

What is Human Computer Interaction?

HCI is about understanding how people interact with computers as well as designing computer systems that are easy, efficient, and enjoyable to use.

This involves considering how users perceive and interpret interfaces, how they learn to use them, and how they perform tasks using them.

HCI draws from computer science, cognitive psychology, design, and several other disciplines to create user-centered designs that improve the interaction between humans and computers.

Evolution of HCI

Machinery: The Early Days



Early machinery was designed primarily with functionality in mind, often neglecting usability. Machines were operated by trained specialists who needed extensive training to understand and use them.

During the industrial revolution, the focus was on improving efficiency and productivity. Usability was still not a primary concern, but this period laid the groundwork for more complex machines.

1970s-1980s



The PC (Personal Computer - Shifting Focus to Usability)

In the arrival of personal computers in the late 20th century marked a significant shift. PCs were designed for general consumers, not just specialists. This change necessitated a greater focus on usability.

1980s-1990s:



The GUI (Graphical User Interface): Making Computers Intuitive

In 1981 the Xerox Star, officially named the Xerox 8010 Information System, was developed by Xerox's Palo Alto Research Center (PARC). It was the first system designed from the ground up to support a graphical user interface (GUI) with the WIMP (windows, icons, menus, pointer).

These systems showed how visual metaphors (like desktop and folders) could make technology more intuitive.

1990s-Present



The Web: The Global Interface

The emergence of the World Wide Web brought another revolution in user interaction. Websites became a primary medium for information exchange, communication, and commerce.

The web introduced new usability challenges. Designers had to consider different browsers, screen sizes, and user expectations. Web usability became a critical area of study.

Present and Future



We can see several emerging technologies that will further shape human-computer interaction, each bringing its own usability considerations like the following:

Ubiquitous Computing

This concept envisions computing integrated seamlessly into everyday objects and environments, requiring interfaces that are highly intuitive and natural to use.

Augmented and Virtual Reality (AR/VR)

AR and VR technologies offer immersive experiences, but designing interfaces that are easy to navigate in these environments remains a challenge.

Artificial Intelligence (AI)

AI can enhance usability by providing personalized experiences, where systems learn from user behavior and adapt accordingly.

Voice and Gesture Interfaces

As voice and gesture-based interfaces become more common, designers must focus on making these interactions as natural and accurate as possible.

Brain-Computer Interfaces (BCIs)

BCIs, which enable direct communication between the brain and a computer, represent a futuristic leap in HCI. However, designing these interfaces to be intuitive and user-friendly will be a significant challenge.

Ice Breaker: Good Design VS. Bad Design

Why Design for Usability?

Designing for usability is crucial because it ensures that systems and products are intuitive, efficient, and pleasant for users to interact with. This idea is extensively explored in Jeff Johnson's book "Designing with the Mind in Mind." Here's a breakdown of the key points why we should design for usability:

1. Human Cognitive Psychology

Understanding human cognitive psychology is fundamental to designing for usability. Our minds have certain strengths and limitations that designers need to accommodate:

- **Perception:** We have limits on what we can perceive at a glance. Designing interfaces that are visually clear and uncluttered helps users process information more efficiently.
- **Memory:** Our short-term memory can only hold a small amount of information at a time. Interfaces should minimize the cognitive load by not requiring users to remember too much information from one step to the next.
- **Attention:** We can only focus on one task at a time. Good design reduces the number of distractions and makes the important information stand out.

2. Consistency and Standards

Consistency helps users learn and predict how to interact with a system:

- **Internal Consistency:** Ensures that similar operations and elements behave the same within the system.

- **External Consistency:** Aligns with other systems users are familiar with. This leverages their existing knowledge, making the new system easier to learn.

3. Visibility and Feedback

- **Visibility:** Important functions should be visible without the user having to search for them. Users should not have to guess or remember where to find important features.
- **Feedback:** Users need immediate feedback to understand the effect of their actions. This can be in the form of visual, auditory, or haptic responses.

4. Affordances and Metaphors

- **Affordances:** These are clues about how an object should be used. For instance, buttons look pressable. Properly designed affordances guide users intuitively.
- **Metaphors:** Using familiar metaphors (like a trash can for deleting files) helps users understand new concepts by relating them to something they already know.

5. Error Prevention and Recovery

Designs should help prevent errors and make it easy to recover when they occur:

- **Prevention:** Provide constraints and suggestions that guide users away from errors.
- **Recovery:** Offer clear, helpful error messages and easy ways to undo actions or correct mistakes.

6. Efficiency and Satisfaction

- **Efficiency:** Good design enables users to achieve their goals quickly and with minimal effort. This includes optimizing workflows and reducing the number of steps needed to complete tasks.
- **Satisfaction:** Ultimately, usability leads to greater user satisfaction. When users find a product easy to use, they are more likely to have a positive experience and continue using it.

Disciplines of Human-Computer Interaction

Human-Computer Interaction (HCI) is a broad field that focuses on the design and use of computer technology, particularly the interfaces between people (users) and computers. HCI involves understanding how people interact with computers and designing technologies that allow for effective interactions.

The field of HCI draws from a wide range of disciplines, including:

1. Computer Science

- **Core Contribution:** Provides the technical foundation for designing and developing software and hardware systems.
- **Relevant Areas:** Algorithms, programming, software engineering, and interface design.
- **Application in HCI:** Computer science contributes to the development of interactive systems, user interfaces, and the underlying architecture that supports user interaction.

2. Psychology

- **Core Contribution:** Offers insights into human behavior, cognition, perception, and learning, which are critical for designing user-friendly interfaces.
- **Relevant Areas:** Cognitive psychology, experimental psychology, and human factors.
- **Application in HCI:** Understanding how users perceive, process, and remember information helps in creating interfaces that align with human cognitive abilities and limitations.

3. Design

- **Core Contribution:** Focuses on the aesthetic, functional, and usability aspects of user interfaces.
- **Relevant Areas:** Graphic design, interaction design, and user experience (UX) design.
- **Application in HCI:** Design disciplines contribute to creating visually appealing, intuitive, and user-centered interfaces that enhance the overall user experience.

4. Ergonomics and Human Factors

- **Core Contribution:** Studies the physical and psychological interactions between people and systems, ensuring that systems are designed to fit the users' needs.
- **Relevant Areas:** Workplace design, safety engineering, and usability engineering.
- **Application in HCI:** Ergonomics ensures that interfaces are not only easy to use but also reduce the risk of user error and physical strain.

5. Sociology and Anthropology

- **Core Contribution:** Helps us understand how people interact with technology in their social environments. It looks at how cultural norms, social behaviors, and group dynamics influence the way people use and perceive technology.
- **Relevant Areas:** Social computing, ethnography, and participatory design.
- **Application in HCI:** Understanding the social dynamics and cultural factors that influence how people use technology can lead to more inclusive and contextually relevant designs.

6. Linguistics/Language

- **Core Contribution:** Explores how language is used in human-computer interaction, particularly in natural language processing and communication.
- **Relevant Areas:** Computational linguistics, semantics, and language technologies.
- **Application in HCI:** Linguistics informs the development of voice interfaces, chatbots, and other systems where natural language plays a central role.

7. Cognitive Science

- **Core Contribution:** Studies the mind and its processes, including how people think, learn, and remember.
- **Relevant Areas:** Artificial intelligence, mental models, and learning theories.
- **Application in HCI:** Cognitive science helps designers understand how users mentally model and interact with systems, leading to more intuitive and effective designs.

8. Artificial Intelligence (AI)

- **Core Contribution:** Focuses on creating intelligent systems that can simulate human-like behavior and decision-making.
- **Relevant Areas:** Machine learning, robotics, and intelligent agents.
- **Application in HCI:** AI is increasingly used to personalize user experiences, enhance interaction with intelligent systems, and support decision-making.

9. Communication Studies

- **Core Contribution:** Examines how people convey and interpret information, which is crucial for designing interfaces that facilitate clear communication.
- **Relevant Areas:** Media studies, information theory, and visual communication.
- **Application in HCI:** Helps in designing interfaces that effectively communicate information to users, whether through text, visuals, or multimedia.

10. Engineering

- **Core Contribution:** Provides the tools and methods for building reliable, efficient, and scalable systems.
- **Relevant Areas:** Electrical engineering, mechanical engineering, and systems engineering.
- **Application in HCI:** Engineering disciplines contribute to the practical implementation of HCI designs, ensuring that systems are not only user-friendly but also technically sound.

11. Ethics and Philosophy

- **Core Contribution:** Addresses the ethical implications of technology use and the philosophical questions surrounding human interaction with machines.
- **Relevant Areas:** Technology ethics, digital rights, and philosophy of mind.
- **Application in HCI:** Ethics ensures that the design and deployment of technology respect user privacy, autonomy, and social justice.

12. Education

- **Core Contribution:** Explores how technology can be designed to support learning and education.
- **Relevant Areas:** Educational technology, instructional design, and e-learning.
- **Application in HCI:** Informs the design of educational software, online learning platforms, and tools that support knowledge acquisition and skill development.