

Chapter 3

GUI

Defining the User Interface

- A collection of techniques and mechanisms to interact with something.
- The user interface is a part of computer and its software that people can see, hear, touch, and talk to.
- The primary mechanism is a pointing device of some kind.
- Objects
 - Collection of elements to which user interacts.
 - Can be seen, heard or touched.
- Actions
 - Operations performed on objects.
 - Pointing, selecting, manipulating etc...

Importance of good design

- A well designed interface is a window to view the system capabilities of the system.
- If they are confusing and inefficient, people will have greater difficulty in doing their jobs and will make more mistakes.
- Poor design chase some people away from a system permanently.

Benefits of good screen design

- Productivity benefits.
- Improve screen clarity and readability.
- Reduce decision making time.
- Fewer errors.
- Lower training cost
- Easy to identify and resolve problems during design and development process.

Importance of good design

TDX95210		THE CAR RENTAL COMPANY		10/11/76 10:25	
NAME		TEL		RO	
_____		_____		_____	
PUD	RD	C	RT	MPD	
_____	_____	_____	_____	_____	
ENTRY ERROR XX465628996Q.997					
Command==>					

A 1970 screen

THE CAR RENTAL COMPANY	
RENTER >>	Name: _____ Telephone: ____ _
LOCATION >>	Office: _____ Pick-up Date: ____ _ Return Date: ____ _
AUTOMOBILE >>	Class: _____ (PR, ST, FU, MD, CO, SC) Rate: _____ Miles Per Day: _____
The maximum allowed miles per day is 150.	
Enter F1=Help F3=Exit F12=Cancel	

A 1980 screen

Importance of good design

THE CAR RENTAL COMPANY

RENTER

Name:

Telephone:


LOCATION


Office:


Pick-up Date:

Return Date:

AUTOMOBILE

Class: 

Rate: 

Miles Per Day: 

A 1990 screen

2000 Onwards Screen

The screenshot shows a web browser window with the address bar displaying 'www.youtube.com'. The YouTube logo is visible in the top left corner of the page. A large red advertisement for 'FOOTWEAR SEASON SALE' by MYNTRA is prominently displayed, featuring a pair of black sneakers and the text 'FLAT 30 + 30% OFF'. Below the advertisement, the 'What to Watch' section is visible, listing 'BEST OF YOUTUBE' and 'CHANNELS FOR YOU'. The main content area displays a grid of video recommendations, including a news interview titled 'DELHI CM TO CNN-IBN' and several technical tutorials related to Hadoop and Big Data.

What to Watch

BEST OF YOUTUBE

- Popular on YouTube
- Music
- Sports
- Gaming
- Movies
- TV Shows
- Spotlight

CHANNELS FOR YOU

- YouTube Nation
- SoulPancake
- Epic Meal Time
- VikiKdrama
- danisnotonfire
- Browse channels

Recommended

- DELHI CM TO CNN-IBN**
Kejriwal: Suspend 4 officers and cops will fall into line
Arvind Kejriwal's interview with Rajdeep Sardesai CNN IBN (FULL)
by The Real Fearless Indian 175,286 views 3 days ago
- Breaking Good : Alok Nath Qtiyapa (Theatrical Trollers)**
by TheViralFeverVideos 285,459 views 1 day ago
- Hadoop Training 2 : Deep Dive In HDFS (What is Hadoop ?) | What is HDFS ? | What is HIVE ?**
by hadoop pass 26,107 views 7 months ago
- How to Install a Single Node Hadoop - A step by step tutorial**
by temboddata.com 7,353 views 5 months ago
- REAL TIME ANALYTICS FOR BIG DATA: A FACEBOOK CASE STUDY**
Nati Shalom
Founder and CEO, CephRocks
October 4, 2015
San Francisco, CA

Popularity of Graphics

DIRECT MANIPULATION

- DM systems have the following characteristics.
 - The system is portrayed as an extension of the real world.
 - Continuous visibility of objects and actions.
 - Actions are rapid and incremental with visible display of results.
 - Incremental actions are easily reversible.

Interaction Styles

- **Styles for “giving commands” to the system**
- **5 main types**
 - Direct Manipulation
 - Menu selection
 - Form fillin
 - Command language
 - Natural language

Advantages	Disadvantages
Direct manipulation Visually presents task concepts Allows easy learning Allows easy retention Allows errors to be avoided Encourages exploration Affords high subjective satisfaction	May be hard to program May require graphics display and pointing devices
Menu selection Shortens learning Reduces keystrokes Structures decision making Permits use of dialog-management tools Allows easy support of error handling	Presents danger of many menus May slow frequent users Consumes screen space Requires rapid display rate
Form fillin Simplifies data entry Requires modest training Gives convenient assistance Permits use of form-management tools	Consumes screen space
Command language Is flexible Appeals to “power” users Supports user initiative Allows convenient creation of user-defined macros	Has poor error handling Requires substantial training and memorization
Natural language Relieves burden of learning syntax	Requires clarification dialog May not show context May require more keystrokes Is unpredictable

Interaction Styles

Advantages

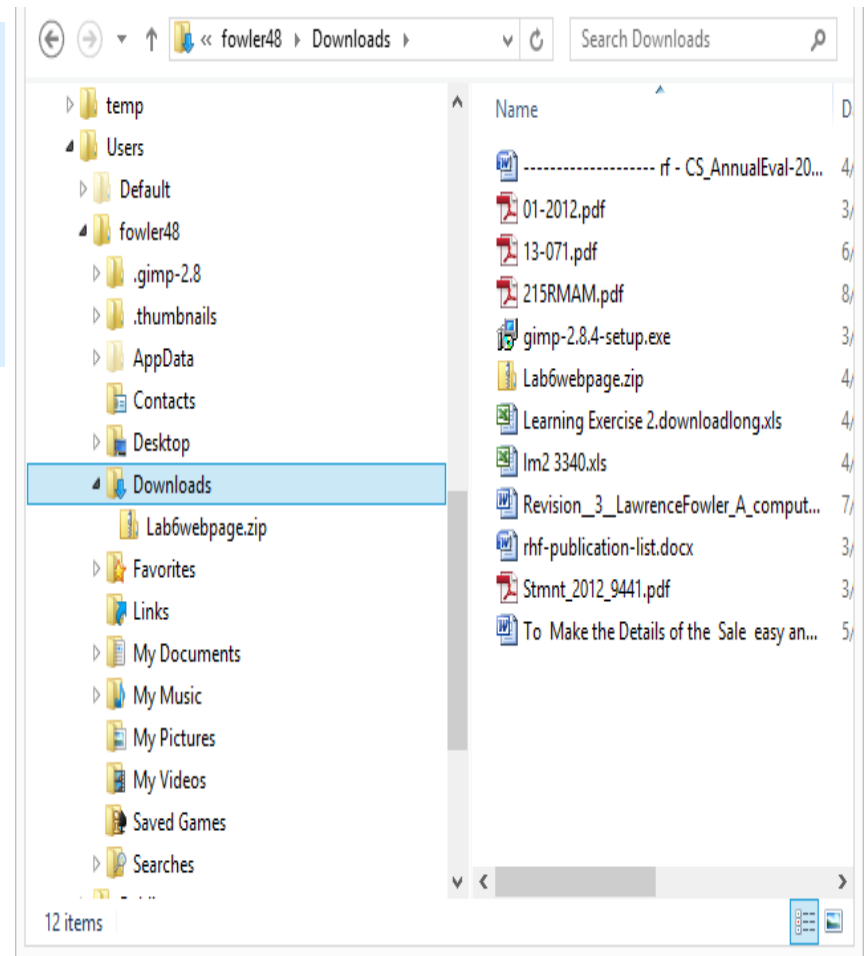
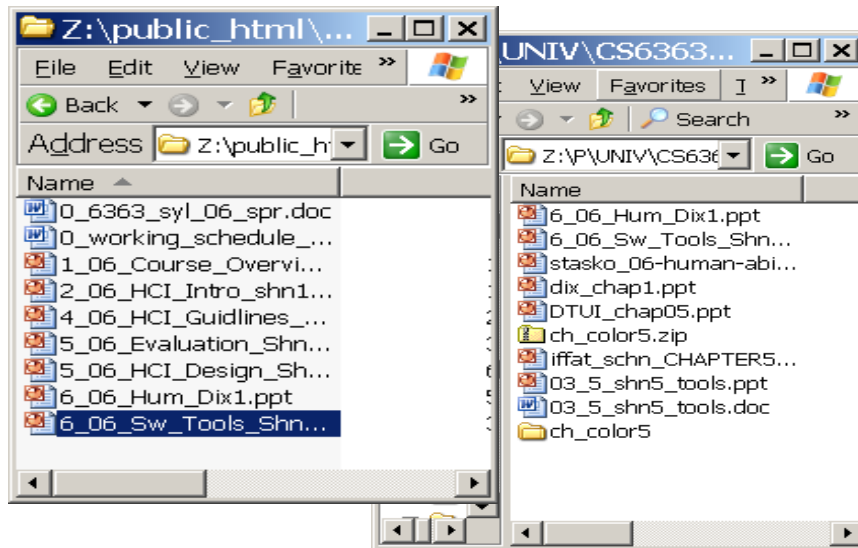
Direct manipulation

Visually presents task concepts
Allows easy learning

Allows easy retention
Allows errors to be avoided
Encourages exploration
Affords high subjective satisfaction

Disadvantages

May be hard to program
May require graphics display and pointing devices



EXAMPLE DIRECT MANIPULATION

- Drive a car
- If you want to turn left, what do you do?
- What type of feedback do you get?
- How does this help?
- Think about turning left using a menu/text interfaces



EXAMPLE DIRECT MANIPULATION

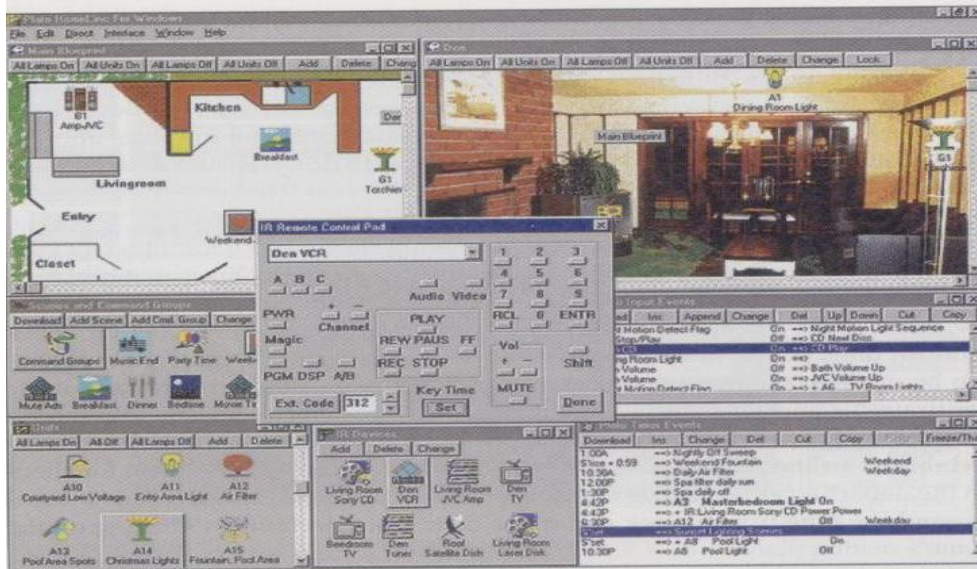
```

C:\WINNT\System32\edlin.exe
End of input file
*?
Edit line      line#
Append        [#lines]A
Copy          [startline],[endline],toline[,times]C
Delete        [startline],[endline]D
End (save file) E
Insert        [line]I
List          [startline],[endline]L
Move          [startline],[endline],tolineM
Page          [startline],[endline]P
Quit (throw away changes) Q
Replace       [startline],[endline]I? ]R[oldtext ][CTRL+Znewtext]
Search        [startline],[endline]I? ]Stext
Transfer      [toline]T[drive:][path]filename
Write        [#lines]W
*1,5L
1: *(<HTML>
2: <HEAD>
3: <META HTTP-EQUIV="Content-Type" CONTENT="text/html; charset=iso-8859-1"
">
4: </HEAD>
5: <BODY bgcolor="#CCCC99">
*
  
```

C11 (L) TOTAL

	A	B	C	D
1	ITEM	NO.	UNIT	COST
2	MUCK RAKE	4	12.95	51.80
3	BUZZ CUT	1	181.25	181.25
4	TOFF TONER	25	48.95	1223.75
5	EYE SNUFF	2	4.95	9.90
			SUBTOTAL	1366.80
			9.75% TAX	133.36
			TOTAL	14438.16

EXAMPLE DIRECT MANIPULATION



LIMITATIONS OF DIRECT MANIPULATION

- Direct Manipulation of all screen objects may not be feasible.
- Graphics capability of system may be limited.
- The amount of space available for placing manipulation controls in the window border may be limited.
- **Screen space**
 - Takes up plenty
 - Multiple pages can slow user down
 - Bad design is ***amplified***
- **Learning curve** – users have to remember all the necessary operations and actions.

INDIRECT MANIPULATION

- It uses
 - words and text,
 - pull-down and pop-up menus,
 - symbols,
 - And typing and pointing.
- Most windows systems are combination of direct and indirect manipulation.



THE GRAPHICAL USER INTERFACE

- A User interface is a collection of techniques and mechanisms to interact with something.
- User interact with a collection of elements referred to as *Objects*.
- In graphical interface, the primary interaction mechanism is a pointing device of some kind.
- Graphics revolutionized design and the user interface.
- Improvement in display enable the user's actions to be reacted quickly, dynamically and meaningfully.

GRAPHICAL SYSTEM ADVANTAGES

- Symbols recognized faster than text
- Faster learning
- Faster use and problem solving
- Easier remembering
- Provides context
- Fewer errors
- Immediate feedback

GRAPHICAL SYSTEM ADVANTAGES

- Predictable system responses
- Easily reversible actions
- More attractive
- May consume less space
- Replaces national languages
- Low typing requirements
- Smooth transition from command language system.

GRAPHICAL SYSTEM DISADVANTAGES

- Greater Design Complexity.
- Learning still necessary.
- Inconsistencies in technique and terminology.
- Not always familiar.
- Human comprehension limitations.
- Windows manipulation requirements.
- Production limitation (few tested icons exist).
- Not always fastest style of interaction.

GRAPHICAL SYSTEM DISADVANTAGES

- Inefficient for expert users.
- Not always the preferred style of interaction.
- Increased chance of clutter and confusion.
- May consume more screen space.
- Hardware limitation.

Conclusion

- The design of an interface, and not its interaction style, is the best determinant of ease of use. (ex. Rural ATM)
- User preferences must be considered in choosing an interaction style. (ex. s/w for disable)
- In majority of cases, words are more meaningful to users than icons. (ex. Photoshop/corel draw screen)

Conclusion

- The content of a graphic screen is critical to its usefulness. The wrong presentation or a cluttered presentation may actually lead to greater confusion.
- The success of a graphical system depends on the skills of its designers in following established principles of usability.

CHARACTERISTICS OF THE GRAPHICAL INTERFACE

- **Sophisticated Visual Presentation**
 - Use of lines, drawings, icons, variety of character fonts, colors etc.
- **Pick-and-Click Interaction**
 - Pick : to identify the element for the proposed action.
 - Click : signal to perform the action.
- **Restricted Set of Interface Option**
- **Concurrent Performance of Functions**
- **Object Orientation**

CHARACTERISTICS OF THE GRAPHICAL INTERFACE

- Object Orientation
 - Objects and sub objects
 - Types of Object
 - Data Object (Screen controls)
 - Container Object (Workplace/ Work Area, Folders)
 - Device Object (Printer, Trash)
 - Relationships
 - Collection: Objects sharing common aspects (multiple selection objects)
 - Constraint : Stronger object relationship (document)
 - Composite : Aggregation of them identified as an object (spread sheets)

CHARACTERISTICS OF THE GRAPHICAL INTERFACE

- Object Orientation
 - Properties of object
 - Text styles
 - Font size
 - Windows background color
 - Actions
 - Commands: To manipulate objects in specific way.
 - Property/attribute Specification : To modify object properties.
 - Views
 - Composed views: presents information and the objects contained within an object.
 - Contents views: list the components of objects.
 - Settings Views: permit seeing and changing object properties.
 - Help Views: provide all help functions.

Questions

- What is Direct Manipulation? Example.
- What is Indirect Manipulation? Example.
- Any two Advantages of GUI.
- Any two Disadvantages of GUI.
- List Characteristics of GUI.
- Types of objects.
- Relationships of objects.

THE WEB USER INTERFACE

- Web interface design is the design of navigation and the presentation of information.
- It is about content, not data.
- The design goal is to build a hierarchy of menus and pages that feels natural, well structured, easy to use, and truthful.
- Popular
 - Allows millions of people scattered across the globe to communicate and publish/access information.
- Difficulties
 - Its design language is HTML.
 - Architecture and task flow are not easy to standardize.

Characteristics of a Web Interface

A web interface has a number of characteristics, some similar to a GUI (?) and some different.

- They are
 - Devices
 - User Focus
 - Data/ Information
 - User Tasks
 - User's Conceptual Space
 - Presentation Elements
 - Navigation
 - Context
 - Interaction
 - Response Time
 - Visual Style
 - System capability
 - Task Efficiency
 - Consistency
 - User Assistance
 - Integration
 - Security
 - Reliability

GUI versus WEB PAGE DESIGN

	GUI	WEB
Devices	User hardware variations limited. User hardware characteristics well defined. Screens appear exactly as specified.	User hardware variations enormous. Screen appearance influenced by hardware being used.
User Focus	Data and applications.	Information and navigation.
Data/ Information	Typically created and used by known and trusted sources. Properties generally known. Typically placed into system by users or known people and organizations. Typically organized in a meaningful fashion. A notion of private and shared data exists.	Full of unknown content. Source not always trusted. Often not placed onto the Web by users or known people and organizations. Highly variable organization. Privacy often suspect.
User Tasks	Install, configure, personalize, start, use, and upgrade programs. Open, use, and close data files. Fairly long times spent within an application. Familiarity with applications often achieved.	Link to a site, browse or read pages, fill out forms, register for services, participate in transactions, download and save things. Movement between pages and sites very rapid. Familiarity with many sites not established.
User's Conceptual Space	Controlled and constrained by program.	Infinite and generally unorganized.
Presentation Elements	Windows, menus, controls, data, toolbars, messages, and so on. Many transient, dynamically appearing and disappearing. Presented as specified by designer. Generally standardized by toolkits and style guides.	Two components, browser and page. Within page, any combination of text, images, audio, video, and animation. May not be presented as specified by the designer—dependent on browser, monitor, and user specifications. Little standardization.

GUI versus WEB PAGE DESIGN

Navigation	Through menus, lists, trees, dialogs, and wizards. Not a strong and visible concept. Constrained by design. Generally standardized by toolkits and style guides.	Through links, bookmarks, and typed URLs. Significant and highly visible concept. Few constraints, frequently causing a lost "sense of place." Few standards. Typically part of page design, fostering a lack of consistency.
Context	Enables maintenance of a better sense of context. Restricted navigation paths. Multiple viewable windows.	Poorer maintenance of a sense of context. Single-page entities. Unlimited navigation paths. Contextual clues become limited or are difficult to find.
Interaction	Interactions such as clicking menu choices, pressing buttons, selecting list choices, and 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.
Visual Style	Typically prescribed and constrained by toolkit. Visual creativity allowed but difficult. Little significant personalization.	Fosters a more artistic, individual, and unrestricted presentation style. Complicated by differing browser and display capabilities, and bandwidth limitations. Limited personalization available.
System Capability	Unlimited capability proportional to sophistication of hardware and software.	Limited by constraints imposed by the hardware, browser, software, client support, and user willingness to allow features because of response time, security, and privacy concerns.
Task Efficiency	Targeted to a specific audience with specific tasks. 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.

GUI versus WEB PAGE DESIGN

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

GENERAL DESIGN PRINCIPLES

Aesthetically Pleasing

- Provide visual appeal by:
 - Providing meaningful contrast between screen elements
 - Creating groupings
 - Aligning screen elements and groups
 - Providing three-dimensional representation
 - Using color and graphics effectively and simply

GENERAL DESIGN PRINCIPLES

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.

GENERAL DESIGN PRINCIPLES

Comprehensibility

- A system should be easily learned and understood:
 - What to look at
 - What it is
 - What to do
 - When to do it
 - Where to do it
 - Why to do it
 - How to do it
- Flow of actions, response, visual presentations, and information should be:
 - In a sensible order
 - Easy to recollect
 - Easy to place in context

GENERAL DESIGN PRINCIPLES

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.

GENERAL DESIGN PRINCIPLES

Control

- The user must control the interaction.
- 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 because they constrain the actions available.
- Permit the user to customize the interface but provide defaults.

GENERAL DESIGN PRINCIPLES

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.

GENERAL DESIGN PRINCIPLES

Familiarity

- Employ familiar concepts and use a language that is familiar to the user
- Keep the interface natural, mimicking the user's behaviour 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

GENERAL DESIGN PRINCIPLES

Forgiveness

- Tolerate and forgive common and unavoidable human errors
- Prevent errors from occurring whenever possible
- Protect against possible catastrophic errors
- When an error does occur, provide constructive messages

GENERAL DESIGN PRINCIPLES

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.

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.

GENERAL DESIGN PRINCIPLES

Responsiveness

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

GENERAL DESIGN PRINCIPLES

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
 - Provide uniformity and consistency

GENERAL DESIGN PRINCIPLES

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.

University Questions

- What is Direct and Indirect manipulation?
explain with Example
- Differentiate between Graphical user interface
and Web page design
- Explain general principles in User interface
Design.