

PRINCIPLES OF USER INTERFACE DESIGN

Human Computer Interaction (HCI)

WHAT IS HUMAN-COMPUTER INTERACTION (HCI)?

- Human-Computer Interaction (HCI) is a multidisciplinary field of study focusing on the design of computer technology and, in particular, the interaction between humans (the users) and computers.
- While initially concerned with computers, HCI has since expanded to cover almost all forms of information technology.

WHO IS INVOLVED IN HUMAN-COMPUTER INTERACTION (HCI)?

- HCI is a broad field that integrates several disciplines, such as computer science, psychology, human factors, information science, and several social science disciplines.
- The professionals involved can include user interface (UI) and user experience (UX) designers, software developers, ergonomists, cognitive psychologists, and many more specialist roles.

WHEN DID HUMAN-COMPUTER INTERACTION (HCI) BEGIN?



- The term 'Human-Computer Interaction' was first coined in the 1980s with the mass adoption of graphical user interfaces. However, its roots stretch back to the early days of computing.
- The advent of personal computing brought computers into the mainstream, making user-friendly interfaces crucial. Since then, HCI has been a key component in designing and developing applications that are focused on usability and meet user needs

WHERE IS HUMAN-COMPUTER INTERACTION (HCI) APPLIED?

- HCI principles have broad application areas. It's implemented anywhere user interactions with a computing device take place, including handheld devices, desktop applications, websites, and more.
- In recent times, HCI's principles also shaped emerging technologies like virtual reality and artificial intelligence interfaces.

WHY IS HUMAN-COMPUTER INTERACTION (HCI) IMPORTANT?

- HCI is vital as it places the user and their experiences and needs at the forefront during the development of interactive computing technologies.
- It focuses on the practical aspects of technological design and use, working towards making systems that are both useful and usable. HCI optimizes the interaction between humans and computers, making them efficient, effective, and satisfying for the intended users.
- A successful HCI design can result in improved productivity, better user experience, and increased acceptance and satisfaction with technology.

THE GOALS AND PRINCIPLES OF HUMAN-COMPUTER INTERACTION



In this section, we will understand the in-depth goals and principles of Human-Computer Interaction (HCI).

CRAFTING USER-FRIENDLY SYSTEMS

- A major thrust of HCI is designing systems that balance functionality and user convenience.
- These systems aim to streamline tasks by automation, creating interfaces that users find comfortable and efficient to navigate while maintaining a robust security profile to ensure user safety

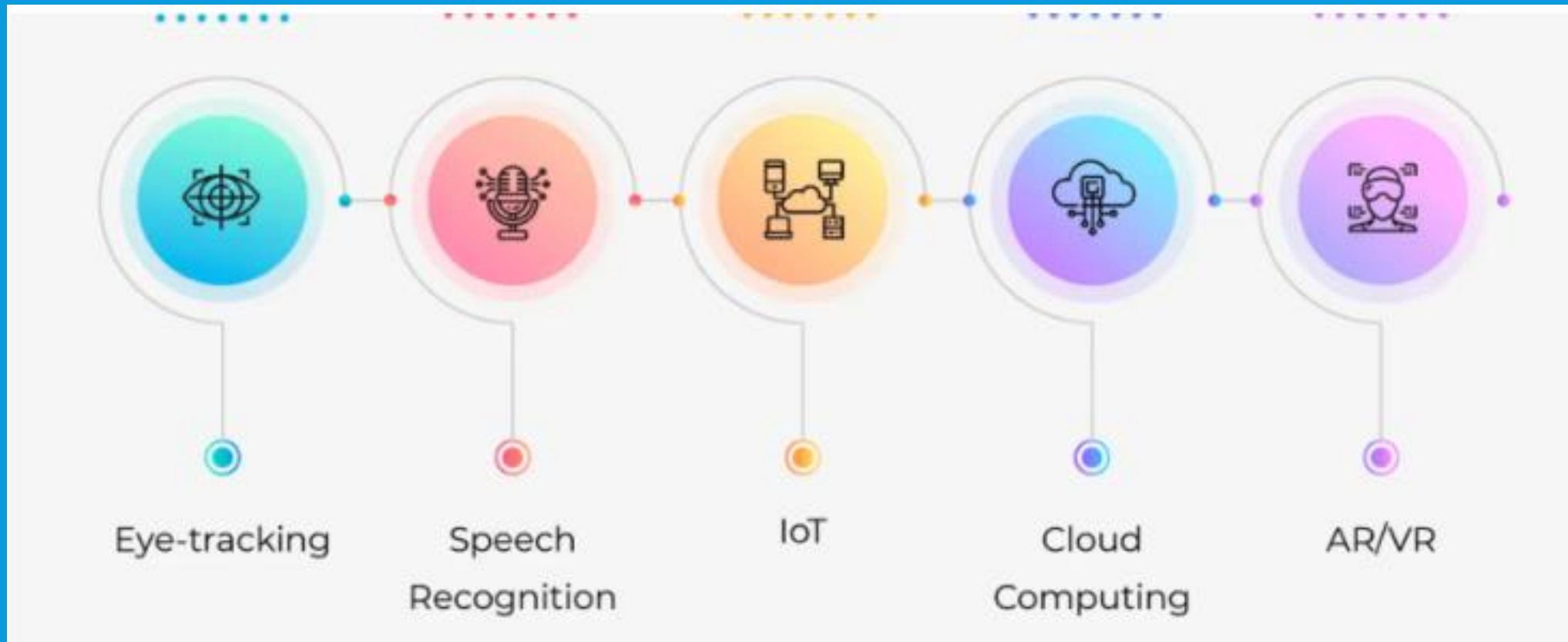
EMPATHIZING WITH USERS

- Creating empathetic design is central to HCI.
- By walking a mile in the end users' shoes, designers cultivate a better understanding of their needs, leading to the development of systems and interfaces that resonate best with their requirements.

DEVELOPING EFFICIENT INTERACTIONS

- HCI's primary aim revolves around creating interactions that are efficient, effective, and safe.
- What this implies is that user interactions should achieve the intended outcome swiftly and safely. This increased effectiveness and efficiency can skyrocket productivity levels and user satisfaction, fostering a sense of well-being

THE SEVEN PILLARS OF HCI



PROPOSED BY DONALD NORMAN IN 1988, THE SEVEN GUIDING PRINCIPLES OF HCI INCLUDE:

- Harnessing both experiential and innate knowledge
- Streamlining task structures
- Maximizing visibility
- Establishing the right mapping (linking user mental models with conceptual and design models)
- Transforming constraints into advantages
- Designing for error
- Standardizing when met by obstacles

THE TRIAD OF HCI COMPONENTS

- HCI rests on three fundamental components:
- **The User:** This represents the individual or group interacting with the system. Understanding their demographics, technical proficiency levels, and physical or cognitive abilities paves the way for an intuitive user interface.
- **The Interface:** The interface includes the graphical, auditory, or visual elements that the user interacts with. An excellent interface is not just aesthetically appealing but also user-friendly and rich in feedback mechanisms.

- **Counting on Collaborations:** The synergistic interaction between the user and interface forms the third pillar of HCI. The goal is to design an interface the user finds easy to interact with and can leverage optimally to meet their requirements.

DISTINGUISHING HCI FROM UX



- The HCI and User Experience (UX) disciplines share common goals.
- However, UX's prime focus lies in adding value to the product by enhancing user experience, while HCI extends its focus to studying psychological impacts, visual communication, and the like.

HCI-DRIVEN TRENDS IN THE USER EXPERIENCE INDUSTRY

- Conversely, HCI has been the driving force behind several emerging trends in the User Experience industry:
- **Voice-guided User Interface:** These interfaces, powered by voice commands and natural language processing, make the user experience hands-free and convenient.
- **Gesture-guided User Interface:** These interfaces let users navigate using hand movements and body motions, facilitating an intuitive interaction.

- **Virtual and Augmented Reality:** While Virtual Reality creates computer-generated environments, Augmented Reality overlays digital information onto the real world, delivering highly interactive experiences.
- **Wearable Technology:** Wearable devices like fitness trackers and smartwatches use integrated sensors for real-time information access and seamless interaction with digital services.

HUMAN-COMPUTER INTERACTION EXAMPLES

- **Touchscreen Devices and Smartphones**
- One of the most ubiquitous examples of Human-Computer Interaction is the touchscreen interface found in smartphones, tablets, and other devices.
- HCI has been integral to the development of these interfaces, ensuring responsive, intuitive touch gestures that allow users to navigate and interact effortlessly with the digital world.

- **Voice-Activated Assistants and Smart Speakers**

- Devices like Amazon Echo, Google Home, and Apple HomePod represent HCI in action as they provide voice-activated assistants capable of understanding spoken language.
- Natural language processing, speech recognition, and AI advancements have improved the interaction between users and these devices, making them indispensable modern home appliances.

- **Gesture-Based Interfaces**

- Gesture-based interfaces, such as those featured in Microsoft's Kinect or [VR](#) gaming systems, grant users the ability to interact with computing devices through simple bodily movements—this eliminates the need for traditional input devices like controllers, keyboards, or mice.

- **Accessibility Features**

- HCI principles have significantly contributed to the development of accessible computing technologies, ensuring that differently-abled users can interact with digital devices effectively.
- Examples include screen readers and speech recognition software for visually impaired users or alternative input devices like sip-and-puff systems for people with limited mobility.

▪ **Website Navigation and User Experience**

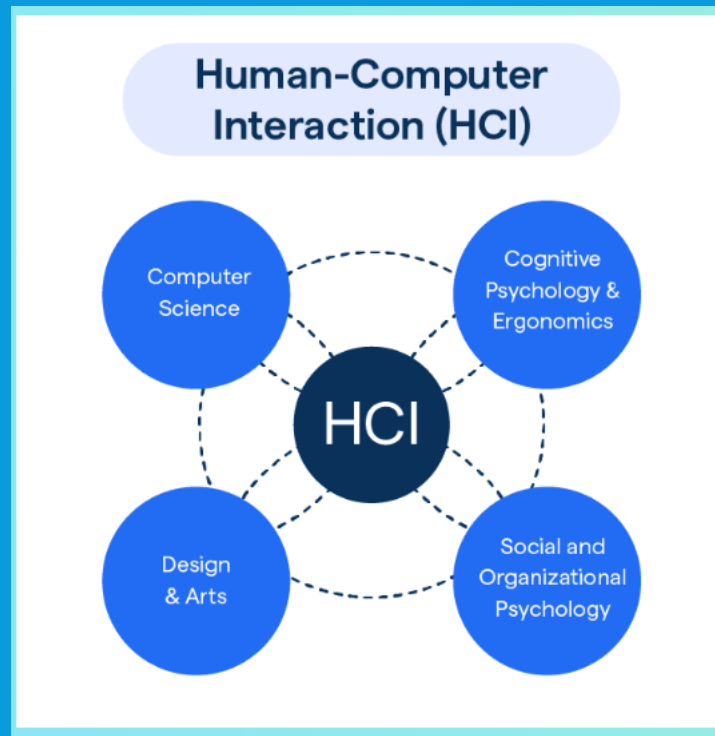
- HCI's design guidelines and principles have been crucial in shaping modern website design and navigation.
- Designers focus on aspects like information architecture, layout consistency, typography, and color schemes to ensure that users can effortlessly find their way around websites and easily access the information they seek.

- **Smart Home Automation**

- Smart home automation systems, such as connected lighting, heating, and security systems, employ HCI strategies to provide a seamless user experience.
- With the help of applications, graphical user interfaces, voice controls, or touch panels, homeowners can efficiently manage and interact with their smart home's connected infrastructure.

HUMAN COMPUTER INTERACTION

- Human-computer interaction (HCI) is a multidisciplinary field
- focusing on the design of computer technology and, in particular, the interaction between humans (the users) and computers



RELATED STUDY AREAS TO HCI

and problem-solving skill

- Ergonomics
 - for the user's physical capabilities
- Sociology
 - to help her understand wider context of the interaction
- Computer Science and Engineering
 - to be able to build the necessary technology
- Business/Management
 - to be able to market it
- Arts
 - Graphic designer's to produce effective interaction
- Writing
 - Technical writing to produce the manuals

CHALLENGE OF DEVELOPING PRODUCTS FOR EVERYONE

- HCI takes advantage of our everyday knowledge of the world to make software and devices more understandable and usable for everyone.
- e.g. Desktop Computers – Consider introducing a computer for very beginner

WHAT ARE INTERACTIVE SYSTEMS?

- Two way communication
 - in the same language,
 - a dialog
 - ability to understand or interpret

FILLS THE GAP BETWEEN HUMAN AND COMPUTING

- Human users and their contexts are major components of the design problems that cannot be neglected since they are complex.

COMPONENTS OF HCI MODEL

- Human User
- Computer
- Interaction

HUMAN USERS

- An individual
- A group of users working together
- A sequence of users in an organization (each dealing with some parts of task)

CLASSIFY OR UNDERSTAND HUMAN USERS

- Physical abilities
- Personality differences
- Skill differences
- Cultural diversity
- Motivation
- Special needs

DIFFERENT TYPES OF COMPUTERS

- PC
- A large scale computer system
- A process control system (computing devices)
- An embedded system
- Mobile computing devices

WHAT IS INTERACTION?

- A communication between a user and computer be it direct and indirect
- Two types of interaction:
 - **Direct:** a dialog with feedback and control throughout the performance of the task
 - **Indirect:** Batch processing or intelligent sensors controlling the environment

TWO TYPES OF INTERACTION DESIGN

- User-centered design
 - In order to optimize the system functionality and resources, human user is considered main stakeholders to satisfy
- Task-centered design
 - Tasks are what the user is carrying out in a way he/she wants.

WHAT IS INTERFACE?

- Interaction happens through the interface
- Interface facilitates the communication between the user and system
- The interface needs to provide some mechanisms for
 - people to provide instructions and enter data into the system:

'input'.

- the system to tell people what is happening: **'feedback'**
- the system to display the content (i.e. information, pictures,

movies, animations) : **'output'.**

INTERACTIVE INTERFACES

- The interface to an interactive system is all those parts of the system with which people come into contact,
 - physically, (by pressing buttons or moving levers)
 - Perceptually (by displaying things on a screen, or making noises)
 - Conceptually (by providing messages and other displays)

DEVELOPING INTERFACES FOR GOOD INTERACTION

- Good interfaces
 - Suitable for the task
 - Easy to use (appropriate, adaptable to the user's knowledge and experience)
 - Feedback on performance
 - Display information to useful for the user

TASK

- Search Human Computer Interaction history
- Prepare short note