-up list box.

Purpose:

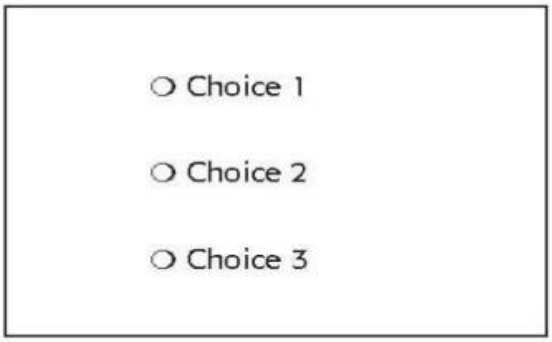
- To allow either typed entry or selection from a list of options in a list box that may be closed and retrieved as needed.

8. a) Construct various structures of menus with diagrams [L6][CO4] [6M]

- Menus vary in form from very simple to very complex. They may range from small dialog boxes requesting the user to choose between one of two alternatives, to hierarchical tree schemes with many branches and level of depth.
- A menu's structure defines the amount of control given to the user in performing a task. The most common structures are the following.

Single Menus:

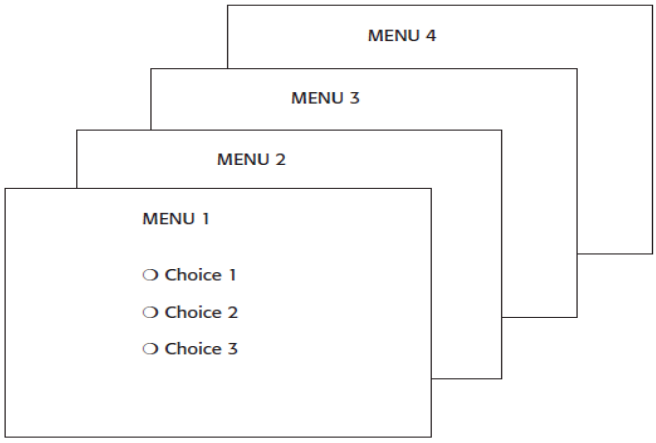
- In this simplest form of menu, a single screen or window is presented to seek the user's input or request an action to be performed, as illustrated in Figure.
- Single menus conceptually require choices from this single menu only, and no other menus will follow necessitating additional user choices.
- The user need only consider the immediate consequences of the item being chosen and need not be concerned with any other additional system menus.
- 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.



Single menu.

Sequential Linear Menus:

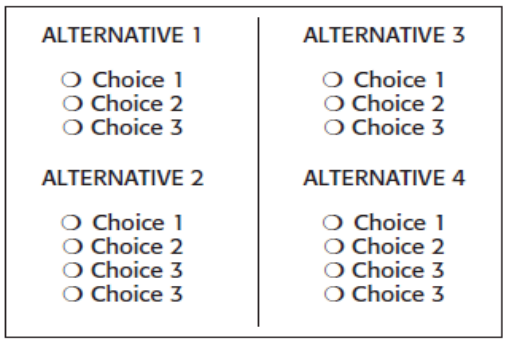
- Sequential linear menus are presented on a series of screens possessing only one path. The menu screens are presented in a preset order, and, generally, their objective is for specifying parameters or for entering data.
- The length of the path may be short, or long, depending upon the nature of the information being collected.
- Sequential path menus have several shortcomings. A long sequence may become tedious as menu after menu is presented. The user may not remember an answer to a previous question, a question important to the currently presented choices.
- The user may also want to return to a previous menu to change an answer or look at an answer, an awkward process that must be allowed.
- Finally, the user may, conceptually, want to complete the menus in a different order than which they are being presented.



Simultaneous Menus:

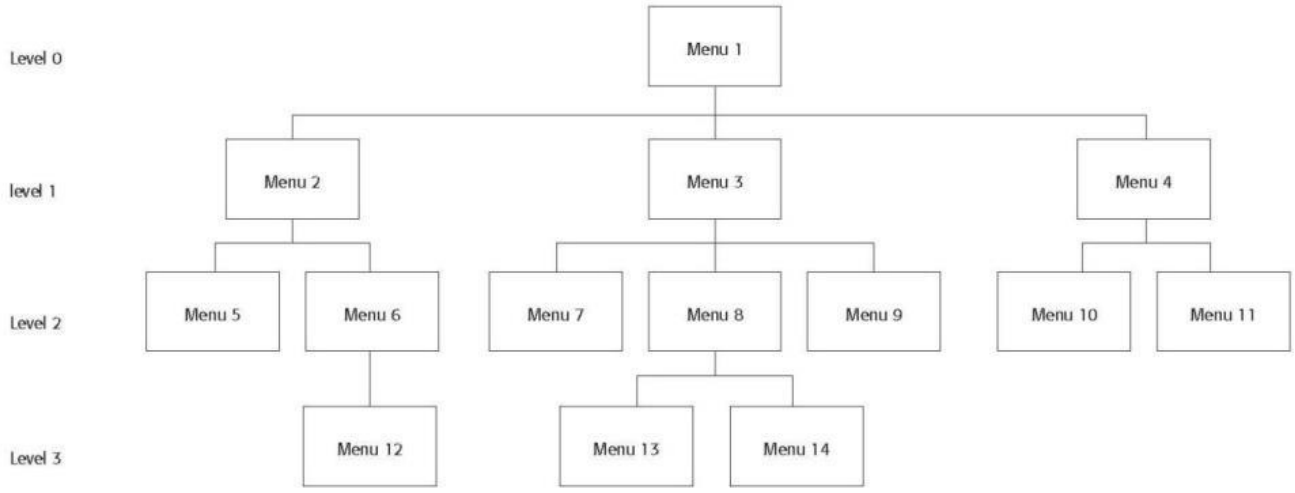
- Instead of being presented on separate screens, all menu options are available simultaneously, as illustrated in Figure.
- The menu may be completed in the order desired by the user, choices being skipped and returned to later. All alternatives are visible for reminding of choices, comparing choices, and changing answers. The tedium associated with a long series of sequential menus is greatly reduced.

- 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 for a novice user.



Hierarchical Menus:

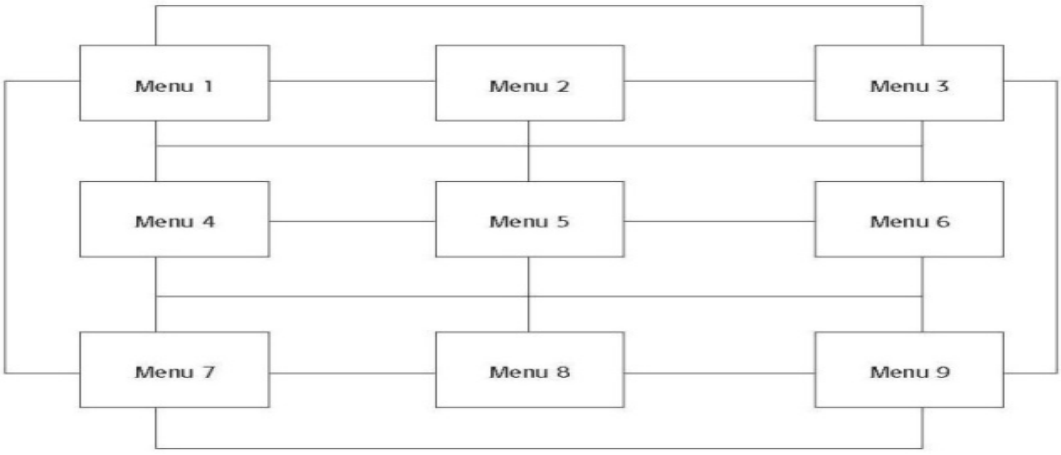
- When many relationships exist between menu alternatives, and some menu options are only appropriate depending upon a previous menu selection, a hierarchical structure is the best solution.
- A hierarchical structure results in an increasing refinement of choice as menus are stepped through, for example, from options, to sub options, from categories to subcategories, from pages to sections to subsections, and so on.
- A hierarchical structure can best be represented as an inverse tree, leading to more and more branches as one moves downward through it. Hierarchical structures are characterized by depth and breadth, depth being the number of choice levels one must traverse to reach the destination, breadth being the number of alternatives found at each level.
- Common examples of hierarchical design today are found in menu bars with their associated pull-downs, and in Web sites with their navigation links. The order and structure of branching in a hierarchy is preset and the normal order of flow one-way, top down.



Hierarchical menus.

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.
- From the user's perspective there is no top-down traversal of the menu system but an almost unhindered wandering between any two menus of interest.
- A connected menu system may be cyclical, with movement permitted in either direction between menus, or acyclical, with movement permitted in only one direction.
- These menus also vary in connectivity, the extent to which menus are linked by multiple paths.
- 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, and its navigation may be daunting for an inexperienced user.



Connected menus.

Event-Trapping Menus:

- Event Trapping menus provide an ever-present background of control over the system's state and parameters while the user is working on a foreground task.
- Event-trapping menus generally serve one of three functions.

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

  (2) They may take the user out of the current environment to perform a function without leaving the current environment (perform a spell check), or

  (3) They may exit the current environment and allow the user to move to a totally new environment (Exit).
- These menus can also change content based upon the system state, or an event, existing at that moment. A Paste option in a word-processing application, for example, will only function if there is something in a clipboard to paste.

8. b) What are the various components of windows in HCI? Explain it. [L2][CO4] [6M]

- A typical window may be composed of so many elements. Some appear on all windows; others only on certain kinds of windows, or under certain conditions.

Microsoft Windows primary window.

Frame

- A window will have a frame or border, usually rectangular in shape, to define its boundaries and distinguish it from other windows. While a border need not be rectangular, this shape is a preferred shape for most people. Also, textual materials, which are usually read from left to right, fit most efficiently within this structure.

Title Bar

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

Title Bar Icon

- Located at the left corner of the title bar in a primary window, this button is used in Windows to retrieve a pull-down menu of commands that apply to the object in the window.
- When clicked with the secondary mouse button, the commands applying to the object are presented. Microsoft suggests that:
    - If the window contains a tool or utility (that is, an application that does not create, load, and save its own data files), a small version of the application's icon should be placed there instead.

- If the application creates, loads, and saves documents or data files and the window represents the view of one of its files, a small version of the icon that represents its document or data file type should be placed there.
- Even if the user has not yet saved the file, display the data file icon rather than the application icon, and again display the data file icon after the user saves the file.

Window Sizing Buttons

- Located at the right corner of the title bar, these buttons are used to manipulate the size of a window. The leftmost button, the *minimize* button— inscribed with a short horizontal line toward the bottom of the button—is used to reduce a window to its minimum size, usually an icon. It also hides all associated windows.
- The *maximize* button—typically inscribed with a large box—enlarges a window to its maximum size, usually the entire screen.
- When a screen is maximized, the *restore* button replaces the maximize button, since the window can no longer be increased in size. The restore button—typically inscribed with a pair overlapping boxes—returns a window to the size it had before a minimize or maximize action was performed. A *close* button—typically inscribed with an X—closes the window
- Sizing buttons are included on primary windows only.
- When these buttons are displayed, use the following guidelines:
  - When a window does not support a command, do not display its command button.
  - The *Close* button always appears as the rightmost button. Leave a gap between it and any other buttons.
  - The *Minimize* button always precedes the *Maximize* button.
  - The *Restore* button always replaces the *Maximize* button or the *Minimize* button when that command is carried out.

What's This? Button

- The *What's This?* Button, which appears on secondary windows and dialog boxes, is used to invoke the What's This? Windows command to provide contextual Help about objects displayed within a secondary window. When provided, it is located in the upper-right corner of the title bar, just to the left of the close button.
- On a primary window this command is accessed from the Help drop-down menu.

What's This? button.

Menu Bar

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

Status Bar

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

Scroll Bars

- When all display information cannot be presented in a window, the additional information must be found and made visible. This is accomplished by scrolling the display's contents through use of a scroll bar.
- A scroll bar is an elongated rectangular container consisting of a scroll area or shaft, a slider box or elevator, and arrows or anchors at each end.
- For vertical scrolling, the scroll bar is positioned at the far right side of the work area, extending its entire length.
- Horizontal scrolling is accomplished through a scroll bar located at the bottom of the work area.

Split Box

- A window can be split into two or more pieces or panes by manipulating a *split box* located above a vertical scroll bar or to the left of a horizontal scroll bar. A split box is sometimes referred to as a *split bar*. A window can be split into two or more separate viewing areas that are called *panes*.
- Splitting a window permits multiple views of an object. A split window allows the user to:
- Examine two parts of a document at the same time.
- Display different, yet simultaneous, views of the same information.

Toolbar

- They are sometimes called *command bars*. Toolbars are designed to provide quick access to specific commands or options. Specialized toolbars are sometimes referred to as *ribbons, toolboxes, rulers,* or *palettes.*

Command Area

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

- If a horizontal scroll bar is included in the window, position the command area just below it.

Size Grip

- A size grip is a Microsoft Windows special handle included in a window to permit it to be resized. When the grip is dragged the window resizes, following the same conventions as the sizing border.
- Three angled parallel lines in the lower-right corner of a window designate the size grip.
- If the window possesses a status bar, the grip is positioned at the bar's right end.
- Otherwise, it is located at the bottom of a vertical scroll bar, the right side of a horizontal scroll bar, or the junction point of the two bars.

Work Area

- The work area is the portion of the screen where the user performs tasks. It is the open area inside the window's border and contains relevant peripheral screen components such as the menu bar, scroll bars, or message bars.
- The work area may consist of an open area for typing, or it may contain controls (such as text boxes and list boxes) or customized forms (such as spreadsheets).
- The work area may also be referred to as the *client area*.

9. Explain about Device-based controls and Screen-based controls? [L2][CO4][12M]

Device Based Controls:
Characteristics of Device Based Controls:

1. Trackball
2. Joystick
3. Graphic Tablet
4. Touch Screen
5. Light Pen
6. Voice
7. Mouse
8. Keyboard

1. Trackball

- Trackball is a spherical object (ball) that rotates freely in all directions in its socket.Direction and speed is tracked and translated into cursor movement.

2. Joystick

- Variable in size, smaller ones being operated by fingers, larger ones requiring the whole hand.
- Variable in cursor direction movement method, force joysticks respond to pressure, moveable ones respond to movement.

- Variable in degree of movement allowed, from horizontal-vertical only to continuous.

3. Graphic Tablet

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

4. Touch Screen

- A special surface on the screen sensitive to finger or stylus touches.

5. Light Pen

- It is a special surface on a screen sensitive to the touch of a special stylus or pen.

6. Voice

- Automatic speech recognition by the computer.

7. Mouse

- A rectangular or dome-shaped, movable, desktop control containing from one to three buttons used to manipulate objects and information on the screen.
- Movement of screen pointer mimics the mouse movement.

8. Keyboard

- It's a standard typewriter keyboard and cursor movement keys.

Screen Based Controls:

1. Operable Controls
2. Text Entry/Read-Only Controls
3. Selection Controls
4. Combination Entry/Selection Controls
5. Presentation Controls

1. Operable controls

Buttons

- A square or rectangular-shaped control with a label inside that indicates action to be accomplished.
- The label may consist of text, graphics or both.
- Purpose of buttons are:
  - To start actions.
  - To change properties.

2. Text Entry/Read-Only Controls

Text Boxes

- A control is usually rectangular in shape, in which text may be entered or may be displayed for read-only purposes.
- Usually possesses a caption describing the kind of information contained within it.
- Two types exist:
  - Single line

- Multiple line
- When first displayed, the box may be blank or contain an initial value.

3. Selection Controls

Radio Buttons

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

Check Boxes

- A two-part control consisting of a square box and choice description.
- Each option acts as a switch and can be either "on" or "off".
  - When an option is selected, a mark such as an "X" or "check" appears within the square box or the box is highlighted in some other manner.
  - Otherwise the square box is unselected or empty (off)
- Each box can be:
  - Switched on or off independently
  - Used alone or grouped in sets

4. Combination Entry/Selection Controls:

Spin Boxes

- A single-line field followed by two small, vertically arranged buttons.
  - The top button has an arrow pointing up.
  - The bottom button has an arrow pointing down.
- Selection/Entry is made by
  - Using the mouse to point at one of the directional buttons and clicking. Items will change by one unit or step with each click.
  - Keying a value directly into the field itself.
- Purpose of spin boxes is to make a selection by either scrolling through a small set of meaningful predefined choices or typing text.

Combo Boxes:

- A single rectangular text box entry field, beneath which is a larger rectangular list box (resembling a drop-down list box) displaying a list of options.
- A text box permits a choice to be keyed within it.
- The larger box contains a list of mutually exclusive choices from which one may be selected for placement in the entry field. Selections are made by using a mouse to point and click.
- As text is typed into the text box, the list scrolls to the nearest match.
- When an item in the list box is selected, it is placed into the text box, replacing the existing content.

- Information keyed may not necessarily have to match the list items.
- Purpose of combo boxes is to allow either typed entry in a text box or selection from a list of options in a permanently displayed list box attached to the text box.

5. Presentation Controls:

Static Text Fields

- Read-only textual information.
- Purposes of static text fields are:
  - To identify a control by displaying a control caption.
  - To clarify a screen by providing instructional or prompting information.

Group Boxes

- A rectangular frame that surrounds a control or group of controls.
- An optional caption may be included in the frame's upper-left corner.
- Purposes of group boxes are:
  - To visually relate the elements of a control.
  - To visually relate a group of related controls.

10. Discuss the advantages and disadvantages of keyboard and mouse? [L2][CO4] [12M]

Keyboard:

Advantage:

- Familiar
- Accurate
- Does not take up additional desk space
- Very useful for
  - Entering text and alphanumeric data
  - Inserting in text and alphanumeric data
  - Keyed shortcuts accelerators
  - Keyboard mnemonics equivalents

Disadvantage:

- Slow for non-touch-typists
- Slower than other devices in pointing
- Requires discrete actions to operate
- No direct relationship between finger or hand movement.

Mouse:

Advantage:

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

Disadvantage:

- Movement is indirect, in a plane different from screen
- Requires hand to be removed from keyboard
- Requires additional desk space
- May require long movement distances
- Requires a degree of eye-hand co ordination

UNIT-IV
GRAPHICS

1. a)What is an Icon? Explain different icons in detail. [L1][CO5][6M]

ICONS:

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

Icons are classified into 5 different categories:

- System Icons.
- Shortcut Icons.
- Program/Folder/Docs Icon.
- Start Button & Search icon.
- Taskbar Icon.

b) Explain in detail about how to choose colors? [L2][CO5][6M]

Choosing Colors

When choosing colors for display, one must consider these factors: the human visual system, the possible problems that the colors' use may cause, the viewing environment in which the display is used, the task of the user, how the colors will be used, and the hardware on which the colors will be displayed.

Choosing Colors for Categories of Information

■ Choosing colors for categories of information requires a clear understanding of how the information will be used.

■ Some examples:

— If different parts of the screen are attended to separately, color-code the different parts to focus selective attention on each in turn.

— If decisions are made based on the status of certain types of information on the screen, color- code the types of status that the information may possess.

— If screen searching is performed to locate information of a particular kind or quality, color- code these kinds or qualities for contrast.

— If the sequence of information use is constrained or ordered, use color to identify the sequence.

— If the information displayed on a screen is packed or crowded, use color to provide visual groupings.

■ Use color as a redundant screen code

2. a)What is a color? List uses of color. [L1][CO5][6M]

COLORS:

Color—What Is It?

3. Color adds dimension, or realism, to screen usability. Color draws attention because it attracts a person's eye. If used properly, it can emphasize the logical organization of information, facilitate the discrimination of screen components, accentuate differences among elements, and make displays more interesting.
4. Wavelengths of light themselves are not colored. What is perceived as actual color results from the stimulation of the proper receptor in the eye by a received light wave.
5. The name that a color is given is a learned phenomenon, based on previous experiences and associations of specific visual sensations with color names. Therefore, a color can only be described in terms of a person's report of his or her perceptions.
6. The visual spectrum of wavelengths to which the eye is sensitive ranges from about 400 to 700 millimicrons.
7. Color Uses
8. ■ Use color to assist in formatting a screen:
9. — Relating or tying elements into groupings.
10. — Breaking apart separate groupings of information.
11. — Associating information that is widely separated on the screen.
12. — Highlighting or calling attention to important information by setting it off from the other information.
13. ■ Use color as a visual code to identify:
14. — Screen components.
15. — The logical structure of ideas, processes, or sequences.
16. — Sources of information.
17. — Status of information.
18. ■ Use color to:
19. — Realistically portray natural objects.
20. — Increase screen appeal.

b) Categorize various graphics available while designing GUI in HCI. [L4][CO5][6M]

Icons-Definition

Icons are most often used to represent objects and actions with which users can interact

with or that they can manipulate. These types of icons may stand alone on a desktop or

in a window, or be grouped together in a toolbar. A secondary use of an icon is to reinforce important information, a warning icon in a dialog message box, for example.

Kinds of Icons

Characteristics of Icons

Influences on Icon Usability

Choosing Icons

Choosing Images

Creating Images

Drawing Images

Icon Animation and Audition

The Design Process

Screen Presentation

3. Discuss about components of Multimedia. **[L2][CO5][6M]**

Multimedia –Defintion

The graphical flexibility of the Web permits inclusion of other media on a screen, including images, photographs, video, diagrams, drawings, and spoken audio

Graphics

Images

Photographs/Pictures

Video

Diagrams

Drawings

Animation

Audition

Combining Mediums

Multimedia can hold the user's attention, add interest to a screen, entertain, and quickly convey information that is more difficult to present textually. It can also make the Web much more accessible to people with disabilities.

Graphics

■ Use graphics to:

— Supplement the textual content, not as a substitute for it.

— Convey information that can't be effectively accomplished using text.

— Enhance navigation through:

• Presenting a site overview

• Identifying site pages.

• Identifying content areas.

■ Limit the use of graphics that take a long time to load.

■ Coordinate the graphics with all other page elements.

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

Navigational. To identify links that may be followed.

Representational. To illustrate items mentioned in the text.

Organizational. To depict relationships among items mentioned in text. Explanative. To show how things or processes work.

Decorative.To provide visual appeal and emphasis.

Images

■ General:

— Use standard images.

— Use images consistently.

— Produce legible images.

— Provide descriptive text or labels with all images.

— Distinguish navigational images from decorative images.

— Minimize: The number and size of presented images.

— Restrict single images to 5K.

— Restrict page images to 20K.

— Provide thumbnail size images. • Image animation.

— Avoid extraneous or gratuitous images.

■Color:

— Minimize the number of colors in an image.

■ Format:

— Produce images in the most appropriate format.

• GIF. • JPEG.

■ Internationalization:

— Provide for image internationalization.

■ Screen design:

— Reuse images on multiple pages.

Image Maps

■ Use:

— To provide navigation links to other content.

■ Advantages:

— Can be arrayed in a meaningful and obvious structure.

— Faster to load than separate images.

■ Disadvantages:

— Consume a significant amount of screen space.

— “Hot spots” not always obvious.

— One’s location within image map is not always obvious.

■ Guidelines:

— Use with caution.

— Provide effective visual cues and emphasis to make it easy to identify link boundaries.

— Ensure image maps are accessible to the vision impaired.

Photographs/Pictures

■ Use:

— When every aspect of the image is relevant.

■ Guidelines:

— Use JPEG format.

— On the initial page: Display a small version.

— A thumbnail size image.

— Zoom-in on most relevant detail.

• Link to larger photos showing as much detail as needed.

Video

■ Uses:

— To show things that move or change over time.

— To show the proper way to perform a task.

— To provide a personal message.

— To grab attention.

■ Disadvantages:

— Expensive to produce.

— Slow to download.

— Small and difficult to discern detail.

■ Guidelines:

— Never automatically download a video into a page.

— Create short segments.

— Provide controls, including those for playing, pausing, and stopping.

— Consider using:

• Existing video.

• Audio only.

• A slide show with audio.

Diagrams

■ Uses:

— To show the structure of objects.

— To show the relationship of objects.

— To show the flow of a process or task.

— To reveal a temporal or spatial order.

■ Guidelines:

— Provide simple diagrams.

— Provide cutaway diagrams or exploded views to illustrate key points.

Drawings

■ Use:

— When selective parts need to be emphasized or represented.

■ Guidelines:

— Provide simple drawings showing minimal detail.

— Provide a link to a complete drawing.

Animation

■ Uses:

— To explain ideas involving a change in:

• Time. • Position.

— To illustrate the location or state of a process.

— To show continuity in transitions.

— To enrich graphical representations.

— To aid visualization of three-dimensional structures.

— To attract attention.

■ Disadvantages:

— Very distracting. and Slow loading.

■ Guidelines:

— Use only when an integral part of the content.

— Create short segments.

— Provide a freeze frame and stop mode.

Disadvantages:

— Is annoying to many people, including users and nonusers in the vicinity.

— Can easily be overused, increasing the possibility that it will be ignored.

— Is not reliable because:

• Some people are hard of hearing.

• If it is not heard, it may leave no permanent record of having occurred.

• The user can turn it off.

• Audio capability may not exist for the user.

■ Guidelines:

— When words are spoken:

• The content should be simple.

• The speed of narration should be about 160 words per minute.

— When used to introduce new ideas or concepts the narration should be slowed.

— Off-screen narration should be used rather than on-screen narration.

• Unless the narrator is a recognized authority on the topic.

— Create short segments.

— Provide segments of high quality.

— Provide audio controls.

— Play background audio softly.

Combining Mediums

■ Combinations:

— Use sensory combinations that work best together:

• Auditory text with visual graphics.

• Screen text with visual graphics.

■ Integration: Closely integrate screen text with graphics.

■ Relevance:

— Both the visual and auditory information should be totally relevant to the task being performed.

■ Presentation:

— Visual and auditory textual narrative should be presented simultaneously, or the visuals should precede the narrative by no more than 7 seconds.

— To control attention, reveal information systematically.

• Limit elements revealed to one item at a time and use sequential revelations for related elements.

— Animation must show action initiation as well as the action's result.

— Avoid animation that distracts from other more important information.

■ Downloading times:

— Consider downloading times when choosing a media.

■ Testing:

— Thoroughly test all graphics for:

• Legibility. • Comprehensibility. • Acceptance.

4. a)Illustrate about creation of meaningful graphics, icons and images. [L2][CO5][6M]

ICONS:

• Icons are most often used to represent objects and actions with which users can interact with or that they can manipulate.

• These types of icons may stand alone on a desktop or in a window, or be grouped together in a toolbar.

• A secondary use of an icon is to reinforce important information, a warning icon in a dialog message box, for example

Choosing Icons

• Icon design is an important process. Meaningful and recognizable icons will speed learning and recall and yield a much more effective system. Poor design will lead to errors, delays, and confusion.

• While the art of icon design is still evolving, it is agreed that the usability of a system is aided by adhering to the following icon design guidelines.

A Successful Icon

■Looks different from all other icons.

■Is obvious what it does or represents.

■Is recognizable when no larger than 16 pixels square.

■Looks as good in black and white as in color.

Size

■ Supply in all standard sizes.

— 16 × 16 pixels.

• 16- and 256-color versions.

— 32 × 32 pixels

• 16- and 256-color versions.

• Effective: 24 × 24 or 26 × 26 in 32 × 32 icon.

— 48 × 48 pixels

• 16- and 256-color versions.

■ Use colors from the system palette.

■ Use an odd number of pixels along each side.

— Provides center pixel around which to focus design.

■ Minimum sizes for easy selection:

— With stylus or pen: 15 pixels square.

— With mouse: 20 pixels square.

— With finger: 40 pixels square.

■ Provide as large a hot zone as possible.

Choosing Images

■ Use existing icons when available.

■ Use images for nouns, not verbs.

■ Use traditional images.

■ Consider user cultural and social norms.

Creating Images

■ Create familiar and concrete shapes.

■ Create visually and conceptually distinct shapes.

— Incorporate unique features of an object.

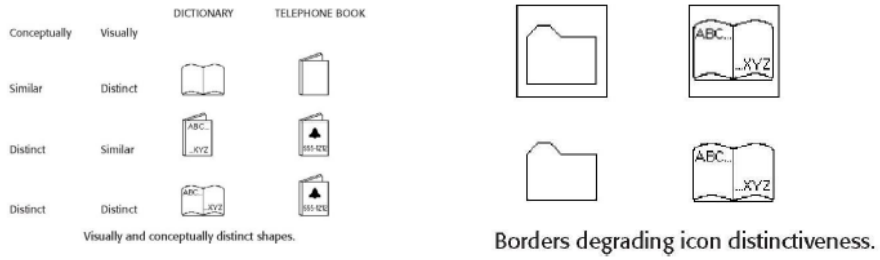
— Do not display within a border.

■Clearly reflect objects represented.

■Simply reflect objects represented, avoiding excessive detail.

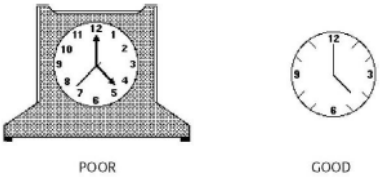
■ Provide consistency in icon type.

■ Create shapes of the proper emotional tone



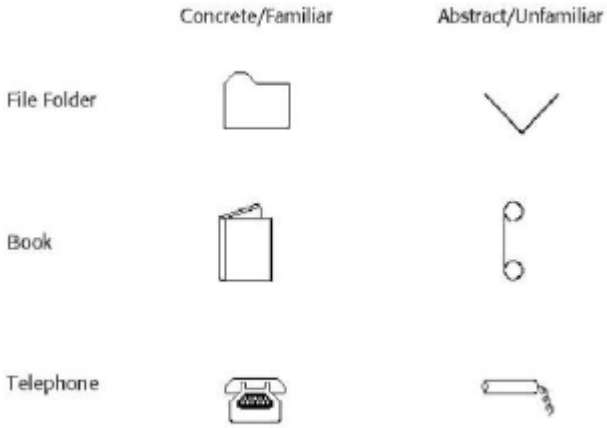
Visually and conceptually distinct shapes.

Borders degrading icon distinctiveness.



Avoid excessive detail in icon design.

Communication relationships in icons.



Concrete and familiar shapes.

b) Discuss various possible problems in choosing colors for screen design? [L1][CO5][6M]

Choosing Colors

When choosing colors for display, one must consider these factors: the human visual system, the possible problems that the colors' use may cause, the viewing environment in which the display is used, the task of the user, how the colors will be used, and the hardware on which the colors will be displayed.

Choosing Colors for Categories of Information

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— If screen searching is performed to locate information of a particular kind or quality, color-code these kinds or qualities for contrast.

— If the sequence of information use is constrained or ordered, use color to identify the sequence.

— If the information displayed on a screen is packed or crowded, use color to provide visual groupings.

■ Use color as a redundant screen code

Colors in Context

Colors are subject to contextual effects. The size of a colored image, the color of images adjacent to it, and the ambient illumination all exert an influence on what is actually perceived.

At the normal viewing distance for a screen, maximal color sensitivity is not reached until the size of a colored area exceeds about a 3-inch square. Smaller images become desiderated (having a greater white component) and change slightly in color.

Adjacent images can influence the perceived color. A color on a dark background will look lighter and brighter than the same color on a light background

A color can be induced into a neutral foreground area (gray) by the presence of a colored background. A red background can change a gray into a green. Induced colors are the complement of the inducing color.

Usage

■ Design for monochrome first.

■ Use colors conservatively.

— Do not use color where other identification techniques, such as location, are available.

Discrimination and Harmony

■For best absolute discrimination, select no more than four or five colors widely spaced on the color spectrum.

— Good colors: red, yellow, green, blue, and brown.

Emphasis

■To draw attention or to emphasize elements, use bright or highlighted colors. To deemphasize elements, use less bright colors.

— The perceived brightness of colors from most to least is white, yellow, green, blue, red.

■To emphasize separation, use contrasting colors.

— Red and green, blue and yellow.

■To convey similarity, use similar colors.

— Orange and yellow, blue and violet.

Common Meanings

■To indicate that actions are necessary, use warm colors.

— Red, orange, yellow.

■To provide status or background information, use cool colors.

— Green, blue, violet, purple.

■ Conform to human expectations.

— In the job.

— In the world at large.

Some common color associations are the following: Red—Stop, fire, hot, danger.

Yellow—Caution, slow, test.

Green—Go, OK, clear, vegetation, safety. Blue—Cold, water, calm, sky, neutrality. Gray—Neutrality.

White—Neutrality.

Warm colors—Action, response required, spatial closeness.

Cool colors—Status, background information, spatial remoteness

Location

■In the center of the visual field, use red and green.

■For peripheral viewing, use blue, yellow, black, and white.

■ Use adjacent colors that differ by hue and value or lightness.

Ordering

■Order colors by their spectral position.

— Red, orange, yellow, green, blue, indigo, violet.

Foregrounds and Backgrounds

■ Foregrounds:

— Use colors that highly contrast with the background color.

— For text or data, use:

• Black.

• Desaturated or spectrum centercolors such as white, yellow, or green.

• Warmer more active colors.

— Use colors that possess the same saturation and lightness.

— To emphasize an element, highlight it in a light value of the foreground color, pure white, or yellow.

— To deemphasize an element, lowlight it in a dark value of the foreground color**.**

■ Backgrounds:

— Use a background color to organize a group of elements into a unified whole.

— Use colors that do not compete with the foreground.

— Use:

• Light-colored backgrounds of low intensity: Off-white or light gray.

• Desaturatedcolors.

• Cool, dark colors such as blue or black.

• Colors on the spectral extremes.

Three-Dimensional Look

■ Use at least five colors or color values to create a 3-D look on a screen.

— Background: The control itself and the window on which it appears.

— Foreground: Captions and lines for buttons, icons, and other objects.

• Usually black or white.

— Selected mode: The color used when the item is selected.

— Top shadow: The bezel on the top and left of the control.

— Bottom shadow: The bezel on the bottom and right of the control.

Color Palette, Defaults, and Customization

■ Permit users to customize their colors.

■ Provide a default set of colors for all screen components.

■ Provide a palette of six or seven foreground colors.

— Provide 2 to 5 values or lightness shades for each foreground color.

■ Provide a palette of six or seven background colors.

■Never refer to a screen element by its color.

Gray Scale

■For fine discriminations use a black-gray-white scale.

— Recommended values are white, light gray, medium gray, dark gray, black

5. Examine in detail colors and human vision in HCI. [L4][CO5][6M]

Color and Human Vision

To understand how color should be used on a screen, it is helpful to know something of the physiology of the human eye.

The Lens

Muscles control the lens of the eye. These muscles focus received wavelengths of light on the retina. The lens itself is not color corrected. The wavelengths of light that create different colors are focused at different distances behind the lens, the longer wavelengths (red) being focused farther back than the shorter wavelengths (blue). The result is that colors of a different wavelength from the color actually being focused by the lens will appear out of focus.

The effect of this focusing for most people is that blues appear more distant and reds appear closer. This can give a three-dimensional appearance to what is being viewed.

The lens does not transmit all light wavelengths equally. It absorbs more wavelengths in the blue region of the spectrum than those in the other regions. Additionally, as the lens ages, it tends to yellow, filtering out the shorter blue wavelengths.

The lens also refocuses for light waves of different brightness. Sharp contrasts in brightness in things being viewed can lead to visual fatigue as the eye continually makes muscular adjustments

The Retina

The retina is the light-sensitive surface of the eye. It comprises two kinds of receptors, rods and cones, which translate the incoming light into nervous impulses. Rods are sensitive to lower light levels and function primarily at night. Cones are stimulated by higher light levels and react to color. The sensitivity of cones to colors varies, different cones possessing maximum sensitivity to different wavelengths of light.

About two-thirds (64 percent) of the cones are maximally sensitive to longer light wavelengths, showing a peak response at about 575 millimicrons. These cones have traditionally been referred to as “red” sensitive cones.

About one-third (32 percent) of the cones achieve maximum sensitivity at about 535 millimicrons and are commonly referred to as “green” sensitive cones.

The remainder (2 percent) primarily react to short light wavelengths, achieving maximum sensitivity at about 445 millimicrons. These are known as “blue” sensitive cones.

Rods and cones vary in distribution across the retina. The center is tightly packed with cones and has no rods. Toward the periphery of the retina, rods increase and cones decrease. Thus, color sensitivity does not exist at the retina’s outer edges, although yellows and blues can be detected further into the periphery than reds and greens.

The receptors in the eye also adjust, or adapt, their level of sensitivity to the overall light level and the color being viewed. Adaptation to increases in brightness improves color sensitivity.

The brightness sensitivity of the eye to different colors also varies. It is governed by output from the red and green cones. The greater the output, the higher the brightness, which results in the eye being most sensitive to colors in the middle of the visual spectrum and less sensitive to colors at

the extremes. A blue or red must be of a much greater intensity than a green or yellow even to be perceived.

The components of the eye—the lens and retina—govern the choices, and combinations, of colors to be displayed on a screen. The proper colors will enhance performance; improper colors will have the opposite effect, as well as increase the probability of visual fatigue 5. a)Examine in detail colors and human vision in HCI.

b) Explain in brief purpose and importance of usability testing. [L2][CO5][6M]

TESTING:

The Purpose of Usability Testing Usability testing serves a twofold purpose.

First, it establishes a communication bridge between developers and users. Through testing, the developer learns about the user's goals, perceptions, questions, and problems. Through testing, the user is exposed to the capabilities of the system early on, before design is solidified.

Second, testing is used to evaluate a product. It validates design decisions. It also can identify potential problems in design at a point in the development process where they can be more easily addressed. Testing also enables comparison of alternate versions of a design element, when a clear direction is not immediately evident.

The Importance of Usability Testing

A thorough usability testing process is important for many reasons, including all of the following.

Developers and users possess different models. Developers and users have different expectations and levels of knowledge. Specialized knowledge possessed by the developers enables them to deal with complex or ambiguous situations on the basis of context cues not visible to the users. Developers also frequently use terminology that does not always match that of the users.

Developer's intuitions are not always correct. The intuition of designers, or anyone for that matter, no matter how good or bad they may be at what they do, is error prone.

There is no average user. We all differ—in looks, feelings, motor abilities, intellectual abilities, learning abilities and speeds, device-based control preferences, and so forth. In a keyboard data entry task, for example, the best operators will probably be twice as fast as the poorest and make 10 times fewer errors. The design must permit people with widely varying characteristics to satisfactorily and comfortably learn and perform the task or job.

It's impossible to predict usability from appearance. Just as it is impossible to judge a person's personality from his or her looks, it's impossible to predict a system's usability from its appearance.

Design standards and guidelines are not sufficient. Design standards and guidelines are an important component of good design, laying the foundation for consistency. But design standards and guidelines often fall victim to trade-offs. They also cannot address all the countless design element interactions that occur within a completed system.

Informal feedback is inadequate. Informal feedback is a hit-and-miss proposition. Parts of the system may be completely overlooked; significant problems in other parts may never be documented.

Products' built-in pieces almost always have system-level inconsistencies. This is a normal and expected result when different developers work on different aspects of a system. We might also say that developers differ—there is no average developer.

Problems found late are more difficult and expensive to fix. Unless they're really severe, they may never be fixed.

Problems fixed during development mean reduced support costs later. Support costs are directly proportional to the usability problems that remain after development. The more problems, the higher the support costs.

Advantages over a competitive product can be achieved. Many products can do something. The most successful products are those that permit doing something easily.

6. a)Write short notes on Testing. [L2][CO5][6M]

Testing should begin in the earliest stages of product development and continue throughout the development process. It should include as many of the user's tasks, and as many of the product's components, as reasonably possible. Always involve all members of the design team in the testing to ensure a common reference point for all. Involving all also permits multiple insights into the test results from the different perspectives of team members.

The Purpose of Usability Testing

Usability testing serves a twofold purpose.

First, it establishes a communication bridge between developers and users. Through testing, the developer learns about the user's goals, perceptions, questions, and problems. Through testing, the user is exposed to the capabilities of the system early on, before design is solidified.

Second, testing is used to evaluate a product. It validates design decisions. It also can identify potential problems in design at a point in the development process where they can be more easily addressed. Testing also enables comparison of alternate versions of a design element, when a clear direction is not immediately evident.

b) Describe elaborately scope of testing. [L2][CO5][6M]

Scope of Testing

Testing should begin in the earliest stages of product development and continue throughout the development process. It should include as many of the user's tasks, and as many of the product's components, as reasonably possible. Always involve all members of the design team in the testing to ensure a common reference point for all. Involving all also permits multiple insights into the test results from the different perspectives of team members.

The three overall usability testing types include:

- Moderated vs. unmoderated.
- Remote vs. in person.
- Explorative vs. comparative.

7. a) Compile different Guidelines for scope of testing [L6][CO5][6M]

Guidelines Review

■ Description:

— A review of the interface in terms of an organization's standards and design

guidelines.

■ Advantages:

— Can be performed by developers.

— Low cost.

— Can identify general and recurring problems

— Particularly useful for identifying screen design and layout problems.

■ Disadvantages:

— May miss severe conceptual, navigation, and operational problems.

Description.A*guidelines review* is an inspection of an interface's navigation and screen

design and layout in the context of an organization's standards and design guidelines.

A checklist summarizing a system's standard or guideline document is

prepared and is used as the basis for the comparison. Failure to comply with a

guideline or standard indicates that a design modification may be necessary.

Advantages. Software developers can perform this kind of test. Its advantages include

its low cost and its ability to identify recurring and general problems. It is

particularly useful in identifying screen design and layout problems.

Disadvantage. Because this review tends to be static in nature, it may miss severe conceptual, navigation, and operational problems

b) Illustrate with necessary examples, the prototypes in testing [L3][CO5][6M]

A prototype is primarily a vehicle for exploration, communication, and evaluation. Its purpose is to obtain user input in design, and to provide feedback to designers. Its major function is the communicative role it plays, not accuracy or thoroughness. A prototype enables a design to be better visualized and provides insights into how the software will look and work. It also aids in defining tasks, their flow, the interface itself, and its screens.

A prototype is a simulation of an actual system that can be quickly created. A prototype may be a rough approximation, such as a simple hand-drawn sketch, or it may be interactive, allowing the user to key or select data using controls, navigate through menus, retrieve displays of data, and perform basic system functions.

A prototype is characterized by its fidelity, the exactness and thoroughness of its replication of a system's screens and user interaction.

Various kinds of prototypes, in general order of increased fidelity, are as follows.

Hand Sketches and Scenarios

■ Description:

— Screen sketches created by hand.

— Focus is on the design, not the interface mechanics.

— A low-fidelity prototype.

■ Advantages:

— Can be used very early in the development process.

— Suited for use by entire design team.

— No large investment of time and cost

— No programming skill needed.
— Easily portable.
— Fast to modify and iterate.
— A rough approximation often yields more substantive critical comments.

— Easier to comprehend than functional specifications.
— Can be used to define requirements.
■ Disadvantages:
— Only a rough approximation.
— Limited in providing an understanding of navigation and flow.
— A demonstration, not an exercise.
— Driven by a facilitator, not the user.
— Limited usefulness for a usability test.
— A poor detailed specification for writing the code.
— Usually restricted to most common tasks.

Sketch Creation Process
■ Sketch (storyboard) the screens while determining:
— The source of the screen's information.
— The content and structure of individual screens.
— The overall order of screens and windows.
■ Use an erasable medium.
■ Sketch the screens needed to complete each workflow task.
■ Try out selected metaphors and change them as necessary.
■ First, storyboard common/critical/frequent scenarios.
— Follow them from beginning to end.
— Then, go back and build in exceptions.
■ Don't get too detailed; exact control positioning is not important, just overall order and flow.
■ Storyboard as a team, including at least one user.
■ Only develop online prototypes when everyone agrees that a complete set of screens has been satisfactorily sketched.

Interactive Paper Prototypes
■ Description:
— Interface components (menus, windows, and screens) constructed of common paper technologies (Post-It notes, transparencies, and so on).
— The components are manually manipulated to reflect the dynamics of the software.
— A low-fidelity prototype.
■ Advantages:
— More illustrative of program dynamics than sketches.
— Can be used to demonstrate the interaction.
— Otherwise, generally the same as for hand-drawn sketches and scenarios.

■ Disadvantages:
— Only a rough approximation.
— A demonstration, not an exercise.
— Driven by a facilitator, not the user.
— Limited usefulness for usability testing.

Programmed Facades
■ Description:
— Examples of finished dialogs and screens for some important aspects of the system.
— Created by prototyping tools.
— Medium-fidelity to high-fidelity prototypes.
■ Advantages:
— Provide a good detailed specification for writing code

A vehicle for data collection.
■ Disadvantages:
— May solidify the design too soon.
— May create the false expectation that the "real thing" is only a short time away.
— More expensive to develop.
— More time-consuming to create.
— Not effective for requirements gathering.
— Not all of the functions demonstrated may be used because of cost, schedule limitations, or lack of user interest.
— Not practical for investigating more than two or three approaches.

Prototype-Oriented Languages
■ Description:
— An example of finished dialogs and screens for some important aspects of the system.
— Created through programming languages that support the actual programming process.
— A high-fidelity prototype.
■ Advantages:
— May include the final code.
— Otherwise, generally the same as those of programmed facades.
■ Disadvantages:
— Generally the same as for programmed facades

8. Analyze various kinds of testing techniques. [L4][CO5][6M]

Kinds of Tests

Guidelines Review

Heuristic Evaluation

Cognitive Walkthroughs

Think-Aloud Evaluations

Usability Test

Classic Experiments
Focus Groups
Choosing a Testing Method

Kinds of Tests

A test is a tool that is used to measure something. The "something" may be:
Conformance with a requirement.
Conformance with guidelines for good design.
Identification of design problems.
Ease of system learning.
Retention of learning over time.
Speed of task completion.
Speed of need fulfillment.
Error rates.
Subjective user satisfaction.

Guidelines Review

■ Description:
— A review of the interface in terms of an organization's standards and design guidelines.
■ Advantages:
— Can be performed by developers.
— Low cost.
— Can identify general and recurring problems
— Particularly useful for identifying screen design and layout problems.
■ Disadvantages:
— May miss severe conceptual, navigation, and operational problems.

Heuristic Evaluation

■ Description:
— A detailed evaluation of a system by interface design specialists to identify problems.
■ Advantages:
— Easy to do.
— Relatively low cost.
— Does not waste user's time.
— Can identify many problems.
■ Disadvantages:
— Evaluators must possess interface design expertise.
— Evaluators may not possess an adequate understanding of the tasks and user communities.
— Difficult to identify system wide structural problems.
— Difficult to uncover missing exits and interface elements.
— Difficult to identify the most important problems among all problems uncovered.
— Does not provide any systematic way to generate solutions to the problems uncovered.

■ Guidelines:
— Use 3 to 5 expert evaluators.
— Choose knowledgeable people:

• Familiar with the project situation.
• Possessing a long-term relationship with the organization.

Heuristic Evaluation Process

■ Preparing the session:
— Select evaluators.
— Prepare or assemble:
• A project overview.
• A checklist of heuristics.
— Provide briefing to evaluators to:
• Review the purpose of the evaluation session.
• Preview the evaluation process.
• Present the project overview and heuristics.
• Answer any evaluator questions.
• Provide any special evaluator training that may be necessary.

■ Conducting the session:
— Have each evaluator review the system alone.
— The evaluator should: • Establish own process or method of reviewing the system.
— Provide usage scenarios, if necessary.
• Compare his or her findings with the list of usability principles.
• Identify any other relevant problems or issues.
• Make at least two passes through the system.
— Detected problems should be related to the specific heuristics they violate.
— Comments are recorded either:
• By the evaluator.
• By an observer.
— The observer may answer questions and provide hints.
— Restrict the length of the session to no more than 2 hours.

■ After the session:
— Hold a debriefing session including observers and design team members where:
• Each evaluator presents problems detected and the heuristic it violated.
• A composite problem listing is assembled.
• Design suggestions for improving the problematic aspects of the system are discussed.
— After the debriefing session:
• Generate a composite list of violations as a ratings form.
• Request evaluators to assign severity ratings to each violation.
• Analyze results and establish a program to correct violations and deficiencies.

Cognitive Walkthroughs

■ Description:
— Reviews of the interface in the context of tasks users perform.
■ Advantages:
— Allow a clear evaluation of the task flow early in the design process

Do not require a functioning prototype.

— Low cost.
— Can be used to evaluate alternate solutions.
— Can be performed by developers.
— More structured than a heuristic evaluation.
— Useful for assessing “exploratory learning.”
■ Disadvantages:
— Tedious to perform.
— May miss inconsistencies and general and recurring problems.
■ Guidelines:
— Needed to conduct the walkthrough are:
• A general description of proposed system users and what relevant knowledge they possess.
• A specific description of one or more core or representative tasks to be performed.
• A list of the correct actions required to complete each of the tasks.
— Review:
• Several core or representative tasks across a range of functions.
• Proposed tasks of particular concern.
— Developers must be assigned roles of:
• Scribe to record results of the action.
• Facilitator to keep the evaluation moving.
— Start with simple tasks.
— Don’t get bogged down demanding solutions.
— Limit session to 60 to 90 minutes.

Think-Aloud Evaluations

■ Description:
— Users perform specific tasks while thinking out load.
— Comments are recorded and analyzed.
■ Advantages:
— Utilizes actual representative tasks.
— Provides insights into the user’s reasoning.
■ Disadvantages:
— May be difficult to get users to think out loud.
■ Guidelines:
— Develop:
• Several core or representative tasks.
• Tasks of particular concern.
— Limit session to 60 to 90 minutes.

Usability Test

■ Description:
— An interface evaluation under real-world or controlled conditions.
— Measures of performance are derived for specific tasks.
— Problems are identified.
■ Advantages:
— Utilizes an actual work environment.
— Identifies serious or recurring problems.
■ Disadvantages:

— High cost for establishing facility.
— Requires a test conductor with user interface expertise.
— Emphasizes first-time system usage.
— Poorly suited for detecting inconsistency problems

Classic Experiments
■ Description:
— An objective comparison of two or more prototypes identical in all aspects except for one design issue.
■ Advantages:
— Objective measures of performance are obtained.
— Subjective measures of user satisfaction may be obtained.
■ Disadvantages:
— Requires a rigorously controlled experiment to conduct the evaluation.
— The experiment conductor must have expertise in setting up, running, and analyzing the data collected.
— Requires creation of multiple prototypes.
■ Guidelines:
— State a clear and testable hypothesis.
— Specify a small number of independent variables to be manipulated.
— Carefully choose the measurements.
— Judiciously select study participants and carefully or randomly assign them to groups.
— Control for biasing factors.
— Collect the data in a controlled environment.
— Apply statistical methods to data analysis.
— Resolve the problem that led to conducting the experiment.

Focus Groups
■ Description:
— A discussion with users about interface design prototypes or tasks.
■ Advantages:
— Useful for:
• Obtaining initial user thoughts.
• Trying out ideas.
— Easy to set up and run.
— Low cost.
■ Disadvantages:
— Requires experienced moderator.
— Not useful for establishing:
• How people really work.
• What kinds of usability problems people have.
■ Guidelines:
— Restrict group size to 8 to 12.
— Limit to 90 to 120 minutes in length.
— Record session for later detailed analysis.

9. Evaluation procedure for developing and conducting the test [L4][CO5][6M]

A usability test requires developing a test plan, selecting test participants, conducting the test, and analyzing the test results.

The Test Plan

■ Define the scope of the test. Determinants include the following issues:

(1) The *design stage:* early, middle, or late—the stage of design influences the kinds of prototypes that may exist for the test,

(2) the time *available* for the test—this may range from just a few days to a year or more

(3) *f*inances *allocated* for testing—money allocated may range from one percent of a project's cost to more than 10 percent,

(4) the project's *novelty* (well defined or exploratory)—this will influence the kinds of tests feasible to conduct,

(5) expected *user numbers* (few or many) and *interface criticality* (life-critical medical system or informational exhibit)—much more testing depth and length will be needed for systems with greater human impact, and

(6) finally, the development team's *experience* and testing knowledge will also affect the kinds of tests that can be conducted.

■ Define the purpose of the test.

— Performance goals.

— What the test is intended to accomplish.

■ Define the test methodology.

— Type of test to be performed.

— Test limitations.

— Developer participants.

■ Identify and schedule the test facility or location.

■ Develop scenarios to satisfy the test's purpose.

Test Participants

■ Assemble the proper people to participate in the test

Test Conduct and Data Collection

To collect usable data, the test should begin only after the proper preparation. Then, the data must be properly and accurately recorded. Finally, the test must be concluded and followed up properly.

Usability Test Guidelines

■ Before starting the test:

— Explain that the objective is to test the software, not the participants.

— Explain how the test materials and records will be used.

— If a consent agreement is to be signed, explain all information on it.

— If verbal protocols will be collected, let participants practice thinking aloud.

— Ensure that all participants' questions are answered and that participants are comfortable with all procedures.

■ During the test:

— Minimize the number of people who will interact with the participants.

— If observers will be in the room, limit them to two or three.

— Provide a checklist for recording:

• Times to perform tasks.

• Errors made in performing tasks.

• Unexpected user actions.

• System features used/not used.
• Difficult/easy-to-use features.
• System bugs or failures.
— Record techniques and search patterns that participants employ when attempting to work through a difficulty.
— If participants are thinking aloud, record assumptions and inferences being made.
— Record the session with a tape recorder or video camera.
— Do not interrupt participants unless absolutely necessary.
— If participants need help, provide some response.
• Provide encouragement or hints.
• Give general hints before specific hints.
• Record the number of hints given
Watch carefully for signs of stress in participants:
• Sitting for long times doing nothing.
• Blaming themselves for problems.
• Flipping through documentation without really reading it.
— Provide short breaks when needed.
— Maintain a positive attitude, no matter what happens.
■ After the test:
— Hold a final interview with participants; tell participants what has been learned in the test.
— Provide a follow-up questionnaire that asks participants to evaluate the product or tasks performed.
— If videotaping, use tapes only in proper ways.
• Respect participants' privacy.
• Get written permission to use tapes

10. Summarize the test

i) purpose of testing **[L2][CO5][6M]**

— Explain that the objective is to test the software, not the participants.
— Explain how the test materials and records will be used.
— If a consent agreement is to be signed, explain all information on it.
— If verbal protocols will be collected, let participants practice thinking aloud.
— Ensure that all participants' questions are answered and that participants are comfortable with all procedures.
■ During the test:
— Minimize the number of people who will interact with the participants.
— If observers will be in the room, limit them to two or three.
— Provide a checklist for recording:
• Times to perform tasks.
• Errors made in performing tasks.
• Unexpected user actions.
• System features used/not used.
• Difficult/easy-to-use features.
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— If videotaping, use tapes only in proper ways.
• Respect participants' privacy.
• Get written permission to use tapes

ii) importance of testing **[L2][CO5][6M]**

The Importance of Testing

A thorough usability testing process is important for many reasons, including all of the following.

Developers and users possess different models..

Developer's intuitions are not always correct.

There is no average user. It's impossible to predict usability from appearance.

Design standards and guidelines are not sufficient.

Informal feedback is inadequate.

Products' built-in pieces almost always have system-level inconsistencies..

Problems found late are more difficult and expensive to fix.

Problems fixed during development mean reduced support costs later.

Advantages over a competitive product can be achieved.

Scope of Testing

Testing should begin in the earliest stages of product development and continue throughout the development process. It should include as many of the user's tasks, and as many of the product's components, as reasonably possible. Always involve all members of the design team in the testing to ensure a common reference point for all. Involving all also permits multiple insights into the test results from the different perspectives of team members.

UNIT-V

SOFTWARE TOOLS

1. **a) Explain in brief, various specification methods for building an interface [L2][CO6][6M]**

specification Methods Design requires a good notation to record and discuss alternate possibilities: –The default language for specifications in any field is natural language, e.g., English –Communication medium, e.g., sketchpad, or blackboard Natural-language specifications tend to be: –lengthy –vague (definite) –ambiguous Therefore often are difficult to prove: –correct –consistent –complete

Specification Methods (cont.) Backus-Naur Form (a.k.a. Backus Normal Form or BNF):–

high-level components are described as non-terminals –specific strings are described as terminals –Non-terminals: non-terminals are higher-level components. They are defined in term of other non-terminals. –Terminals: Terminals are particular strings. They denote the lower level of user behavior. Grammars Example ::= ::=, ::= ::= | ::= A|B|C|D|E|F|G|H|I|J|K|L|M|N|O|P|Q|R|S|T|U|V|W|X|Y|Z ::= ( ) - ::= ::= ::= 0|1|2|3|4|5|6|7|8|9

4 Menu-Selection Trees Menu selection-tree is a simple structural component that provides help to its users and designers. Rules: Menus must be built on the meaning of an activity to be carried. Opt for wide-shallow to small-deep. Graphics, numbers or headings must be used to display location. Sub trees must have items as headings. Classify items on the basis of the meaning. Keep a proper order of items. Start with keywords and utilize short items. Grammar, layout and terminology must be consistent.

5 Dialog-Box Trees A dialog-box tree is also a simple structural component that provides help to users and designers. Rules: Uniform style and titles should be meaningful. The order of organization for the dialog-boxes must be from top-left to bottom-right. The similar elements must be clustered in a box and can be distinguished by using a variety of color. Font sizes. The margins, white spaces, grid, boxes and line layouts must be uniform. Standard OK and cancel buttons must be used.

6 Specification Methods (cont.) Transition Diagram –a set of nodes that represents system states and a set of links between the nodes that represents possible transitions

7 Specification Methods (cont.) State Charts: A state machine depicts the flow of control from one state to another and is represented by a state- chart.

b)Discuss the features of interface-building tools. [L2][CO6][6M]

User Interface Independence

Separate interface design from internals

Enable multiple user interface strategies

Enable multiple platform support

Establish user interface architect role

Enforce standards Methodology & Notation

Develop design procedures

Find ways to talk about design

Create project management

1. Interface-Building Tools :
2. Rapid Prototyping –Try out ideas very early –Test, revise, test, revise,... –Engage end users, managers, and others Software Support –Increase productivity –Offer some constraint & consistency checks –Facilitate team approaches –Ease maintenance
3. User interface mockup tools Examples –Paper and pencil –Word processors –Slide-show software –Macromedia Director, Flash mx, or Dreamweaver Visual Editing –Microsoft Visual Studio –Borland JBuilder
4. Finding the right tool is a tradeoff between six main criteria: 1.Part of the application built using the tool. 2.Learning time 3.Building time 4.Methodology imposed or advised 5.Communication with other subsystems 6.Extensibility and modularity
   The windowing system layer –Sometimes working at a low-level is required. –E.g., new platform
5. Interface-Building Tools (cont.) The GUI toolkit layer –Widgets, such as windows, scroll bars, pull-down or pop-up menu, etc. –Difficult to use without an interface
6. The application framework and specialized language layer –Application frameworks are based on object-oriented programming –Can quickly build sophisticated interfaces –Require intensive learning –Specialized language layers lighten the programming burden –Tcl (and its toolkit Tk) –Perl/Tk –Python/Tk –Visual Basic –Java Script
7. Interface-Building Tools:
8. Evaluation and Critiquing Tools Tullis' Display Analysis Program, Version 4.0: Takes alphanumeric screen designs and produces display-complexity metrics plus some advice: –Upper-case letters: 77% The percentage of upper- case letters is high. Consider using more lower-case letters, since text printed in normal upper- and lower-case letters is read about 13% faster than text in all upper case. Reserve all upper-case for items that need to attract attention.
9. Evaluation and Critiquing Tools (cont.) Doctor HTML - Web Page Analyzer: http://imagiware.com/RxHTML –Did not find the required open and close HEAD tag. You should open and close the HEAD tag in order to get consistent performance on all browsers. –Found extra close STRONG tags in the document. Please remove them.

2.Explain the following **[L2][CO6][6M]**

i) Comparison of pointing devices

• Some results

– direct pointing devices faster, but less accurate

– graphics tablets are appealing when user can remain with device for long periods

without switching to keyboard

– mouse is faster than isometric joystick

– for tasks that mix typing and pointing, cursor keys a faster and are preferred by users to a mouse

– muscular strain is low for cursor keys

• Fitts' Law

Index of difficulty = log2 (2D / W)

– Time to point = C1 + C2 (index of difficulty)

– C1 and C2 and constants that depend on the device

– Index of difficulty is log2 (2*8/1) = log2(16) = 4 bits

– A three-component equation was thus more suited for the high-precision pointing task:

– Time for precision pointing = C1 + C2 (index of difficulty) + C3 log2 (C4 / W)

Novel devices

• Foot controls

• Eye-tracking

• Multiple-degrees-of-freedom devices

• DataGlove

• Haptic feedback

• Bimanual input

• Ubiquitous computing and tangible user interfaces

• Handheld devices

Mouse

Keyboard

Touchpad

Joystick

Trackball

Light Pen

Optical Card Reader

Digitizing Tablet

Stylus

1 MOUSE:

The mouse is one of the famous pointing devices which acts as an interface between users and computers.

The users who use mouse has an extra edge over the keyboard users where the mouse can perform operations and task given to them at rapid speed and with precision.

The mouse pointer or cursor can highlight certain elements on the screen with absolute accuracy which enables the user to drag, drop, copy, and select without any fuss.

The mouse can be used to copy any files and documents from one location to another within just a few clicks.

The mouse has two buttons one on the left side and another on the right side and a scroll button| wheel on the centre of the mouse which is used to scroll documents while reading.

The mouse is used in application software or computer projects where GUI [Graphical User Interface] technology is used where the task has to be done with rapid speed with almost 100% accuracy.

2 KEYBOARD

Keyboard - Types of Pointing Devices

Keyboard

The keyboard is another pointing device. Although the keyboard cannot replace the mouse as the mouse contains some special features which the keyboard lacks.

Now I will guide you on how to use a keyboard just like a mouse? Don’t worry I will guide you through the entire process.

1] Select Control Panel.

2] In the Control Panel Go To Open Ease of Access.

3] Click on Make the keyboard easier to use.

4] Select Turn on Mouse Keys.

3] Touch screen

The touch screen is capable of showing information and data on their screen which can be touched and accessed using fingers and the information can be accessed by a device called a pen-like stylus.

Whenever we touch our fingertips on the screen there is a signal generated which is transferred to the CPU [Central Processing Unit] to process and handle the information and later this information is handover to output devices for further processing.

Touch Pad

The touch screen does not require a pointing device like a mouse for performing operations. They have an inbuilt sensor that detects fingertips and allows them to access the information and device.

Touch screens sometimes are also called pointing devices as well as output devices as they carry out both the basic essential functions.

4] Joystick

The joystick is a pointing device that is used for playing games on a computer and can also be used in CAD [Computer Aided Design].

Some of the latest games in the market cannot be played with the help of a keyboard as it requires speed and accuracy. The latest joystick has multidimensional features which enable users to play games with speed and precision.

The joystick can be moved up, down, left, and right it also has a push button at the top of the joystick which is used while playing video games.

5] TrackBall

The trackball is installed in laptops and notebooks which are used as pointing devices that work exactly similar to a mouse.

These trackballs are square-shaped boxes and act as a sensor when fingers are moved across this box one can select, drag, and drop files, folders, and documents.

Nowadays the trackballs are extensively used because of their shape and small size with amazing features when compared to a mouse. This trackball does not require huge space.

6] Light Pen

The light pen looks like a pen that is used for drawing pictures on the screen this device is also one of the important pointing devices which are used very extensively in presentations and graphics slide shows.

The light pen has a light sensor once the user touched the screen with the help of a light pen a signal is generated for further operations.

7] Optical Card Reader

OCR [Optical Card Reader] is a mechanical device that can translate images, pictures, and documents into a machine-readable form.

OCR has an inbuilt memory that stores previously scanned data or information.

These OCR can be used in scanning barcodes that have pictures and can be rechecked with the data previously stored in the memory.

8] Digitizing Tablet

The digitizing tablet is also called a graphic tablet. These are other types of pointing devices that are used in drawing pictures and graphics.

These devices are used with a stylus. These drawings can be stored in computer memory and can be used later for further modifications and processing.

ii) Speech and auditory interfaces

Speech recognition still does not match the fantasy of science fiction:

demands of user's working memory

background noise problematic

variations in user speech performance impacts effectiveness

most useful in specific applications, such as to benefit handicapped users

• Discrete word recognition

recognize individual words spoken by a specific person; can work with 90- to98 percent reliability for 20 to 200-wordvocabularies

Speaker-dependent training, in which the user repeats the full vocabulary once or twice Speaker-independent systems are beginning to be reliable enough for

certain commercial applications been successful in enabling bedridden, paralyzed, or otherwise disabled people also useful in applications with at least one of the following conditions:

• speaker's hands are occupied

• mobility is required

• speaker's eyes are occupied

• harsh or cramped conditions preclude use of keyboard

– voice-controlled editor versus keyboard editor

• lower task-completion rate

• lower error rate

– use can disrupt problem solving

• Continuous-speech recognition

– Not generally available:

• difficulty in recognizing boundaries between spoken words

normal speech patterns blur boundaries

• many potentially useful applications if perfected

• Speech store and forward

– Voice mail user scan

• receive messages

• replay messages

• reply to caller

• forward messages to other users, delete messages

• archive messages

• Systems are low cost and reliable.

• Voice information systems

– Stored speech commonly used to provide information about tourist

sites, government services, after-hours messages for organizations

– Low cost

– Voice prompts

– Deep and complex menus frustrating

– Slow pace of voice output, ephemeral nature of speech, scanning

and searching problems

– Voicemail

– Handheld voice recorders

– Audio books

– Instructional systems

• Speech generation

– Michaels and Wiggins (1982) suggest that speech generation is

"frequently preferable" under these circumstances:

• The message is simple.

• The message is short.

• The message will not be referred to later.

• The message deals with events in time.

• The message requires an immediate response.

• The visual channels of communication are overloaded.

• The environment is too brightly lit, too poorly lit, subject to

severe vibration, or otherwise unsuitable for transmission of visual information.

• The user must be free to move around.

• The user is subjected to high G forces or anoxia

Audio tones, audio libation, and music

– Sound feedback can be important:

• to confirmations

• offer warning

• for visually impaired users

• music used to provide mood context, e.g. in games

• can provide unique opportunities for user, e.g. with

simulating various musical instruments

3.Examine the following term **[L3][CO6][6M]**

i) Indirect pointing devices

• mouse

– the hand rests in a comfortable position, buttons on the mouse are easily pressed, even

long motions can be rapid, and positioning can be precise

• trackball

– usually implemented as a rotating ball 1 to 6 inches in diameter that moves a cursor

• joystick

– are appealing for tracking purposes

• graphics tablet

– a touch-sensitive surface separate from the screen

• touchpad

– built-in near the keyboard offers the convenience and precision of a touchscreen while

keeping the user's hand off the display surface

• Human-factors variables

– speed of motion for short and long distances

– accuracy of positioning

– error rates

– learning time

– user satisfaction

• Other variables

– cost

– durability

– space requirements

– weight

– left- versus right-hand use

– likelihood to cause repetitive-strain injury

– compatibility with other systems

ii) Function keys of Keyboard

The function keys or F-keys on a computer keyboard, labeled F1 through F12, are keys that have a special function defined by the operating system, or by a currently running program.

They may be combined with the Alt or Ctrl keys

F1 to F12 and their functions.

What are the F1 through F12 keys?

F1

Almost always used as the help key, almost every program opens a help screen when this key is pressed.

Enter CMOS Setup.

Windows Key + F1 would open the Microsoft Windows help and support center.

Open the Task Pane.

F2

In Windows renames a highlighted icon, file, or folder in all versions of Windows.

Alt + Ctrl + F2 opens document window in Microsoft Word.

Ctrl + F2 displays the print preview window in Microsoft Word.

Quickly rename a selected file or folder.

Enter CMOS Setup.

Reduce laptop screen brightness (on some laptops).

F3

Often opens a search feature for many programs including Microsoft Windows when at the Windows Desktop.

In MS-DOS or Windows command line F3 will repeat the last command.

Shift + F3 will change the text in Microsoft Word from upper to lower case or a capital letter at the beginning of every word.

Windows Key + F3 opens the Advanced find window in Microsoft Outlook.

Open Mission Control on an Apple computer running Mac OS X.

Increase laptop screen brightness (on some laptops).

F4

Open find window in Windows 95 to XP.

Open the address bar in Windows Explorer and Internet Explorer.

Repeat the last action performed (Word 2000+).

Alt + F4 closes the program window currently active in Microsoft Windows.

Ctrl + F4 closes the open window within the current active window in Microsoft Windows.

F5

In all modern Internet browsers, pressing F5 will refresh or reload the page or document window.

Open the find, replace, and go to window in Microsoft Word.

Starts a slideshow in PowerPoint.

Puts on the laptop keyboard backlight in some laptops. Also varies the brightness and or puts off the light.

F6

Move the cursor to the address bar in Internet Explorer, Mozilla Firefox, and most other Internet browsers.

Ctrl + Shift + F6 opens to another open Microsoft Word document.

Reduce laptop speaker volume (on some laptops).

Mute laptop speaker (on some laptops).

F7

Commonly used to spell check and grammar check a document in Microsoft programs such as Microsoft Word, Outlook, etc.

Shift + F7 runs a Thesaurus check on the word highlighted.

Turns on Caret browsing in Mozilla Firefox.

Increase laptop speaker volume (on some laptops). Or reduce speaker volume in others.

F8

Function key used to enter the Windows startup menu, commonly used to access Windows Safe Mode.

Used by some computers to access the Windows recovery system, but may require a Windows installation CD.

Displays a thumbnail image for all workspaces in Mac OS.

Increase laptop speaker volume (on some laptops).

F9

Refresh document in Microsoft Word.

Send and receive e-mail in Microsoft Outlook.

Reduce laptop screen brightness (on some laptops).

Using the Fn key and F9 at the same time opens Mission Control on an Apple computer running Mac OS X.

F10

In Microsoft Windows activates the menu bar of an open application.

Shift + F10 is the same as right-clicking on a highlighted icon, file, or Internet link.

Access the hidden recovery partition on Compaq, HP, and Sony computers.

Enter CMOS Setup on some computers.

Increase laptop screen brightness (on some laptops)

With Mac OS 10.3 or later, shows all open Windows for the active program.

F11

Enter and exit fullscreen mode in all modern Internet browsers.

Ctrl + F11 as computer is starting to access the hidden recovery partition on many Dell computers.

Access the hidden recovery partition on eMachines, Gateway, and Lenovo computers.

With Mac OS 10.4 or later, hides all open windows and shows the Desktop.

F12

Open the Save as window in Microsoft Word.

Ctrl + F12 opens a document In Word.

Shift + F12 saves the Microsoft Word document (like Ctrl + S).

Ctrl + Shift + F12 prints a document in Microsoft Word.

Preview a page in Microsoft Expression Web.

Open Firebug or browser debug tool.

With an Apple running Mac OS 10.4 or later,

F12 shows or hides the Dashboard.

Access the list of bootable devices on a computer at startup, allowing you to select a different device to boot from (hard drive, CD or DVD drive, floppy drive, USB drive, and network).

4. a) What is the function of an input device? List various input devices. [L1][CO6][6M]

In computing, an input device is a piece of equipment used to provide data and control signals to an information processing system, such as a computer or information appliance.

Examples of input devices include keyboards, mouse, scanners, cameras, joysticks, and microphones.

Keyboard

A simple device comprising keys and each key denotes either an alphabet, number or number commands which can be given to a computer for various actions to be performed

It has a modified version of typewriter keys

The keyboard is an essential input device and computer and laptops both use keyboards to give commands to the computer

Mouse

It is also known as a pointing device

Using mouse we can directly click on the various icons present on the system and open up various files and programs

A mouse comprises 3 buttons on the top and one trackball at the bottom which helps in selecting and moving the mouse around, respectively

In case of laptops, the touchpad is given as a replacement of the mouse which helps in the movement of the mouse pointer

Joy Stick

It is a device which comprises a stick which is attached at an angle to the base so that it can be moved and controlled

Mostly used to control the movement in video games

Apart from a computer system, a joystick is also used in the cockpit of an aeroplane, wheelchairs, cranes, trucks, etc. to operate them well

Light Pen

It is a wand-like looking device which can directly be moved over the device's screen

It is light-sensitive

Used in conjunction with computer's cathode ray tube

Microphone

Using a microphone, sound can be stored in a device in its digital form

It converts sound into an electrical signal

To record or reproduce a sound created using a microphone, it needs to be connected with an amplifier

Scanner

This device can scan images or text and convert it into a digital signal

When we place any piece of a document on a scanner, it converts it into a digital signal and displays it on the computer screen

Barcode Reader

It is a kind of an optical scanner

It can read bar codes

A source of light is passed through a bar code, and its aspects and details are displayed on the screen

All the devices mentioned above are the most commonly used input devices. Several other such types of equipment are used in different fields which can be counted as an input device.

b) Explain in detail about the function of Key board and its function keys. [L2][CO6][6M]

Alt Key
A computer key that you press together with another key so that the other key does something different from what it usually does. You can also refer to this key simply as Alt.
Arrow Key
One of four computer keys marked with an up, down, left, or right arrow, used for moving the cursor.
Backspace
The key that you press on a keyboard to move one space backwards in a document.
Caps Lock
A key on a computer keyboard that makes all the keys produce capital letters.
Character Set
A complete set of letters, numbers, or symbols that can be used by a computer.
Command Key
On some computers, a key that you press together with another key to make the computer do a particular thing.
Control
The control key on a computer keyboard.
Control Key
A key on a computer keyboard that is used in combination with other keys for doing particular operations. This key is usually marked 'Ctrl'.
ctrl abbreviation control: the control key on a computer keyboard.
Delete Key
A computer key that removes characters. This key is sometimes simply referred to as del.
Enter Key
A key on a computer keyboard that makes the computer perform an action or start a new line of writing.
Escape
The escape key on a computer.

Escape Key
A key on a computer keyboard that allows someone to stop an action, leave a program, or return to a previous menu. This key is usually marked ‘Esc’.
Function Key
A special button on a computer keyboard that is used for a particular operation in a program. The keys near the top of a keyboard marked ‘F1’ to ‘F12’ are function keys.
Hot Key
A key on a computer keyboard that provides a short way of performing a set of actions
Key
One of the parts that you press on a keyboard to make it produce letters, numbers etc.
Keypad
The part at the side of a computer keyboard that has number keys and arrow keys on it.
Numeric Keypad
The part of a computer keyboard to the right of the main keys that has keys with numbers on them.
Num Lock
A computer key that you press to make the number keys below it enter numbers and not be used for moving up and down a document.
Pound Key
American the hash key on a telephone keypad or computer keyboard.
Return
A return key.
Return key
A key on a computer keyboard that makes the computer perform an action or start a new line of writing.
Shift
Computing a shift key on a computer keyboard.
Shift Key
The key that you press on a computer keyboard when you want to write a capital letter.
Short Cut
Computing a computer icon or a combination of keys on the keyboard such as ‘Alt + C’ that helps you to do something on the computer more quickly, for example go to a particular program or copy information.
Space Bar
The long narrow bar at the front of a computer keyboard that you press to make a space between words when you are typing.
Star key
The key with the asterisk symbol (*) on a telephone keypad or computer keyboard.
Tab
Computing a button on a computer keyboard or typewriter that you press to move several spaces along the same line.
Tab key
A tab on a computer keyboard.
Toggle
Computing a key or command (=instruction) on a computer that you use to move from one operation or

program to another and back again.

Touchpad

Computing a small flat surface on a laptop computer that you touch with your finger in order to move the cursor on the screen.

5. Discuss about Image and Video displays? [L2][CO6][6M]

Image:

An image is a visual representation of something while a digital image is a binary representation of visual data. These images can take the form of photographs, graphics and individual video frames. For this purpose, an image is a picture that was created or copied and stored in electronic form.

Video displays:

Displays – Small and Large

• The display has become the primary source of feedback to the user from the computer

The display has many important features, including:

• Physical dimensions (usually the diagonal dimension and depth)

• Resolution (the number of pixels available)

• Number of available colors, color correctness

• Luminance, contrast, and glare

• Power consumption

• Refresh rates (sufficient to allow animation and video)

• Cost

• Reliability

Usage characteristics distinguish displays:

• Portability

• Privacy

• Saliency

• Ubiquity

• Simultaneity Display technology

• Monochrome displays are adequate, and are attractive because of their lower cost

• RGB shadow-mask displays small dots of red, green, and blue phosphors packed closely

• Raster-scan cathode-ray tube(CRT)

electron beam sweeping out lines of dots to form letters refresh rates 30 to 70 per second

• Liquid-crystal displays(LCDs) voltage changes influence the polarization of tiny capsules of liquid

crystals

flicker-freesize of the capsules limits the resolution

• Plasma panel

rows of horizontal wires are slightly separated from vertical wires by small glass-enclosed capsules of neon-based gases

• Light-emitting diodes(LEDs)

certain diodes emit light when a voltage is applied arrays of these small diodes can be assembled to display characters

• Electronic ink

Paper like resolution

Tiny capsules with negatively and positively charged particles

• Braille displays

Pins provide output for the blind

• Large displays

Informational wall displays

Interactive wall displays

Multiple desktop displays

• Heads-up and helmet mounted displays

A heads-up display can, for instance, project information on a partially silvered widescreen of an airplane or car

A helmet/head mounted display (HMD) moves the image with the user 3D images

Mobile device displays

• Currently mobile devices used for brief tasks, except for game playing

• Optimize for repetitive tasks

• Custom designs to take advantage of every pixel

• Data Lens allows compact overviews

• Web browsing difficult

• Okay for linear reading, but making comparisons can be difficult

Animation, image, and video

• Accelerated graphics hardware

• More information shared and downloaded on the web

• Scanning of images and OCR

• Digital video

• CDROMS and DVDs

• Compression and decompression through MPEG

• Computer-based videoconferencing

Printers

• Important criteria for printers:

– Speed

– Print quality

– Cost

– Compactness

– Quiet operation

– Use of ordinary paper (fan folded or single sheet)

– Character set

– Variety of typefaces, fonts, and sizes

– Highlighting techniques (boldface, underscore, and soon)

– Support for special forms (printed forms, different lengths, and soon)

– Reliability

• dot-matrix printers

– print more than 200 characters per second, have multiple fonts, can print

boldface, use variable width and size, and have graphics capabilities

• inkjet printers

– offer quiet operation and high-quality output

• thermal printers or fax machines

– offer quiet, compact, and inexpensive output on specially coated papers

• laser printers

– operate at 30,000 lines per minute

• color printers

– allow users to produce hardcopy output of color graphics, usually by an inkjet

approach with three colored and black inks

• photographic printers

– allow the creation of 35-millimeter or larger slides (transparencies) and photographic prints.

6. Explain in brief about Digitization and generation? [L2][CO6][6M]

Digitization is the process of converting information into a digital format. In this format, information is organized into discrete units of data called bits that can be separately addressed, usually in multiple-bit groups called bytes.

This is the binary data that computers and many devices with computing capacity, such as digital cameras and digital hearing aids, can process.

Michaelis and Wiggins (1982) suggest that speech generation is "frequently preferable" under these circumstances:

• The message is simple.

• The message is short.

• The message will not be referred to later.

• The message deals with events in time.

• The message requires an immediate response.

• The visual channels of communication are overloaded.

• The environment is too brightly lit, too poorly lit, subject to severe vibration, or otherwise unsuitable for transmission of visual information.

• The user must be free to move around.

• The user is subjected to high G forces or anoxia

Audio tones, audiolization, and music

– Sound feedback can be important:

• to confirm actions

• offer warning

• for visually-impaired users

• music used to provide mood context, e.g. in games

• can provide unique opportunities for user, e.g. with simulating various musical instruments

7. Illustrate the following [L3][CO6][6M]

i) Indirect pointing devices

mouse

– the hand rests in a comfortable position, buttons on the mouse are easily pressed, even long motions can be rapid, and positioning can be precise

• trackball

– usually implemented as a rotating ball 1 to 6 inches in diameter that moves cursor

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– built-in near the keyboard offers the convenience and precision of a touch screen while keeping the user's hand off the display surface

• Human-factors variables

– speed of motion for short and long distances

– accuracy of positioning

– error rates

– learning time

– user satisfaction

• Other variables

– cost

– durability

– space requirements

– weight

– left- versus right-hand use

– likelihood to cause repetitive-strain injury

– compatibility with other systems

ii) Speech recognition

Speech recognition still does not match the fantasy of science fiction:

demands of user's working memory background noise problematic variations in user speech performance impacts effectiveness most useful in specific applications, such as to benefit handicapped

users

• Discrete word recognition

recognize individual words spoken by a specific person; can work with 90- to98- percent reliability for 20 to 200-wordvocabularies. Speaker-dependent training, in which the user repeats the full vocabulary once or twice Speaker-independent systems are beginning to be reliable enough for certain commercial applications been successful in enabling bedridden, paralyzed, or otherwise disabled people also useful in applications with at least one of the following conditions:

• speaker's hands are occupied

• mobility is required

• speaker's eyes are occupied

• harsh or cramped conditions preclude use of keyboard voice-controlled editor versus keyboard editor

• lower task-completion rate

• lower error rate use can disrupt problem solving

• Continuous

speech recognition

Not generally available:

• difficulty in recognizing boundaries between spoken words

• normal speech patterns blur boundaries

• many potentially useful applications if perfected

• Speech store and forward

Voice mail user scan

• receive messages

• replay messages

• reply to caller

• forward messages to other users, delete messages

• archive messages

• Systems are low cost and reliable.

• Voice information systems

– Stored speech commonly used to provide information about tourist sites, government services, after-hours messages for organizations

Low cost

Voice prompts

Deep and complex menus frustrating

Slow pace of voice output, ephemeral nature of speech, scanning and searching problems

Voicemail

Handheld voice recorders

Audio books

Instructional systems

iii) Display technology

Displays – Small and Large

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approach with three colored and black inks

• photographic printers

– allow the creation of 35-millimeter or larger slides (transparencies) and photographic prints

8. Explain in brief about Building tools? [L2][CO6][6M]

Part of the application built using the tool.

• Learning time

• Building time

• Methodology imposed or advised

• Communication with other subsystems

• Extensibility and modularity

The windowing system layer

– Sometimes working at a low-level is required.

– E.g., new platform

– The while(true) main loop

The GUI toolkit layer

Widgets, such as windows, scroll bars, pull-down or pop-up menu, etc.

Difficult to use without an interface

The application framework and specialized language layer

Application frameworks are based on object-oriented programming

– Can quickly build sophisticated interfaces

– Require intensive learning

Specialized language layers lighten the programming burden

– Tcl (and its toolkit Tk)

– Perl/Tk

– Python/Tk

– Visual Basic

– Java Script

Evaluation and Critiquing Tools

Tullis' Display Analysis Program, Version 4.0:

• Takes alphanumeric screen designs and produces display-complexity metrics plus some

advice:

– Upper-case letters: 77% The percentage of upper-case letters is high.

• Consider using more lower-case letters, since text printed in normal

upper- and lower-case letters is read about 13% faster than text in all upper case. Reserve all upper-case for items that need to attract attention.

– Maximum local density = 89.9% at row 9, column 8.

Average local density = 67.0%

• The area with the highest local density is identified...you can reduce local density by distributing the characters as evenly as feasible over the entire screen.

– Total layout complexity = 8.02 bits

Layout complexity is high.

• This means that the display items (labels and data) are not well aligned with each other...Horizontal complexity can be reduced by starting items in fewer different columns on the screen (that is, by aligning them vertically).

• Doctor HTML - Web Page Analyzer:

• Did not find the required open and close HEAD tag. You should open and close the HEAD tag in order to get consistent performance on all browsers.

– Found extra close STRONG tags in the document. Please remove them.

9. Discuss drivers in interaction devices? [L2][CO6][6M]

Several interactive devices are used for the human computer interaction. Some of them are known tools and some are recently developed or are a concept to be developed in the future. In this chapter, we will discuss on some new and old interactive devices.

Touch Screen

The touch screen concept was prophesized decades ago, however the platform was acquired recently. Today there are many devices that use touch screen. After vigilant selection of these devices, developers customize their touch screen experiences.

The cheapest and relatively easy way of manufacturing touch screens are the ones using electrodes and a voltage association. Other than the hardware differences, software alone can bring major differences from one touch device to another, even when the same hardware is used.

Along with the innovative designs and new hardware and software, touch screens are likely to grow in a big way in the future. A further development can be made by making a sync between the touch and other devices.

In HCI, touch screen can be considered as a new interactive device.

Gesture Recognition

Gesture recognition is a subject in language technology that has the objective of understanding human movement via mathematical procedures. Hand gesture recognition is currently the field of focus. This technology is future based.

This new technology magnitudes an advanced association between human and computer where no mechanical devices are used. This new interactive device might terminate the old devices like keyboards and is also heavy on new devices like touch screens.

Speech Recognition

The technology of transcribing spoken phrases into written text is Speech Recognition. Such technologies can be used in advanced control of many devices such as switching on and off the electrical appliances. Only certain commands are required to be recognized for a complete transcription. However, this cannot be beneficial for big vocabularies.

This HCI device help the user in hands free movement and keep the instruction based technology up to date with the users.

Keyboard

A keyboard can be considered as a primitive device known to all of us today. Keyboard uses an organization of keys/buttons that serves as a mechanical device for a computer. Each key in a keyboard corresponds to a single written symbol or character.

This is the most effective and ancient interactive device between man and machine that has given ideas to develop many more interactive devices as well as has made advancements in itself such as soft screen keyboards for computers and mobile phones.

Response Time

Response time is the time taken by a device to respond to a request. The request can be anything from a database query to loading a web page. The response time is the sum of the service time and wait time. Transmission time becomes a part of the response time when the response has to travel over a network.

In modern HCI devices, there are several applications installed and most of them function simultaneously or as per the user's usage. This makes a busier response time. All of that increase in the response time is caused by increase in the wait time. The wait time is due to the running of the requests and the queue of requests following it.

So, it is significant that the response time of a device is faster for which advanced processors are used in modern devices.

10.a)Write about the Borland J Builder interface building tool. [L1][CO6][6M]

Kodo JDO provides integration into JBuilder 7 and higher in the form of a JBuilderOpenTool. The integration features allow the JBuilder user to configure the Kodo runtime, edit .jdo metadata files (both as raw XML and via a specialized editor), automatically run the JDO Enhancer as part of the build process, and perform various schema manipulation tasks.

Installing Kodo into JBuilder

To install Kodo support in JBuilder, just copy all the .jar files from the lib/ directory of your Kodo installation to the lib/ext/ directory of JBuilder, and copy the lib/KodoJDO.library to JBuilder's lib/ directory. For example, if Kodo is installed in C:\development\kodo\ and JBuilder is installed in C:\JBuilder7\, then you would copy all the .jar files from C:\development\kodo\lib\ to C:\JBuilder7\lib\ext\, and then copy the C:\development\kodo\lib\KodoJDO.library file to C:\JBuilder7\lib\.

To validate the installation, you should start (or restart) JBuilder. You should see the Kodo logo in the build toolbar, which is used to configure the Kodo installation.

If you use the Windows Installer program to install Kodo, and you elected to perform the "Install KodoJBuilder extensions", then you do not need to perform the manually file copying or any other additional steps.

Warning

The KodoJBuilderOpenTool only works in JBuilder 7 and 8. It will not work in releases of JBuilder prior to version

Kodo Configuration from JBuilder

The Kodo configuration panel provides various options for configuring runtime usage of Kodo. Configuration options are saved in JBuilder'suser.properties, and will be automatically written out to a file named kodo.properties at the root of the project directory for runtime configuration operations. The current project's kodo.properties file can either be edited manually, or values can be modified in the "Project Configuration" tab of the Kodo Configuration dialog.

Creating and building JDO projects in JBuilder

When right-clicking on a .java in JBuilder, you will see an option to "Create Kodo JDO Metadata". This will create a default .jdo file for the selected .java file. The .jdo file that is created will then be edit-able in the JBuilder interface, either manually as an XML text file, or via the integrated metadata editor. For more details on JDO metadata, please see the Metadata section.

Creating and editing package.jdo metadata files for multiple classes is currently not supported in the JBuilder interface.

The JDO enhancer will be automatically run on any .class file that has an associated .jdo metadata file during the JBuilder build process. Furthermore, the .jdo file will be copied over to the output directory, so that it will be available at runtime.

Editing JDO Metadata from JBuilder

The .jdo metadata files can either be edited in JBuilder's native XML editor, or they can be modified using a dialog by selecting "Properties" from the context menu of the .jdo file in the JBuilder browser. The dialog contains entries for all of the standard JDO attributes, as well as Kodo-specific vendor extensions. See the section on JDO Metadata for more details about the various properties and their meanings.

Running the SchemaTool from JBuilder

The Schema Tool can be run from within JBuilder on one or more .jdo metadata files by selecting them in the JBuilder browser pane and selecting "Kodo JDO Database Schema Tool" from the context menu. The Schema Tool GUI allows users to perform all the operations of the command-line schema tool. See the Schema Manipulation for more details on the Schema Tool.

JBuilder Project Sample

An example JBuilder Swing project is available in the Kodo JDO installation, in the samples/swing/petshop directory. To run the sample, do the following:

Double-click the PetShop.jpx file in the samples/swing/petshop directory of your Kodo JDO installation. This will load the PetShop sample in JBuilder.

Build the project by selecting Make Project "PetShop.jpx" from the Project menu. This will also run the JDO enhancer on Animal.

Expand the <Project Source> item in the top left pane of the JBuilder display. This will expose the classes in the sample and the Animal.jdo metadata file.

Right-click on the Animal.jdofile in the top left pane, and select Kodo JDO Database Schema Tool from the menu. This will load the schema tool dialog.

Click on the Execute button at the bottom of the dialog, and then click OK. This will initialize the database with the appropriate table for the Animal class.

Right-click on the PetShop.java file in the top left pane, and select Run using defaults from the menu. This will run the Pet Shop example.

The Pet Shop example allows you to create and delete pets in a database. The pets have a string type -- dog, cat, giraffe, etc. -- and a price.

The Pet Shop example code demonstrates how to put together a simple Swing example, and also how to use a Kodo-specific feature to extend the PersistenceManager class to enable Swing updates to happen at the optimal time.

b) Discuss about Microsoft Visual Studio. [L2][CO6][6M]

Visual Studio is an Integrated Development Environment(IDE) developed by Microsoft to develop GUI(Graphical User Interface), console, Web applications, web apps, mobile apps, cloud, and web services, etc. With the help of this IDE, you can create managed code as well as native code. It uses the various platforms of Microsoft software development software like Windows store, Microsoft Silverlight, and Windows API, etc. It is not a language-specific IDE as you can use this to write code in C#, C++, VB(Visual Basic), Python, JavaScript, and many more languages. It provides support for 36 different programming languages. It is available for Windows as well as for macOS.

Evolution of Visual Studio: The first version of VS(Visual Studio) was released in 1997, named as Visual Studio 97 having version number 5.0. The latest version of Visual Studio is 15.0 which was released on March 7, 2017. It is also termed as Visual Studio 2017. The supported .Net Framework Versions in latest Visual Studio is 3.5 to 4.7. Java was supported in old versions of Visual Studio but in the latest version doesn't provide any support for Java language.

Visual Studio Editions

There are 3 editions of Microsoft Visual Studio as follows:

1. Community: It is a free version which is announced in 2014. All other editions are paid. This contains the features similar to Professional edition. Using this edition, any individual developer can develop their own free or paid apps like .Net applications, Web applications and many more. In an enterprise organization, this edition has some limitations. For example, if your organization have more than 250 PCs and having annual revenue greater than $1 Million(US Dollars) then you are not permitted to use this edition. In a non-enterprise organization, up to five users can use this edition. Its main purpose is to provide the Ecosystem(Access to thousands of extensions) and Languages(You can code in C#, VB, F#, C++, HTML, JavaScript, Python, etc.) support.

2. Professional: It is the commercial edition of Visual Studio. It comes in Visual Studio 2010 and later versions. It provides the support for XML and XSLT editing and includes the tool like Server Explorer and integration with Microsoft SQL Server. Microsoft provides a free trial of this edition and after the trial period, the user has to pay to continue using it. Its main purpose is to provide Flexibility(Professional developer tools for building any application type), Productivity(Powerful features such as CodeLens improve your team's

productivity), Collaboration(Agile project planning tools, charts, etc.) and Subscriber benefits like Microsoft software, plus Azure, Pluralsight, etc.

3. Enterprise: It is an integrated, end to end solution for teams of any size with the demanding quality and scale needs. Microsoft provides a 90-days free trial of this edition and after the trial period, the user has to pay to continue using it. The main benefit of this edition is that it is highly scalable and deliver high-quality software.

Getting Started with Visual Studio 2017

First, you have to download and install the Visual Studio. For that, you can refer to Downloading and Installing Visual Studio 2017. Don't forget to select the .NET core workload during the installation of VS 2017. If you forget then you have to modify the installation.

You can see a number of tool windows when you will open the Visual Studio and start writing your first program as follows:

Code Editor: Where the user will write code.

Output Window: Here the Visual Studio shows the outputs, compiler warnings, error messages and debugging information.

Solution Explorer: It shows the files on which the user is currently working.

Properties: It will give additional information and context about the selected parts of the current project.

A user can also add windows as per requirement by choosing them from View menu. In Visual Studio the tool windows are customizable as a user can add more windows, remove the existing open one or can move windows around to best suit.

Various Menus in Visual Studio: A user can find a lot of menus on the top screen of Visual Studio as shown below

Create, Open and save projects commands are contained by File menu.

Searching, Modifying, Refactoring code commands are contained by the Edit menu.

View Menu is used to open the additional tool windows in Visual Studio.

Project menu is used to add some files and dependencies in the project.

To change the settings, add functionality to Visual Studio via extensions, and access various Visual Studio tools can be used by using Tools menu.

The below menu is known as the toolbar which provide the quick access to the most frequently used commands. You can add and remove the commands by going to View → Customize

Support for different programming languages in Visual Studio is added by using a special VSPackage which is known as Language Service.

When you will install the Visual Studio then the functionality which is coded as VSPackage will be available as Service.

Visual Studio IDE provides the three different types of services known as SVsSolution, SVsUIShell, and SVsShell.

SVsSolution service is used to provide the functionality to enumerate solutions and projects in Visual Studio.

SVsUIShell service is used to provide User Interface functionality like toolbars, tabs etc.

SvsShell service is used to deal with the registration of VSPackages.