Human Computer Interaction
Chapter one: Introduction

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What is HCI?

- Interacting with technology has become an essential part of everyday life for the majority of people.
- People are busy and may spend little or no time actually learning a new system.
- Therefore, computer systems should be easy to use, easy to learn, and with no errors.
- To design and develop of such a system is a major concern of HCI
- HCI is the study of interaction between people (users) and computers

CON…

- HCI consists of three parts:
  - **Human**: could be an individual user or a group of users.
  - Computer: could be any technology ranging from the general desktop computer to a large scale computer system.
  - Interaction: any direct or indirect communication between a human and computer.

CON…

- Also called
  - Man-machine-interaction (MMI)
  - Computer-human-interaction (CHI)
- HCI is
  - Not primarily the study of Human
  - Not primarily the study of Computer
  - The study of bridge between them.
- The knowledge gained from this study/discipline is used to **create information systems** and **work environments** which help
  - To make people more productive and
  - More satisfied with their work life.

Con…

- *HCI concerns:*
  - **design**, **implementation** and **evaluation** on
    - **interactive computing systems for human use**. And
    - **the study of major phenomena surrounding them**

- HCI Analysis the involved interactions e.g.
  - Are all the steps involved are necessary
- Human consequences after interacting with computers, e.g.,
  - Can the user perform his task correctly?
  - Does he enjoy working with the computer?

Why we study HCI

- The goals of HCI are to produce usable and safe systems, as well as functional systems.
- Computers have to be designed in such a way that they are '**user friendly**' (should have an '**easy to use**' interfaces)
- In the past, computers were expensive & used by technical people only
- Now, computers are cheap and used by non-technical people (different backgrounds, needs, knowledge, skills)
- HCI is not about making the interface look pretty
  - Must be easy to use/user friendlily
  - support the tasks the people actually want to do

Con…

- User friendliness can affect:
  - Effectiveness
  - Productivity
  - Morale
  - Safety
- A system may be thrown away because of bad user interface.
  - people no longer willing to accept products with poor interfaces
- So generally the HCI goals is to enhance the quality of the interaction between people and computers.

CON…

- HCI enable us to design interactive products to support people in their everyday and working lives.
- Used to develop usable product(easy to learn, effective to use)
- In order to fulfill that, developers must attempt to:
  - Understand how people use technology
  - Building suitable systems
  - Achieve efficient, effective, and safe interaction
  - Put people first: People needs, capabilities and preferences should come first.

HCI Goals

Ensuring usability.

"A usable software system is one that supports the effective and efficient completion of tasks in a given work context" (Karat and Dayton 1995).

- The bottom-line benefits of more usable software system to business users include:
  - Increased productivity
  - Decreased user training time and cost
  - Decreased user errors
  - Increased accuracy of data input and data interpretation
  - Decreased need for ongoing technical support
- So among the HCI goals, one is *to enhance the quality of the interaction between people and computers*.

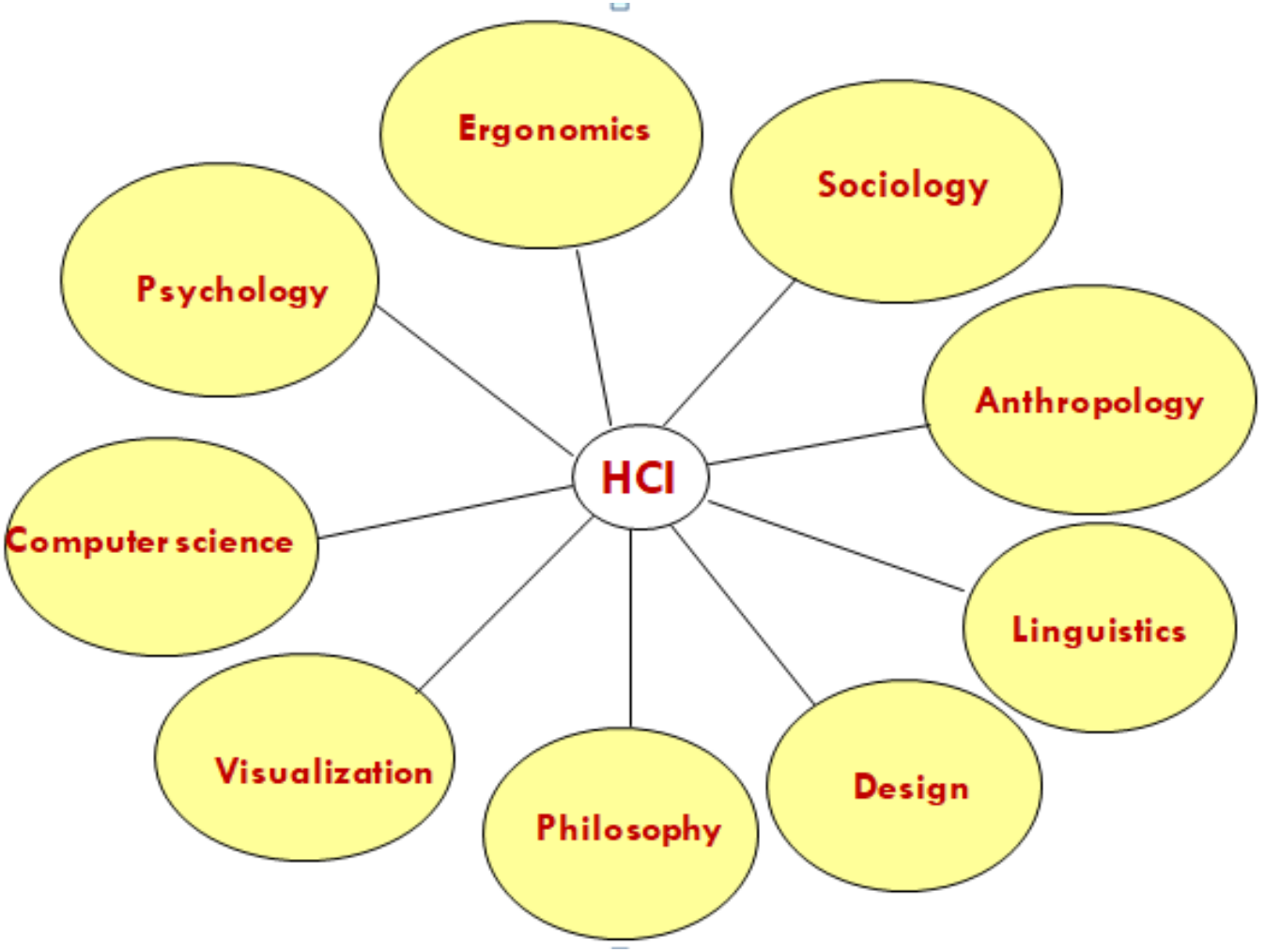
Con…

- Allow users to carry out tasks
  - Safely
  - Effectively and efficiently
  - Enjoyably
- Specifically, HCI has interests in:
  - Methodologies and processes for designing interfaces
  - Methods for implementing interfaces
  - Techniques for evaluating and comparing interfaces
  - Developing new interfaces and interaction techniques

Disasters Caused by Poorly Designed User Interfaces…

- ***The Herald of Free Enterprise***
  - **What happened?** a ferry between Belgium and England sunk
  - **Reason:** *open door*-forgot to close the door that allows cars to board the ferry because it had no any kind of indicator that the door or is open.
  - **Damage:** 193 passengers and crew died
- ***Air Inter Flight 148***
  - **What happened?** crashed while approaching an airport in Strasbourg
  - **Reason:** *Display Screen Was Too Small* - It was approaching a mountain and the pilots intended the plane to descend toward the airport at an angle of **3.3 degrees** but "-3.3" enterer which is 3,300 feet
  - **Damage:** 82 passengers & 5 crew members died

What fields does HCI cover?



What fields does HCI cover?

- **Computer science:** is concerned with the application design and engineering of the human interfaces
- **Psychology:** is concerned with the cognitive processes of humans and the behavior of users.

  - **Cognitive**: mental process of knowing, reasoning …

- **Ergonomics:** Study of how equipment and things can be arranged and designed in order to people can use in more efficient and safe way
- The Goal of ergonomics is to ‘fit the job to the person,’ rather than making the person fit the job.” Ergotech

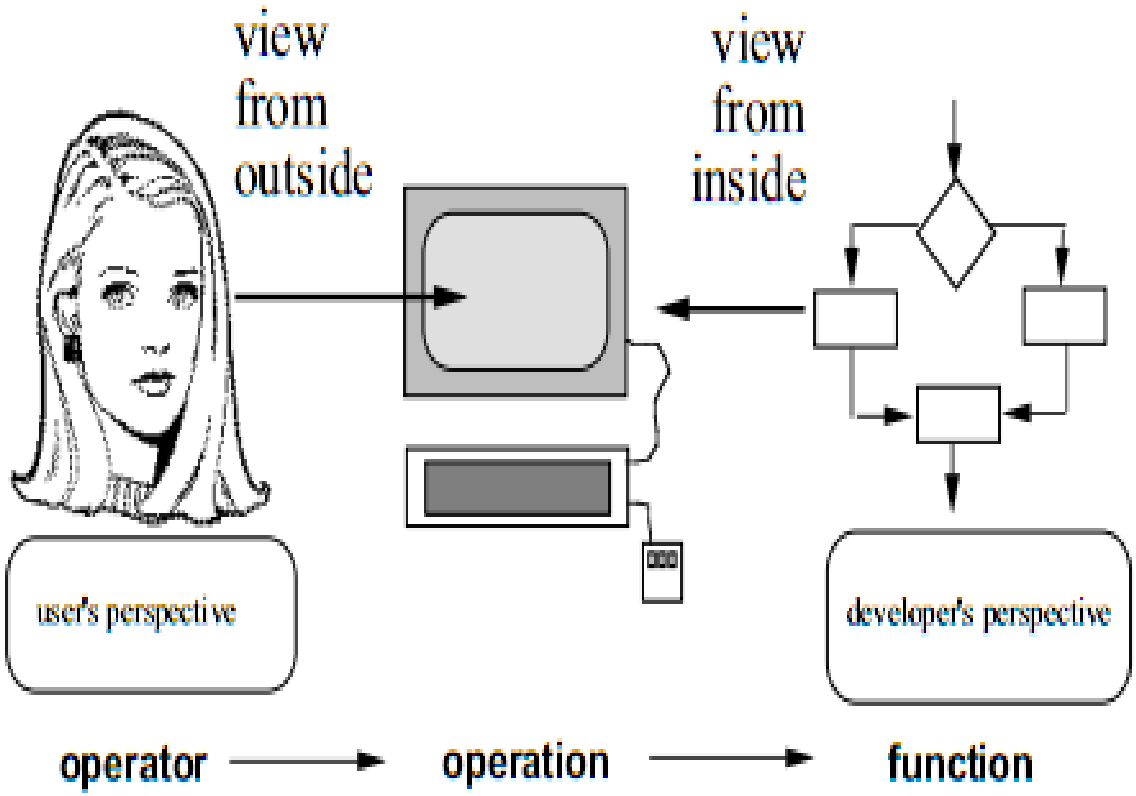
Con…

- **Sociology and Anthropology**
  - Sociology – study of human society at a given period of time
  - Anthropology – study of human beings and their ancestors in terms social relations and culture
  - Both contribute observational techniques that help HCI analyst understand the user/ operation culture
- **Linguistics**
  - is concerned with the study of human speech including its structure and modification of language.

Historical root of HCI

- **Human-computer interaction** (**HCI**) is an area of research and practice that emerged in the early 1980s, initially as a specialty area in computer science and human factors engineering.
- Humans interact with computers in many ways
  - GUI, Voice user interface(VUI), Gesture
- New computing technologies arrive, creating a new perception of the human-computer relationship.
- Understanding HCI history is largely about understanding a series of paradigm shifts
- We can trace some of these shifts in the history of interactive technologies.
- The current technologies were the product of previous HCI concept.

Con…

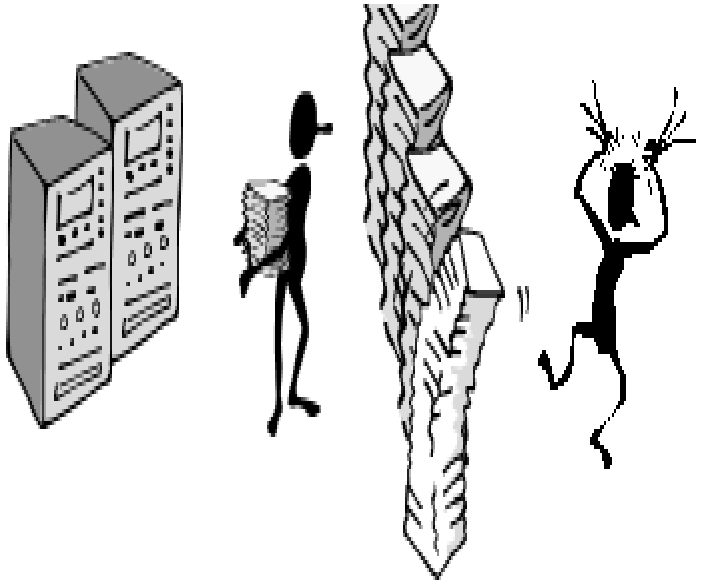

view
from
outside
view
from
inside
user's perspective
developer's perspective
operator
operation
function

Con…

- **The initial paradigm**

  Batch processing

  - Computer had one task, performed sequentially
  - No "interaction" between computer operator and computer after starting the run
  - Punch cards, tapes for input
  - Serial operation
  - Called ***Impersonal computing***



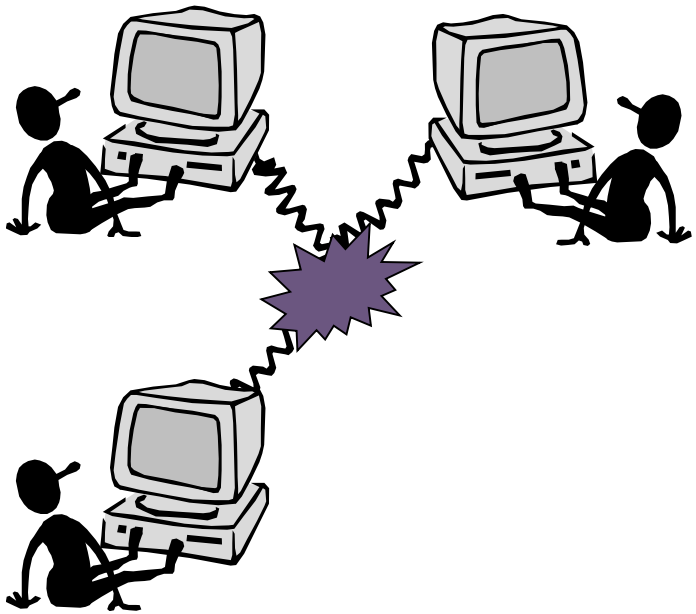
Con…

- **Example Paradigm Shifts…**
  - **Batch processing**
  - **Time-sharing:** single computer supports multiple users.
  - Interactive computing

Con..

- **Example Paradigm Shifts…**
  - Batch processing
  - Timesharing
    - **Networking:** Many computers interconnected to share resources.
    - networked computing devices pass data to each other along network links

Called *Community computing*



Con…

- **Example Paradigm Shifts…**
  - ✓ Batch processing
  - ✓ Timesharing
  - ✓ Networking
  - ✓ Graphical display: Monitor, mouse, ……
  - ✓ Microprocessor: CPU incorporated in a single IC
  - ✓ WWW: HTTP,HTML,….

discussion

- What about you ?
- Have you noticed such bad or good designs in your surrounding ?

Con…

- Design problems on some mobile devices
  - **Space Vs Number of keys**: More keys lay on small surface; Keys/buttons are very congested. Thus proper usage on each keys is so difficult →This generate type error and limit writing speed.
  - **Key Vs its function**: This can be acceptable, however there is lack of consistency among these available devices. Even some are completely differ from the usual or common devices

Bad user interface design

- **Kitchen Appliance**: "Funny Mistake"

➢ Poor handling

Toilet Paper: In a luxuries hotel, having sat down and done the business then you lost where the toilet paper.

Key Concepts for user centred design

- Donald Norman in his book (The design of everyday things) introduces six key concepts for User centred Design:

  1. Affordances
  2. Constraints
  3. Mappings
  4. Conceptual models
  5. Visibility
  6. Feedback

Affordance

- Things by their shape and other attributes should suggest what you can do to them
- Their shape should say something
- Like shape of the things should give a clue to the user on how to use it or on the operations of things just by looking
- Example
  - a mouse button invites scrolling
  - a cap handle affords grasping(take hold)
  - Door handle affords for pulling or pushing

Con…

- *A faucet with bad affordance*

- Invites you to rotate the knob, but no water comes out if you do so

Affordance in Physical world

Affordance in digital, ex. Buttons, Text fields

Submit

Submit

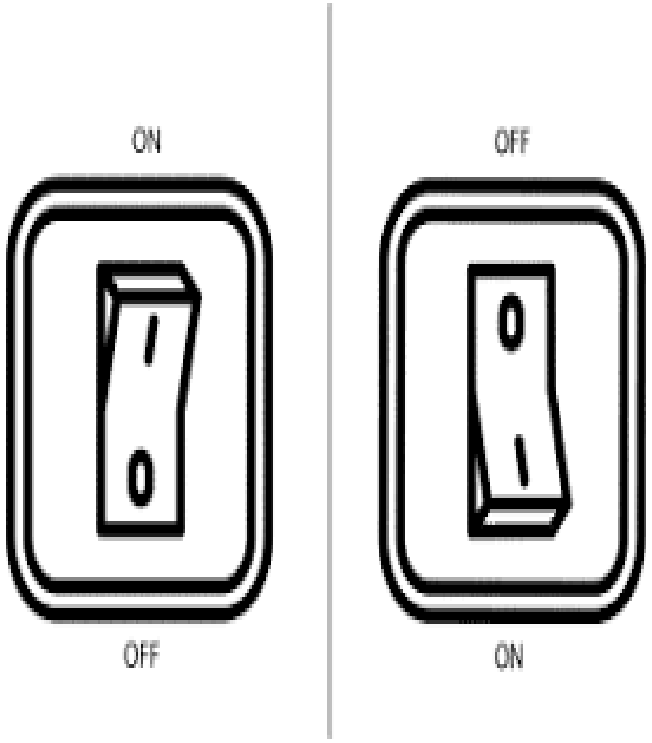
Name

Name

Con…

- Affordances are not **fundamental**, but depend on the background and culture of users
- Complex things may required explanation, but simple things should not need Picture, Label or instruction
- When simple things need pictures, labels, or instructions, the design has failed

Affordance example



Constraints

- Are restrictions that protects the system from entering into an invalid state
- Prevent invalid data from being entered and prevent invalid actions from being performed
- Its directly related to the number of possibilities
- Constraints can take many forms
  - Word processors disable the “Copy” and “Cut” commands when no text is currently selected

Con…

- Outer cover that serves as a constraints prohibiting one from inserting in a wrong way is added
- The left one is cool but it lacks constraint
  - It can be inserted either direction. May not work

Mapping

- Mappings are the relationships between controls and their effects on a system
- It is the relationship of **mental model** that we have in our head to items we encounter in the world.
- Example 1.
  - Turning steering wheel clockwise should turn the car to the right
  - Rotating volume control clockwise should increase volume

Conceptual model

- A conceptual model is a mental model of how something works, which is formed inside a person's brain
- Conceptual model built up in a user is influenced by numerous factors, including:
  - familiarity with similar devices interacting with the device affordances, mapping, constraints, instructions
- Conceptual models may be wrong, particularly if the above factors are misleading

visibility

- Controls should have placed in a visible place in our design
- For tasks that involve a series of steps, having clearly-marked controls in a visible location can help the user figure out what to do next
- Helps users to form correct mental models
- And Important elements should be able to tell at a glance (quick look) what they can and cannot do

Feedback

- Feedback from a system provides information about the effect of users' action
- It sends back to the user information about
  - What action has actually been done
  - What results has been accomplished
- If you press a button and nothing seems to happen, it's wondering.

Con…

- You can't know whether the button is working properly or whether there is a delay between the button press and the expected action?
- The principle of **feedback** suggests that you should give users confirmation that an action has been performed successfully (or unsuccessfully).
- Example: confirmation message in a pop-up dialog sending an e-mail.
- E.g. When a button is pushed, a tone is fed back to the user and tells that the button had been properly pushed

summery

HCI is about

- Understanding the users
- Understanding users tasks
- Understanding the surrounding environment
- Requirements gathering and analysis
- Design prototype
- Evaluate the system

Advantage of HCI

- Can Preventing accidents(make safe design)
- reduce the cost of customer training and support

Thank you!

Question?