

3/7/23 Human Computer Interaction

Human computer Interface (HCI):

It is a study trying to develop or design computer technology which could help to make interaction between human and user beneficial and easy.

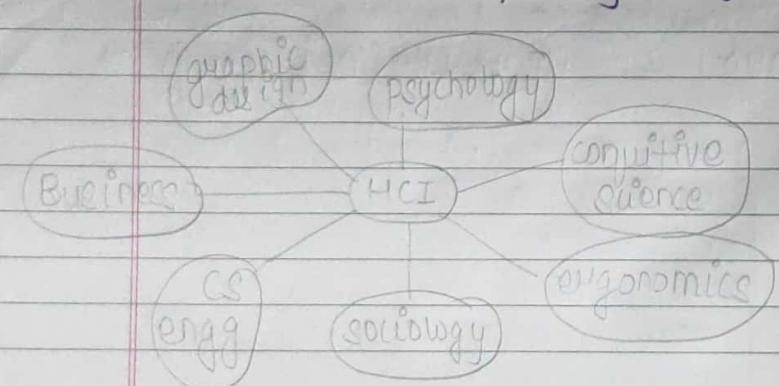
Human I/O channel:

Human I/O channel

Input: Sight, Touch,
hearing.

Output: fingers,
voice, body,
position.

→ HCI is multidisciplinary subject.



4/7/23 Unit I:

Introduction of HCI:

It is the process to communicate betⁿ user/human and computer/machine by designing and computer technology.

User:

By 'user' we may mean an individual user or group of user working together. An appreciation of the way peoples sensory systems (sight, hear and touch) relay information is ^{vital} ~~vital~~.

Computer:

When we talk about computer we're referring any technology ranging from desktop computers to large scale of computer system for example, if we were discussing the design of website, then the website could be referred to as "the computer". Devices such as phones or VCR's can be also considered to be computers.

Interaction:

There are obvious differences

between human & machine. Inspite of these, HCI attempt to ensure that they both get on with each other interact successfully.

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Goal of HCI:

Short term goal:

- To improve interaction
- To increase usability of computer system.

long term goal:

- Minimize the barrier
- To understand the user's task

* To achieve HCI goals we have some factors:

- ① Task factors : ① Easy translate
② Language related problem solving
③ Skill related problem solving.

- ② Constraints : ① Time skills
② cost issues

③ Equipment / building issue.

③ System functionalities : ① Hardware
② Software
③ Application

④ Productivity factor : ① Increase output
② Increase quality
③ Decrease cost
④ Decrease error
⑤ Increase innovation

* Discipline contribution to HCI:
(field)

- ① Computer science
→ Technology
→ Software maintenance
→ Graphics
→ Development environment
→ User interface management system.

- ② Cognitive psychology
→ Information processing
→ Capabilities
→ Limitations.

- Co-operative working
- Performance prediction.

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③ Social psychology.

- social and organizational structure

imp.

④ Ergonomics / human factor usable

- Hardware design

- Display readability.

⑤ Artificial Intelligence.

- Intelligent software engineering design

Usability in HCI

- It is one of the key concept in HCI.

- It is concern with making system easy to learn and easy to use. A usable system is :

- Easy to learn
- Easy to remember how to use
- Effective to use
- Efficient to use
- Safe to use
- Enjoyable to use

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Input/Output Channel in HCI :

Input Channel:

- A person interaction with outside world occurs through information being received and send. i.e. I/p and O/p.

- There are 5 major senses. sight, hear, touch, smell, taste
- Of these first three are most important to HCI.

Taste and smell don't currently play a significant role in HCI.

- There are a no. of effectors, including fingers, eyes, and vocal system.

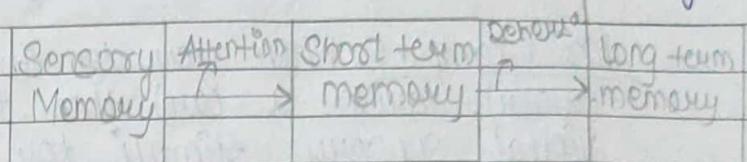
Visual Perception:

To understand we must consider how image appears on retina. We must consider reflected light from the object forms an upside down image on the retina. The size of that image is specified as a sight angle.

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Human Memory

A model of structure of memory.



or
sensory
buffer.

or
working
memory.

There are 3 types of memory:

- Sensory Memory
- Short-term memory
- Long-term memory

i) Sensory Memory :

The sensory memory includes:

- sight
- hearing
- touch

These stimuli's acting as a buffer for the stimuli from the sensors of the human.

Exist a sensory memory for every sensory channel.

These sensory memories are

- sight → Echoic sensory
- hearing → Echoic sensory

or visual angle.



Hearing:

The sense of hearing is often considered secondary to sight, because we tend to underestimate the amount of information that we receive through our ears; hearing begins with vibrations in air and sound waves.

The ear comprises three sections commonly known as outer ear, middle ear or inner ear.

→ Touch → stir Haptic Sensory.

for example: When you see an object (car). (drive a car) then the visual sensory stimuli for the attention.

2) Short - Term memory

Short term memory is temporary memory which is temporarily stored in memory.

Example:

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3) Long - term memory

It is a time or memory in which we store & where information for long term..

There are two types of long term memory.

- Episodic memory
- Semantic memory,

Episodic Memory:

It represent a memory of events and experiences in a serial form. It is from this memory that we can reconstruct the actual event that took place at a given point in our lives.

Semantic Memory:

On the other hand structure record our facts, concepts and skills that we have acquire.

20/7/23 Thinking Reasoning & Problem

Solving:

Thinking: Thinking can require different amount of knowledge. Some thinking activities are much directed and the knowledge require is constraint.

for example: When we have calculation, requires a small amount of knowledge from a constraint domain.

Reasoning: Reasoning is the process by which we use the knowledge we have to infer something new about domain of interest.

- There are 3 types of reasoning:
- Deductive Reasoning (correct type)
 - Inductive Reasoning.
 - Abductive Reasoning

Deductive Reasoning

It derives the logically necessary conclusion from the given premise

Example:

If it is Sunday then he/she will watch movie.

It is Sunday

Therefore he/she will watch movie.

Inductive Reasoning

It is a generalizing from cases we have seen to infer information about cases we have not seen.

Example:

We can never see all the elephant that have ever lived or will ever live but we have certain knowledge about elephants which we are prepared to trust

for all practical purposes, which has largely being inferred by induction. Even if we saw an elephant without trunk, we would be unlikely to move from our position that all elephants have trunk. Since we are better at using positive than negative evidence.

Abductive Reasoning

Abduction Reason from a fact to the action or state that caused it. This method we use to derive explanation from events we observe.

Example:

Suppose we know that Sam always drives too fast when she has been drinking. If we see Sam driving too fast we may infer that she has been drinking. Of course, this two is unreliable, since there may be another reason why she is driving fast. She may have been called a emergency.

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Topic : The Computer

Main component of computer :

- Monitor
- Keyboard
- Mouse

Variation of Computer :

- PC / desktop
- Laptop
- PDA (Pocket Digital Access)

→ These devices decides the style of interaction that the system supports if we use different devices then the interface will support the different style of interaction.

→ A computer system is made up of various elements, each of these element affects the interaction.

I/P device : It is use for text typing & reading clicking or pointing.

D/P Device :- It is use for screen display, printing paper

Virtual reality :- By display device without special interaction devices.

Physical interaction :- ~~Computer~~. By Haptic by sound.

Paper :- Paper in HCI for I/P is print and I/P scan

Memory :- Memory in computer is RAM, permanent media, capacity and access.

Processing :- Processing in HCI includes speed and process through networks.

* Interaction Style:

Interaction can be seen as a dialogue between users and computer. The choice of interface style can have a profound effect on the nature of these dialogue. There are no. of common interface style including:-

• Command Line Interface:

→ It was the first interaction dialogue style to be commonly used and despite of availability of menu driven interface it is still commonly used.

→ It provides a means of expressing instruction to the computer directly.

→ It provides some mean of expressing instruction to the computer directly using function keys, single characters, abbreviation or whole word command:-

• Menus:

→ The set of operation available to use is displayed on the screen by selected using mouse.

any numeric or alphabetic key.

• Natural language:

Natural language is human language

• Ques/Ans & query dialog:

form fill & spreadsheet

WIMP (Window icon, menus, pointer)

Point & click interface

Unit 2 : Design & Software Process

* Design include goals & constraint
↳ to achieve ↳ time,
cost, health and etc.
Trade off → To ignore something to
achieve health safety.

Software process:

- 1) Activity
- 2) Action
- 3) Task

Design: To define term design means
in HCI "achieving goal within constrain
and these goals and constraint
implemented together is very
difficult because there are many
various conflicts to deal with
this conflicts we have trade off.

Software processes: It is simply
define as "it is a collection of
activity, action and task that are
needed to be performed in
order to create a product.

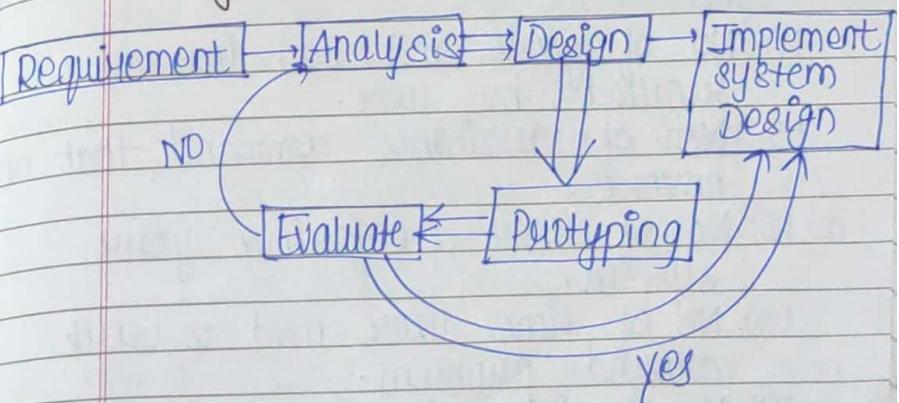
Activity: It strives to achieve a
broad objective.

Action: It encompasses a set of task
produce a major work product.

Task: It focuses on a small but
well objective the produce a
tangible output.

Process framework: It established
a foundation for a complete
software engineering process.

* Interactive system lifecycle
design:



• Usability Engineering:

- 1) Time to complete task
- 2) Percentage of task completed
- 3) Percentage of task completed per unit time.

- 4) Ratio of success to failure
- 5) Time spent in error
- 6) Percent or no. of error
- 7) Percentage or no. of operations better than it.
- 8) No of command used
- 9) Frequency of help and documentation used.
- 10) Percentage of favourable and unfavourable comment
- 11) No of repetition of failed commands
- 12) No of runs of success and failure
- 13) No of times interface mislead the user.
- 14) No of good and bad features recalled by user.
- 15) No of available command that not invoke.
- 16) No of user preferring your system.
- 17) No of time user need to work around problem.
- 18) No of time the user is distracted from a work task.
- 19) No of time user loses the control of system.
- 20) No of time user expresses (satisfaction or frustration).

Prototyping in HCI:

A prototype is a conflict representation of the all interactive system. A prototype is tangible, artifact or model, not a detailed description of the project. Every stakeholder like designer, customer, manager, developer and end user can use this model.

Low fidelity (Lo-fi) → Brainstorm diff' representation
(paper prototype) rough out interface & fix style.

Medium fidelity → Took centered walkthrough (screen prototype) 8 design

, fine tune interface, screen interface design, Heuristic evaluation and redesign.

High fidelity (Hi-fi)
(restructured system or working system)

→ Usability testing and redesign limited for testing.

Late design

fig: Design process & prototyping.

- Prototyping are experienced & incomplete design which is cheaply and fast developed.
- The main purpose of prototyping is to involve the user in testing design idea and their feedback in earlier stages of development.
- Thus to reduce the time and the cost.
- It can be divided into three types:

- ① Low fidelity (Lo-fi)
- ② Medium fidelity
- ③ High fidelity (Hi-fi)

1) Low fidelity (Lo-fi): It is mainly about paper based prototyping markup, they are quickly constructed to depict concept design and screen layer. It provide no functionality. It just demonstrate the general look of interface. But no detail of its operation tools used in Lo-fi is paper and pen.

- 2) Medium fidelity: It is mainly about fine tune interface and screen design to evaluate the design.
- 3) High fidelity: It is mainly about computer based simulation. It is fully functional and attractive. Here user can operate the prototype or even perform some real task with it that are not really easy to create as we do the Lo-fi.

Unit 3 : Models & Theories

(*) Socio organizational issues & Stakeholder Requirements:

* Socio - organizational issues :

Socio organizational —

① It includes organizational issues effect , acceptance in which conflict and power are determined , benefit and encouraging user included .

② Stakeholder → It defines their requirement in organizational context .

③ Socio technical model — in which human and technical requirements are defined

④ Soft system methodology in this broader view of human and organizational context .

⑤ Participatory design it includes the user directly in design process .

⑥ Ethnographic method in this we study user in context and unbiased perspective

Cognitive Model

- Cognitive model is an area of computer science that deals with simulating human problem .
- Solving and mental processing in a computational model .
- It represents user of interactive systems .
- It is classified into three models:
 - a) Hierarchical
 - b) Linguistic
 - c) Physical

a) Hierarchical

- It is based on goal and task also called goal structure .
- It is to predict quantitative time and quantitative use of expert user .
- It includes GOMS .

b) Linguistic

- Linguistic model is based on how to interact with system , different mind or way to interact .
- So, perform a particular BNF & TAG

c) Physical

- It is based on choice of work , performance .

→ In this single click of mouse button , double click , long press are performed .

Mobile Information Architecture (MIA)

Information Architecture: (IA)

- Information architecture plays vital role in creating well structured navigation, content flow & structure of software, internet, intranet & mobile website appln.
- It has two main component.
 - 1) Identification
 - 2) definition of app content or functionality
- The underline organization & structure that define relationship betⁿ content or functionality
- The information architecture is documented in spreadsheet & diagram usually not in wireframe, uncomprehensive layout
- Typically the activities undertaken in defining architecture involve
 - 1) Content Inventory: Examination of an existing appln or website to locate & identify existing app & side content.
 - 2) Content Audit: It defines evaluation of content hierarchy, usefulness, priority, relevance, accuracy & overall effectiveness.
 - 3) Information Grouping: Definition of user content relationship betⁿ content and its types.

4) Taxonomy development: Definition of its standardize naming convention applied to all site content.

5) Description Information creation: In this definition of useful metadata that can be utilize to generate 'related links', list or other navigation component that aid discovery.

Mobile Information Architecture:

As we live in smartphone era and mobile website & mobile app are overtaking conventional software and websites, understanding how information & navigation flow in mobile app scenario are becoming more & more crucial.

As a designer, developer and UX expert put their efforts in to creating successful & better mobile app or mobile website.

for these they face the four challenges:-

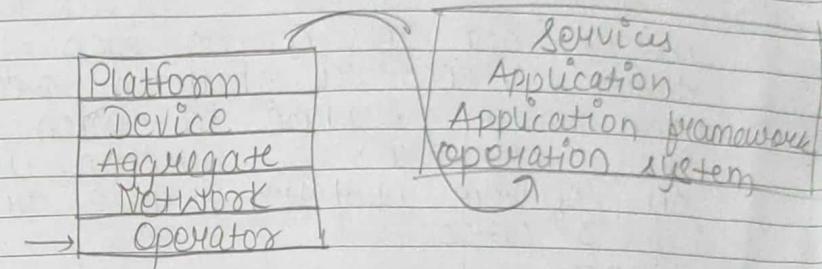
- 1) What will be the right interface? (responsive design, adaptive design)
- 2) How do I design better navigation?
- 3) How do I maximize the use of screen real estate.

4) What type of pattern & screen elements shall I use.

5) How do I build prototype and conduct the usability test.

6) What type of UI design & UX approach shall I adopt.

26/9/23 - Mobile Ecosystem:



Mobile is an entirely unique ecosystem and like the internet. It is made up of many different parts that must work seamlessly together.

1) Operator :- The base layer in mobile ecosystem is operator. It can be referred to as mobile network operator (MNO).

2) Network :- Operator operate wireless network, bluetooth, Wi-Fi, NFC. Remember that cellular technology is just a radio that receive

signal from antenna. The type of radio & antenna determine capacity of network and services u can enable on it.

3) Aggregator : Provide access to device.

4) Device : As next generation devices become reality. The distinction between the feature phone and the smart phone will go away.

5) Platform : A mobile platform primary duty is to provide access to device to run software and services on each of these devices, u need a platform or core programming language in which all of your software is written. like all software platform, these are split into 3 categories

- licensed
- Proprietary
- open source

6) Operating system : It is used to be that if a mobile device has an operating system it was most likely consider a smart phone most common operating system used in smart phone are

- symbian (open source)
- windows mobile (window mobile platform)
- Palm OS (lower end mobile phone)
- Linux (power smart phones)
- Mac OS X (apple iphones, Ipad)
- Android (open source)