MODULE 1-Foundations of HMI

1) What are three levels of processing and seven stages of Action ? How are they interrelated to each other?

Three levels of processing are:

- **Visceral level**
  - ➔ Immediate level of processing
  - ➔ Look and feel of the product is addressed.
  - ➔ Visually pleasing composition dominates the decision
  - ➔ Accept or reject a product, biased by its appearance.
  - ➔ only when this level approves the product we go ahead with the next level
  - ➔ If there is a negative feeling at this level, the next level has to put tremendous efforts for the acceptance of the product.
- **Behavioral level**
  - ➔ Middle level of processing
  - ➔ Products functionality dominates the decision
  - ➔ In this design Semantic and usability practices are addressed.
  - ➔ Communication , proper feedback is important.
- **Reflective Level**
  - ➔ Last level of processing
  - ➔ To build a long term relationship with the customer
  - ➔ The analysis of all the experiences are made.

Seven stages of action:

- *Human actions have two aspects:*
  - ***Execution*** *– perform action*
    Gulf of execution*:The distance between the options available, and the user's goal is the gulf of execution.*
  - ***Evaluation*** *– analyze consequence*
    Gulf of evaluation:*The amount of effort a person has to put to interpret the options available on the system and determine if they will match his intentions*

1. Forming the goal (goal)
2. Forming the intention (plan)
3. Specifying an action (specify)
4. Execute the action (Perform)
5. Perceive the state of the world (perceive)

6. Interpreting the state of the world (reflect)
7. Evaluating the outcome (compare)
Example
1. I want to kill my boredom (goal)
2. Movie good idea (plan)
3. Check for nearest cinema and show time(specify)
4. Purchase a ticket(perform)
5. You watch the audio visual effects of the movie (perceive)
6. You interpret the effects to your understanding (reflect)
7. After the movie you say " it was good time pass"(Compare)

Relation between level of processing and seven stages of actions

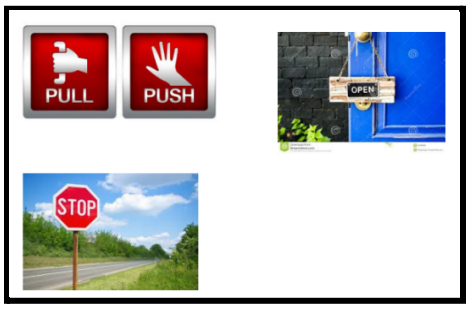
1. Goal : Kill boredome – Reflective
2. Plan: plan for movie – Reflective
3. Specify – choose a movie – behavioral
4. Perform – book the ticket , choose a seat– visceral
5. Perceive – watch the audio video effects – visceral
6. Reflect – You interpret or analyse the effects to your understanding – The behavioral level reacts to these perceptions with an emotion. We relate ourselves with one of the actor in a movie
7. Compare- Was good time pass – reflective. Here the entire experience is compared with the goal.

2) Norman's FUNDAMENTAL PRINCIPLES OF INTERACTION

1. **Affordances**
   - **a.** " The quality of the physical world that suggest the possibility of interaction relative to the ability of an actor to interact"
   - **b.** Affordance are the physical clues that lead the user to understand the functionality of the object.
   - **c.** Example:
     - **i.** Shape of the lid of the container and the container itself
     - **ii.** 3D button – clickable
     - **iii.** Handle of a cup – use to lift the cup
   - **d.** **Three fundamental qualities of affordance:**

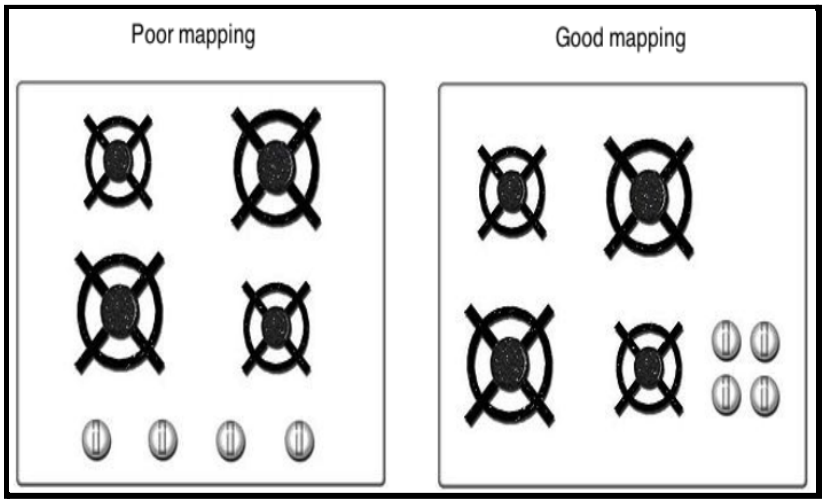
i. The affordance exists relative to the action capabilities of a particular actor.
ii. The existence of an affordance is independent of the actor's ability to perceive it.
iii. An affordance does not change as the needs and goals of the actor change.
iv. Examples : Kitchen containers

2. **Signifiers**
   a. A **physical** form of **showing the functionality** to the user.
   b. Example:
      i. A sound, printed word or an image.
      ii. Click Here Handle of door with PUSH written on it



3. **Perceived affordance**
   a. Perceived affordance **is what the user understands by looking at the object.** It may be different than what the designer intended to be(i.e. real affordance) .
   b. Example:
      i. Up and down arrows on the lift panel.
      ii. Two enter keys on keyboard
4. **Mapping**
   a. "Mapping is the relationship between two objects"
   b. Get the mappings right.
   c. Map actions to appropriate consequences.
   d. Acknowledge every user's action.
   e. Examples:
      i. when you move the mouse to the right, the cursor also moves to the right.
      ii. Steering wheel of the car.
      iii. Regulator of the fan

iv. Switches provide immediate feedback

v. 

5. **Feedback**
    a. A correct mapping of an action to the consequence creates good feedback.
    b. For every action its consequences should be predictable.
    c. Create good feedback.
6. **Conceptual Model**
    a. The mental image of the product in the user.
    b. "I think the system does this" is different from what the system actually does.
    c. Design model is the mental image of the developer, not the user.
    d. Smaller the gap in mental model and design model, better is the user experience.

3) EXPLAIN THE FOLLOWING FOR the scenario:

"We've just parked our car and need to pay for our parking space."

- **The gap between what we wanted to do, and what we have done.**
- Norman called this the **Gulf of execution** and **Gulf of Evaluation**.

GULF OF EXECUTION (1st 4 from 7 stages of action)
GULF OF EVALUATION (next 3)

Now let's imagine the scenario: we've just parked our car and need to pay for our parking space. The first part of this activity will require a sequence of steps in the gulf of execution:

1. Form the goal to use a ticket machine to pay for the parking space
2. Figure out the possible actions on the machine
3. Select a sequence of actions, such as entering coins and pressing a button
4. Physically execute the action sequence

The second part of this activity involves perceiving and interpreting the state of the world by undergoing the gulf of evaluation:

1. Perceive what has just happened
2. Interpret the perception
3. Evaluate the outcome: did our actions move us closer to our goal?

SEVEN STAGES OF ACTION

- **The goal:** use the ticket machine to pay for my parking space
- **Plan:** understand how to operate the ticket machine
- **Specify:** select the actions to enter the car registration number, insert the required amount of money, and print the ticket
- **Perform:** physically execute the specified action sequence
- **Perceive:** observe the digital display and printed ticket
- **Interpret:** the car details and money have been accepted
- **Compare:** the printed ticket has led me to my goal

THREE LEVELS OF PROCESSING

Starting at the lowest level (visceral), a user can experience emotions such as calmness or anxiety. For example, a user unfamiliar with the layout of a ticket machine will likely experience feelings of anxiety when performing an action and perceiving what they've just done.

In the middle level (behavioural), a user's expectations will drive emotions such as hope and fear, and feelings of relief or despair. This level is also sensitive to the expectations of specifying the task and then interpreting the results. For example, while specifying the steps for using a ticket machine, a novice user could experience feelings of doubt. But if they interpret positive results from their actions, then they'll experience relief.

At the highest level (reflective), a user will compare their expectations with what has actually happened. For example, a user follows the correct sequence of actions but then discovers that the ticket machine has errored; this will drive emotions of dissatisfaction, blame or even anger. On the flip side, however, if a user were to successfully complete their activity, then they'll likely experience feelings of satisfaction.

4) EXPLAIN SEVEN STAGES OF ACTION FOR :

YOU ARE AT HOME AND YOU WATCHED A MOVIE

- ★ Goal: Stay home & Watch A movie
- ★ Plan: Watch a movie
- ★ Specify: Choose a movie
- ★ Perform: Download the movie, make popcorn
- ★ Perceive: Watch the movie
- ★ Reflect: Relate the movie to ourselves
- ★ Compare: Compare the movie with another movie

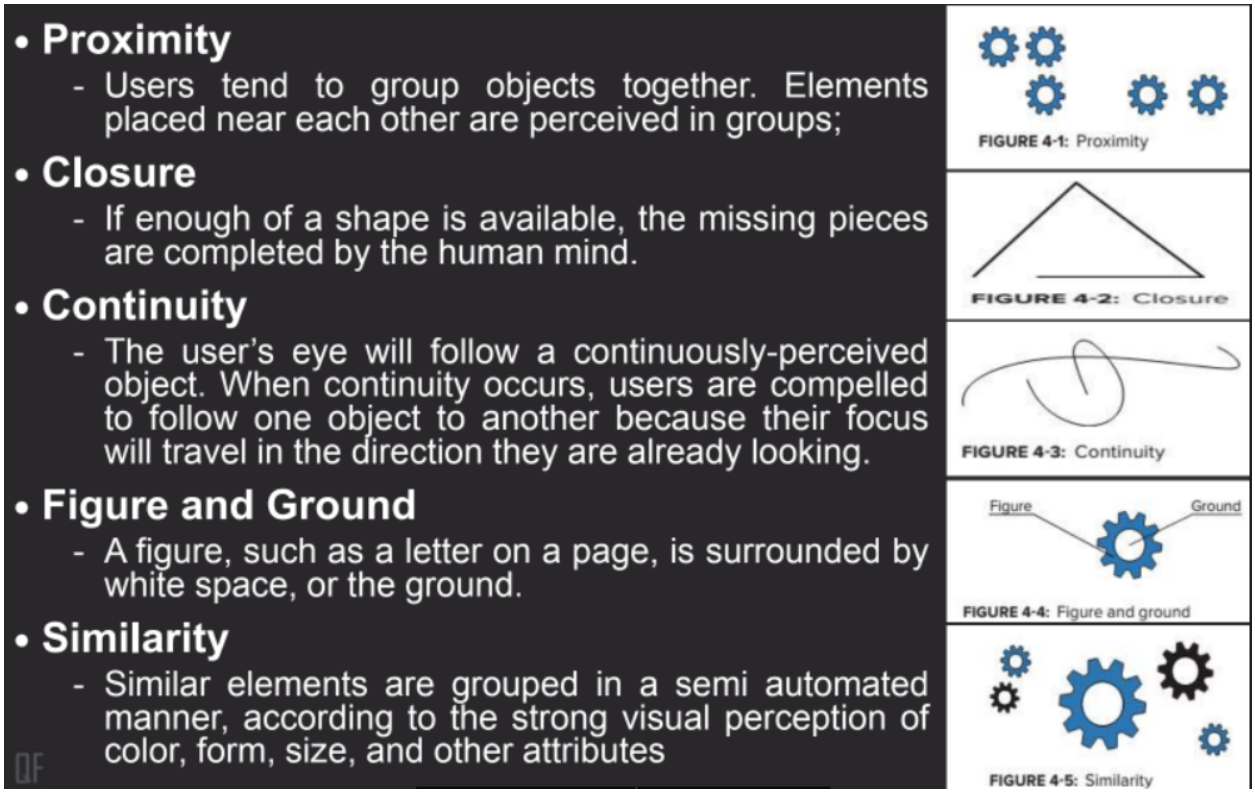
5) WRITE HISTORY OF HUMAN INTERFACE DESIGN

- 1G: Reduce physical labour: Tools such as Axe, Pulley, Wheel
- 2G: Machines that display output. E.g. Speedometer, thermometer, Compass

- 3G: Provide output with feedback. E.g. AC, Oven, mixer grinder fridge.
- 4G: Machines with computing power. Eg. Computers, laptops, smart phones, gadgets.
- 5G:Intelligent machines. E.g. driverless car, automatic AC, Obstacle sensor in automobile

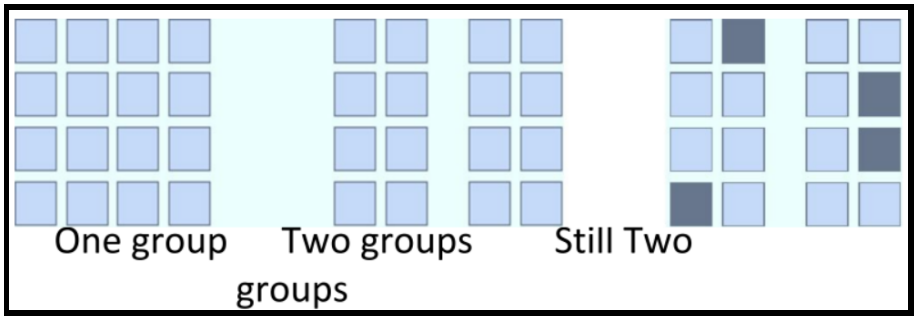
6) EXPLAIN Gestalt Theory

- The Gestalt principles have had a considerable influence on design, describing how the human mind perceives and organizes visual data.
- The Gestalt principles refer to theories of visual perception developed by German psychologists in the 1920s.
- Key principles include proximity, closure, continuity, figure and ground, and similarity.



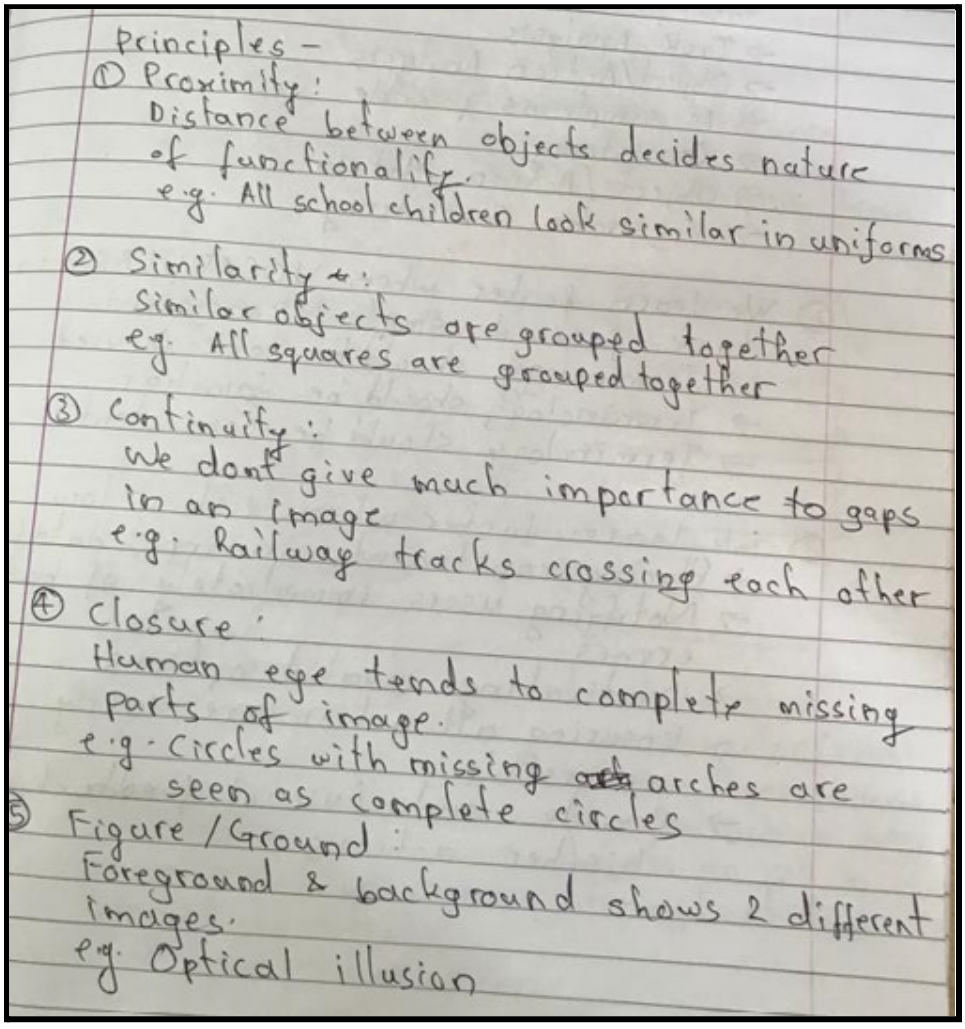
- Gestalt (German/ Deutsche) = unified whole.
- "The whole is other than the sum of the parts" - Kurt Koffka, a German psychologist.
- **Our human mind always tries to make sense even out of chaos.**
    1. Proximity
        a. Distance between objects decides the nature of their functionality.

b.



2. Similarity
3. Continuity
4. Closure

   Human eye tends to complete the missing parts of an image.
5. Figure / Ground
   a. Figure – foreground (black)
   b. Ground – background (white)



Principles –

① Proximity:
Distance between objects decides nature of functionality.
e.g. All school children look similar in uniforms

② Similarity:
Similar objects are grouped together
eg. All squares are grouped together

③ Continuity:
We dont give much importance to gaps in an image
e.g. Railway tracks crossing each other

④ Closure:
Human eye tends to complete missing parts of image.
e.g. Circles with missing arches are seen as complete circles

⑤ Figure / Ground:
Foreground & background shows 2 different images.
eg. Optical illusion

7) EXPLAIN COMMON INTERACTION STYLE

8) What is HMI?

- ➔ Focuses on interaction between users and computers
- ➔ HMI concentrates on how to **present functionality of the system to user**
- ➔ Technology changes rapidly..people change slowly
- ➔ HMI aims at bridging the gap between **human psychology** and **upcoming technologies.**

  "Good Listener can be good speaker"

  In HMI

  "Good observer can be a good designer"

9) WHAT IS User Interface

- ➔ Interaction between users and computers (or machine) occurs at the user interface which includes both software and hardware.
- ➔ User interface design is a **subset** of a field of study called **"human computer interaction (HCI).**
- ➔ Interface design is involved in a wide range of projects from computer systems, to cars, to commercial planes; all of these projects involve much of the same basic human interactions yet also require some unique skills and knowledge.
- ➔ "An interface is the way of presenting the functionalities of the machine to the user."

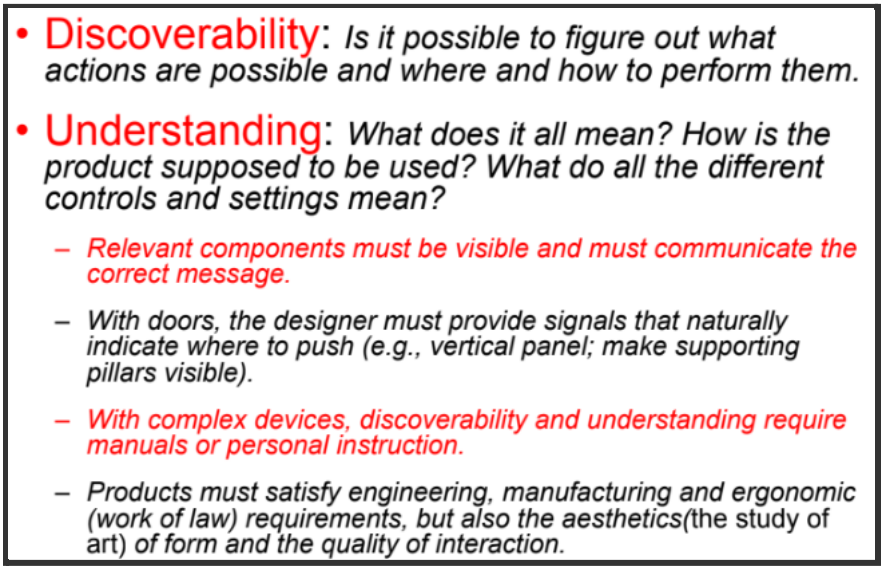
10) COMPARE AR Vs. VR

Augmented Reality	Virtual Reality
System augments the real world sense	Totally immersive environment
User maintains a sense of presence in real world	Visual senses are totally under control of the system
Users are able to distinguish between the real world and augmented contents	Users cannot tell the difference between the real and virtual world
Users remain in the real world	Users are transported into a new world.

Example: AR: If I am looking at a street and point my smartphone towards that street, it may give me more information, such as names of cafes, gyms, dentists, etc.

11) Human Centered Design:

- ➔ HCD is to consider all aspects of the target users: **likes, dislikes, behavior, experience, skill sets etc.**
- ➔ Every user has some kind of experience of the real world. The internal representation of something is called the user's mental model.
- ➔ Conceptual models must confront the user's mental model..
- ➔ If the end product does not map to the user's mental model then the product will fail.
- ➔ **Four aspects of HCD**
    1. **Feedback:** Every action must be acknowledged.
    2. **Constraint:** Prevents the user from making mistakes. E.g. Date picker to enter date.
    3. **Affordance:** Convey the rules by leaving visual clues.
    4. **Power of observation:** Learn from the struggle of others. Observe people.
- ➔ **Human-Centered Design Principles:**



12) Good design

13) Psychopathology of everyday things

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MODULE 2-Design and software process

1) What is Goal Directed Design

Goal directed design mainly focuses on the design issues related to the specific task that need to be carried out as per user's requirements.

Three Keys to success

- **Desirability**: What does the end user need? - **Designer**
- **Viability:** How can we sustain the business? (ensure use, usage, and usability) - **Manager**
- **Capability**: What can we deliver by using the latest available technology. - **Technical Expert**

Recognizing the goals

- The user interface should be communicated to the end user for **acceptance** well before the coding begins.
- Present the **prototype** of the interface to the user. Take feedback and change it.
- The prototype presented after identifying the exact goals must ensure,
  - It is **user friendly**
  - It provides **feasibility** for the user
  - User is able to **effectively** operate the system
  - User is able to **enjoy** the system operation
- **Goals are human centric**; They change very slowly.
- **Activities** may change each time you perform some task.

Identify Goals and activities for..
Automated customer care interface using telephone.
ATM
Mobile app for performing shopping

1. **Goal**: To provide customer care **Activity**: Answering the queries asked by the customer
2. **Goal**: To help the user to avoid standing in long queues. **Activity**: Make transactions easier
3. **Goal**: To make shopping easier. **Activity**: To order clothes.

2) Six phases of Goal directed Design

1. **Research**
    a. In this stage you collect qualitative data about the users or potential users through field studies and interviews.
2. **Modeling**
    a. The modeling stage can be broken down into **two** parts.
        i. In part one you define the **domain model.** Domain model includes information flow and workflow from the Research stage.
        ii. In part two you define the **user model** through the use of personas which represent identifiable groups of users.
3. **Requirement Definition**
    a. Requirement gathering is done in this phase.
    b. Focus is on the most important tasks performed by the user.
4. **Framework**
    a. Focus is on the actual design of the system
    b. You create the overall product concept and define the behavior and visual design of the product. You can also **create prototypes** during this stage.
5. **Refinement**
    a. In the refinement stage you place more focus on detail and implementation
    b. This phase may use ***storyboards***.
    c. The shortcomings of the previous phase are overcome in this phase.
6. **Support**
    a. The system is sent to the user.
    b. This phase will fulfill the **requirements of the user.**

3) Quantitative Vs. Qualitative Research

Quantitative	Qualitative
Quantitative Research is used to quantify the problem by way of generating numerical data or data that can be transformed into usable statistics. It is used to quantify attitudes, opinions, behaviors, and other defined variables	Qualitative Research is primarily exploratory research. It is used to gain an understanding of underlying reasons, opinions, and motivations.
Helps to forecast the use and usability of the interface	It helps to identify any existing same or similar products are available.
Quantitative data collection methods are much more structured than Qualitative data collection methods. Quantitative data collection methods include various forms of surveys – online surveys, paper surveys, mobile surveys and kiosk surveys, face-to-face interviews, telephone interviews.	Qualitative data collection methods vary using unstructured or semi-structured techniques. Some common methods include focus groups (group discussions), individual interviews, and participation/observations. The sample size is typically small, and respondents are selected to fulfil a given quota
It uses non-statistical data analysis	Statistical data is usually in the form of tabulations (tabs). Findings are conclusive and usually descriptive in nature

4) Storyboard

- User stories are less suited to describe complex user interactions. This is where **scenarios and storyboards** come into play: Both are great tools to describe the interaction steps.
- Storyboard illustrates the interaction required to achieve a goal. But instead of using a list of steps, **a storyboard visualizes the interaction similar to a comic strip.**
- https://www.storyboardthat.com/storyboard-creator

5) Persona

- A persona, depending on the context, is the public image of one's personality, the social role that one adopts, or simply a fictional character.
- A user persona is a **fictional representation of your ideal customer.** A persona is generally based on user research and incorporates the needs, goals, and observed behavior patterns of your target audience.

- https://xtensio.corn/
- Why Do You Need A Persona?
    - Whether you're developing a smartphone app or a mobile-responsive website, it's very important to understand who will be using the product.
    - **Knowing your audience will help influence the features and design elements you choose, thus making your product more useful.**

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6) Direct and indirect method of information collection technique

❖ Direct

Individual Face-to-Face Interview • A one-on-one visit with the user to obtain information. It may be structured or somewhat open-ended.
Telephone Interview or Survey • A structured interview conducted via telephone.
Traditional Focus Group • A small group of users and a moderator brought together to verbally discuss the requirements.
Facilitated Team Workshop • A facilitated, structured workshop held with users to obtain requirements information. Similar to the Traditional Focus Group.
Observational Field Study • Users are observed and monitored for an extended time to learn what they do.
Requirements Prototyping • A demo, or very early prototype, is presented to users for comments concerning functionality.
User-Interface Prototyping • A demo, or early prototype, is presented to users to uncover user-interface issues and problems.
Usability Laboratory Testing • Users at work are observed, evaluated, and measured in a specially constructed laboratory.

❖ Indirect

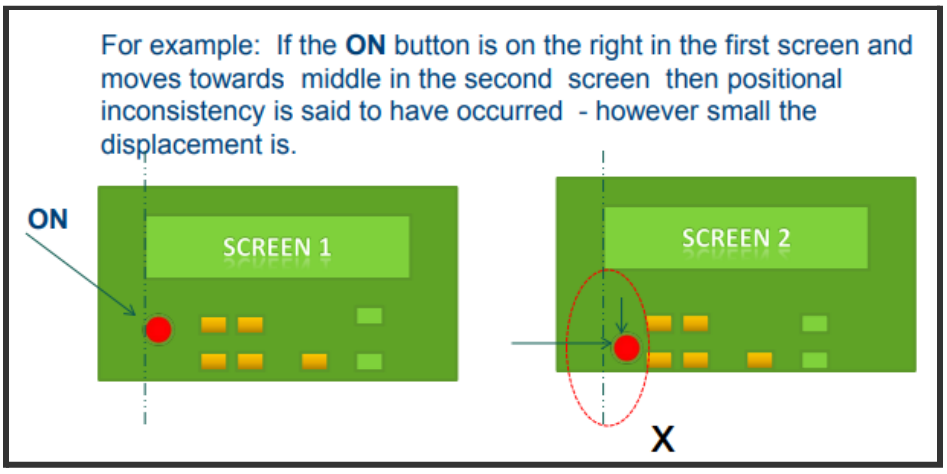
MIS Intermediary • A company representative defines the user's goals and needs to designers and developers.
Paper Survey or Questionnaire • A survey or questionnaire is administered to a sample of users using traditional mail methods to obtain their needs.
Electronic Survey or Questionnaire • A survey or questionnaire is administered to a sample of users using e-mail or the Web to obtain their needs.
Electronic Focus Group • A small group of users and a moderator discuss the requirements online using workstations.
Marketing and Sales • Company representatives who regularly meet customers obtain suggestions or needs, current and potential.
Support Line • Information collected by the unit that helps customers with day-to-day problems is analyzed (Customer Support, Technical Support, Help Desk, etc.).
E-Mail or Bulletin Board • Problems, questions, and suggestions from users posted to a bulletin board or through e-mail are analyzed.
User Group • Improvements are suggested by customer groups who convene periodically to discuss software usage.
Competitor Analyses • A review of competitor's products or Web sites is used to gather ideas, uncover design requirements and identify tasks. 85

7) Donald Norman seven principles for the evaluation of the interaction between.

1. **Use both knowledge in world & knowledge in the head**
    a. Task Level
    b. Goal Level
    c. Semantic level
    d. Syntax level
    e. Lexical level
    f. Physical Level
2. **Simplify task structures.**
3. **Make things visible: bridge the gulfs of Execution and Evaluation.**
4. **Get the mapping right (User mental model = Conceptual model = Designed model)**
5. **Convert constraints into advantages (Physical constraints, Cultural constraints, Technological constraints)**
6. **Design for Error**
7. **When all else fails – Standardize**

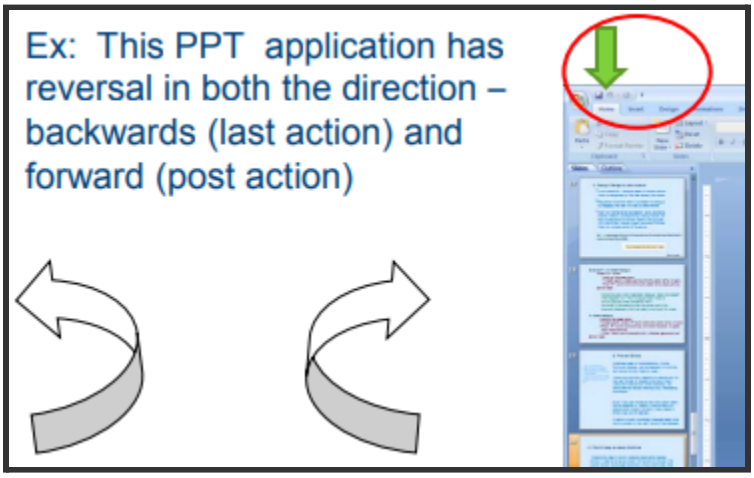
8) Eight Golden Rules of User Interface Design stated by Ben Shneiderman.

1. **Strive for Consistency**
    a. Users need to be able to do the same thing the same way that they have been doing.- every time.

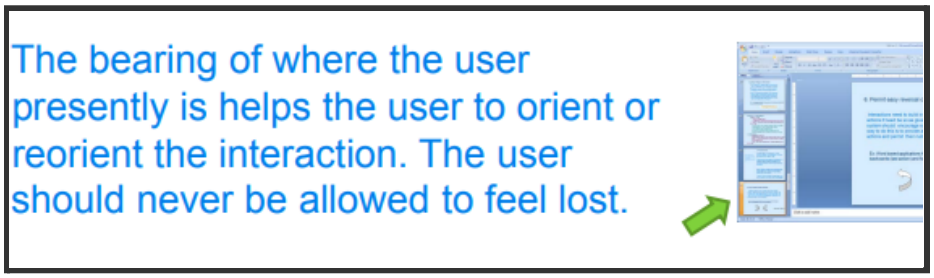


2. **Cater to Universal Usability**
    a. Interfaces need to cater to all levels & classification of users: **beginners, intermediate and experts.**
3. **Offer Informative feedback**
    a. Interfaces should not just be communicative but also need to inform the 'user' in terms of learning & feedback which tells them that they are proceeding in the right direction.
    b. Unless the user gets feedback he/she cannot proceed or becomes unsure of the correctness of the action.
4. **Design Dialogs to yield closure**
    a. In an interaction - dialogue needs to have a closure which is recognized by the user as the end of an action.
    b. Sequences of actions need to proceed in a dialogue by engaging the user in a step by step manner.
    c. Like in a mathematical expression, every enclosing bracket needs a corresponding closing bracket. So also subsequence of actions needs to be grouped with intermittent closing of each sub group followed finally by a closer action of the group.
    d. Ex: A message at the end of a sequence of events gives a feedback & closure of sending a SMS

5. **Prevent Errors**
    a. Even if the user makes an error the system needs to be designed to detect it, take corrective or precautionary steps to arrest it. It also needs to offer a way out for recovery from the error.
    b. A default system message needs to be communicated to the user if an error has happened
6. **Permit easy reversal of actions**
    a. Interactions need to build in retracing backwards /reverse actions if need be so as to give relief from anxiety to the user.
    b. The system should encourage exploration without techno fear.
    c. One way to do this is to provide a re-traceable path backwards of all actions and permit their nullification.

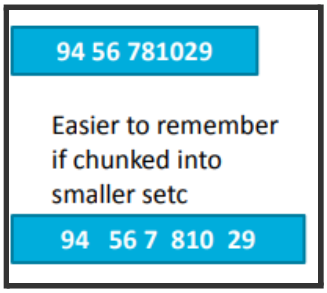


7. **Support internal locus of control**
    a. Allow users to always feel 'in control' of the system and of the situation. Make the user aware that he/she is in control.
    b. Users should believe that they are controlling the system and not the other way around. This is achieved by more opportunities for 'interactions'.



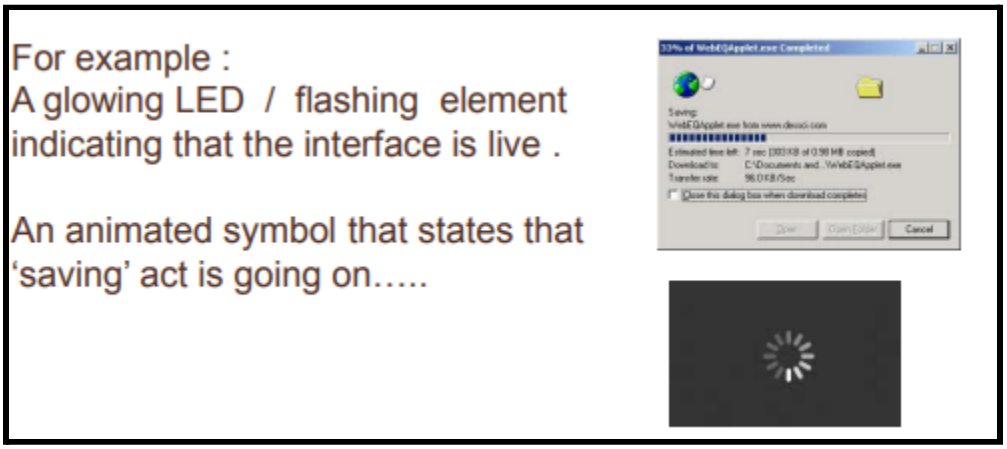
8. **Reduce short term memory load**

a. Do not expect the user to remember several sequences , actions and their consequences at a time. Means loading their short term memory while interacting.



9) Jacob Nielsen's Ten Heuristic Principles

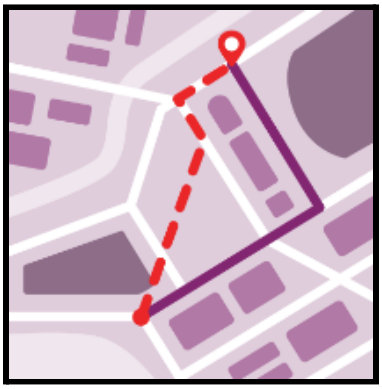
1. **Visibility of system status**
   a. Users need to be kept informed by the system about what is going on, through appropriate feedback within reasonable time.



2. **Match between system and the real world**
   a. The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow realworld conventions, making information appear in a natural and logical order.
   b. Example: Tendency to use programming language and syntax on the display, while understandable to the software programmer, will certainly be a mismatch to a user.
3. **User control and freedom**
   a. Users often perform actions by mistake. They need a clearly marked "exit" to leave the unwanted action without having to go through an extended process.

b. When it's easy for people to back out of a process or undo an action, it fosters a sense of freedom and confidence. Exits allow users to remain in control of the system and avoid getting stuck and feeling frustrated.
c. Example: Undo & Redo button

4. **Consistency and standards**
    a. Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform and industry conventions.
5. **Error prevention**
    a. It is possible to pinpoint the typical errors that users normally tend to commit. Prevention of error is the best approach.
    b. However recovery from error prone actions through a well designed error message should be adopted
6. **Recognition rather than recall**
    a. Loading the short term memory of the user beyond a limit has negative consequences.
    b. a user need not have to remember or recall all the instructions.
    c. Users are better at recognising things they have previously experienced. Prompts , visibility , sequential direction, pop-ups etc should come to the aid of the user. Help needs to be easily retrievable.
    d. Example: It's easier for most people to recognize the capitals of countries, instead of having to remember them. People are more likely to correctly answer the question Is Lisbon the capital of Portugal? rather than What's the capital of Portugal?
7. **Flexibility and efficiency of use**
    a. Shortcuts — hidden from novice users — may speed up the interaction for the expert user such that the design can cater to both inexperienced and experienced users.
    b. Example: Regular routes are listed on maps, but locals with more knowledge of the area can take shortcuts.



8. **Aesthetic and minimalist design**
    a. Interfaces should not contain information which is irrelevant or rarely needed.
    b. Every extra unit of information in an interface competes with the relevant units of information and **diminishes** their relative visibility.
    c. Example: An teapot may have excessive decorative elements that can interfere with usability, like an uncomfortable handle or hard to wash nozzle.
9. **Help users recognize, diagnose, and recover from errors**
    a. Error messages should be expressed in plain language (no error codes), precisely indicate the problem, and constructively suggest a solution.
    b. Example: Wrong way signs on the road remind drivers that they are heading in the wrong direction and ask them to stop.
10. **Provision of Help and documentation**
    a. It's best if the system doesn't need any additional explanation. However, it may be necessary to provide documentation to help users understand how to complete their tasks.
    b. Example: Information kiosks at airports are easily recognizable and solve customers' problems in context and immediately.

MODULE 3-GUI

1) Principles of Design

- Universal Design is "the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design"
- **The Principles of Universal Design**
    - **Principle 1: Equitable Use**
        - The design is useful and marketable to people with diverse abilities.
        - Example
            - Power doors with sensors at entrances that are convenient for all users
    - **Principle 2: Flexibility in Use**
        - The design accommodates a wide range of individual preferences and abilities
        - Example:
            - Scissors designed for right- or left-handed users

        - An ATM that has visual,tactile, and audible feedback, a tapered card opening,and a palm rest
- **Principle 3: Simple and Easy to Use**
    - Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.
    - Example:
        - An instruction manual with drawings and no text
        - A moving sidewalk or escalator in a public space
- **Principle 4: Perceptible Information**
    - The design **communicates necessary information effectively to the user**, regardless of ambient conditions or the user's sensory abilities.
    - Example:
        - Tactile, visual, and audible cues and instructions on a thermostat
        - Redundant cueing (e.g., voice communications and signage) in airports, train stations, and subway cars
- **Principle 5: Tolerance for Error**
    - The design minimizes hazards and the adverse consequences of accidental or unintended actions.
    - Example
        - An "undo" feature in computer software that allows the user to correct mistakes without penalty
- **Principle 6: Low Physical Effort**
    - The design can be used efficiently and comfortably and with a minimum of fatigue.
    - Example:
        - Lever or loop handles on doors and faucets
- **Principle 7: Size and Space for Approach and Use**
    - Appropriate size and space is provided for approach, reach, manipulation, and use regardless of the user's body size, posture, or mobility.
    - Example:
        - Wide gates at subway stations that accommodate all users
        - Controls on the front and clear floor space around appliances, mailboxes, garbage dumpsters, and other building elements

2) Features of Graphical Interface

- Sophisticated visual presentation

o Objective is to reflect real world of the user realistically, meaningfully, simple and clear

- Pick-and-Click interaction

o (Using mouse and keyboard)

- Restricted set of interface options

- Visualization

- Effective visualization can facilitate mental insights and increased productivity

- Object orientation

- Use of Recognition memory

- Concurrent performance of functions.

3) Graphical Systems advantages and disadvantages

Advantages:

- **Symbols recognized faster than text**
    - Brain processes Visual content in 0.25s
- **Faster Learning**
    - Graphical, Pictorial representation can be easily learned
- **Faster use and problem solving**
    - Eg: Installation of software
- **Easier remembering**
- **More Natural**
    - Graphical representation are more natural
- **Exploits visual/spatial cues**
    - Visually thinking is believed to be better than logical thinking
- **Fosters more concrete thinking**
    - No need mentally decompose tasks.
    - Abstract thinking is minimized
- **Easily reversible actions**
- **Fewer errors.**
- **Less anxiety concerning use.**
- **Immediate feedback**
- **Predictable system responses**
- **More attractive.**
- **May consume less space**
    - More information can be packed in less space through icons
- **Replaces national languages.**

    - No need for language translations.
    - Icons are universally same
- **Low typing requirements**
    - Pointing and selection controls such as mouse,trackball eliminate need for typing
- **Smooth transition from command language system.**

Disadvantages

- **Greater design complexity.**
- **Learning is still necessary**.
    - Icons may not be known to the first time users
    - Significance of each icons has to remembered
    - How to use pointing device needs to be learned
- **Lack of experimentally-derived design guidelines.**
- **Inconsistencies in technique and terminology.**
- **Not always familiar.**
    - Symbolic representations may not be familiar as words or numbers.
    - Nontechnical people may prefer text based system over graphics
- **Human comprehension limitations**.
  Eg: Touch screens, double clicking a mouse, drag and drop
- **Few tested icons exist.**
    - Poor and improper icon design will lead to confusion
- **Inefficient for touch typists.**
- **Not always the preferred and fastest style of interaction.**
- **Increased chances of clutter and confusion.**
- **Hardware limitations**
    - Require adequate power, speed, screen resolution and graphic capability

4) Characteristics of the graphical user interface

- Sophisticated visual presentation
  - Objective is to reflect real world of the user realistically, meaningfully, simple and clear
- Pick-and-Click interaction(using mouse and keyboard)
- Restricted set of interface options
- Visualization
  - Effective visualization can facilitate mental insights and increased productivity
- Object orientation
- Use of Recognition memory
- Concurrent performance of functions.

5) GUI Vs. Web page design

GUI V/S WEB PAGE DESIGN ...

Features	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 organizatio 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, register for services, participate in transactions, fill out forms, download and Movement between pages and sites very rapid. save things. Familiarity with many sites not established.
Response Time	Nearly instantaneous	Quite variable, depending on transmission speeds, page content, and so on. Long times can upset the user.
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.

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.
Context	Restricted navigation paths. Multiple viewable windows.	Single-page entities. Unlimited navigation paths.

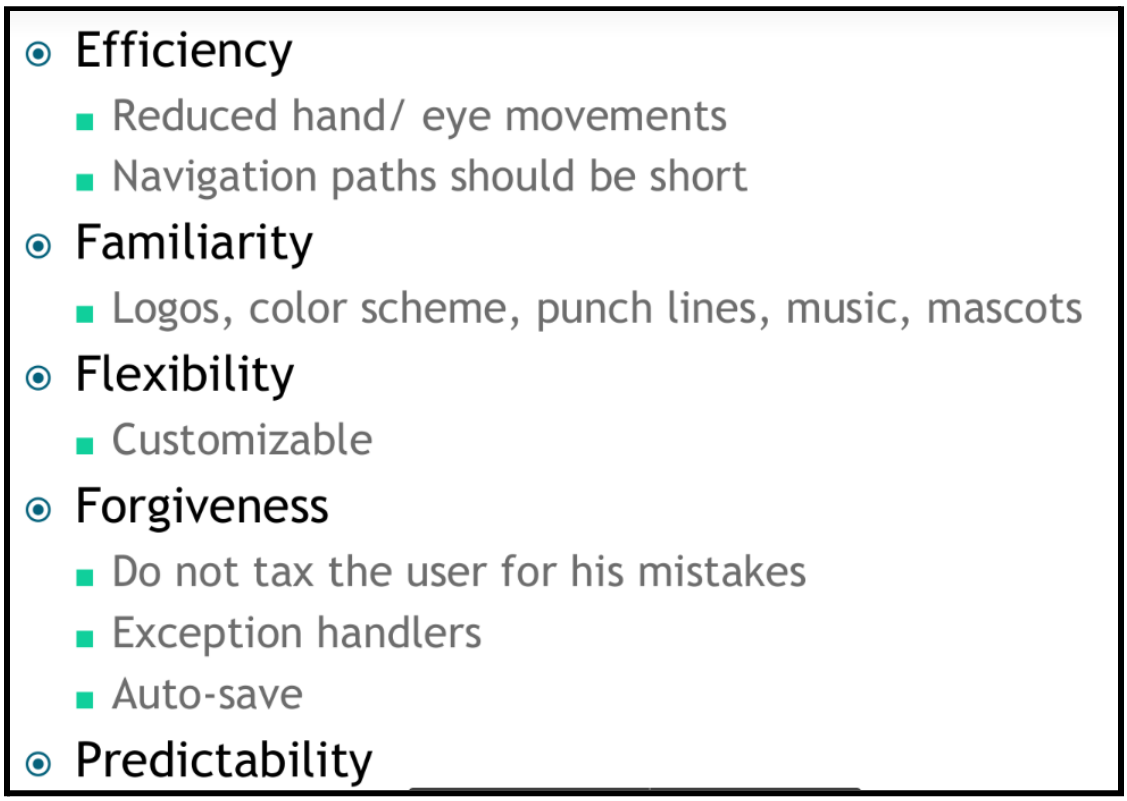
Navigation	Through menus, lists, trees, dialogs, and wizards.	Through links, bookmarks, and typed URLs.
Visual Style	Typically prescribed and constrained by toolkit. Visual creativity allowed but difficult. Little significant personalization.	Fosters a more artistic, individual, and unrestricted presentation style. Complicated by differing browser and display capabilities, and bandwidth limitations. Limited personalization available.

Task Efficiency	Targeted to a specific audience with specific tasks.	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 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.

6) GENERAL PRINCIPLES OF USER INTERFACE DESIGN

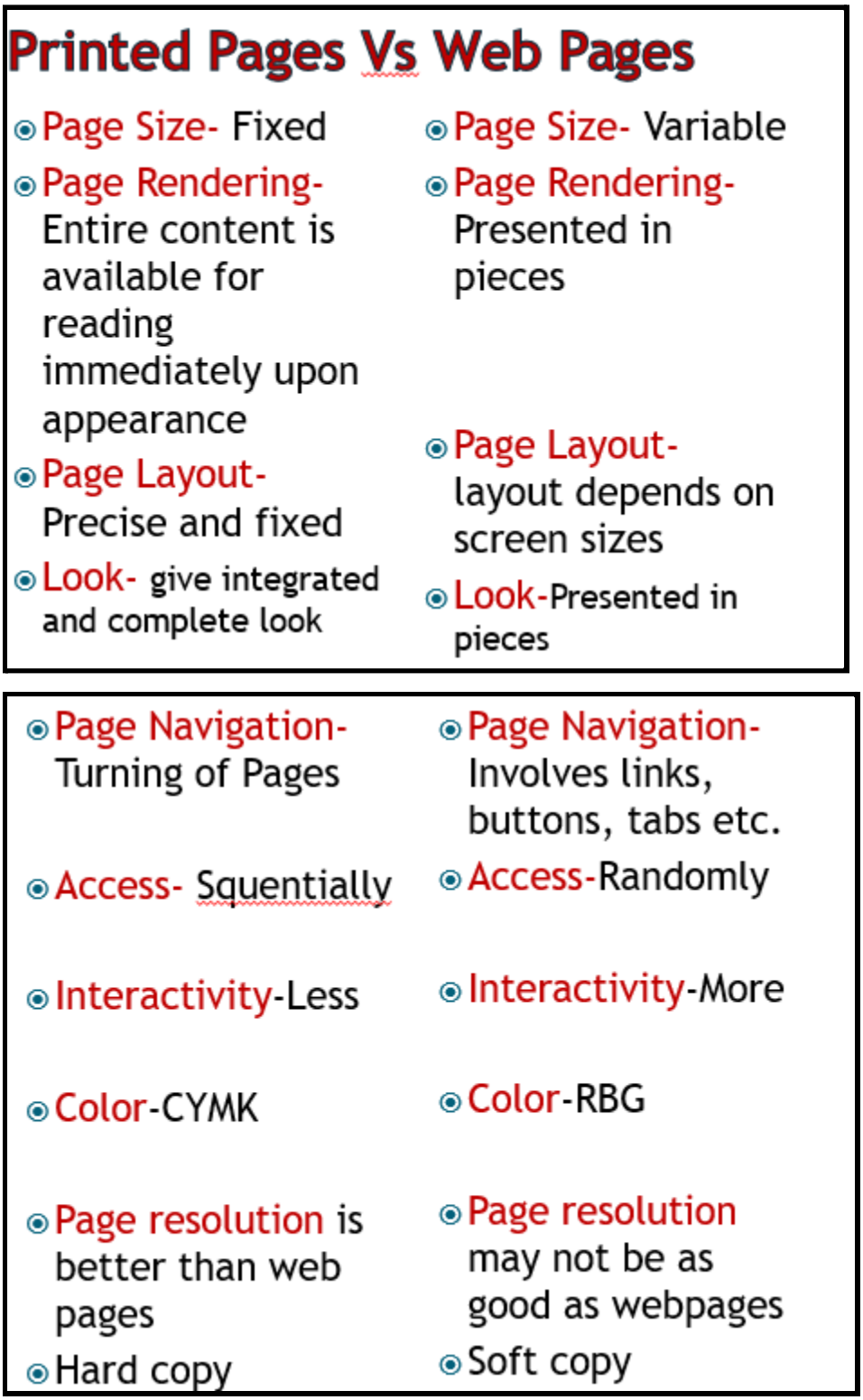
- **Aesthetically pleasing**
  - Appeals to our eyes – color, shape, size, images…
- **Clarity**
  - Not confusing
  - Interface should be visually, conceptually and linguistically clear
  - Avoid computer Jargons
- **Compatibility**
  - User

    - Task
    - Product
- **Comprehensibility**
    - Easy to understand (what to look at?)
    - what ,when how where to do
- **Configurability**
    - Easy to personalize
    - Desktop view/ mobile view
- **Consistency**
    - System should look, act and operate the same throughout
- **Control**
    - Every action has a consequence
    - Nothing happens without a user action.
- **Directness**
    - Provide direct ways to accomplish tasks



- Recovery
  - Remember last activity of user
  - User should be able to retract action using *undo*
- Responsiveness
  - Every user action has to be responded appropriately and immediately.
- Simplicity
  - Don’t confuse the user
- Transparency
  - User need not understand the working of the system to use it.

7) Printed Pages Vs Web Pages



MODULE 4

1) Apply a visual emphasis technique to highlight the most important or prominent parts of a screen.

1. Brightness :

- A brighter element has a ***good*** *attention-getting* quality and no disturbing features. It may be used to indicate items in error, and increased brightness is the best for calling attention to data on inquiry screens.
- Do not use more than two brightness levels on a screen.

2. Fonts:

- Differences in fonts have a ***moderate*** *attention-getting* capability. Their varying sizes and shapes can be used to differentiate screen components.
- Larger, bolder letters can be used to designate higher-level screen pieces, such as different levels of headings, if the headings are used to search for something.
- Do not use larger fonts, however, for entry/modification (conversational) and display/read-only screens, because this will place too much emphasis in the headings themselves. **If you are using multiple fonts, never use more than two styles or weights, and three sizes, on a screen.**

3.Underlining:

- Underlining is a ***moderate*** *attention-getting* mechanism but it can reduce legibility, so it should be used conservatively and carefully.
- In Web pages it is used to designate *navigation links* .

4.Blinking.

- Blinking has a very ***high*** *attention-getting* capability, but it reduces text readability and is **disturbing** to most people.
- It often causes visual fatigue if used excessively. Therefore, it **should be reserved for urgent situations and times when a quick response is necessary.**
- **A user should be able to turn off the blinking once his or her attention has been captured.**
- The recommended blink rate is 2–5 Hz, with a minimum “on” time of 50 percent. An alternative to consider is creating an “on” cycle considerably longer than the “off,” a wink rather than a blink.

5. Line rulings and surrounding boxes or frames.

- Use lines to emphasize and guide the user's eye through the screen.
- Use *horizontal* rulings as a substitute for spaces when *breaking a screen into pieces.*
- Use *vertical* rulings to convey to the screen viewer that a screen should be *scanned from top to bottom* .
- Use rules to surround radio buttons and check box controls, and other groupings of controls or important single controls.
- Use no more than three line thicknesses or two line styles on a screen.

6. Colors.

- Use color to emphasize and assist in the identification of screen components.
- Some colors appear brighter than others.
- Display ***no more than four colors*** **at one time** on a screen essentially alphanumeric in nature, six on a statistical graphics screen.

7. Other emphasis techniques:

- Other emphasis techniques include:
- displaying the element in a larger size,
- placing an element in a position where the eye first meets the screen,
- isolating the element from the remainder of the screen,
- presenting the element in a distinctive or unusual shape, and using white space to emphasize blocks of text.
- One's eyes will also be drawn to the start of any text following white space.

8. De-emphasize less important elements:

- To designate an element as not applicable or not active, **dim it or gray it out.**

9. Avoid too much emphasis:

- Emphasis will lose its attractive value if too many different items on a screen are emphasized.
- Focus problems will also be created if too many emphasizing techniques are used within a screen.
- In using emphasis, simplicity is the key.

10.Web page emphasis:

- The dynamic nature of the Web and its available screen design tools raise some other emphasis considerations.
- New or changed Web page content should be emphasized to immediately call the user's attention to it when the page is presented.

- Inappropriate page backgrounds may degrade an emphasis technique's usability.
- Background graphics, pictures, patterns, or textures may reduce the technique's attention-getting quality, as well as reduce text legibility.

11. Reverse polarity:

- Reverse polarity meant **displaying dark text on a light background, or reversing the standard light text on a dark background.**
- For elements of screens—pieces of data, messages, and so on—reverse polarity has a very **high** attention-getting quality.

2) With respect to screen explain the following

- 2.1) SCREEN Meaning AND PURPOSE

Each screen element

- Every control
- All text
- Screen organizations
- All emphasis
- Each color
- Every graphic
- All screen animation
- All forms offered back

Must

- Have meaning to screen users
- Serve a purpose in performing task organizing screen elements

Consistency

- Provide **real world** consistency
- Provide **internal** consistency
- Follow the same conventions
- Deviate only when there is clear benefit to user

- 2.2) ORDERING OF SCREEN DATA & CONTENT

- **Divide information into units that are logical, meaningful and sensible.**
- Organize interrelationships between data or information.

- Provide an ordering of screen units of elements depending on priority.
- Possible ordering schemes include
    - Conventional
    - Sequence of use
    - Frequency of use
    - Function
    - Importance
    - General to specific**.**
- Form groups that cover all possibilities.
- Ensure that information is visible.
- Ensure that only information relative to the task is presented on screen.
- Organizational scheme is to minimize the number of information variables.

Upper left starting point

- Provide an obvious starting point in the screen's upper left Corner.

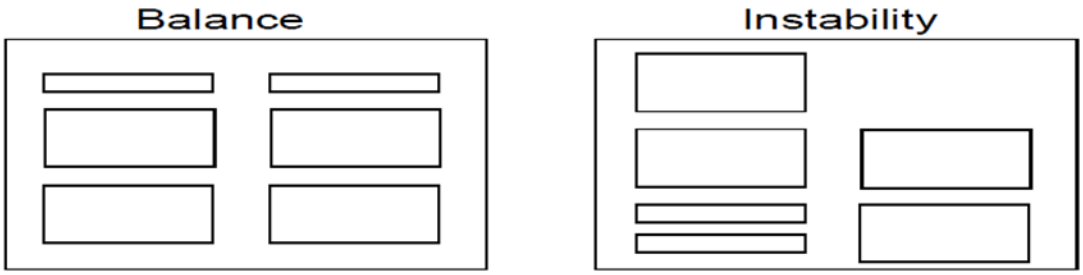
- 2.3) SCREEN NAVIGATION AND FLOW

- Provide an ordering of screen information and elements that:
    - is rhythmic guiding a person's eye through display
    - Encourages natural movement sequences.
    - Minimizes pointer and eye movement distances.
- **Locate the most important and most frequently used elements or controls at top left.**
- Maintain top to bottom, left to right flow.
- Assist in navigation through a screen by
    - Aligning elements
    - Grouping elements
    - Use of line borders
- Through focus and emphasis, sequentially, direct attention to items that are
    - Critical
    - Important
    - Secondary
    - Peripheral
- Tab through the window in logical order of displayed information.
- Locate command button at the end of the tabbing order sequence,

3) VISUALLY PLEASING COMPOSITION

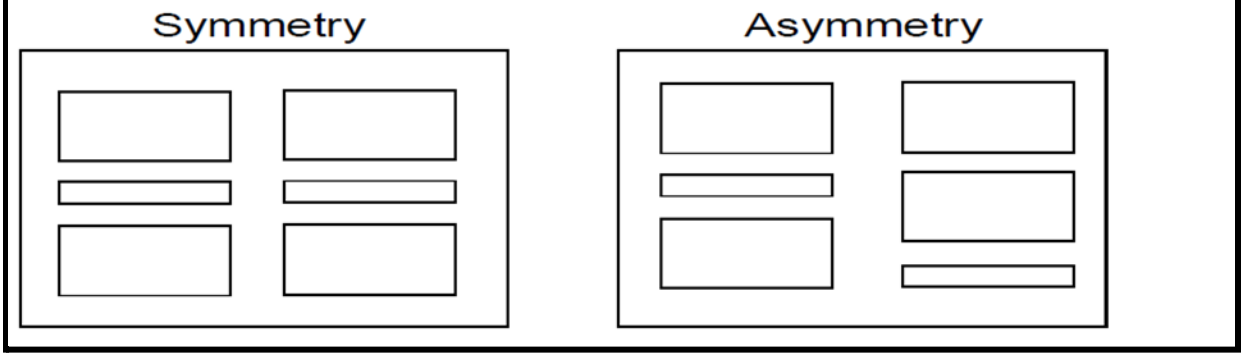
- **Balance**

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



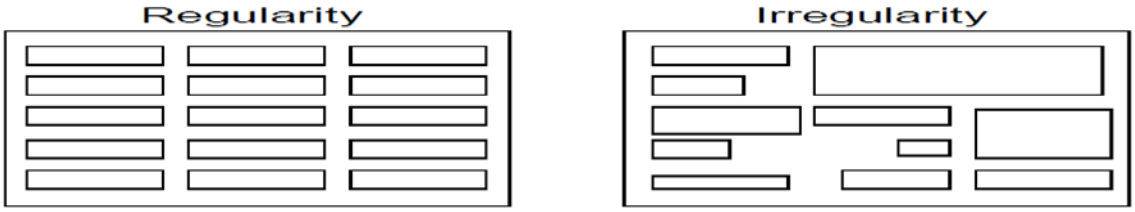
- **Symmetry**

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



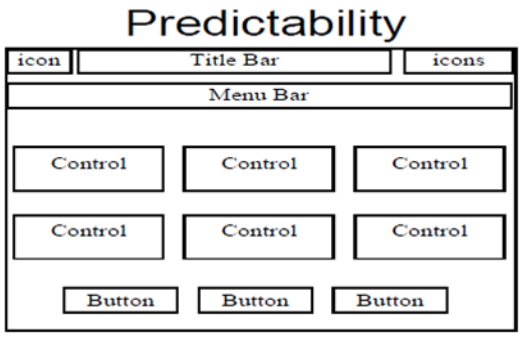
- **Regularity(Consistency)**

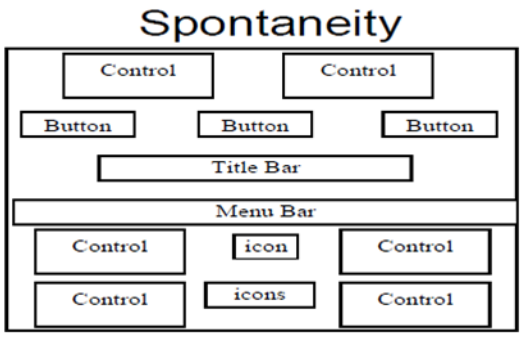
Regularity: Create regularity by using consistently spaced column and row starting points for widgets. Also use elements similar in size shape, color and spacing.



- **Predictability**

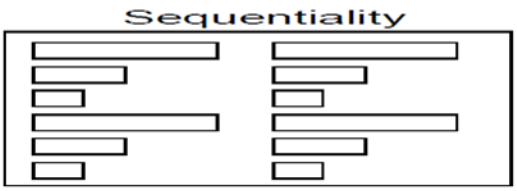
Predictability: Create predictability by being consistent and following conventional orders or arrangements.

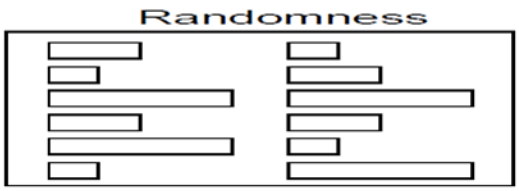




- **Sequentiality**

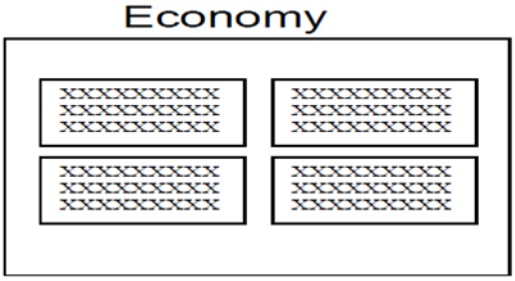
Sequentiality: Provide sequentiality by arranging elements to guide the eye through the screen in an obvious, logical, rhythmic, and efficient manner.

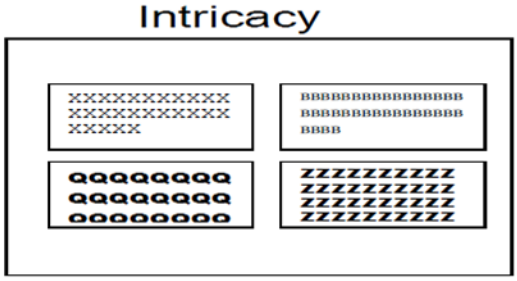




- **Economy**

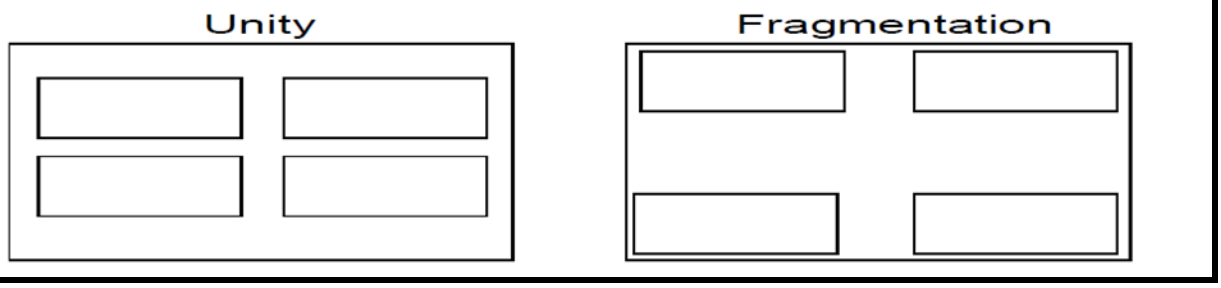
Economy: Provide economy by using as few styles, display techniques, and colors as possible.





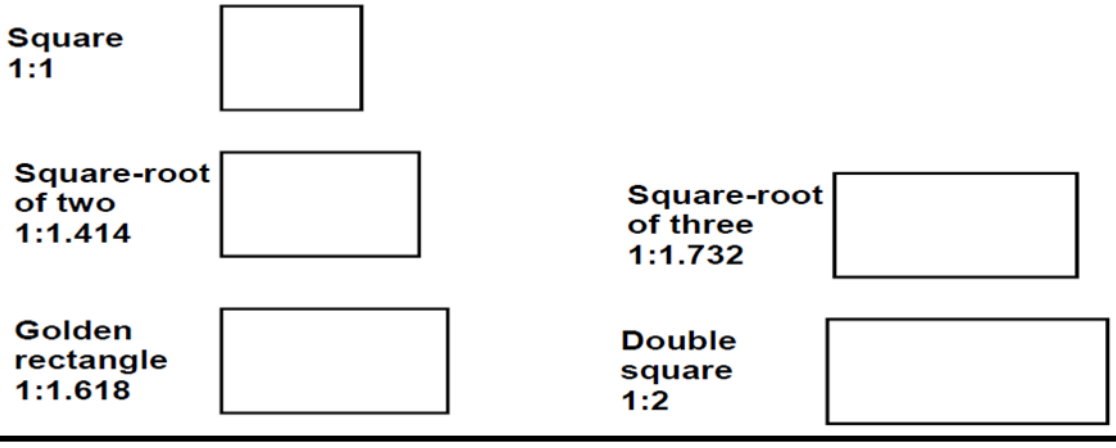
- **Unity**

Unity: Create unity by using similar sizes, shapes, or colors for related information. Also by leaving less space between elements of a screen than the space left in the margins.



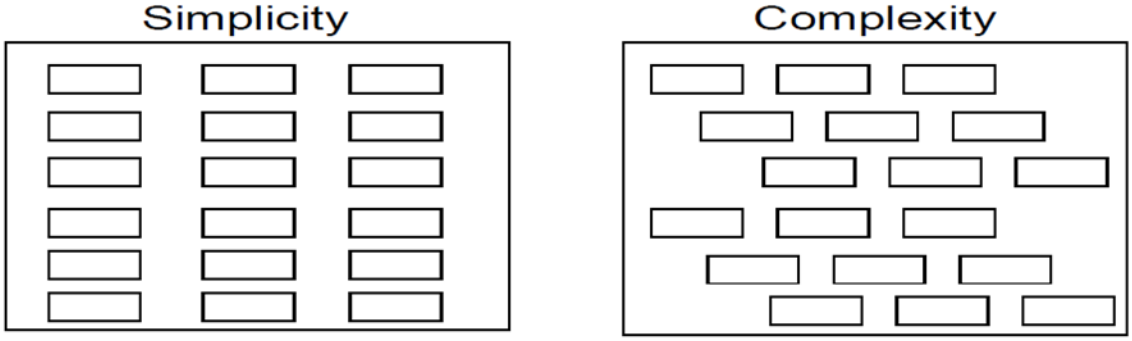
- **Proportion**

Proportion: Create windows and groupings of data or text with aesthetically pleasing proportions.



- **Simplicity**

Simplicity: Optimize the number of elements on a screen, within the limits of clarity. Minimize the alignment points, especially horizontal and vertical.



- **Groupings**

Groupings: GROUPING USING BORDERS

- Provide functional groupings
- Create spatial groupings
- Provide meaningful titles for each grouping
- Incorporate line borders
- Do not exceed three-line thickness
- Create lines consistent in height and length
- For adjacent groupings with borders wherever possible
- Use rules and borders sparingly

4) A well-designed screen

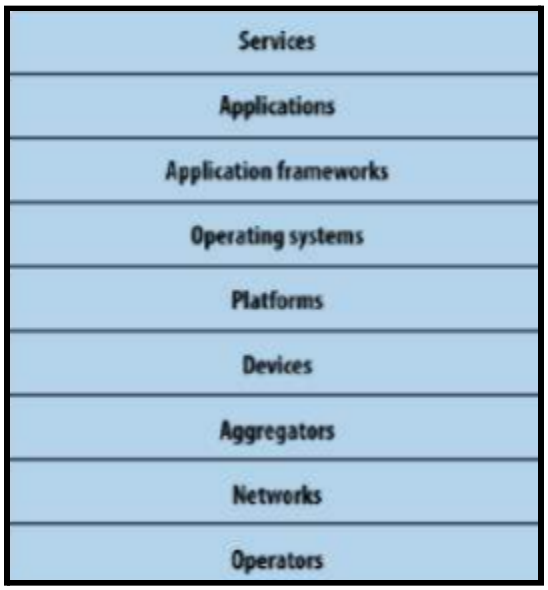
- Reflects the capabilities, needs, and tasks of its users.
- Is developed within the physical constraints imposed by the hardware on which it is displayed.
- Effectively utilizes the capabilities of its controlling software.
- Achieves the business objectives of the system for which it is designed.

5) Types of Statistical Graphics

- Curve and Line Graphs
- Surface Charts
- Scatterplots
- Bar Graphs
- Segmented or Stacked Bars
- Pie Charts

MODULE 5

1) MOBILE ECOSYSTEM



- **Operators**
  - The base layer in the mobile ecosystem is the operator.
  - Operators can be referred to as Mobile Network Operators (MNOs); mobile service providers, wireless carriers, or simply carriers; mobile phone operators; or cellular companies
- **Networks:**
  - Operators operate wireless networks
- **Aggreagators:**
  - A third party company which helps the user to satisfy his/her goals.
- **Devices**
- **PLATFORMS:**
  - A mobile platform's primary duty is to provide access to the devices. These are split into three categories: licensed, proprietary, and open source.
  - **Licensed:**
    - Licensed platforms are sold to device makers for nonexclusive distribution on devices. The goal is to create a common platform of development Application Programming Interfaces (APIs)
    - Java Micro Edition, BREW
  - **Proprietary**

        - Proprietary platforms are designed and developed by device makers for use on their devices. They are not available for use by competing device makers. These include: iPhone, Blackberry
    - **Open Source**
        - Open source platforms are mobile platforms that are freely available for users to download, alter, and edit. These include: Google
- **APPLICATION FRAMEWORKS**
    - Application frameworks often run on top of operating systems, sharing core services such as **communications, messaging, graphics, location, security, authentication, and many others.**
    - These include : BREW, Windows Mobile
- **Services:**
    - Services is what the user can perform or do
    - Accessing a location, sending a text message etc.

2) Types of Mobile Applications

1. **Mobile Application Medium Types**
    a. The mobile medium type is the type of application framework or mobile technology that presents content or information to the user. It is a technical approach regarding which type of medium to use;
    b. Example: SMS
2. **Mobile websites**
    a. Mobile website is a website designed specifically for mobile devices, not to be confused with viewing a site made for desktop browsers on a mobile browser.
    b. Mobile websites often have a simple design and are typically informational in nature.
    c. **Pros:**
        i. They are easy to create, maintain, and publish.
        ii. Nearly all mobile devices can view mobile websites.
    d. **Cons:**
        i. They can be difficult to support across multiple devices.
        ii. They offer users a limited experience.
3. **Mobile Web Widgets**
    a. A mobile web widget is a standalone chunk of HTML-based code that is executed by the end user in a particular way. Mobile web widgets are small

web applications that can't run by themselves; they need to be executed on top of something else.

b. Example: Opera Widgets, Nokia Web RunTime (WRT), Yahoo! Blueprint, and Adobe Flash Lite

c. **Pros:**
   i. They are easy to create, using basic HTML, CSS, and JavaScript knowledge.

d. **Cons**:
   i. They cannot run in any mobile web browser.

4. **Mobile Web Applications**
   a. Mobile web applications are mobile applications that do not need to be installed or compiled on the target device.
   b. Using XHTML, CSS, and JavaScript, they are able to provide an application-like experience to the end user while running in any mobile web browser.
   c. Pros:
      i. They are easy to create, using basic HTML, CSS, and JavaScript knowledge.
   d. Cons:
      i. They don't always support native application features, like offline mode, location lookup,file system access, camera, and so on.
5. **Games**
   a. The most popular of all media available to mobile devices.
   b. Technically games are really just native applications that use the similar platform SDKs to create immersive experiences.
   c. Pros:
      i. Porting them to multiple mobile platforms is a bit easier than typical platform-based applications
   d. Cons:
      i. They cannot be easily duplicated with web technologies.

3) Mobile 2.0

4) MOBILE DESIGN

- **THE ELEMENTS OF MOBILE DESIGN**
  1. **Context:**
     a. Context is core to the mobile experience.

b. As the designer, it is your job to make sure that the user can figure out how to address context using your app.
c. Example: Who are the users? What do you know about them? What type of behavior can you assume or predict about the users?

2. **Message:**
3. **Look and Feel:**
    a. Look and feel is used to describe appearance
4. **Layout**
    a. Layout is an important design element, because it is how the user will visually process the page, but the structural and visual components of layout often get merged together, creating confusion and making your design more difficult to produce..
5. **Color**
6.

5) What is Mobile Information Architecture?

- **Information architecture:**
    - The organization of data within an informational space. In other words, how the user will get to information or perform tasks within a website or application.
- **Interaction design:**
    - The design of how the user can participate with the information present, either in a direct or indirect way, meaning how the user will interact with the website or application to create a more meaningful experience and accomplish her goals.
- **Information design:**
    - The visual layout of information or how the user will assess meaning and direction given the information presented to him.
- **Navigation design:**
    - The words used to describe information spaces; the labels or triggers used to tell the users what something is and to establish the expectation of what they will find.
- **Interface design:**
    - The design of the visual paradigms used to create action or understanding.

Site Maps:

- Relationship of content to other content and provide a map for how the user will travel through the informational space

ClickStreams:

- Clickstream is a term used for showing the behavior on websites, displaying the order in which users travel through a site's information architecture, usually based on data gathered from server logs.
- used to see the flaws in your information architecture

Wireframes

- Wireframes are a way to lay out information on the page, also referred to as information design
- **Site maps** show how our content is organized in our informational space; **wireframes** show how the user will directly interact with it

Prototyping

- **Paper prototyping:**
  - taking our **printed-out wireframes or even drawings of our interface** and putting them in front of people.
- **Context prototype:**
  - Take a higher-end device that enables you to **load full-screen images** on it. Take your wireframes or sketches and load them onto the device, sized to fill the device screen
- **HTML prototype**
  - Real product experience

MODULE 6

1) TYPES OF WINDOWS-REFER PPT

2) WINDOW PRESENTATION STYLES-REFER PPT

3) WINDOW COMPONENTS-REFER PPT

- **Frame**
  Border, usually rectangular in shape, to define its boundaries and distinguish it from other windows, can be resizable using control points.
- **Title Bar**
  Top edge of the window, inside its border and extending its entire width, also referred as caption, caption bar, or title area, contains a descriptive title identifying the purpose or content of the window
- **Title Bar Icon**
  Located at the left corner of the title bar in a primary window, used in Windows to retrieve a pull-down menu of commands that apply to the object in 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. Sizing buttons are included on primary windows only.
- **Menu Bar**
  Located horizontally at the top of the window, just below the title bar, contains a list of topics or items, displayed on a pull-down menu beneath the choice.
- **Status Bar**
  Information of use to the user can be displayed in a designated screen area, i.e displays the current state of what is being viewed in the window.
- **Scroll Bars**
  Elongated rectangular container consisting of a scroll area, to support scrolling
  Vertical scrolling: Right end
  Horizontal scrolling: Bottom end
- **Split Box**
  A window can be split into two or more separate viewing areas that are called panes, permitting multiple views of an object.
- **Toolbar**
  Permanently displayed panels or arrays of choices or commands that must be accessed quickly, window dependent.
- **Command Area**
  Needed in a specific situation, located at the bottom of the window, just below the horizontal scroll bar.
- **Size Grip**

Microsoft Windows special component to resize the window, at right side of the status bar.

- **Work Area**
  Portion of the screen where the user performs tasks, consists of an open area for typing, or it may contain controls (such as text boxes and list boxes) or customized forms.

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4) Feedback and Guidance.

Feedback

(a)Response Time

- The optimum response time is dependent upon the task
- Satisfaction with response time is a function of expectations.
- Dissatisfaction with response time is a function of one's uncertainty about delay.
- People will change work habits to conform to response time.
- Constant delays are preferable to variable delays
- More experienced people prefer shorter response times.

- Very fast or slow response times can lead to symptoms of stress.
- Web response time.
  - High (Good): Up to 5 seconds.
  - Average: From 6 to 10 seconds.
  - Low (Poor): Over 10 seconds.

(b) Dealing with time delays

- **Button click acknowledgement:**
  - ➢ All clicks made must be confirmed by some **audible sound or visible indication within a split of a second** so that the user is assured of performing the button click.
- **Waits that require up to 10 seconds:**
  - ➢ A delay that might take up to 10 seconds is quite conspicuous. Such delays must be acknowledged with a **busy indicator** showing that the process is going on till it completes. E.g.the most commonly used animated hourglass cursor.
- **Waits that require anything between 10 seconds to 1 minute:**

- ➢ Operations that require more than 10 seconds to complete, is a sizable amount of time and must be indicated with **larger animated objects.**
- ➢ A progress indicator can also be useful in showing the time left for completion or the time that has elapsed.

❖ **Waits that require over a minute:**

- ➢ When a wait is longer than a minute then an estimate of the wait time must be provided.
- ➢ Use **progress indicators that also display percentage of completion** of the operation, or elapsed time along with the animated filling bar.

❖ **Long, invisible operation:**

- ➢ When operations take a long time to execute and progress indicators are not visible to the users then the acknowledgements can be presented using an **audible sound or by a message on the screen.**

❖ **Progress indicators:**

- ➢ This is an **animated rectangular** bar that is initially empty and fills up corresponding to the progress of the operation.

❖ **Percent complete message:**

- ➢ This is a message that presents the **percentage of completion** of operation or sometimes the percentage of operation that is left to be completed.

❖ **Elapsed time message:**

- ➢ It is **similar to the progress indicator**, but it is used for presenting only the amount of time elapsed during the progress of an operation.

❖ **Web page downloads:**

- ➢ Some web pages take ages to load. For pages that require download time exceeding 5 seconds, users must be provided with something so that they do some activity while they are waiting for their operation.
  - ■ **Provide advertisements, offers, deals on the top of the page that is seen on the downloading screen.**
  - ■ Inform users of the download time and also warn the user of the **"Time Outs".**

(c) Blinking for Attention

Attract attention by flashing an indicator when an application is inactive but must display a message to the user.

– If a window, flash the title bar.

– If minimized, flash its icon.

To provide an additional message indication, also provide an auditory signal (one or two beeps).

– Very useful if:

The window or icon is hidden.

The user's attention is frequently directed away from the screen.

Display the message:

– When the application is activated.

– When requested by the user.

(d) Use of Sound

Always use in conjunction with a visual indication.

Use no more than six different tones.

– Ensure that people can discriminate among them.

Do not use:

– Jingles or tunes.

– Loud signals.

Use tones consistently.

– Provide unique but similar tones for similar situations.

Provide signal frequencies between 500 and 1,000 Hz.

Allow the user to adjust the volume or turn the sound off altogether.

Test the sounds with users over extended trial periods.

Use sounds sparingly because they:

– Are annoying to many people, including other users and nonusers in the vicinity.

– Can easily be overused, increasing the possibility that they will be ignored.

Guidance:

- Guidance and Assistance
  - Preventing Errors
  - Problem Management
  - Providing Guidance and Assistance
  - Instructions or Prompting
  - Help Facility
  - Task-Oriented Help
  - Reference Help
  - Hints or Tips

PROBLEM MANAGEMENT

- Prevention:
  - Disable inapplicable choices.
  - Use selection instead of entry controls.
  - Use aided entry.
  - Accept common misspellings, whenever possible.
- Detection:
  - For conversational dialogs, validate entries as close to point of entry as possible.
    - At character level.
    - At control level.
    - When the transaction is completed or the window closed.
  - For high speed, head-down data entry.
- Correction:
  - Preserve as much of the user's work as possible.
  - At window-level validation, use a modeless dialog box to display an error list.
    - Highlight first error in the list.
    - Place cursor at first control with error.

5) HOW TO PRESENT
5.1) WORDS

■Do not use:

– Jargon, words, or terms:

- Unique to the computer profession.
- With different meanings outside of the computer profession.
- Made up to describe special functions or conditions.

– Abbreviations or acronyms.

- Unless the abbreviation or acronym is as familiar as a full word or phrase.

– Word contractions, suffixes, and prefixes.

■ Use:

– Short, familiar words.

– Standard alphabetic characters.

– Complete words.

– Positive terms.

– Simple action words; avoid noun strings.

– The "more" dimension when comparing.

– Consistent words.

5.2) SENTENCES

5.3) MESSAGES AND TEXT

2. SENTENCES & 3. MESSAGES

- Sentences and messages must be:
  - Brief and simple.
  - Directly and immediately usable.
  - An affirmative statement.
  - In an active voice.
- Sentences and messages must be of the proper tone:
  - Nonauthoritarian.
  - Nonthreatening.
  - Nonanthropomorphic.
  - Nonpatronizing.
  - Nonpunishing.
  - Cautious in the use of humour.

6) GRAPHICS

7) ICONS

Provide icons that are:

- Familiar.
- Clear and Legible.
- Simple.
- Consistent.
- Direct.
- Efficient.
- Discriminable.

A Successful Icon

- Looks different from all other icons.
- Is obvious what it does or represents.
- Is recognizable when no larger than 16 pixels square.
- Looks as good in black and white as in color.

Size

Colors

8) IMAGES

5. Choosing Images

- Use existing icons when available.
- Use images for nouns, not verbs.
- Use traditional images.
- Consider user cultural and social norms.

6. Creating Images

- Create familiar and concrete shapes.
- Create visually and conceptually distinct shapes.
  - Incorporate unique features of an object.
  - Do not display within a border.
- Clearly reflect objects represented.
- Simply reflect objects represented, avoiding excessive detail.
- Create as a set, communicating relationships to one another through common shapes.
- Provide consistency in icon type.
- Create shapes of the proper emotional tone.

7. Drawing Images

- Provide consistency in shape over varying sizes.
- Do not use triangular arrows in design to avoid confusion with other system symbols.
- When icons are used to reflect varying attributes, express these attributes as meaningfully as possible.
- Provide proper scale and orientation.
- Use perspective and dimension whenever possible.
- Accompany icon with a label to assure intended meaning.