CBCS SCHEME

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18CS734

Seventh Semester B.E. Degree Examination, Feb./Mar. 2022
User Interface Design

Time: 3 hrs. Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Define User Interface? Explain the important benefits of a good design. **(08 Marks)**

b. Explain the concept of Direct and indirect manipulation. **(08 Marks)**

c. Write any four advantages and graphical system? **(04 Marks)**

OR

2 a. List and explain the characteristics of Graphical User Interface (GUI). **(08 Marks)**

b. Compare the characteristic of Graphical User Interface Versus Web User Interface. **(08 Marks)**

c. Discuss the general principles of User Interface Design [any 4]. **(04 Marks)**

Module-2

3 a. What are the common pitfalls identified in the design process? Explain the five commandments to eliminate the pitfalls in designing the Interface? **(08 Marks)**

b. Define the term Usability. List any 8 usability problems as defined by Model in graphical system. **(08 Marks)**

c. Explain briefly about human Interaction speeds. **(04 Marks)**

OR

4 a. Explain the techniques for determining the user requirements using Direct Methods. **(08 Marks)**

b. Explain the guidelines for designing the conceptual model. **(08 Marks)**

c. List the various design standards or guideline to be followed in user design to achieve consistency. **(04 Marks)**

Module-3

5 a. List out the major functions of menus. Explain the structure of menus with illustration. **(08 Marks)**

b. Explain the guidelines to be followed for formatting the menus. **(08 Marks)**

c. What are the elements of menu contents? Explain. **(04 Marks)**

OR

6 a. Describe the various guidelines to be followed in phrasing of menus during the development of system menus? **(08 Marks)**

b. Describe the components of Web navigation system with illustration. **(08 Marks)**

c. What are disadvantages of popup menus? **(04 Marks)**

Module-4

7 a. Explain the major components of windows. **(08 Marks)**

b. Discuss in brief, the different types of windows with an example. **(08 Marks)**

c. What are the different windows management schemes? Discuss any two schemes in detail. **(04 Marks)**

OR

8 a. List the characteristics of device based controls. Identify various device based control. **(08 Marks)**

b. Write a short note on :
   i) Trackball
   ii) Joystick **(08 Marks)**

c. Explain the general guidelines followed in designing of windows operations. **(04 Marks)**

Module-5

9 a. What are Operable Controls? Explain usage of buttons along with their advantages and disadvantages. **(10 Marks)**

b. Explain the following controls with an example
   i) Radio Buttons
   ii) Check Boxes
   iii) Tool Tips
   iv) Progress Indicators **(10 Marks)**

OR

10 a. Explain Slider and Tree view operable controls with advantage and disadvantages. **(10 Marks)**

b. Explain cognitive Walkthrough, Thick aloud Evaluation and Usability tests conducted in the User Interface Design. **(10 Marks)**

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Department of Information Science and Engineering

18CS734 – User Interface Design Feb / March 2022

VTU Question Paper – Scheme and Solution

Module 1

1. (a) Define user Interface? Explain the important benefit of a good design. (8m)

Solution : User interface design is a subset of a field of study called human-computer interaction (HCI). Human-computer interaction is the study, planning, and design of how people and computers work together so that a person's needs are satisfied in the most effective way.

Benefits of Good Design

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

(b) Explain the concept of direct and indirect manipulation (8m)

Concept of Direct Manipulation

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

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

Indirect Manipulation

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

(c) Write any four advantages of graphical system (4m)

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

- **Symbols recognized faster than text**: symbols can be recognized faster and more accurately than text. An example of a good classification scheme that speeds up recognition is the icons. These icons allow speedy recognition of the type of message being presented.
- **Faster learning**: a graphical, pictorial representation aids learning, and symbols can also be easily learned.
- **Faster use and problem solving**: Visual or spatial representation of information has been found to be easier to retain and manipulate and leads to faster and more successful problem solving.

  Easier remembering: Because of greater simplicity, it is easier for casual users to retain operational concepts.
- **More natural**: symbolic displays are more natural and advantageous because the human mind has a powerful image memory.
- **Fewer errors**: Reversibility of actions reduces error rates because it is always possible to undo the last step. Error messages are less frequently needed.
- **Increased feeling of control**: The user initiates actions and feels in control. This increases user confidence
- **Immediate feedback**: The results of actions furthering user goals can be seen immediately. If the response is not in the desired direction, the direction can be changed quickly.

2. (a) List and explain the characteristics of Graphical user Interface (8m)

Solution :

Sophisticated Visual Presentation

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

Pick-and-Click Interaction

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

Restricted Set of Interface Options

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

Visualization

- Visualization is a cognitive process that allows people to understand information that is difficult to perceive, because it is either too voluminous or too abstract.
- The goal is not necessarily to reproduce a realistic graphical image, but to produce one that conveys the most relevant information. Effective visualizations can facilitate mental insights, increase productivity, and foster faster and more accurate use of data.

Object Orientation

- A graphical system consists of objects and actions. Objects are what people see on the screen as a single unit.
- Objects can be composed of sub objects .For example, an object may be a document and its sub objects may be a paragraph, sentence, word, and letter.
- Objects are divided into three meaningful classes as Data objects, which present information, container objects to hold other objects and Device objects, represent physical objects in the real world.
- Objects can exist within the context of other objects, and one object may affect the way another object appears or behaves. These relationships are called collections, constraints, composites, and containers.
- **Properties or Attributes of Objects :** Properties are the unique characteristics of an object. Properties help to describe an object and can be changed by users.
- **Actions :** People take actions on objects. They manipulate objects in specific ways (commands) or modify the properties of objects (property or attribute specification).
- The following is a typical property/attribute specification sequence*:*
  - The user selects an object—for example, several words of text.
  - The user then selects an action to apply to that object, such as the action
  - BOLD.
  - The selected words are made bold and will remain bold until selected and changed again.

(b) Compare the characteristics of GUI versus Web User Interface (8m)

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

(c) Explain General Principles of GUI (4m)

Control

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

- Directness
  - Provide direct ways to accomplish tasks.
    - Available alternatives should be visible.
    - The effect of actions on objects should be visible.
- Efficiency
  - Minimize eye and hand movements, and other control actions.
    - Transitions between various system controls should flow easily and freely.
    - Navigation paths should be as short as possible.
    - Eye movement through a screen should be obvious and sequential.
  - Anticipate the user's wants and needs whenever possible.
- Familiarity
  - Employ familiar concepts and use a language that is familiar to the user.
  - Keep the interface natural, mimicking the user's behavior patterns.
  - Use real-world metaphors.
- Flexibility

- A system must be sensitive to the differing needs of its users, enabling a level and type of performance based upon:
    - Each user's knowledge and skills.
    - Each user's experience.
    - Each user's personal preference.
    - Each user's habits.
    - The conditions at that moment.

- Forgiveness
    - Tolerate and forgive common and unavoidable human errors.
    - Prevent errors from occurring whenever possible.
    - Protect against possible catastrophic errors.
- Predictability
    - The user should be able to anticipate the natural progression of each task.
        - Provide distinct and recognizable screen elements.

Module 2

3. (a) What are the common pitfalls identified in the design process? Explain the five commandments to eliminate the pitfalls in designing the interface? (8m)

Solution :

Gould (1988) has made these general observations about design:

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

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

Designing for People: The Five Commandments

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

Solicit early and ongoing user involvement: Involving the users in design from the beginning provides a direct conduit to the knowledge they possess about jobs, tasks, and needs. Involvement also allows the developer to confront a person's resistance to change, a common human trait. People dislike change for a variety of reasons, among them fear of the unknown and lack of identification with the system.

- Perform rapid prototyping and testing: Prototyping and testing the product will quickly identify problems and allow you to develop solutions. Prototyping and testing must be continually performed during all stages of development to uncover all potential defects. If thorough testing is not performed before product release, the testing will occur in the user's office. Encountering a series of problems early in system use will create a negative first impression in the customer's mind, and this may harden quickly, creating attitudes that may be difficult to change. It is also much harder and more costly to fix a product after its release.
- Modify and iterate the design as much as necessary: While design will proceed through a series of stages, problems detected in one stage may force the developer to revisit a previous stage.. Establish user performance and acceptance criteria and continue testing and modifying until all design goals are met.
- Integrate the design of all the system components: The software, the documentation, the help function, and training needs are all important elements of a graphical system or Web site and all should be developed concurrently. Time will also exist for design trade-offs to be thought out more carefully.

(b) Define the term usability. List any 8 usability problems as defined by model in graphical system.

Usability

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

  easily = to a specified level of subjective assessment,

  effectively = to a specified level of human performance."

Common Usability Problems

- Mandel (1994) lists the 10 most common usability problems in graphical systems as reported by IBM usability specialists. They are:

  1. Ambiguous menus and icons.
  2. Languages that permit only single-direction movement through a system.
  3. Input and direct manipulation limits.
  4. Highlighting and selection limitations.
  5. Unclear step sequences
  6. More steps to manage the interface than to perform tasks.
  7. Complex linkage between and within applications.
  8. Inadequate feedback and confirmation.
  9. Lack of system anticipation and intelligence.
  10. Inadequate error messages, help, tutorials, and documentation.

(c) Explain about human interaction speeds.

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

Reading

Prose text:	250–300 words per minute.
Proofreading text on paper:	200 words per minute.
Proofreading text on a monitor:	180 words per minute.

Listening: 150–160 words per minute.

Speaking to a computer: 105 words per minute.

After recognition corrections: 25 words per minute.

Computer

Transcription: 33 words per minute.

Composition: 19 words per minute.

Two finger typists

Memorized text: 37 words per minute.

Copying text: 27 words per minute.

Hand printing

Memorized text: 31 words per minute.

Copying text: 22 words per minute.

4. (a) Explain the techniques for determining the user requirements using Direct methods.

Solution :

Individual Face-to-Face Interview

- A one-on-one visit with the user to obtain information. It may be structured or somewhat open-ended.
- A formal questionnaire should not be used, however. Useful topics to ask the user to describe in an interview include:
- The activities performed in completing a task or achieving a goal or objective.
- The methods used to perform an activity.
- What interactions exist with other people or systems?
- It is also very useful to also uncover any:
    - Potential measures of system usability
    - Unmentioned exceptions to standard policies or procedures.
    - Relevant knowledge the user must possess to perform the activity.

Telephone Interview or Survey

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

Traditional Focus Group

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

participates.

- Allow the moderator flexibility in using the script.
- Take good notes, using the session recording for backup and clarification

Facilitated Team Workshop

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

Observational Field Study

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

Requirements Prototyping

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

User-Interface Prototyping

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

Usability Laboratory Testing

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

(b) Explain the guidelines for designing the conceptual model

Guidelines for Designing Conceptual Models

- **Reflect the user's mental model not the designer's:** A user will have different expectations and levels of knowledge than the designer. So, the mental models of the user and designer will be different. The user is concerned with the task to be performed, the business objectives that must be fulfilled.
- **Draw physical analogies or present metaphors:** Replicate what is familiar and well known. Duplicate actions that are already well learned. A metaphor, to be effective, must be widely applicable within an interface.
- **Comply with expectancies, habits, routines, and stereotypes:** Use familiar associations, avoiding the new and unfamiliar. With color, for example, accepted meanings for red, yellow, and green are already well established. Use words and symbols in their customary ways.
- **Provide action-response compatibility:** All system responses should be compatible with the actions that elicit them. Names of commands, for example, should reflect the actions that will occur.

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

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

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

Provide design consistency: Design consistency reduces the number of concepts to be learned. Inconsistency requires the mastery of multiple models. If an occasional inconsistency cannot be avoided, explain it to the user.

- **Provide documentation and a help system that will reinforce the conceptual model:** Do not rely on the people to uncover consistencies and metaphors themselves. The help system should offer advice aimed at improving mental models.

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

(c) What are the elements of menu contents? Explain

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

Menu Context

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

Menu Title

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

Choice Descriptions

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

Completion Instructions

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

Module 3

5. (a) List out the major functions of menus. Explain the structure of menus with illustration.

Solution :

Functions of Menus

- a menu can be used to perform several functions, to navigate to a new menu, to execute an action or procedure, to display information, or to input data or parameters

Navigation to a New Menu

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

Execute an Action or Procedure

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

Displaying Information

- The main purpose of selecting a menu choice may simply be to display information.
- The user may be searching for specific information in a database or browsing the Web. The content material and the user's interests will determine the paths followed.

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.

(b) Explain the guidelines to be followed for formatting the menus

Formatting of Menus

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

Consistency

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

Display

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

Presentation

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

Organization

- Provide a general or main menu.
- Display:
  - All relevant alternatives.
  - Only relevant alternatives.
    - Delete or gray-out inactive choices.
- Match the menu structure to the structure of the task.
  - Organization should reflect the most efficient sequence of steps to accomplish a person's most frequent or most likely goals.
- Minimize number of menu levels within limits of clarity.
  - For Web sites, restrict it to two levels (requiring two mouse clicks) for fastest performance.
- Easier hiding of inappropriate choices.
- Less likelihood of confusing similar choices since there is less likelihood that they will be seen together.
- Greater depth disadvantages are:
- More steps and longer time to reach one's objective.
- More difficulties in learning since relationships between elements cannot always be seen.
- More difficulties in predicting what lies below, resulting in increased likelihood of going down wrong paths or getting lost.

- Higher error rates.

Complexity

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

Item Arrangement

- Align alternatives or choices into single columns whenever possible.
  - Orient for top-to-bottom reading.
  - Left-justify descriptions.

(c) What are the elements of menu contents? Explain

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

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6. **(a) Describe the various guidelines to be followed in phrasing of menus during the development of system menus? Phrasing the Menu**

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

Menu Titles

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

Menu Choice Descriptions

- Create meaningful choice descriptions that are familiar, fully spelled out, concise, and distinctive.
- Descriptions may be single words, compound words, or multiple words or phrases.
  - Exception: Menu bar items should be a single word (if possible).
- Place the keyword first, usually a verb.
- Use the headline style, capitalizing the first letter of each significant word in the choice description.

Menu Instructions

- For novice or inexperienced users, provide menu completion instructions.
  - Place the instructions in a position just preceding the part, or parts, of the menu to which they apply.
    - Left-justify the instruction and indent the related menu choice descriptions a minimum of three spaces to the right.
    - Leave a space line, if possible, between the instructions and the related menu choice descriptions.
  - Present instructions in a mixed-case font in sentence style.

- For expert users, make these instructions easy to ignore by:

  — Presenting them in a consistent location.

  — Displaying them in a unique type style and/or color.

Intent Indicators

- Cascade indicator:

  — To indicate that selection of an item will lead to a submenu, place a triangle or right-pointing solid arrow following the choice.

  — A cascade indicator must designate every cascaded menu.

- To a window indicator:

  — For choices that result in displaying a window to collect more information, place an ellipsis (. . .) immediately following the choice.

    • Exceptions—do not use when an action:

      – Causes a warning window to be displayed.

      – May or may not lead to a window.

- Direct action items:

  — For choices that directly perform an action, no special indicator should be placed on the menu.

(b) Describe the components of web navigation system with illustration.

Following are some of the important components required for a good web site navigation.

1. Scrolling:

- Do not require scrolling of navigation-only pages.
- Minimize the need for scrolling to view all links on pages containing content.
- Never require horizontal scrolling.

2. Number of Links:

- One link: At a minimum, every page should contain at least one link. To follow a path and then reach a dead end
- Conservative number: A smaller number of links also increases the likelihood that those being looked for will be noticed. It is not necessary to mention all features of a site on all pages. To reduce the number of links, restrict those presented to the most important site content or useful features.
- Embedded links: Embedded links can be a distraction and reduce page readability, especially if used in abundance. They may also be overlooked in text scanning, especially if the scanning is not carefully done. The best trade-off is to incorporate embedded links in moderation.

3. Presenting Links:

■ Link text:

— Underline all link text, including that:

- Embedded in page content.
- Contained in explicit menu listings.
- Contained in headings.
- Used as graphical labels.

— Distinguish between unselected/unvisited links and selected/visited links.

- Make unselected/unvisited links blue.
- Make selected/visited links purple.

Kinds of links:

— Distinguish links leading to different Web destinations through a differentiating symbol:

- Precede links to content within the same page with a pound sign (#).

– For links moving downward in the page, use: #The principles of design.

– For links moving upward in the page use: #^ Principles introduction.

- Precede links to external or foreign sites with another unique symbol such as an asterisk (*): * Additional information.
- Do not precede links to other site pages with any symbol:

– More principles of design.

— Also distinguish links leading to different Web destinations by presenting them in consistent locations.

■ Graphical links:

— Distinguish graphical links from decorative graphics through:

- Underlining graphical text labels.

■ Links in toolbars:

— Distinguish links contained in toolbars through:

- Presenting in consistent locations.
- Using different colored backgrounds.

Kinds of Links:

■ Within a page:

— For long pages, include links to internal page content.

■ Within a Web site:

— On all pages include links to:

- The Web site home page.
- Global Web site features.
- Other main pages, navigation points, or categories.
- The likely Web site starting point.
- Main pages with links to the page.

— On sequential pages, include links to the:

- Next page.
- Previous page.

— Also consider including links to:

- Places of related interest.
- Important pages.

(c) What are the disadvantages of popup menus?

Advantages:

— Unlimited number of choices.

— Reminds users of available options.

— Conserves screen space.

- Disadvantages:
  - — Requires an extra action to display the list of choices.
  - — When displayed, all choices may not always be visible, requiring scrolling.
  - — The list may be ordered in an unpredictable way, making it hard to find items.

Module 4

7. (a) Explain the major components of windows.

Frame

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

Title Bar

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

Window Sizing Buttons

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

What's This? Button

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

Menu Bar

- A menu bar is used to organize and provide access to actions. It is located horizontally at the top of the window, just below the title bar.

Status Bar

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

Scroll Bars

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

Split Box

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

Toolbar

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

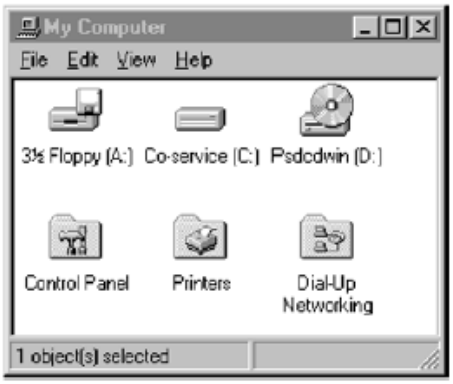
Command Area

- In situations where it is useful for a command to be typed into a screen, a command area can be provided.

The desired location of the command area is at the bottom of the window

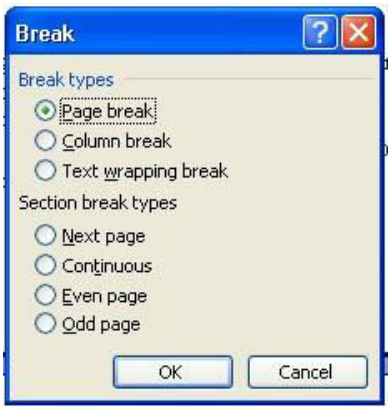
(b) Discuss in brief, the different types of windows with an example

Primary Window



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

Secondary Windows



- Proper usage:
  - For performing subordinate, supplemental, or ancillary actions that are:
    - Extended or more complex in nature.
    - Related to objects in the primary window.
  - For presenting frequently or occasionally used window components.
- Important guidelines:
  - Should typically not appear as an entry on the taskbar.

- A secondary window should not be larger than 263 dialog units x 263 dialog units.

- A *dependent* secondary window is one common type. It can only be displayed from a command on the interface of its primary window. It is typically associated with a single data object, and appears on top of the active window when requested. It is movable, and scrollable.
- An *independent* secondary window can be opened independently of a primary window—for example, a property sheet displayed when the user clicks the Properties command on the menu of a desktop icon.

Modal and Modeless

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

Cascading and Unfolding

- Cascading:
  - Purpose:
    - To provide advanced options at a lower level in a complex dialog.
  - Guidelines:
    - Provide a command button leading to the next dialog box with a "To 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.

(c) What are the different window management schemes ? Discuss any two in detail

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

Single-Document Interface

- Description:

  — A single primary window with a set of secondary windows.

- Proper usage:

  — Where object and window have a simple, one-to-one relationship.

— Where the object's primary presentation or use is as a single unit

Multiple-Document Interface

- Description:

  — A technique for managing a set of windows where documents are opened into windows.

Workbooks

- Description:

  — A window or task management technique that consists of a set of views organized like a tabbed notebook.

  — It is based upon the metaphor of a book or notebook.

  — Views of objects are presented as sections within the workbook's primary windows; child windows do not exist.

  — Each section represents a view of data.

  — Tabs can be included and used to navigate between sections.

  — Otherwise, its characteristics and behavior are similar to those of the multiple document interface with all child windows maximized.

Projects

- Description:

  — A technique that consists of a container: a project window holding a set of objects.

  — The objects being held within the project window can be opened in primary windows that are peers with the project window.

  — Visual containment of the peer windows within the project window is not necessary.

  — Each opened peer window must possess its own menu bar and other interface elements.

8. (a) List the characteristics of device based controls. Identify various device based control
(b) Write a short note on track ball and Joystick

Characteristics of Device-Based Controls

Several specific tasks are performed using graphical systems.

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

Trackball

- Description:

  — A spherical object (ball) that rotates freely in all directions in its socket.

  — Direction and speed is tracked and translated into cursor movement.

- Advantages:

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

  — Does not obscure vision of screen.

  — Does not require additional desk space (if mounted on keyboard).

- Disadvantages:

  — Movement is indirect, in a plane different from the screen.

  — No direct relationship exists between hand and pointer movement in terms of distance.

Joystick

- Description:
  - — A stick or bat-shaped device anchored at the bottom.
  - — Variable in size, smaller ones being operated by fingers, larger ones requiring the whole hand.
  - — Variable in cursor direction movement method, force joysticks respond to pressure, movable ones respond to movement.
  - — Variable in degree of movement allowed, from horizontal-vertical only to continuous.
- Advantages:

  — Direct relationship between hand and pointer movement in terms of direction.

  — Does not obscure vision of screen.

  — Does not require additional desk space (if mounted on keyboard).

- Disadvantages:
  - — Movement indirect, in plane different from screen.
  - — Indirect relationship between hand and pointer in terms of speed and distance.

Graphic Tablet

- Description:
  - — Pressure-, heat-, light-, or light-blockage-sensitive horizontal surfaces that lie on the desktop or keyboard.
  - — May be operated with fingers, light pen, or objects like a stylus or pencil.
  - — Pointer imitates movements on tablet.
- Advantages:
  - — Direct relationship between touch movements and pointer movements in terms of direction, distance, and speed.
  - — More comfortable horizontal operating plane.
  - — Does not obscure vision of screen.

(c) Explain the general guidelines followed in designing of window operations.

General Guidelines

- Design easy to use and learn windowing operations.
  - — Direct manipulation seems to be a faster and more intuitive interaction

Minimize the number of window operations necessary to achieve a desired effect.

- Make navigating between windows particularly easy and efficient to do.
- Make the setting up of windows particularly easy to remember.
- In overlapping systems, provide powerful commands for arranging windows on the screen in user-tailorable configurations.

Opening a Window

- Provide an iconic representation or textual list of available windows.
  - — If opening with an expansion of an icon, animate the icon expansion.
- When opening a window:
  - — Position the opening window in the most forward plane of the screen.

— Adapt the window to the size and shape of the monitor on which it will be presented.

— Designate it as the active window.

— Set it off against a neutral background.

— Ensure that its title bar is visible.

- When a primary window is opened or restored, position it on top.

  — Restore all secondary windows to the states that existed when the primary window was closed.

- When a dependent secondary window is opened, position it on top of its associated primary window.

  — Position a secondary window with peer windows on top of its peers.

  — Present layered or cascaded windows with any related peer secondary windows.

- When a dependent secondary window is activated, its primary window and related peer windows should also be positioned at the top.

- If more than one object is selected and opened, display each object in a separate window.

Sizing Windows

- Provide large-enough windows to:

  — Present all relevant and expected information for the task.

  — Avoid hiding important information.

  — Avoid crowding or visual confusion.

  — Minimize the need for scrolling.

    • But use less than the full size of the entire screen.

Window Placement

- Considerations:
  - In placing a window on the display, consider:
    - The use of the window.
    - The overall display dimensions.
    - The reason for the window's appearance.
- General:
  - Position the window so it is entirely visible.
  - If the window is being restored, place the window where it last appeared.
  - If the window is new, and a location has not yet been established, place it:
    - At the point of the viewer's attention, usually the location of the pointer or cursor.
    - In a position convenient to navigate to.

- So that it is not obscuring important or related underlying window information.

Window Separation

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

Moving a Window

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

Resizing a Window

- Permit the user to change the size of primary windows.
  - Unless the information displayed in the window is fixed or cannot be scaled to provide more information.
- Change the pointer shape to indicate that the resizing selection is successful.
- The simplest operation is to anchor the upper-left corner and resize from the lower right corner.
  - Also permit resizing from any point on the window.
- Show the changing window as the pointer moves.
  - If it is impossible to show the entire window being resized, show the window's outline while leaving the window displayed in its original position.
- When window size changes and content remains the same:
  - Change image size proportionally as window size changes.

Module 5

9. What are operable controls? Explain usage of buttons along with their advantages and disadvantages.

Operate Controls

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

Buttons

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

Advantages

- Convenient.
- Can be logically organized in the work area.
- Can provide meaningful descriptions of the actions that will be performed.
- Larger size generally provides faster selection target.
- Can possess 3-D appearance:
  - Adds an aesthetically pleasing style to the screen.
  - Provides visual feedback through button movement when activated.
- May permit use of keyboard equivalents and accelerators.
- Faster than using a two-step menu bar/pull-down sequence.

Disadvantages:

- Consumes screen space.
- Size limits the number that may be displayed.
- Requires looking away from main working area to activate.
- Requires moving the pointer to select.

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.

Labels

- Use standard button labels when available.
- Provide meaningful descriptions of the actions that will be performed.
- Use single-word labels whenever possible.
  - — Use two-three words for clarity, if necessary.
- Use mixed-case letters with the first letter of each significant label word capitalized.
- Display labels:
  - — In the regular system font.
  - — In the same size font.

(b) Explain the following controls with an example

(i) Radio buttons

(ii) Check box

(iii) Tool Tips

(iv) Progress Indicators

Solution :

Radio Buttons

- Description:
  - — A two-part control consisting of the following:
    - Small circles, diamonds, or rectangles.
    - Choice descriptions.
  - — When a choice is selected:
    - The option is highlighted.
    - Any existing choice is automatically unhighlighted and deselected.
- Purpose:
  - — To set one item from a small set of mutually exclusive options (2 to 8).
- Advantages:
  - — Easy-to-access choices.
  - — Easy-to-compare choices.
  - — Preferred by users.
- Disadvantages:
  - — Consume screen space.
  - — Limited number of choices.

- Proper usage:
  - — For setting attributes, properties, or values.
  - — For mutually exclusive choices (that is, only one can be selected).
  - — Where adequate screen space is available.
  - — Most useful for data and choices that are:
    - Discrete.
    - Small and fixed in number.

Check Boxes

Description:

- A two-part control consisting of a square box and choice description.
- Each option acts as a switch and can be either “on” or “off.”
- When an option is selected (on), a mark such as an “X” or “check” appears within the square box, or the box is highlighted in some other manner.
- Otherwise the square box is unselected or empty (off).
- Each box can be:
- Switched on or off independently.
- Used alone or grouped in sets.
  - Purpose:
    - — To set one or more options as either on or off.
  - Advantages
    - — Easy-to-access choices.
    - — Easy-to-compare choices.
    - — Preferred by users.
  - Disadvantages:
    - — Consume screen space.
    - — Limited number of choices.
    - — Single check boxes difficult to align with other screen controls.
  - Proper usage:
    - — For setting attributes, properties, or values.
    - — For nonexclusive choices (that is, more than one can be selected).
    - — Where adequate screen space is available.
    - — Most useful for data and choices that are:

ToolTips

Description :

— A small pop-up window containing descriptive text that appears when a pointer is moved over a control or element either:

- Not possessing a label.
- In need of additional descriptive or status information.

- Purpose:

  — To provide descriptive information about a control or screen element.

- Advantages:

  — Identifies an otherwise unidentified control.

  — Reduces possible screen clutter caused by control captions and descriptive information.

  — Enables control size to be reduced.

- Disadvantages:

  — Not obvious, must be discovered.

  — Inadvertent appearance can be distracting.

- Proper usage:

  — To identify a control that has no caption.

  — To provide additional descriptive or status information about a screen element.

Progress Indicators

- Description:

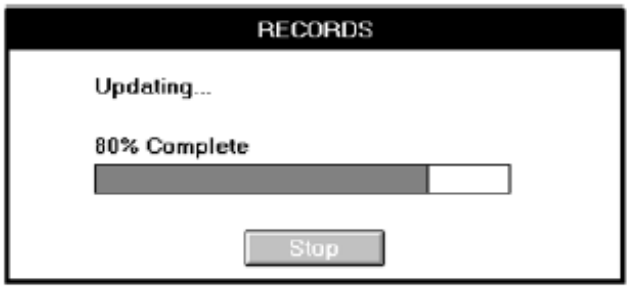
  — A rectangular bar that fills as a process is being performed, indicating the percentage of the process that has been completed.

- Purpose:

  — To provide feedback concerning the completion of a lengthy operation.

- Proper usage:

  — To provide an indication of the proportion of a process completed.



Progress Indicator Guidelines

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

10. (a) Explain slider and Tree View operable controls with advantage and disadvantage.

Solution :

Slider

- Description:

  — A scale exhibiting degrees of a quality on a continuum.

  — Includes the following:

    • A shaft or bar.

    • A range of values with appropriate labels.

    • Optionally, a pair of buttons to permit incremental movement of the slider arm.

    • Optionally, a text box for typing or displaying an exact value.

    • Optionally, a detent position for special values.

  — May be oriented vertically or horizontally.

  — Selected by using the mouse to:

    • Drag a slider across the scale until the desired value is reached.

    • Point at the buttons at one end of the scale and clicking to change the value.

    • Keying a value in the associated text box.

- Purpose:

  — To make a setting when a continuous qualitative adjustment is acceptable, it is useful to see the current value relative to the range of possible values.

- Advantages:

  — Spatial representation of relative setting.

  — Visually distinctive.

- Disadvantages:

  — Not as precise as an alphanumeric indication.

  — Consumes screen space.

  — Usually more complex than other controls.

- Proper usage:

  — To set an attribute.

— For mutually exclusive choices.

— When an object has a limited range of possible settings.

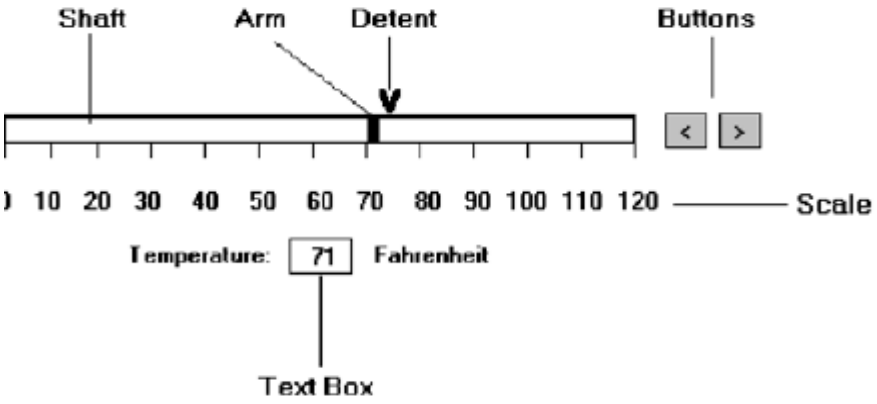
— When the range of values is continuous.

— When graduations are relatively fine.

— When the choices can increase or decrease in some well-known, predictable, and easily understood way.

— When a spatial representation enhances comprehension and interpretation.

— When using a slider provides sufficient accuracy.



Tree View

- Description:

  — A special list box control that displays a set of objects as an indented outline, based on the objects' logical hierarchical relationship.

  — Includes, optionally, buttons that expand and collapse the outline.

    • A button inscribed with a plus (+) expands the outline.

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

  — Elements that can optionally be displayed are:

    • Icons.

    • Graphics, such as a check box.

    • Lines to illustrate hierarchical relationships.

- Purpose and proper usage:

— To display a set of objects as an indented outline to illustrate their logical hierarchical relationship.

(b) Explain Cognitive walkthrough, thick aloud evaluation and usability tests conducted in the user interface design.

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.