Unit 5

User Interface Design

- Elements of good design
- Eight golden rules for design .
- Features of modern GUI,
  - Menus,
  - Scroll bars,
  - windows,
  - Buttons,
  - icons,
  - panels,
  - error messages etc.

User Interface Design

- The user interface is the **front-end application** view to which the **user interacts** to use the software.

- User interface is the front-end application view to which user interacts in order to use the software.
- User can manipulate and control the software as well as hardware by means of user interface.
- Today, user interface is found at almost every place where digital technology exists, right from computers, mobile phones, cars, music players, airplanes, ships etc.
- User interface is part of software and is designed such a way that it is expected to provide the user insight of the software.
- UI provides fundamental platform for human-computer interaction.
- UI can be graphical, text-based, audio-video based, depending upon the underlying hardware and software combination. UI can be hardware or software or a combination of both.

The software becomes more popular if its user interface is:

1. **Attractive**
2. **Simple to use**
3. **Responsive in a short time**
4. **Clear to understand**
5. **Consistent on all interface screens**

Types of User Interface

1. **Command Line Interface:**

   The Command Line Interface provides a command prompt, where the user types the command and feeds it to the system.

   The user needs to remember the syntax of the command and its use.

2. **Graphical User Interface:**

   Graphical User Interface provides a simple interactive interface to interact with the system.

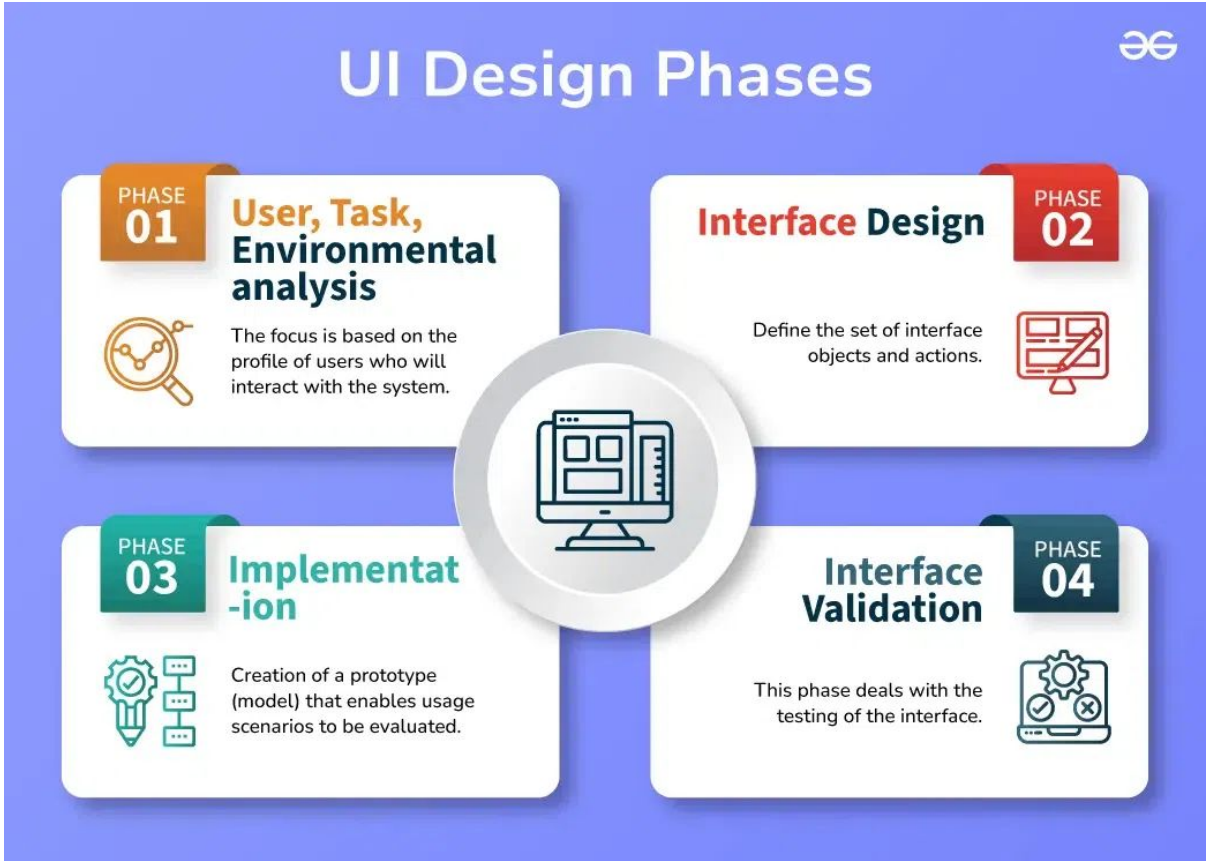
   GUI can be a combination of both hardware and software.

   Using GUI, the user interprets the software.

User Interface Design Process

The **analysis** and **design** process of a user interface is iterative and can be represented by a **spiral model**.

The analysis and design process of user interface consists of four framework activities.



1. User, Task, Environmental Analysis, and Modeling

- Initially, the focus is based on the profile of users who will interact with the system, i.e., understanding, skill and knowledge, type of user, etc., based on the user's profile users are made into categories.
- From each category requirements are gathered.
- Based on the requirement's developer understand how to develop the interface.
- Once all the requirements are gathered a detailed analysis is conducted. In the analysis part, the tasks that the user performs to establish the goals of the system are identified, described and elaborated.
- The analysis of the user environment focuses on the physical work environment.
- Among the questions to be asked are:
    - Where will the interface be located physically?
    - Will the user be sitting, standing, or performing other tasks unrelated to the interface?
    - Does the interface hardware accommodate space, light, or noise constraints?
    - Are there special human factors considerations driven by environmental factors?

2. Interface Design

- The goal of this phase is to define the set of interface objects and actions i.e., control mechanisms that enable the user to perform desired tasks.
- Indicate how these control mechanisms affect the system.
- Specify the action sequence of tasks and subtasks, also called a user scenario. Indicate the state of the system when the user performs a particular task.
- Always follow the three golden rules stated by Theo Mandel.
- Design issues such as response time, command and action structure, error handling, and help facilities are considered as the design model is refined.
- This phase serves as the foundation for the implementation phase.

3. Interface Construction and Implementation

- The implementation activity begins with the creation of a prototype (model) that enables usage scenarios to be evaluated.
- As iterative design process continues a User Interface toolkit that allows the creation of windows, menus, device interaction, error messages, commands, and many other elements of an interactive environment can be used for completing the construction of an interface.

4. Interface Validation

- This phase focuses on testing the interface.
- The interface should be in such a way that it should be able to perform tasks correctly, and it should be able to handle a variety of tasks.
- It should achieve all the user's requirements.
- It should be easy to use and easy to learn. Users should accept the interface as a useful one in their work.

Advantages of User Interface (UI)

- Some advantages of User Interface are mentioned below:
- No need to learn complex commands/languages for working with UI.
- Easiness for non-technical people. A beginner can navigate through a site with ease if its simple and well informative.
- Usage of blocks and typography makes user experience better.
- Easy setup and ready to start working are awesome. Hiding the complexity of actions from the user and display only the required information is key to good interface.

Disadvantages of User Interface(UI)

- Some disadvantages of User Interface are listed below:
- When not properly built, it can be very difficult to work with.
- Takes time to built a Perfect UI.

Eight Golden Rules Of Interface Design:

1. Strive For Consistency:

1. Consistency can be achieved through elements such as fonts, color, shape, and position being consistently the same in all menus & screens, across, categories for a particular software.
2. The sequence of actions that we perform must be in a similar situation.
3. Usage of Identical terminology in prompts, menus, screens, capitalization, fonts, and layouts must be consistent throughout.
4. Users should be able to do the same thing in the same way that they have been doing every time.
5. consistency such as similar sequences of actions in similar situations makes it easy to learn.
6. There should be a limited number of exceptions regarding the echoing of passwords and commands.
7. Example: If the login button in screen 1 is placed at the left bottom of the screen and in screen 2 it is placed at the center of the bottom. This leads to positional inconsistency which is not a good practice.

2. Seek Universal Usability:

1. The needs of diverse users must be recognized for facilitating the transformation of content.
2. While designing make sure you keep in mind various audiences ranging from different expertise, ages, disabilities, and international variations.
3. Users are classified as NOVICE, INTERMEDIATE, and EXPERTS. Experts tend to use lesser actions at a faster pace.
4. Introduction of shortcuts for faster pacing and user interactions.
5. Interfaces need to cater to all levels of users.

3. Offer Informative Feedback:

1. Proper feedback should be provided for every user action. For frequent actions, the response can be modest whereas for infrequent actions the response can be substantial.
2. Interfaces not just being communicative but also need to help users in terms of learning and feedback which tells them that they are moving in the right direction.
3. For every action of the user, there should be feedback. such that there exists good interaction.
4. Unless a user gets feedback. The user is unsure of the correctness of the action.

4. Design Dialogs To Yield Closure:

1. The sequence of actions must be organized clearly into beginning, middle, and end phases.
2. Providing feedback to the user after the completion of a group of actions gives the user satisfaction of accomplishment, and a sense of relief, and prepare for the next group of actions.
3. Interaction dialogue needs to have a closure that is recognized by the user as the end of an action.
4. The sequence of actions needs to proceed in a dialogue by engaging the user in a step-by-step manner.
5. Similar to a mathematical expression where every enclosing bracket needs a corresponding closing bracket. Even the subsequence of actions needs to have a closing action.
6. If we consider an example of an e-commerce website that provides users with clear information from selecting a product to the checkout ending with clear information.

5. Prevent Errors:

1. Make sure the user interface is as user-friendly as possible. such that user doesn't make any serious errors.
2. Users can commit errors while interacting with the computers as well as while inputting or interpreting information.
3. If the user commits an error the interface should offer simple, constructive, and specific instructions for recovery.
4. For example, if a user is filing a form and if he types an invalid captcha or pin code then he should be redirected to update only the specific mistake and all other details must be saved and need not be entered again.

6. Permit Easy Reversal Of Actons:

1. The interactions must be built such that retracing backward or reverse of actions can be performed which gives flexibility to users to explore new options.
2. Make sure the actions are as much as reversible. such that user doesn't feel anxiety, as the user knows that errors can be undone, and helps the user to explore unfamiliar options.
3. The system should encourage exploration without incurring any kind of anxiety for users.
4. one way to do this is to provide a traceable path backward of all actons.
5. Reversibility may be single action such as a data entry task or a group of actions such as the entry of name and address.

7. Keep Users In Control:

1. Allow users to always feel 'in control' of the system and of the situation. Make the user aware that he/she is in control.
2. Users should believe that they are controlling the system and not the way around.
3. Users should never feel lost.
4. Experienced users don't like it If any new features are added to the interface as it makes them feel new and uncomfortable.
5. Changes in familiar behavior make users annoyed and make them unable to produce a desirable result.

8. Reduce Short-Term Memory Load:

1. As Humans have a limited capacity for Information processing in short-term memory.
2. The interface design must be in such a way that it should not force users to remember huge amounts of information which make them overwhelmed like remembering information from one display and then using it on another display.

Introduction to GUI

- **What are the different GUI Elements?**
- **Different ways** by which the **user is enabled to interact** and **work** with **the system** are **made available** by **the components of the GUI.**
- **GUI system** includes the following elements –
- **Window**
- **Tabs**
- **Menu**
- **Icon**
- **Cursor**

Introduction to GUI

- **Window :**
- The **application contents** that are **displayed** either as **icons** or as **lists in a window.**
- The **structure** of the file is **demonstrated** by **a window.**
- A **window can** be **explored** and a **file** can **easily found** in the **system.**
- It is **possible** to **minimize, resize** or **maximize** the **size of the window.**
- They can be **dragged and moved** as **desired** on **the screen.**
- A **window** with **another window** of **same application** is known as **child window.**

Introduction to GUI

Menu:

A menu is a **set of options** presented to **the user** of a **computer application** to **help the user find information** or **execute** a **program function.**

Menus are **common** in **graphical user interfaces (GUI** s) such as **Windows.**

In menu **all the standard commands** are **collected, grouped together**, **arranged** and are **displayed** at a **place** that is **clearly visible inside the window.**

Introduction to GUI

Tabs :

Users are **enabled** to **open more** than **one document** in the **same window.**

This is **facilitated** by **tabbed document interface.**

This **feature** is **used** by almost all the **web browsers.**

Icon:

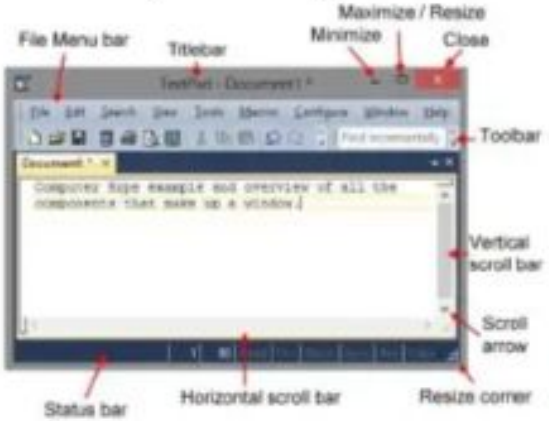
An application is **replicated by small picture** known as **an icon.**

The **application window** can be **visited** and **opened** on **clicking** on this **icon.**

All the **programs installed** on **the system** and the **applications** are **displayed** by using **small pictures as Icons.**

Introduction to GUI

- **Scroll bar:**
- A **vertical or horizontal** bar **commonly** located **on right** or **bottom of a window** that allows you **to move** the **window viewing area up, down, left, or right.**
- **Most people** are familiar with **scroll bars** because of the **need to scroll up and down** in almost **every Internet web page.**
- **Scroll bars** are utilized using **the mouse, touchpad,** or **keyboard.**
- With a mouse, you can move the **scroll bar** by **clicking** the **scroll arrow** at **either end** of the **scroll bar**



Introduction to GUI

- **Panel :**
  - ✓ **A panel** is a **representation** of **what information** will be **sent** to a **user's display screen** in given **conditions.**
  - ✓ A panels **provide** a **flexible** and **extensible content container** with **multiple variants.**
  - ✓ These options include **headers** and **footers**, a wide **variety** of **content, appropriate background colors**, and **powerful display options.**
  - ✓ **Panels** are **similar to cards**, but they don't **include media.**

User Interface Design Golden Rules

The following are the golden rules stated by Theo Mandel that must be followed during the design of the interface. **Place the user in control:**

1. **Define the interaction modes in such a way that does not force the user into unnecessary or undesired actions:** The user should be able to easily enter and exit the mode with little or no effort.
2. **Provide for flexible interaction:** Different people will use different interaction mechanisms, some might use keyboard commands, some might use mouse, some might use touch screen, etc., Hence all interaction mechanisms should be provided.
3. **Allow user interaction to be interruptible and undoable:** When a user is doing a sequence of actions the user must be able to interrupt the sequence to do some other work without losing the work that had been done. The user should also be able to do undo operation.

User Interface Design Golden Rules

The following are the golden rules stated by Theo Mandel that must be followed during the design of the interface. **Place the user in control:**

4 Streamline interaction as skill level advances and allow the interaction to be customized: Advanced or highly skilled user should be provided a chance to customize the interface as user wants which allows different interaction mechanisms so that user doesn't feel bored while using the same interaction mechanism.

5 Hide technical internals from casual users: The user should not be aware of the internal technical details of the system. He should interact with the interface just to do his work.

6 Design for direct interaction with objects that appear on-screen: The user should be able to use the objects and manipulate the objects that are present on the screen to perform a necessary task. By this, the user feels easy to control over the screen.

Key Principles for Designing User Interfaces

1. **User-centered design:** User interface design should be focused on the needs and preferences of the user. This involves understanding the user's goals, tasks, and context of use, and designing interfaces that meet their needs and expectations.
2. **Consistency:** Consistency is important in user interface design, as it helps users to understand and learn how to use an application. Consistent design elements such as icons, color schemes, and navigation menus should be used throughout the application.
3. **Simplicity:** User interfaces should be designed to be simple and easy to use, with clear and concise language and intuitive navigation. Users should be able to accomplish their tasks without being overwhelmed by unnecessary complexity.

Key Principles for Designing User Interfaces

4 Feedback: Feedback is significant in user interface design, as it helps users to understand the results of their actions and confirms that they are making progress towards their goals. Feedback can take the form of visual cues, messages, or sounds.

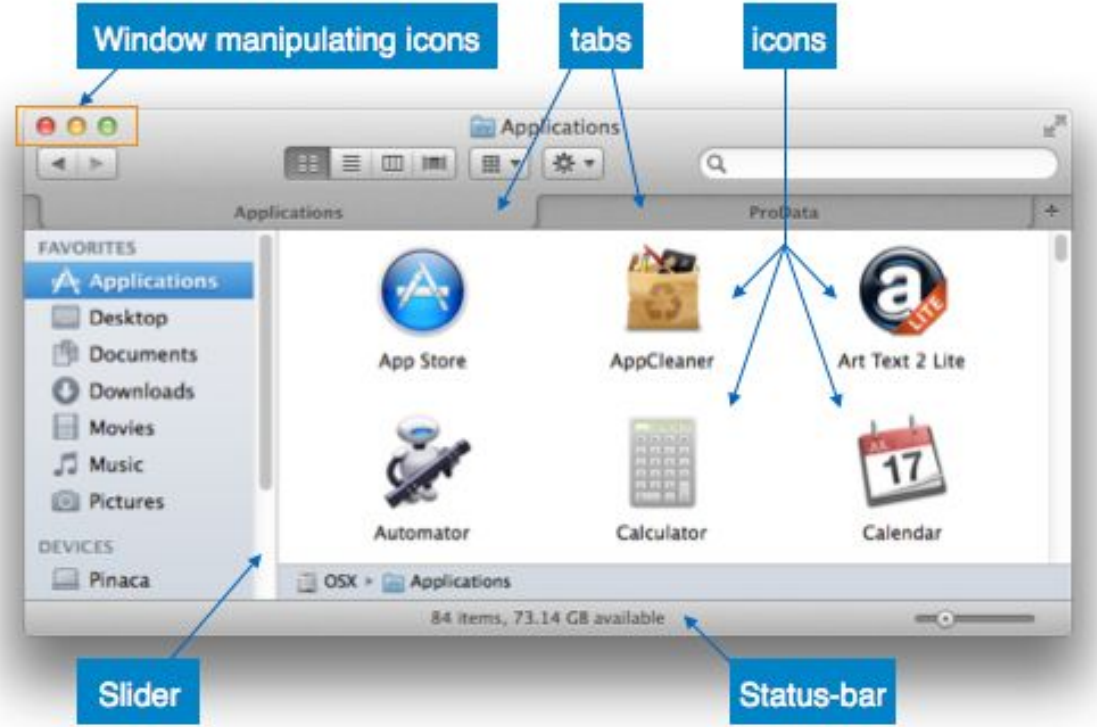
5 Accessibility: User interfaces should be designed to be accessible to all users, regardless of their abilities. This involves considering factors such as color contrast, font size, and assistive technologies such as screen readers.

6 Flexibility: User interfaces should be designed to be flexible and customizable, allowing users to tailor the interface to their own preferences and needs.

GUI Elements

GUI provides a set of components to interact with software or hardware.

Every graphical component provides a way to work with the system. A GUI system has following elements such as:



- **Window** - An area where contents of application are displayed.

❑ Contents in a window can be displayed in the form of icons or lists, if the window represents file structure.

❑ It is easier for a user to navigate in the file system in an exploring window.

❑ Windows can be minimized, resized or maximized to the size of screen.

❑ They can be moved anywhere on the screen.

❑ A window may contain another window of the same application, called child window.

- **Tabs** - If an application allows executing multiple instances of itself, they appear on the screen as separate windows.

❑ **Tabbed Document Interface** has come up to open multiple documents in the same window.

❑ This interface also helps in viewing preference panel in application.

❑ All modern web-browsers use this feature.

- **Menu** - Menu is an array of standard commands, grouped together and placed at a visible place (usually top) inside the application window.

  The menu can be programmed to appear or hide on mouse clicks.

- **Icon** - An icon is small picture representing an associated application.

  When these icons are clicked or double clicked, the application window is opened.

  Icon displays application and programs installed on a system in the form of small pictures.

- **Cursor** - Interacting devices such as mouse, touch pad, digital pen are represented in GUI as cursors.

  On screen cursor follows the instructions from hardware in almost real-time.

  Cursors are also named pointers in GUI systems.

  They are used to select menus, windows and other application features.

User Interface Golden rules

The following rules are mentioned to be the golden rules for GUI design, described by Shneiderman and Plaisant in their book (Designing the User Interface).

- **Strive for consistency** -
  - Consistent sequences of actions should be required in similar situations.
  - Identical terminology should be used in prompts, menus, and help screens.
  - Consistent commands should be employed throughout.
- **Enable frequent users to use short-cuts** -
  - The users desire to reduce the number of interactions increases with the frequency of use.
  - Abbreviations, function keys, hidden commands, and macro facilities are very helpful to an expert user.
- **Offer informative feedback** -
  - For every operator action, there should be some system feedback.
  - For frequent and minor actions, the response must be modest, while for infrequent and major actions, the response must be more substantial.
- **Design dialog to yield closure** -
  - Sequences of actions should be organized into groups with a beginning, middle, and end.
  - The informative feedback at the completion of a group of actions gives the operators the satisfaction of accomplishment, a sense of relief, the signal to drop contingency plans and options from their minds, and this indicates that the way ahead is clear to prepare for the next group of actions.

User Interface Golden rules

The following rules are mentioned to be the golden rules for GUI design, described by Shneiderman and Plaisant in their book (Designing the User Interface).

- **Offer simple error handling** -
  - As much as possible, design the system so the user will not make a serious error.
  - If an error is made, the system should be able to detect it and offer simple, comprehensible mechanisms for handling the error.
- **Permit easy reversal of actions** -
  - This feature relieves anxiety, since the user knows that errors can be undone.
  - Easy reversal of actions encourages exploration of unfamiliar options.
  - The units of reversibility may be a single action, a data entry, or a complete group of actions.
- **Support internal locus of control** -
  - Experienced operators strongly desire the sense that they are in charge of the system and that the system responds to their actions.
  - Design the system to make users the initiators of actions rather than the responders.
- **Reduce short-term memory load** -
  - The limitation of human information processing in short-term memory requires the displays to be kept simple, multiple page displays be consolidated, window-motion frequency be reduced, and sufficient training time be allotted for codes, mnemonics, and sequences of actions.

Case Study 1: Zomato App

🧩 1. Elements of Good Design

Element	Explanation	Example from Zomato App
Clarity	Interface should clearly communicate purpose and actions.	Clear icons (🍔 food, 🔍 search, 🛒 cart). Each function labeled simply.
Consistency	Colors, fonts, and navigation patterns remain same.	Red–white color palette used across all screens, consistent font and icons.
Feedback	System should respond immediately to user actions.	When user clicks "Add to Cart", message "Added Successfully" pops up.
Efficiency	Design allows users to perform tasks quickly.	Search bar with suggestions and filters saves time.
Aesthetics	Balanced, attractive layout using visuals effectively.	High-quality food images and minimal text improve appeal.

2. Shneiderman's Eight Golden Rules of Design

Golden Rule	Meaning	Zomato Example
1. Strive for Consistency	Uniform commands, colors, and placement	Same navigation bar and button colors on every page.
2. Enable Shortcuts for Experts	Power users can use faster methods	Recently ordered restaurants show first — a kind of shortcut.
3. Offer Informative Feedback	System responds to every action	"Order Placed" confirmation, "Payment Successful" message.
4. Design Dialogs to Yield Closure	Completion messages for reassurance	Order tracking screen shows "Delivered" for closure.
5. Prevent Errors	Avoid conditions that cause mistakes	Disables "Place Order" button if address missing.
6. Permit Easy Reversal of Actions	Undo or cancel options	Remove item from cart option always available.
7. Support Internal Locus of Control	User feels in charge of interaction	Users choose delivery options, modify orders anytime before payment.
8. Reduce Short-Term Memory Load	Keep critical info visible	Cart and past orders displayed for easy recall.

3. Features of Modern GUI (Graphical User Interface)

Feature	Explanation	Example in Zomato App
Windows / Panels	Divides content into logical sections	“Order Panel” displays details while menu stays open.
Menus	Provide structured navigation options	Bottom navigation (Home, Search, Orders, Profile).
Buttons	Trigger actions or submit data	“Login”, “Checkout”, “Track Order”. Red = primary action color.
Scroll Bars	Allow viewing of long lists	Infinite scroll on restaurant and food menus.
Icons	Pictorial representation of actions	Cart 🛒, Search 🔍, Location 📍, Heart ❤️ for favorites.
Panels / Cards	Containers showing related info	Each restaurant shown as card with name, image, rating, and distance.
Error Messages	Display problems and solutions	“Network Error: Please try again later.”
Pop-ups / Alerts	Short notifications for feedback	“Coupon Applied Successfully.”

4. Good vs. Poor Design Comparison (Conceptual Example)

Design Element	Good Design (Zomato)	Poor Design (Example: Old University Website)
Navigation	Intuitive, always visible at bottom	Confusing, multiple links on same page
Colors	Consistent red & white theme	Inconsistent backgrounds and font colors
Feedback	Immediate confirmation messages	No message after form submission
Buttons	Clearly labeled and placed	Small, poorly aligned buttons
Layout	Visually balanced with icons and images	Text-heavy, no visual hierarchy
Accessibility	Mobile-friendly responsive design	Not mobile optimized

5. Summary of Key Takeaway

Topic	Key Point	Example / Tip
UI Design Objective	Make system easy, efficient, and pleasing to use	Prioritize user needs first
Good Design Elements	Simplicity, Consistency, Feedback, Efficiency	Avoid clutter, maintain color uniformity
Eight Golden Rules	Psychological and usability guidelines	Always validate user input, provide closure
GUI Components	Building blocks of user interaction	Menus, buttons, icons, error messages
Modern GUI Features	Intuitive, minimal, responsive, accessible	Keep design mobile-friendly

Quick Mini Activity for Students

Pick any 1 mobile app or website you use daily (

- ➔ e.g., Swiggy,
- ➔ YouTube,
- ➔ IRCTC,
- ➔ Google Pay,
- ➔ Mumbai University site).

Evaluate it on **Three Parameters:**

1. Consistency
2. Feedback
3. Error Prevention

and

Suggest **two improvements** to make it more user-friendly.