

Introduction to Human-Computer Interaction

Introduction to Human-Computer Interaction (HCI)

Key concepts, principles, and foundational ideas for designing usable interactive systems.

1. What Is HCI?

Aspect	Description
Definition	The interdisciplinary study of how people interact with computers, software, and digital devices, and how to design those systems to be effective, efficient, and satisfying.
Goals	• Usability – ease of learning and use • Utility – providing the right functionality • User Experience (UX) – overall satisfaction, emotions, and aesthetic appeal
Disciplines Involved	Computer science, psychology, design, ergonomics, sociology, linguistics, anthropology, engineering.

2. Core Concepts

Concept	Meaning	Example
User	The person (or group) who interacts with the system.	User of a mobile banking app.
Task	Goal-oriented activity the user wants to accomplish.	“Transfer money to a friend.”
Interface	The medium through which the user and system communicate.	Graphical UI, voice assistant, VR headset.
Feedback	System’s response that informs the user about the result of an action.	A toast message “Message sent.”
Affordance	Perceived properties of an object that suggest how it can be used.	A button that looks pressable.
Mapping	Relationship between controls and their effects.	Turning a knob clockwise increases volume.
Mental Model	User’s internal representation of how a system works.	Expecting a “trash can” icon to delete files.

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Context	Physical, social, and technical environment influencing interaction.	Using a smartwatch while jogging.

3. HCI Design Process (Iterative)

1. User Research

- Methods: interviews, surveys, observations, ethnography, diary studies.
- Output: personas, scenarios, task analyses.

2. Requirement Specification

- Functional: what the system must do.
- Non-functional: usability, accessibility, performance, security.

3. Conceptual Design

- Sketches, paper prototypes, storyboards.
- Focus on information architecture and interaction flow.

4. Detailed Design

- Wireframes, mockups, UI style guides.
- Define visual hierarchy, typography, color palette.

5. Implementation

- Front-end development, integration with back-end services.
- Follow coding standards, responsive design, accessibility guidelines.

6. Evaluation

- **Formative** (early, low-fidelity): heuristic evaluation, cognitive walkthrough, think-aloud testing.
- **Summative** (final, high-fidelity): usability testing, A/B testing, field studies, analytics.

7. Iteration

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- Analyze results ? refine design ? re?evaluate. Repeat until goals are met.
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4. Usability Heuristics (Nielsen, 1994)

#	Heuristic	Practical Check
1	Visibility of system status	Show progress indicators, real?time feedback.
2	Match between system & real world	Use familiar terminology, natural language.
3	User control & freedom	Provide “undo”, “cancel”, and easy navigation.
4	Consistency & standards	Keep icons, terminology, and layout uniform.
5	Error prevention	Disable invalid actions, confirm destructive