Design of Interactive Systems (DIS)

Lecture 1: Introduction

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Key Information

- **Google classroom link:** https://classroom.google.com/c/NjUwNjkxNzEwNDUw?cjc=4uqmsbd

- **Instructor:** Dr. Kalpana Shankhwar

- **Email id:** kalpana@iiitd.ac.in

- **Office:** A-403 (R&D Block)

- **Office hours:** Monday 9:30-11:30

- **Class:** Wednesday 9:30 and Friday 11:00

- **Course mailing group:** des519@iiitd.ac.in

About me

Kalpana Shankhwar

Education
- PhD in Mechanical Engineering, National Taiwan University (NTU)
- M.Tech in Mechanical Engineering, IIT Guwahati
- B.E. in Mechanical Engineering, SGSITS Indore

Work Experience
- Engineer at MAN Trucks India Pvt. Ltd.
- Assistant Professor at KIIT University, Bhubaneswar
- Assistant Professor at IIT Delhi (From July 2023 – Present)

Lab
- Emerging Technology Integrated Design & Manufacturing (https://etidm.iiitd.edu.in/)

Lab Information

The Emerging Technology Integrated Design & Manufacturing lab (ETiDM) at HCD focuses on exploring and investigating emerging technologies including Extended reality (XR)/ (AR, VR, MR), Artificial Intelligence (AI), Digital Twin, Internet Of Things (IoT) and Haptic Technology. The ongoing research projects employ emerging technologies to develop smart training, tutorial and evaluation systems in the context of Industry 4.0 and Education 4.0. The lab aims to explore emerging technologies and conduct interdisciplinary research to overcome existing challenges in diverse fields for example, education, healthcare, manufacturing, teleoperation, guidance for safety and so forth.

Extended Reality

Haptic Technology

Digital Twin

Artificial Intelligence

Finite Element Method

User Centered Design

Grading Policy

Type of Evaluation	% Contribution in Grade
Class Participation	5 [attendance and responses in class]
Paper Presentation	5 [all groups need to present]
Assignment	20 [4 assignments]
Mid-sem	15
End-sem	25
Project	30+Bonus (5) [group of 3 students] [3 intermediate project reports and evaluation]

Resources

- Book by David Benyon
- Research Papers, *etc.*
- Government Report, *etc.*

Designing Interactive Systems

A comprehensive guide to HCI, UX and interaction design
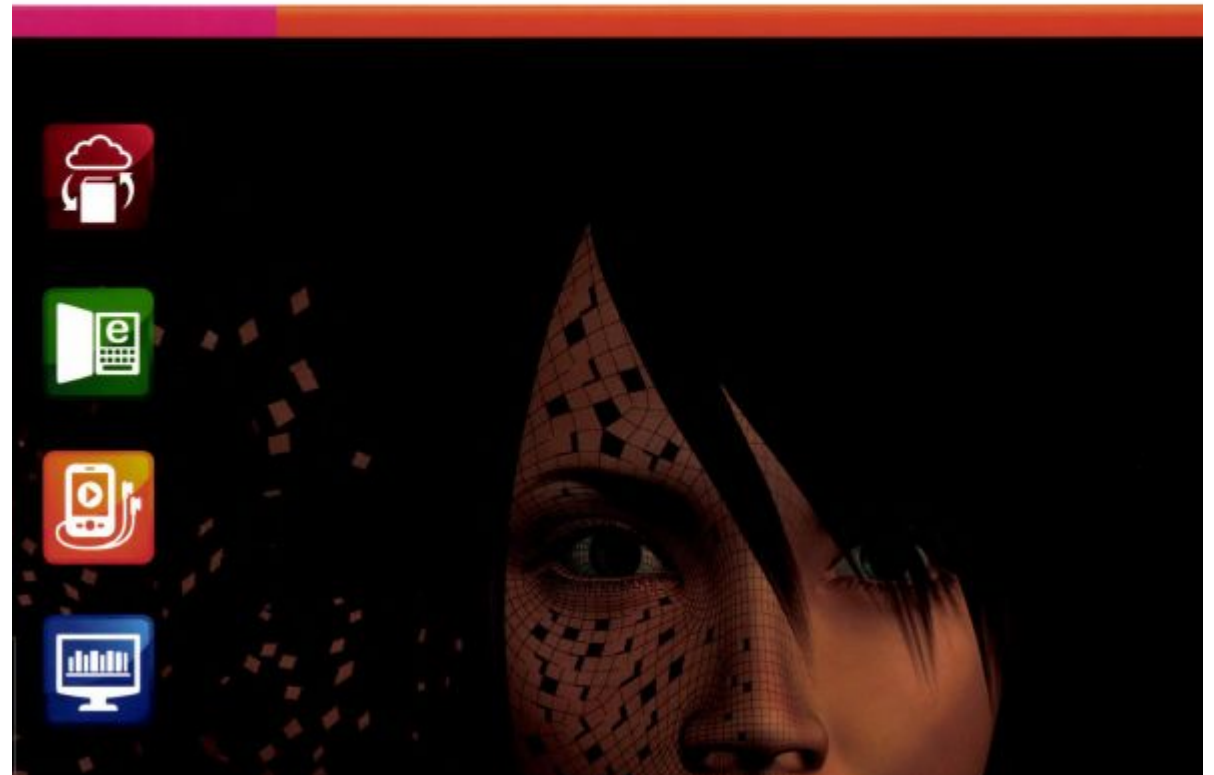
What is an interactive system?

- Interactive systems are computer systems characterized by significant amounts of interaction between human and computer.

- Who are the people involved?

  - User experience designers, information architects and interaction designers

Why do we need interactive systems?

- Do you use any interactive system?
  - Interactive television, personal digital assistants

- Applications/domains where interactive systems are useful?
  - Household appliances
  - Automobiles
  - Cash dispensing machine
  - Ticket machine

Design of Interactive Systems

"Aims to focus this emerging discipline

by *bringing together* the

best practice and experience from

HCI, **UX** and **ID**"

Human Computer Interaction (HCI)

"The strength and tradition of HCI has been in its **human-centredness** and **usability concerns**. HCI has evolved methods, guidelines, principles and standards to ensure that systems are easy to use and easy to learn."
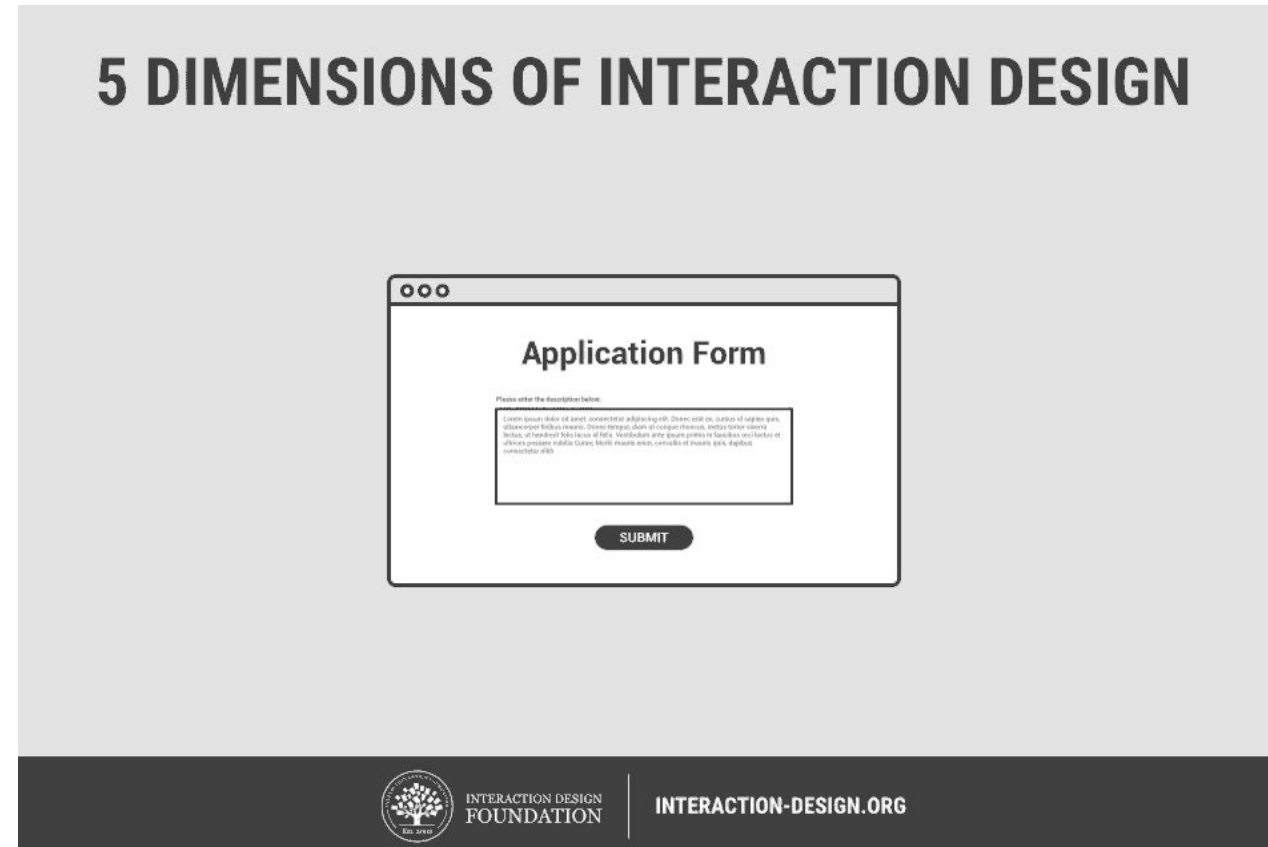
Interaction Design (ID)

"Interaction Design (ID) is the design of interactive products and services in which a designer's focus goes beyond the item in development to include the *way* users will interact with it."

Interaction Design (ID)

5 dimensions of interaction design

- 1D: Words
- 2D: Visual representation
- 3D: Physical objects or space
- 4D: Time
- 5D: Behavior

5 DIMENSIONS OF INTERACTION DESIGN

Application Form

Please enter the description below:

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Donec erat ex, cursus ut sapien quis, ullamcorper finibus mauris. Donec tempus, diam ut congue rhoncus, metus tortor viverra lectus, ut hendrerit felis lacus at felis. Vestibulum ante ipsum primis in faucibus orci luctus et ultrices posuere cubilia Curae; Morbi mauris enim, convallis et mauris quis, dapibus consectetur nibh.

SUBMIT

INTERACTION DESIGN FOUNDATION | INTERACTION-DESIGN.ORG

User Experience

- User experience (UX) design is the process design teams use to create products that provide meaningful and relevant experiences to users.

- UX design involves the design of the entire process of acquiring and integrating the product, including aspects of branding, design, usability and function.

HCI and Software Engineering

- **Software Engineering** is the study of designing, development and preservation of software. It comes in contact with HCI to make the man and machine interaction more vibrant and interactive.

- Software engineering and HCI group is a multi-perspective group focusing on a single problem: how to help people develop software that is effective and accurate.

Multimedia
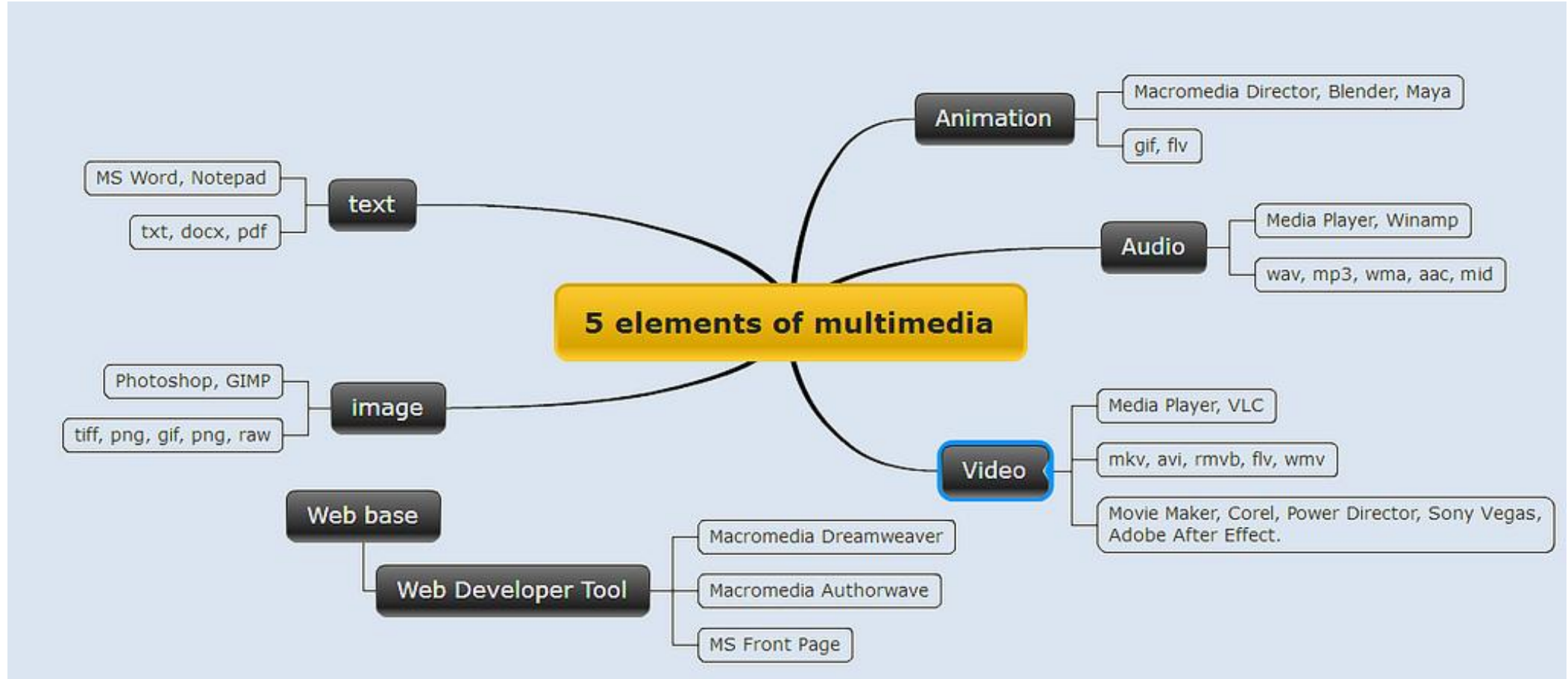
- Human perceptual system is composed of senses:
  - Visual: input
  - Acoustical: input/output
  - Haptic: input/output (touch, skin sensors, motor system)
  - Taste
  - Smell

- Brain is the processing, controlling and coordination center for the senses.
- Human senses are perfectly coordinated into a fully integrated system
- This system can receive and process multimodal information from the senses and produce multimedia output effortlessly

Design of Interactive Systems

- **Aim:**

  - Design interactive system that are **enjoyable to use**, that **do useful things** and enhance the lives of people who use them

  - That is, we want our interactive system to be **accessible**, **usable** and **engaging**

  - In order to achieve this, the design of such systems should be **human-centered**
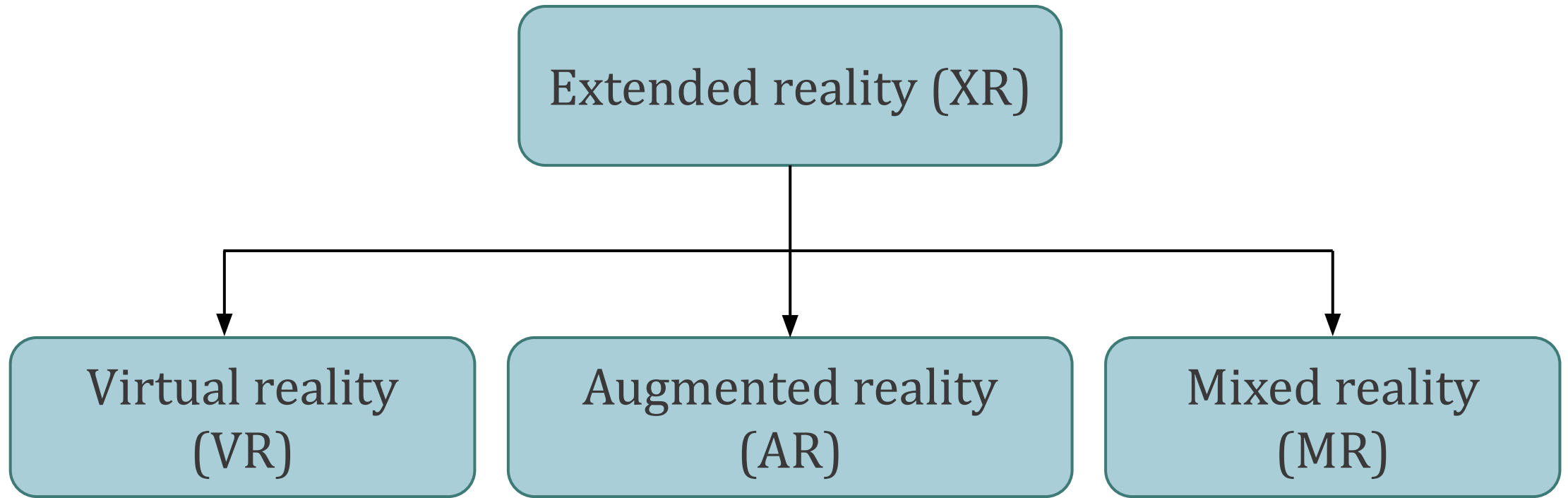
Essential of DIS
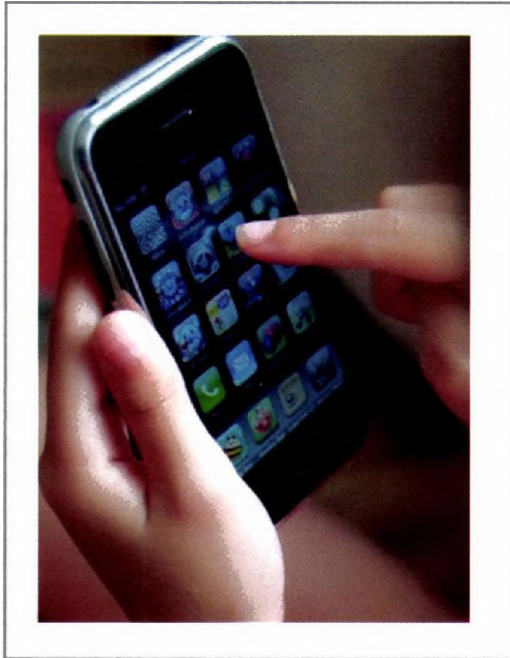
The iPhone

Wii Fit

Virtual reality (VR)

- VR is an artificial environment which is experienced through sensory stimuli (such as sights and sounds) provided by a computer and in which one's actions partially determine what happens in the environment

- Provide new kinds of experience, enabling users to interact with objects and navigate in 3D space

- Create highly-engaging user experiences

https://www.youtube.com/watch?v=yy8_IW4Q8dI&t=39s

Augmented Reality (AR)

- Enhanced version of virtual reality in which digital information is overlaid on an image of a physical object being viewed through a device for example, smartphone camera.

- Used smartphone camera and GPS to place virtual characters onto objects in the environment as if they really are there

Mixed Reality

- Mixed realty is similar to AR, combining digital information with the real world. Physical objects and virtual objects can interact with each other. Users can interact and manipulate the physical and virtual objects.

A Realistic Visuo-Haptic-Based Manual Milling Training Simulator with a Milling Machine Mockup

Key concerns of interactive system design

- **Design**. What is design and how should you do it?
- **Technologies**. These are the interactive systems, products, devices and components themselves.
- **People** who will use the systems and whose lives would we like to make better through our designs?
- **Activities and contexts**. What do people want to do? What are the contexts within which those activities take place?

People and Technologies

- Interactive systems are things that deal with the transmission, display, storage or transformation of information that people can perceive.

- Excludes tables, chairs and doors

- Includes mobile phones, website, computer game controllers

Machine- and people-centred views

View	People are	Machines are
Machine-centred	Vague Disorganized Distractible Emotional Illogical	Precise Orderly Undistractible Unemotional Logical
People-centred	Creative Compliant Attentive to change Resourceful Able to make flexible decisions based on content	Dumb Rigid Insensitive to change Unimaginative Constrained to make consistent decisions

Source: Adapted from Norman (1993), p. 224

The interface

UI is all those parts of the system with which people come into contact,
- Physically
- Perceptually
- Conceptually


(a)   (b)   (c)   (d)

Being Human-Centered

- Thinking about what people want to do rather than what the technology can do

- Designing new ways to connect people with people

- Involving people in the design process

- Designing for diversity

Being Digital

- We live in a digital age, when all manner of devices represent things using binary digits (bits). The significance of being digital is that bits are transformable, transmittable and storable using digital technologies.

- Digital alarm clock
- Heating adjustments in car, warning signs
- Ticket machine
- Coffee machine

Why being human centered is important

- Return on investment
- Safety
- Ethics
- Sustainability
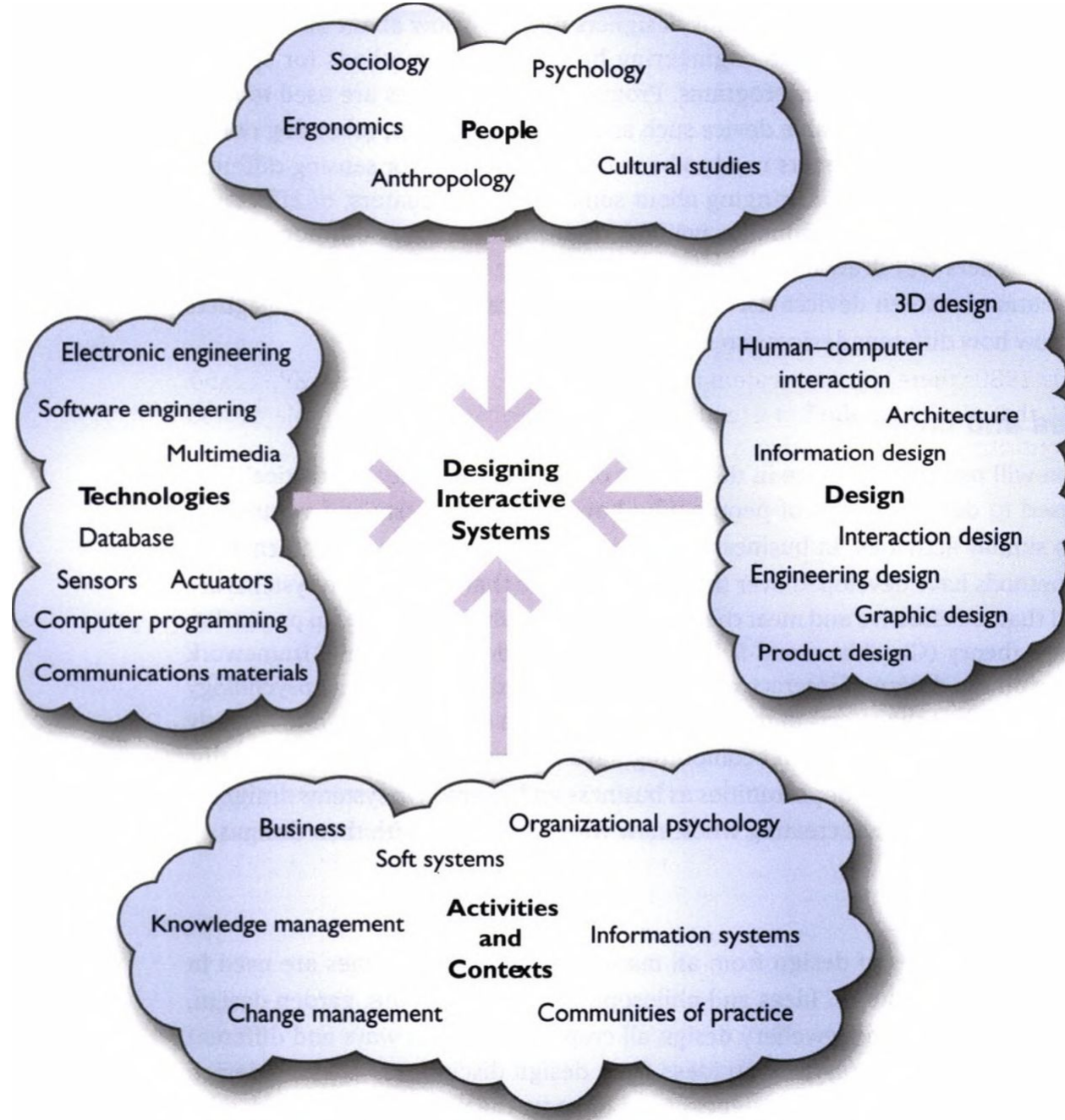
Disciplines contributing to interactive systems deign

PACT: A framework for Designing Interactive Systems

- An essential part of DIS is that it should put people first (human centered).

- PACT (people, activities, contexts, technologies) as a useful framework for thinking about a design situation.

Activities and Technologies

Requirements

Activities in contexts → Technologies
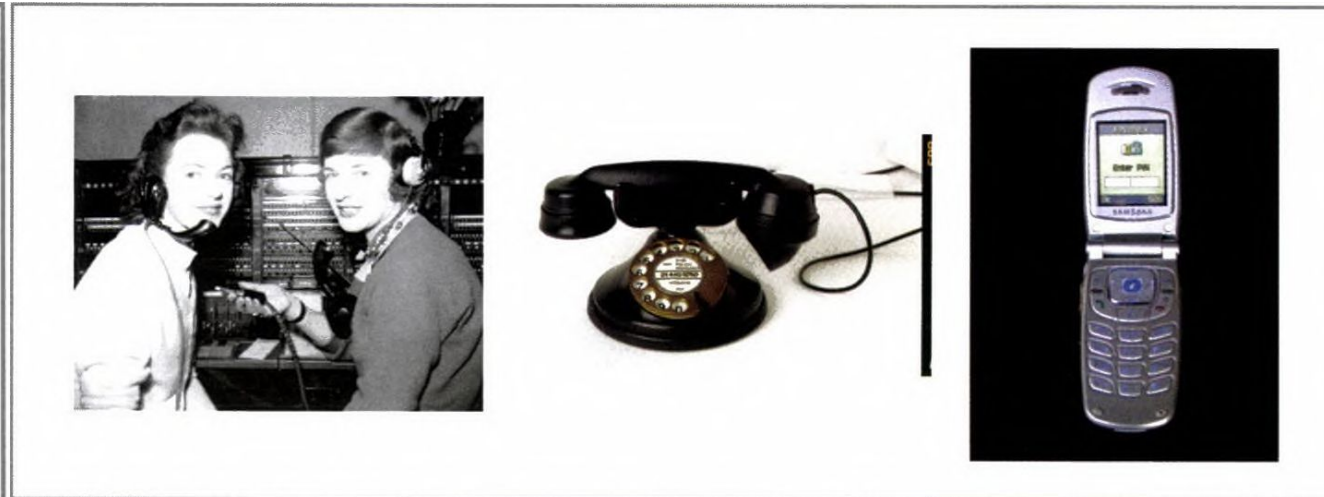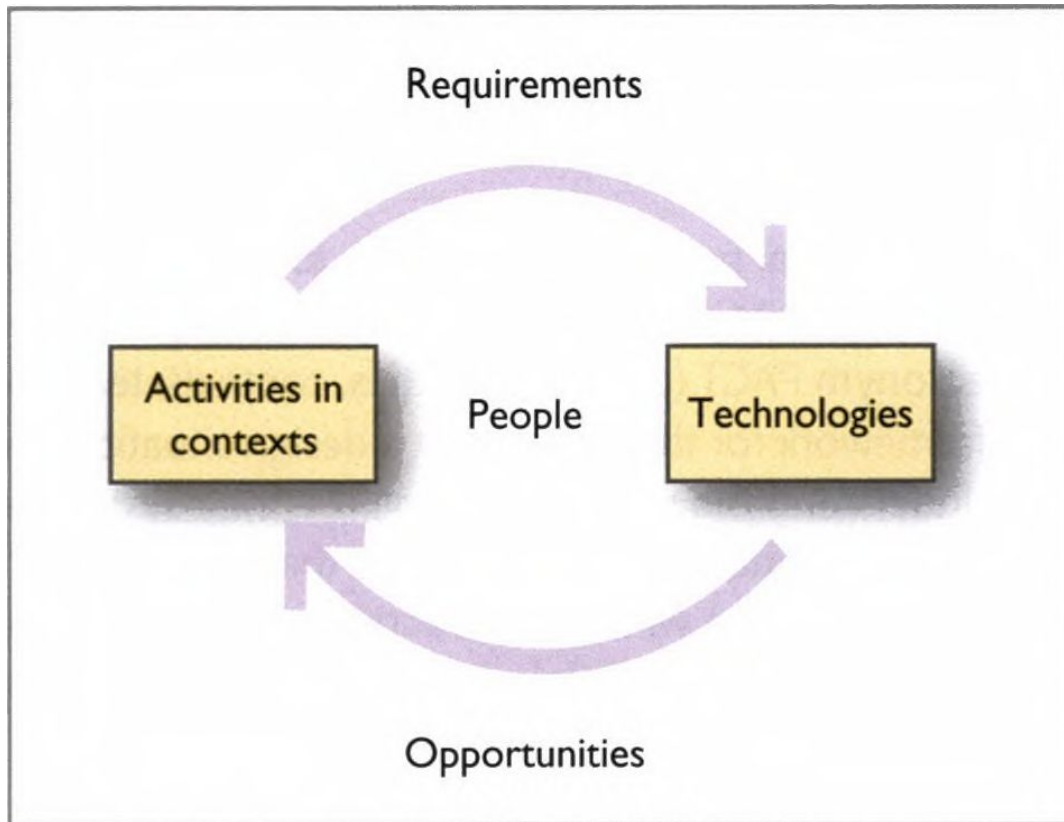
People

Opportunities

Figure 2.1 Activities and technologies

(Source: Based on Carroll (2002), Figure 3.1, p. 68)

Figure 2.1 shows how activities (and the contexts within which they take place)

People: Physical Difference

- People differ from others in a variety of ways
- Variability in five senses – sight, touch, hearing, smell and taste.

Ergonomics

- Ergonomics: the study of the relationships between people and their environment.

- The environment includes
  - the ambient environment (temperature, humidity, atmospheric pressure, light levels, noise and so on)
  - the working environment too (the design of machines, health and safety issues - e.g. hygiene, toxicology, exposure to ionizing radiation, microwaves, etc.).

Ergonomics

- Despite Ergonomics is old, it has much to tell us about the design of interactive devices such as a mobile games console, a tablet PC or smartphone.

Projects

- Project should solve some problems of human/society
- Should involve interaction design (ID)
- Should involve user experience (UX)
- Should involve human computer interaction (HCI)
- Think of different departments a government has and what kind of problem they solve
  - Healthcare, Education, Women Security, Agriculture, Power, Housing, Industry, Transportation, Accessibility, Visualization, *etc.*

Project Planning

- Process
  - Propose the design of an interactive system (*Or, let me assign some problem*)
  - Completely understand it (requirement gathering)
  - Design the system
  - Collect data
  - Build the system
  - Do thorough testing and verify claims
  - Has to be of sufficient complexity
  - Simple implementations not acceptable
- Then submit project

- Check recent papers of Core A* Conference

Project Evaluation

- Criteria
  - 3 Intermediate reports/progress/Implementations
  - Final report
  - Code
  - Demo
  - Presentation
  - Testing and Evaluation
- Bonus
  - Novelty
  - Present in workshop/conference
  - Real-time systems