Scheme of Evaluation
Internal Assessment Test 1 – October 2024

Sub:	User interface design							**Code:**	21IS733
Date**:**	/10/2024	Duration:	90 mins	Max Marks:	50	**Sem:**	VII	**Branch:**	ISE

Note: Answer Any five full questions.

Question #		**Description**	**Marks Distribution**		**Max Marks**
1	a	Define User Interface Design with example. Explain its importance and describe good design benefits. Definition UID Importance of good design Design benefits	 2M 2M 2M	6M	10M
1	b	Explain the concept of direct manipulation for graphical system. Direct manipulation characteristics	1M*4	4M	
2	a	Define GUI. Write the differentness between GUI and webpage design. Definition GUI Any 5 differences	1M 1M*5	6M	10M
2	b	List and discuss the characteristics of graphical user interface in detail. Any 4 characteristics	1M*4	4M	
3	a	List and explain the advantages and disadvantages of graphical system Any 3 advantages Any 3 disadvantages	1M*3 1M*3	6M	10M

3	b	Differentiate the characteristics of intranet and internet. Any 4 differences	1M*4	4M	
4		Human are complex organism with variety of attributes that have an important influence on interface and screen design". Analyze and explain. Any 10 important human characteristics	1M*10	10	10
5		Discuss the general principles of User Interface Design. Any 10 principles	1M*10	10	10
6		Define obstacles and pitfalls. Mention the general observation of design and common pitfalls and also explain five commandments used in designing. Definition obstacles and pitfalls general observation of design general observation of design five commandments used in designing.	 1M 2M 2M 5M	10	10

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Note: Answer Any full five questions

Q. 1 Define User Interface Design with example. Explain its importance and describe good design benefits.

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

The user interface is the part of a computer and its software that people can see, hear, touch, talk to, or otherwise understand or direct. User interface **has 2 components: Input, Output**. Input is how a person communicates his or her needs or desires to the computer. Ex. Keybord,mouse. Output is how the computer conveys its results of its computations and requirements to the user. Ex. Display screen.

Importance of good design:

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:

1. We don't care?
2. We don't possess common sense?
3. We don't have the time?
4. We still don't know what really makes good design?

A well-designed interface and screen is terribly important to our users. It is their window to view the capabilities of the system. To many, *it is* the system, being one of the few visible components of the product we developers create. 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.

Benefits of good design:

- Training costs are lowered because training time is reduced.
- Support line costs are lowered because fewer assist calls are necessary.
- Employee satisfaction is increased because aggravation and frustration are reduced.
- Customers benefit because of the improved service they receive.

Based on an actual system requiring processing of 4.8 million screens per year and illustrated in
Table 1.1

Table 1.1 Impact of Inefficient Screen Design on Processing Time

ADDITIONAL SECONDS REQUIRED PER SCREEN IN SECONDS	ADDITIONAL PERSON-YEARS REQUIRED TO PROCESS 4.8 MILLION SCREENS PER YEAR
1	.7
5	3.6
10	7.1
20	14.2

Studies have also shown that the proper formatting of information on screens does have a significant positive effect on performance. The benefits of a well-designed screen have also been under experimental scrutiny.

A general rule of thumb: every dollar invested in usability returns $10 to $100 (IBM, 2001).

Q. 1 b) Explain the concept of direct manipulation for graphical system.

The Concept of Direct Manipulation

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, among which are 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.

Continuous visibility of objects and actions : Like one's desktop, objects are continuously visible. Reminders of actions to be performed are also obvious, labeled buttons replacing complex syntax and command names. Cursor action and motion occurs in physically obvious and intuitively natural ways.

Actions are rapid and incremental with visible display of results : Since tactile feedback is not yet possible (as would occur with one's hand when one touches something), 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.

Q. 2 a) Define GUI. Write the differentness between GUI and webpage design.

GUI versus Web Page Design

GUI and Web interface design are similar. Both are software designs, they are used by people, they are interactive, they are heavily visual experiences presented through screens, and they are composed of many similar components. Significant differences do exist, however. The following paragraphs highlight the most significant differences. Table 2.2 provides a summary listing. Parts of this discussion are based upon Berry (2000) and Nielsen (1997a).

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

GUI versus Web Design

Characteristics	GUI	WEB
Devices	User hardware variations limited. User hardware characteristics well defined Screens appear exactly as specified.	User hardware variations enormous. Screen appearance influenced by hardware being used.
User Focus	Data and applications.	Information and navigation.
Data	Typically created and used by known and trusted	Full of unknown content.
Information	Sources are trusted. Properties generally known. Typically placed into system by users or known people and organizations.	Source not always trusted. Often not placed onto the Web by users or known people and organizations.
User Tasks	Install, configure, personalize, start, use, and Open, use, and close data files. Familiarity with applications often achieved.	Link to a site, browse or read pages, fill out forms, upgrade programs. register for services, participate in transactions, download and save things.
Presentation	Windows, menus, controls, data, toolbars Presented as specified by designer. Generally standardized by toolkits and style specifications. guides.	Two components, browser and page. Within page, any combination of text, images, audio, video, and animation. May not be presented as specified by the designer—dependent on browser, monitor, and user Little standardization.
Navigation	Through menus, lists, trees, dialogs, and wizards.	Through links, bookmarks, and typed URLs.
Interaction	Interactions such as clicking menu choices, pressing buttons, selecting list choices, and cut/copy/paste occur within context of active program.	Basic interaction is a single click. This can cause extreme changes in context, which may not be noticed.
Response Time	Nearly instantaneous	Quite variable, depending on transmission speeds, page content, and so on. Long times can upset the user.
System Capability	Unlimited capability proportional to sophistication of hardware and software.	Limited by constraints imposed by the hardware, browser, software, client support, and user willingness to allow features because of response time, security, and privacy concerns.
Task Efficiency	Targeted to a specific audience with specific tasks. Only limited by the amount of programming undertaken to support it.	Limited by browser and network capabilities. Actual user audience usually not well understood. Often intended for anyone and everyone.

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

Q. 2 b) List and discuss the characteristics of graphical user interface in detail.

1. Sophisticated Visual Presentation
2. Pick-and-Click Interaction
3. Restricted Set of Interface Options
4. Visualization
5. Object Orientation
6. Use of Recognition Memory
7. Concurrent Performance of Functions

1. 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 photographs 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, pulldown, pop-up, cascading
- icons - represent objects such as programs or files

 Assorted screen-based controls - text boxes, list boxes, combination boxes, settings, scroll bars, and buttons
 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.

2. Pick-and-click interaction:
To identify the element for 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. The user moves the mouse pointer to the relevant element (pick) and the action is signaled (click).
 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.

3. **A restricted set of interface options:**
The array of alternatives available to the user is what is presented on the screen or what may be retrieved through what is presented on the screen, nothing less, nothing more. This concept fostered the acronym WYSIWYG.
4. 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**. It involves changing an entity's representation to reveal gradually the structure and/or function of the underlying system or process. 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 realistic graphical image, but to produce one that conveys the most relevant information. **Effective visualizations can facilitate mental insights, increase productivity and more accurate use of data.**

5. Object orientation:
A graphical system consists of **objects and actions**. *Objects* are what people see on the screen.Objects can be composed of *subobjects.*
A) IBM's Common User Access application breaks objects into three meaningful classes:
1.Data
2.Container
3.device.
Data objects present information. This information, either text or graphics, normally appears in the body of the screen. It is, essentially, the screen-based controls for information collection or presentation organized on the screen.
Container objects are objects to hold other objects. They are used to group two or more related objects for easy access and retrieval. There are three kinds of container objects:
 Workplace
 Folders
 Workareas.
The *workplace* is the desktop, the storage area for all objects. *Folders* are general-purpose containers for long-term storage of objects. *Workareas* are temporary storage folders used for storing multiple objects currently being worked on.
Device objects represent physical objects in the real world, such as printers or trash baskets. These objects may contain others for acting upon. A file, for example, may be placed in a printer for printing of its contents.
B) Microsoft Windows specifies the characteristics of objects depending upon the

relationships that exist between them.These relationships are called collections, constraints, composites, and containers.
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.
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.

 Properties or Attributes of Objects

Properties help to describe an object and can be changed by users. Examples of properties are text styles (such as normal or italics), font sizes (such as 10 or 12 points), or window background colors (such as black or blue).

 Actions

Commands are actions that manipulate objects. They may be performed in a variety of ways, including by direct manipulation or through a command button. They are executed immediately when selected. Once executed, they cease to be relevant. Examples of commands are opening a document, printing a document, closing a window, and quitting an application.
Property/attribute specification actions establish or modify the attributes or properties of objects. When selected, they remain in effect until deselected. Examples include selecting cascaded windows to be displayed, a particular font style, or a particular color.
The following is a typical *property/attribute specification sequence:*
1. The user selects an object—for example, several words of text.
2. The user then selects an action to apply to that object, such as the action BOLD.
3. The selected words are made bold and will remain bold until selected and changed again.
A series of actions may be performed on a selected object. Performing a series of actions on an object also permits and encourages system learning through exploration.

 Application versus Object or Data Orientation

An application-oriented approach takes an action:object approach, like this:
Action> 1. An application is opened (for example, word processing).
Object> 2. A file or other object selected (for example, a memo).
An object-oriented object:action approach does this:
Object> 1. An object is chosen (a memo).
Action> 2. An application is selected (word processing).

 Views

Views are ways of looking at an object's information. IBM's SAA CUA describes four kinds of views: composed, contents, settings, and help.
Composed views present information and the objects contained within an object. They are typically associated with data objects and are specific to tasks and products being worked with.
Contents views list the components of objects. ***Settings*** views permit seeing and changing object properties. ***Help*** views provide all the help functions.

6. 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.

7. Concurrent performance of functions:

Graphic systems may do two or more things at one time. Multiple programs may run simultaneously. When a system is not busy on a primary task, it may process background tasks (cooperative multitasking). When applications are running as truly separate tasks, the system may divide the processing power into time slices and allocate portions to each application (preemptive multitasking). Data may also be transferred between programs. It may be temporarily stored on a “clipboard” for later transfer or be automatically swapped between programs.

Q. 3 a) List and explain the advantages and disadvantages of graphical system

Graphical Systems
Explain in detail
Advantages

1. □ Symbols recognized faster than text
2. □ Faster learning
3. □ Faster use and problem solving
4. □ Easier remembering
5. □ More natural
6. □ Exploits visual/spatial cues
7. □ Fosters more concrete thinking
8. □ Provides context
9. □ Fewer errors
10. □ Increased feeling of control
11. □ Immediate feedback
12. □ Predictable system responses
13. □ Easily reversible actions
14. □ Less anxiety concerning use
15. □ More attractive
16. □ May consume less space
17. □ Replaces national
18. □ Easily augmented with text
19. □ Low typing requirements
20. □ Smooth transition from command language system

Disadvantages

1. □ Greater design complexity
2. □ Learning still necessary
3. □ Lack of experimentally-derived design principles
4. □ Inconsistencies in technique and terminology
5. □ Working domain is the present
6. □ Not always familiar
7. □ Human comprehension limitations
8. □ Window manipulation requirements
9. □ Production limitations
10. □ Few tested icons exist
11. □ Inefficient for touch typists
12. □ Inefficient for expert users
13. □ Not always the preferred style of interaction

14. □ Not always the fastest style of interaction
15. □ Increased chances of clutter and confusion
16. □ The futz and fiddle
17. □ May consume more screen space
18. □ Hardware limitations

Q. 3 b) Differentiate the characteristics of intranet and internet.

Characteristics of an Intranet versus the Internet

An intranet has many of the same characteristics as the Internet. They differ, however, in some important ways. The following discussion is partly based upon Nielsen (1997b):

Users. The users of intranets, being organization employees, know a lot about the organization, its structure, its products, its jargon, and its culture. Internet sites are used by customers and others who know much less about the organization, and often care less about it. The intranet user's characteristics and needs can be much more specifically defined than those of the general Internet user.

Tasks. An intranet is used for an organization's everyday activities, including complex transactions, queries, and communications. The Internet is mainly used to find information, with a supplementary use being simple transactions.

Type of information. An intranet contains detailed information needed for organizational functioning. Information is often be added or modified. The Internet usually presents more stable information: marketing and customer or client information, reports, and so forth.

Amount of information. Typically, an intranet site is much larger than an organization's Internet site. Massive amounts of information and processes seem to be needed to make an organization function. It has been estimated that an intranet site can be ten to one hundred times larger than its corresponding public site.

Hardware and software. Because intranets exist in a controlled environment, the kinds of computers, monitors, browsers, and other software can be restricted or standardized. The need for cross-platform compatibility is minimized or eliminated, permitting more predictable design. Upgraded communications also permit intranets to run from a hundred to a thousand times faster than typical Internet access can. This allows the use of rich graphics and multimedia, screen elements that contribute to very slow download times for most Internet users.

Design philosophy. Implementation on the intranet of current text-based and GUI applications will present a user model similar to those that have existed in other domains. This will cause a swing back to more traditional GUI designs — designs that will also incorporate the visual appeal of the Web, but eliminate many of its useless, promotional, and distracting features. The resulting GUI hybrids will be richer and much more effective.

Some specific intranet design guidelines are discussed in Part 2 of this book.

q. 4 Human are complex organism with variety of attributes that have an important influence on interface and screen design". Analyze and explain

Important Human Characteristics in Design
Perception

Perception is our awareness and understanding of the elements and objects of our environment through the physical sensation of our various senses, including

sight,
sound, smell, and so forth. Perception is influenced, in part, by *experience*. We classify stimuli based on models stored in our memories and in this way achieve understanding. In essence, we tend to match objects or sensations perceived to things we already know. Comparing the accumulated knowledge of the child with that of an adult in interpreting the world is a vivid example of the role of experience in perception.

Other perceptual characteristics include the following:
Proximity. Our eyes and mind see objects as belonging together if they are near each other in space.
Similarity. Our eyes and mind see objects as belonging together if they share a common visual property, such as color, size, shape, brightness, or orientation.
Matching patterns. We respond similarly to the same shape in different sizes. The
letters of the alphabet, for example, possess the same meaning, regardless of physical
size.
Succinctness. We see an object as having some perfect or simple shape because perfection or simplicity is easier to remember.
Closure. Our perception is synthetic; it establishes meaningful wholes. If something does not quite close itself, such as a circle, square, triangle, or word, we see it as closed anyway.
Unity. Objects that form closed shapes are perceived as a group.
Continuity. Shortened lines may be automatically extended.
Balance. We desire stabilization or equilibrium in our viewing environment. Vertical, horizontal, and right angles are the most visually satisfying and easiest to look at.

Expectancies. Perception is also influenced by expectancies; sometimes we perceive not what is there but what we expect to be there. Missing a spelling mistake in proof reading something we write is often an example of a perceptual expectancy error; we see not how a word *is* spelled, but how we *expect* to see it spelled.

Context. Context, environment, and surroundings also influence individual perception. For example, two drawn lines of the same length may look the same length or different lengths, depending on the angle of adjacent lines or what other people have said about the size of the lines.

Memory
Memory is not the most stable of human attributes, as anyone who has forgotten why they walked into a room, or forgotten a very important birthday, can attest. Today, memory is viewed as consisting of two components, long-term and short-term (or working) memory.

Short-term, or working, memory receives information from either the senses or longterm memory, but usually cannot receive both at once, the senses being processed separately. Within short-term memory a limited amount of information processing takes place.

Minimize the need for a mighty memory.

Long-term memory contains the knowledge we possess. Information received in short-term memory is transferred to it and encoded within it, a process we call learning. It is a complex process requiring some effort on our part. The learning process is
improved if the information being transferred from short-term memory has structure and is meaningful and familiar. Learning is also improved through repetition. Unlike short-term memory, with its distinct limitations, long-term memory capacity is thought to be unlimited. An important memory consideration, with significant implications for interface design, is the difference in ability to recognize or recall words. The human active vocabulary (words that can be recalled) typically ranges between 2,000 and 3,000 words. Passive vocabulary (words that can be recognized) typically numbers about 100,000. 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.

Sensory Storage

Sensory storage is the buffer where the automatic processing of information collected from our senses takes place. It is an unconscious process, large, attentive to the environment, quick to detect changes, and constantly being replaced by newly gathered stimuli. In a sense, it acts like radar, constantly scanning the environment for things that are important to pass on to higher memory.

Visual Acuity

The capacity of the eye to resolve details is called *visual acuity*. It is the phenomenon that results in an object becoming more distinct as we turn our eyes toward it and rapidly losing distinctness as we turn our eyes away—that is, as the visual angle from the point of fixation increases.

3213123
54321212345
6543211123456
765432101234567
6543211123456
54321212345
3213123

Figure 1.1 Size of area of optimum visual acuity on a screen.

Foveal and Peripheral Vision

Foveal vision is used to focus directly on something; *peripheral vision* senses anything in the area surrounding the location we are looking at, but what is there cannot be clearly resolved because of the limitations in visual acuity just described. Foveal and peripheral vision maintain, at the same time, a cooperative and a competitive relationship. Peripheral vision can aid a visual search, but can also be distracting.

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.

Mental Models

A mental model is simply an internal representation of a person's current understanding of something. Usually a person cannot describe this mental mode and most often is unaware it even exists. Mental models are gradually developed in order to understand something, explain things, make decisions, do something, or interact with another person. Mental models also enable a person to predict the actions necessary to do things if the action has been forgotten or has not yet been encountered.

Movement Control

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. Particularly important in screen design is Fitts' Law (1954). This law states that:

The time to acquire a target is a function of the distance to and size of the target.

This simply means that the bigger the target is, or the closer the target is, the faster it will be reached. The implications in screen design are:

Provide large objects for important functions.

Take advantage of the "pinning" actions of the sides, top, bottom, and corners of the screen.

Learning

Learning 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 their performance in almost any task. Too often, however, designers use our learning ability as an excuse to justify complex design. Because people can be taught to walk a tightrope is no excuse for incorporating tightropes in a design when walkways are feasible

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.

Q. 5 Discuss the general principles of User Interface Design.

General Principles

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

- Aesthetically Pleasing
  - — Provide visual appeal by following these presentation and graphic design principles:
    - Provide meaningful contrast between screen elements.
    - Create groupings.
    - Align screen elements and groups.
    - Provide three-dimensional representation.
    - Use color and graphics effectively and simply.
- Clarity
    - The interface should be visually, conceptually, and linguistically clear, including:Visual elements
    - Functions
    - Metaphors
    - Words and text
- Compatibility
  - — Provide compatibility with the following:
    - The user
    - The task and job
    - The product
  - — Adopt the user's perspective.
- Comprehensibility
  - — A system should be easily learned and understood. A user should know the following:
    - What to look at
    - What to do
    - When to do it
    - Where to do it

    - Why to do it
    - How to do it
  - — The flow of actions, responses, visual presentations, and information should be in a sensible order that is easy to recollect and place in context.
- Configurability
  - — Permit easy personalization, configuration, and reconfiguration of settings.
    - Enhances a sense of control.
    - Encourages an active role in understanding.
- Consistency
  - — A system should look, act, and operate the same throughout. Similar components should:
    - Have a similar look.
    - Have similar uses.
    - Operate similarly.
  - — The same action should always yield the same result.
  - — The function of elements should not change.
  - — The position of standard elements should not change.
  - — In addition to increased learning requirements, inconsistency in design has a number of other prerequisites and by-products, including:
  - — More specialization by system users.
  - — Greater demand for higher skills.
  - — More preparation time and less production time.
  - — More frequent changes in procedures.
  - — More error-tolerant systems (because errors are more likely).
  - — More kinds of documentation.
  - — More time to find information in documents.
  - — More unlearning and learning when systems are changed.
  - — More demands on supervisors and managers.
  - — More things to do wrong.

- Control

  --The user must control the interaction.
    - Actions should result from explicit user requests.
    - Actions should be performed quickly.
    - Actions should be capable of interruption or termination.
    - The user should never be interrupted for errors.
  - — The context maintained must be from the perspective of the user.
  - — The means to achieve goals should be flexible and compatible with the user's skills, experiences, habits, and preferences.
  - — Avoid modes since they constrain the actions available to the user.
  - — Permit the user to customize aspects of the interface, while always providing a proper set of defaults.
- Directness
  - — Provide direct ways to accomplish tasks.
    - Available alternatives should be visible.
    - The effect of actions on objects should be visible.
- Efficiency
  - — Minimize eye and hand movements, and other control actions.

        - Transitions between various system controls should flow easily and freely.
        - Navigation paths should be as short as possible.
        - Eye movement through a screen should be obvious and sequential.
    - Anticipate the user's wants and needs whenever possible.
- Familiarity
    - Employ familiar concepts and use a language that is familiar to the user.
    - Keep the interface natural, mimicking the user's behavior patterns.
    - Use real-world metaphors.
- Flexibility
    - A system must be sensitive to the differing needs of its users, enabling a level and type of performance based upon:
        - Each user's knowledge and skills.
        - Each user's experience.
        - Each user's personal preference.
        - Each user's habits.
        - The conditions at that moment.
- Forgiveness
    - Tolerate and forgive common and unavoidable human errors.
    - Prevent errors from occurring whenever possible.
    - Protect against possible catastrophic errors.
- Predictability
    - The user should be able to anticipate the natural progression of each task.
        - Provide distinct and recognizable screen elements.
        - Provide cues to the result of an action to be performed.
    - All expectations should be fulfilled uniformly and completely.
    - When an error does occur, provide constructive messages.
- Recovery
    - A system should permit:
        - Commands or actions to be abolished or reversed.
        - Immediate return to a certain point if difficulties arise.
    - Ensure that users never lose their work as a result of:
        - An error on their part.
        - Hardware, software, or communication problems.
- Responsiveness
    - The system must rapidly respond to the user's requests.
    - Provide immediate acknowledgment for all user actions:
        - Visual.
        - Textual.
        - Auditory.
- Simplicity
    - Provide as simple an interface as possible.
    - Five ways to provide simplicity:
        - Use progressive disclosure, hiding things until they are needed.
    - Present common and necessary functions first.
    - Prominently feature important functions.
    - Hide more sophisticated and less frequently used functions.
        - Provide defaults.

        - Minimize screen alignment points.
        - Make common actions simple at the expense of uncommon actions being made harder.
        - Provide uniformity and consistency.
- Transparency
    - Permit the user to focus on the task or job, without concern for the mechanics of the interface.
        - Workings and reminders of workings inside the computer should be invisible to the user.
- Trade-Offs
    - Final design will be based on a series of trade-offs balancing often-conflicting design principles.
    - People's requirements always take precedence over technical requirements.

Q. 6 Define obstacles and pitfalls. Mention the general observation of design and common pitfalls and also explain five commandments used in designing.

Obstacles and Pitfalls in the Development Path

The path is littered with obstacles and traps, many of them human in nature. 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.

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

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. A wide gap in technical abilities, goals, and attitudes often exists between users and developers. A failure to understand the differences will doom a product or system to failure.

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 sys-tem. Involvement in design removes the unknown and gives the user a stake in the system or identification with it. One caution, however: user involvement should be based on job or task knowledge, not status or position. The boss seldom knows what is really happening out in the office.

Perform rapid prototyping and testing.

Prototyping and testing the product will quickly identify problems and allow you to develop solutions. The design process is complex and human behavior is still not well understood. While the design guidelines that follow go a long way toward achieving ease of use, all problems cannot possibly be predicted. 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. In many instances, people may adapt to, or become dependent upon, a design, even if it is inefficient. This also makes future modifications much more difficult.

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. This is normal and should be expected. 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. A system is being constructed, not simply software. Concurrent development of all pieces
will point out possible problems earlier in the design process, allowing them to be
more effectively addressed. Time will also exist for design trade-offs to be thought out more carefully.

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