

COMPUTER ENGINEERING DEPARTMENT

ASSIGNMENT NO. 1

Subject: Human-Machine Interaction

COURSE: B.E

Year: 2021-2022

Semester: VIII

DEPT: Computer Engineering

SUBJECT CODE: CSC801

SUBMISSION DATE: 15/02/2022

Roll No.: 50

Name: Amey Thakur

Class: BE-Comps B

Date of Submission: 15/02/2022

HMI Assignment - 1

Sr. No.	Questions
1	Explain in brief the evolution of User Interface Design.
2	Explain 7 Stages of actions and 3 levels of processing.
3	Explain Implementation, Representation and Mental Model with examples.
4	Explain different types of users and design for different experience levels.
5	Explain Direct and Indirect manipulation interaction styles.
6	Design a user interface for automated ticket vending machines for state road transport service. Consider all necessary elements in your design.

Student Signature:



Q1 Explain in brief the evolution of User Interface Design.

Ans:

- Today, computers are omnipresent. With the rapid advance in the evolution of UI design, an exploration into human interaction with objects, the environment and technology has become essential.
- The evolution of UI design can be broken down into four periods:
 - ① The age of tools
 - ② The age of machine
 - ③ The age of software
 - ④ The age of self.

① The age of tools

- Using primitive tools, early humans began to communicate by drawing representations of animals and nature on stone surfaces.
- Hieroglyphs, which were highly symbolic, were one of the first methods used to communicate. This symbolism would later develop into art, writing, documentation, etc.
- Over time, the tools became more sophisticated, resulting in some (e.g. pens) still being in wide use today.

② The age of machine

- The industrial revolution emphasized productivity.
During "the age of the machine", we built objects at scale to help our lives become easier.
It was a time when the hardware itself was still the main "user interface".
- One example of this is the invention of the typewriter in 1868 by Christopher Lathrop Sholes.
We began tapping physical keys to create words still using our hands, but with the help of the typewriter as a replacement for the pen.

③ The age of Software

- Software needed a "User - Interface" and searching for a model that would be easy for users to adopt.
UI designers turned to people's behavior and earlier hardware designs for inspiration.
- People already had a mental model of a typewriter's keyboard; they already knew how to type, so the natural progression was to begin interacting with text on digital screens the same way.

④ The age of self

- UI design's evolution has been influenced by common analogies, preceding hardware and intuition.
- Best practices for lowering the barriers to adoption include a desire to align with people's mental model, keep an open mind and maintain a connection to the ambient world.

Q2 Explain 7 stages of actions and 3 levels of processing.

Ans:

Three levels of Processing

① Visceral Level

- The most immediate level of processing.
- Here the human reacts to audio, visual and other aspects of a product before experiencing it.
- The look and feel of the product dominates the user in this level.
- Visceral design often corresponds to creating an aesthetically pleasing appearance.

② Behavioral Level

- The middle level of processing.
- The emotional brain takes control of the decision making.
- We react to the products at a deeper level than that of visceral.
- This level manages simple, everyday actions. Here functionality of the product takes prime importance.
- In behavioral design, semantics and usability practices are primarily addressed.

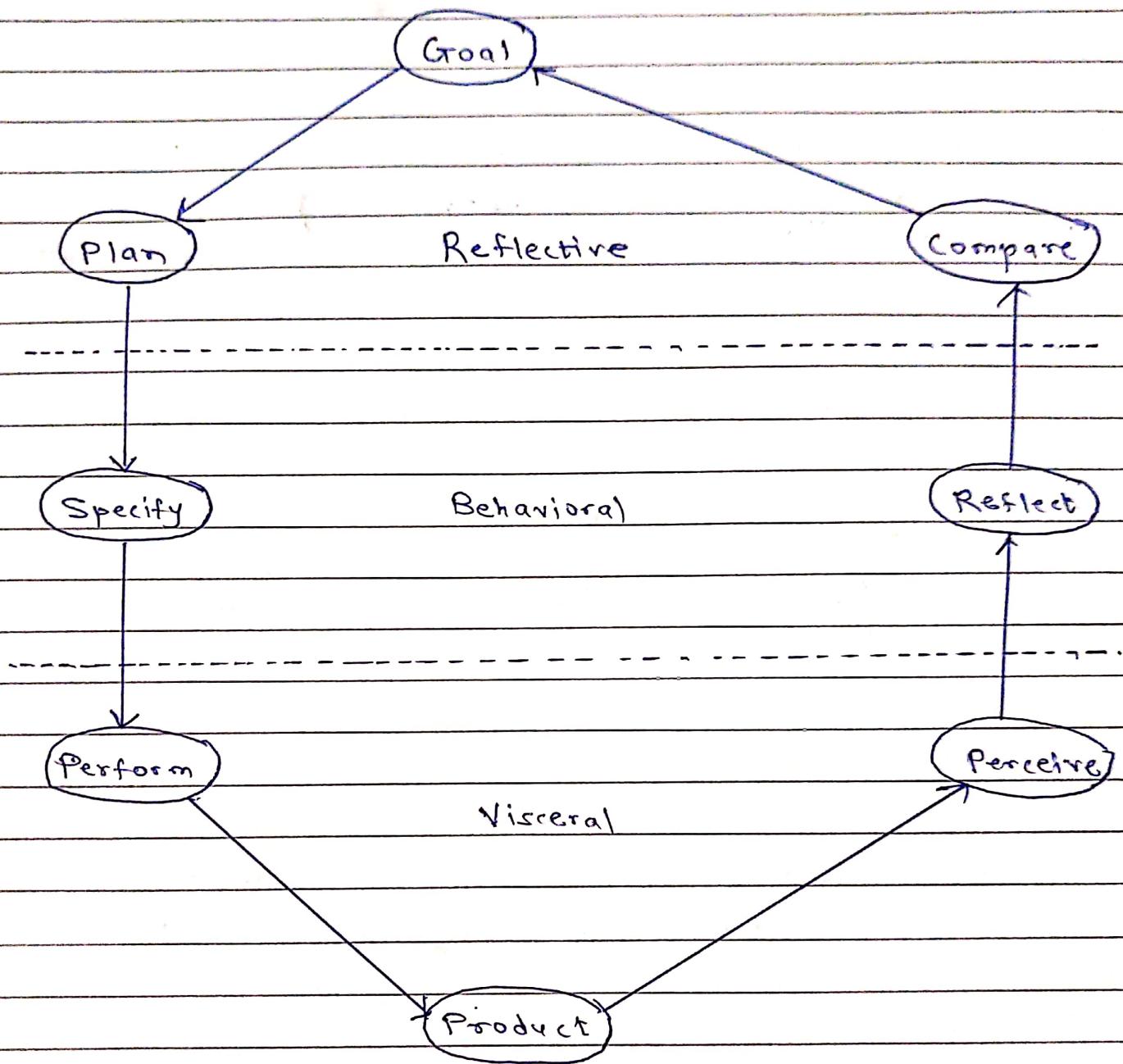
③ Reflective Level

- The last level of processing.
- A careful analysis and reflection of all the incidents or experiences is made. The meaning of an experience is stored in our brain.
- Reflective design can tell us about customer's inclination towards various ranges of products.

Seven stages of Actions:

- ① Goal: The reflective level has analysed situation and realizes from past experiences.
- ② Plan: In this reflective layer gathers from past experiences.
- ③ Specify: In this behavioral layer has its likes and dislikes. It takes responsibility of choosing perfect action.
- ④ Perform: The visceral layer looks for physical activities like choosing specific things.
- ⑤ Perceive: In this the visceral layer takes care of various audio and visual aspects.
- ⑥ Reflect: In this behavioral layer, reacts to their perceptions with an emotion, we reflect ourselves with particular aspect emotionally.
- ⑦ Compare: In this, the reflective level gives a meet to the entire experience, by comparing it with the goals.

Interrelation of level of processing and stages of action

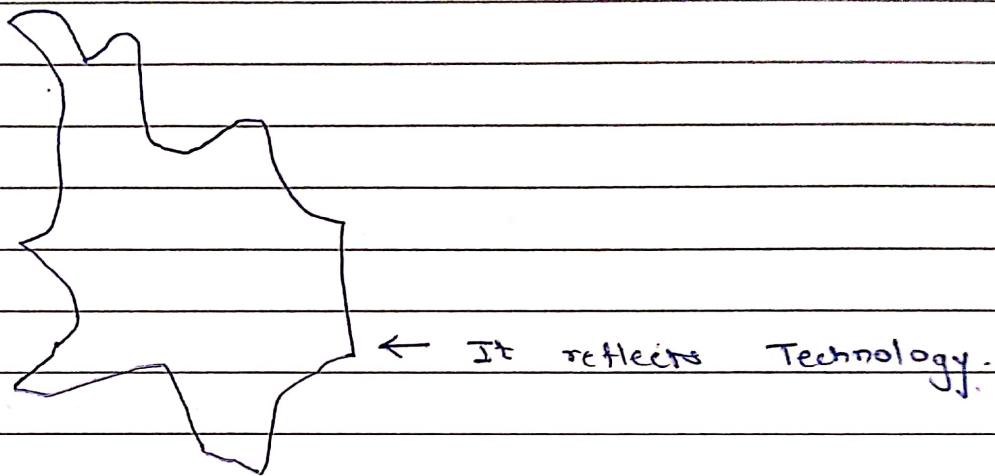


Q3. Explain Implementation, Representation and Mental Model with examples!

Ans:

Implementation Model

- Implementation model or system model is a representation of how a machine or a program actually works.
- It can be a scheme, description, pseudo code, etc.



Implementation Model

- In above figure, the way engineers must build software is often a given, dictated by various technical and business constraints.
- The model for how the software actually works is called the implementation model.
- User interfaces designed by engineers follow the implementation model.

Mental Model

- mental model or conceptual model is our explanation of how things work, mental models can be the same as the implementation model, if it is easier for us to imagine all the actions the way they actually performed. It is not always possible and needed, mental model is an explanation which is sufficient for us to comfortably use a tool.



← It reflects user's vision

Mental

Model

- The way users perceive the job they need to do and how the program helps them do it is their mental model of interaction with the software, it is based on their own ideas and how they do their jobs and how computers might work.
- Goal directed interactions reflect user mental models.
- The mental model look like the way the user thinks the machine or software works. It represents information for human mind as opposed to a computer information is aggregated into meaningful concepts such as visuals, graphs, colors, metaphors and buttons.
- User interfaces should be based on user mental models rather than implementation models.

AMEY THAKUR

B750

Amey.

Representation Model

- Representation models are directly related to the user interface itself. It connects the layer of interaction between the system and the user.
- It's rarely a direct representation of the implementation model.
- It is more often a designer's view of user's mental models.
- The wonderful thing about digital systems is that the interface can differ from what is going on inside the machine.
- Think about the leap from text-based computer systems to the graphical user interfaces we know today. Suddenly, instead of memorizing list of commands, all people had to do was to click on a picture of what they wanted.

Q4 Explain different types of users and design for different experience levels.

Ans:

- The main goal of designer is to identify user is expert or a beginner.
- This understanding may help designer to design system as per designated user requirements
- The system users do not belong to similar group of expertise as they are mixed bunch of people.
- These categories can be decided from their age, IQ level, skills they have and experience

① Beginner User

- Every user is beginner user at earlier phase of their life
- To make beginner user to intermediate designers we must ensure that the things they see and use UI to remain in their mental models.
- The main usability of beginning users is their main focus area is on,

(a) Menus

(b) Messages.

- They tend to use above optional hierarchical system architectures, reading all the labels and understanding of location where specific options and features are placed.
- The beginner user may require lot of help from system to understand process.

- Questions of beginning user

- (a) Which program should I use
- (b) What will this program do
- (c) From where should I start
- (d) What is the way to do it.
- (e) Am I doing right things.

- Example:

- (a) In case of microsoft office word,
- (b) The beginner user will take help for office assistant to understand few functions of system.
- (c) User majority times refer menu given at the header in system.

(2) Intermediate User

- Intermediate user is always looking for desired features and way to easily access them.
- Intermediate level users will have some different requirements
- The basic skill to operate system is already known to them.
- As they are familiar with basics they will now find out new techniques to operate system very effectively.
- Majority numbers of users are intermediates

③ Expert User

- The number of expert users is always smaller than other types of users as they become expert by longer experience and excellent skill set.
- This group of user becomes very important group of users although their number is very small but their effectiveness is very high.
- As always company trust on expert people and ask them for advice as well as design help.
- Experts may know additional functionalities and abilities of system to perform all tasks.
- If some interface is not accepted by these users it can be rejected on these grounds.
- Experts may be using some features of system which is used very rarely.
- Experts always look for customization in available system.

Q5. Explain Direct and Indirect Manipulation Interaction styles.

Ans:

Direct Manipulation

- The term direct manipulation is given by Shneiderman (1982) as they possess the following characteristics.
 - ① The system is portrayed as an extension of the real world.
 - ② Continuous visibility of objects and actions.
 - ③ Actions are rapid and incremental with visible display of results.
 - ④ Incremental actions are easily reversible.

Example of direct manipulation :

Driving an automobile

- The scene is directly visible through the front window and performance of actions such as breaking or steering has become common knowledge in our culture. To turn left, the driver simply rotates the steering wheel to the left. The response is immediate and the scene changes, providing feedback to refine the turn.
- In above example, a driver looking at an object directly manipulates the scenario by his sudden action which can be referred as direct manipulation.

Indirect Manipulation

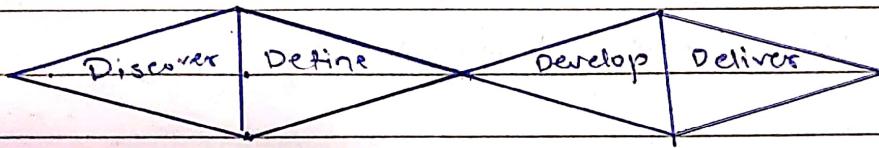
- In practice, direct manipulation of all screen objects and actions may not be feasible because of the following:
 - ① The operation may be difficult to conceptualize in graphical system.
 - ② The graphic capability of the system may be limited.
 - ③ The amount of space available for placing manipulation controls in the window borders may be limited.
 - ④ It may be difficult for people to learn and remember ~~all~~ the necessary operations and actions.
- When this occurs, indirect manipulation is provided. Indirect manipulation substitutes words and text, such as pull-down or pop-up menus, for symbols and substitutes typing for pointing.
- Most window systems are a combination of both direct manipulation and indirect manipulation. A menu may be accessed by pointing at a menu icon and then selecting it. (direct manipulation) or the menu itself is a textual list of operations (indirect manipulation).

Q6. Design a user interface for automated ticket vending machines for state road transport service. Consider all necessary elements in your design.

Ans:

① Design Process

- For state road transport corporations information klock Double diamond process of design is used.
- It is based on principle of divergence and convergence



Discover:

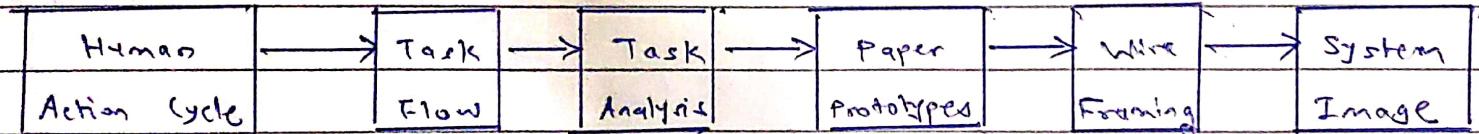
- A human interaction centric activity is discovered.
- Every user can relate to this activity while interacting with klock system.

Define:

- In this level, user persona is defined.
- Persona is defined based on literacy levels and competence.

Develop:

- According to the persona, design is developed. It includes following steps:



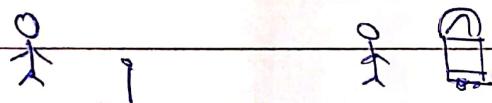
Deliver

- Final product is delivered.
- It has low learn ability writing.

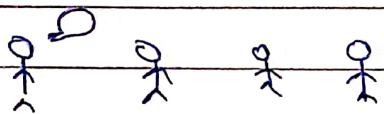
(2) Human Action Cycle

- Scenario 1 : Where the individual finds the state transport by asking other people.
- Scenario 2 : Where the individual finds a bus via visual Aid channels like charts and signs.

Scenario 1 : Find the state transport by asking people

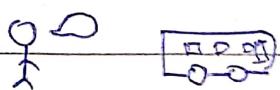


Reach Bus stop

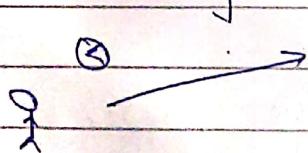


Ask bystanders which bus goes to your desired stop.

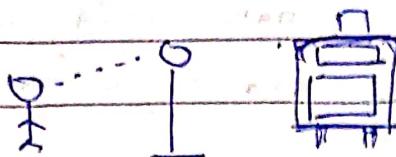
Board the bus



Ask people on the bus or conductor if the bus goes to your destiny



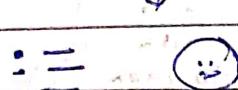
Scenario 2: Finding a bus via visual aids: Charts & signs.



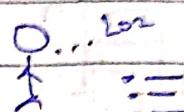
Approach to desired
bus stop to board
bus



Board the bus



Approach stop & look
at visual signage



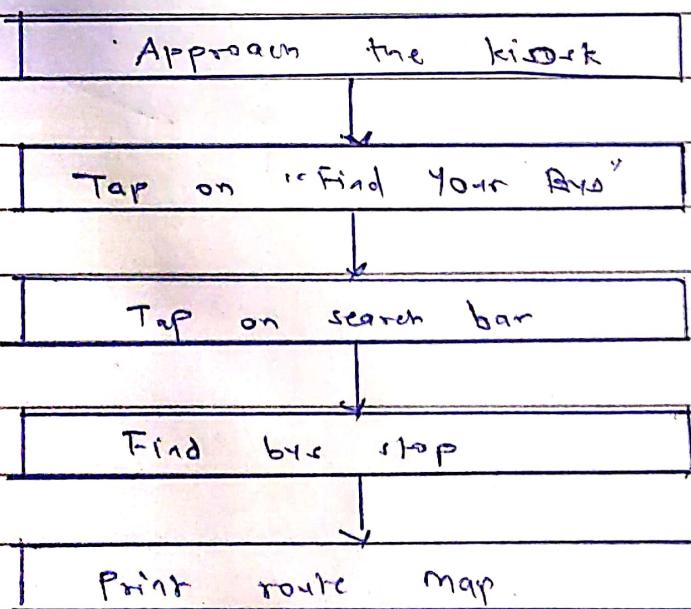
Locate the associated
bus number.



Find the name of your destination.

③ Task Flow

- The task flow for state road transport information
- It includes finding the bus, searching stop, printing route map.



③ System Image

- Some of the interface design for gate road transport corporation information kiosk is shown below

