Human Computer Interaction

Lecture 1+2+3

Introduction to HCI & why design matters!
Course Outline

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COMP322 | Based on: Interaction Design, 6th Ed. (Rogers, Sharp, Preece)

About the course

Textbooks

Interaction Design: Beyond Human-Computer Interaction

Rogers, Sharp, Preece. 6th Edition, Wiley 2024 (4th/5th OK)

Companion site: id-book.com

The Design of Everyday Things

Don Norman. Revised Edition, Basic Books 2013

Assessment

Component	Weight
Individual assignment	15%
In-class quiz	10%
Multi-phase group project	30%
Final presentation (project defence)	15%
Final exam	30%

Full details of the project, assignments, and presentation are provided in a separate document: COMP322 Project and Assignments Specification.

Today's Agenda

01 **What is HCI?**

Definition, scope, and the field's evolution

02 **Why does design matter (anyway)?**

Good vs. poor design in everyday life

03 **HCI as a multidisciplinary field**

Where computer science meets psychology and design

04 **Key vocabulary**

Usability, UX, and Interaction Design

05 **Norman's Design Principles**

The foundational ideas from The Design of Everyday Things

What is HCI?

> *"A discipline concerned with the design, evaluation, and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them."*
>
> ACM SIGCHI Curricula for HCI, 1992

In simpler terms:

HCI studies how people interact with computers and how to design computer systems that are easy, effective, and satisfying to use.

"Computers" here means any interactive technology: phones, kiosks, cars, wearables, voice assistants, and more.

The Evolution of Interaction

1950s-60s — **Batch Processing**

No direct interaction. Submit a program on punch cards, wait hours for output.

1970s — **Command Line**

Type precise text commands. Powerful but requires memorization.

1980s — **GUI (WIMP)**

Windows, Icons, Menus, Pointer. Xerox PARC, Apple Macintosh.

2000s — **Touch & Mobile**

Direct manipulation with fingers. iPhone (2007) changed everything.

2020s — **AI & Multimodal**

Voice, gesture, AI assistants. Conversational interfaces and beyond.

Why does design matter?

Good design is invisible. Bad design is everywhere.

The cost of poor design

Therac-25 (1985-87)

A radiation therapy machine with a software interface flaw caused six patients to receive massive overdoses. Three died.

Poor interface design can be fatal.

Hawaii Missile Alert (2018)

An emergency alert "BALLISTIC MISSILE THREAT INBOUND" was sent to 1.7 million people due to a confusing dropdown menu in the alert system.

A single bad dropdown menu caused 38 minutes of mass panic.

Healthcare.gov Launch (2013)

The US health insurance website crashed on launch. Users could not register. It cost over $1.7 billion to build and fix.

Ignoring usability testing is expensive.

What does good design look like?

Google Search

One text box. The entire world's information. No manual needed.

London Underground Map

Harry Beck's 1933 design sacrificed geographic accuracy for clarity. It is still the model for transit maps worldwide.

WhatsApp's Double Checkmarks

One check = sent. Two checks = delivered. Blue = read. Complex status, communicated without words.

ATM Withdrawal Flow

Card in, PIN, amount, cash out, card returned. Each step is one clear action.

The Norman Door

A door where the design tells you to do the opposite of what you are supposed to do.

Have you ever...

- Pushed a door that needed to be pulled?
- Pulled a door that needed to be pushed?
- Stood confused in front of a door that slides?

That is not your fault. That is bad design.

Video: Search YouTube for "It's Not You. Bad Doors Are Everywhere." by Vox (2016)

HCI is Multidisciplinary

Where computer science meets psychology, design, and more

The disciplines behind HCI

Computer Science

Building interactive systems, prototyping, and technical feasibility

Cognitive Psychology

How people perceive, remember, think, and learn

Design

Visual communication, layout, aesthetics, and interaction patterns

Sociology & Anthropology

How groups of people behave, cultural contexts, social norms

Ergonomics / Human Factors

Physical capabilities and limitations of the human body

Linguistics

Language, communication, dialog design, and NLP

Business & Marketing

User needs, market fit, and product strategy

Ethics & Philosophy

Privacy, accessibility, fairness, and responsibility

HCI is not about being an expert in all of these. It is about knowing enough to collaborate across them.

Vocabulary

The terms you will use in this course

Usability

قابلية الاستخدام

ISO 9241-11 defines usability as:

> *The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use.*

Effectiveness

Can users accomplish their goals?

Efficiency

Can they do it with minimal effort and time?

Learnability

How easy is it for new users to get started?

Memorability

Can users return after time away and still use it?

Error tolerance

How well does the system handle and recover from mistakes?

Satisfaction

Is the experience pleasant?

User Experience (UX)

تجربة المستخدم

UX goes beyond usability. It encompasses every aspect of a person's interaction with a company, its services, and its products.

Usability vs UX:

Usability

Can the user complete the task?
How quickly? How many errors?
Is it learnable?

Measurable, task-focused

User Experience

How does the user feel about it?
Was it enjoyable? Trustworthy?
Would they recommend it?

Holistic, emotion-focused

Interaction Design (IxD)

التصميم التفاعلي

Designing interactive products to support the way people communicate and interact in their everyday and working lives.

The four basic activities of interaction design:

1. **Discovering requirements**
   What do users need? What are their goals, contexts, constraints?
2. **Designing alternatives**
   Generating multiple design ideas and concepts, not just one.
3. **Prototyping**
   Building interactive versions for testing: paper sketches to clickable mockups.
4. **Evaluating**
   Testing designs with real users and iterating based on findings.

Norman's Design Principles

From The Design of Everyday Things (2013)

Affordances and Signifiers

Affordance

(What can be done) ما يمكن فعله

The relationship between a physical object (or digital element) and a person that determines how the object can be used.

A chair affords sitting.

A button affords pressing.

A scrollbar affords scrolling.

Signifier

(What signals the action) ما يُشير إلى الفعل

A perceivable signal that communicates what actions are possible. Signifiers make affordances discoverable.

A 'Push' sign on a door.

An underlined blue text = link.

A shadow on a button = clickable.

Distinction: Affordances exist whether or not the user perceives them. Signifiers are what make affordances visible.

Visibility & Feedback

Visibility

The more visible functions are, the more likely users will know what to do next.

Good: A phone's home screen shows all apps.

Bad: Hidden gestures with no visual cue (swipe from edge?).

Feedback

Sending back information about what action has been done and what has been accomplished.

Good: A button changes colour when clicked.

Bad: You press 'Submit' and nothing happens.

The Gulf of Execution: The gap between a user's intention and the actions available.

The Gulf of Evaluation: The gap between the system's state and the user's understanding of it.

Mapping & Constraints

Mapping

The relationship between controls and their effects. Natural mapping uses spatial correspondence to make the connection obvious.

Good: Steering wheel turns right, car goes right.

Good: Scroll down, content moves up.

Bad: Four identical switches in a row for four lights in a square.

Constraints

Limiting the range of possible actions to prevent errors. Constraints guide users toward correct use.

Physical: A USB-A plug only fits one way.

Logical: Graying out unavailable menu items.

Cultural: Red means stop/danger/error.

Good design makes the right thing easy and the wrong thing hard (or impossible).

Conceptual Models

النموذج المفاهيمي

A conceptual model is the user's understanding of how something works. It does not need to be accurate, but it needs to be useful.

Example: Files & Folders

Your computer does not actually have 'files' sitting inside 'folders.' These are metaphors from the physical office world. Data is stored as bits across a hard drive in no particular spatial arrangement.

But the files-and-folders conceptual model is so effective that billions of people use computers without ever needing to understand how storage actually works.

Good interfaces create clear conceptual models. Bad interfaces leave users guessing.

Norman's Principles: Summary

Affordances	What actions are possible?
Signifiers	How do users discover those actions?
Visibility	Can users see what they need?
Feedback	Does the system respond to actions?
Mapping	Do controls match their effects?
Constraints	What prevents errors?
Conceptual Models	Can users form a clear mental picture?

When you evaluate any interface, ask these seven questions.

Quick activity

The Elevator Challenge

Imagine you are designing an elevator panel for a 30-story building.

In the Teams chat, answer:

1. How would you arrange the floor buttons? Why?
2. What feedback should the elevator give when a button is pressed?
3. How would you handle the needs of a visually impaired user?

Think about: affordances, signifiers, mapping, feedback, and constraints.

What we covered today

HCI is the study of how people interact with technology and how to design better interactions.

The field is multidisciplinary: CS, psychology, design, sociology, and more.

Poor design has real consequences, from frustration to fatalities.

Usability is measurable (effectiveness, efficiency, satisfaction). UX is holistic.

Interaction Design is the iterative practice: discover, design, prototype, evaluate.

Norman's principles (affordances, signifiers, visibility, feedback, mapping, constraints, conceptual models) are your design checklist.

Next session

User-centred design and usability engineering

- What is user-centred design (UCD) and how does it differ from technology-centred design?
- The UCD process: understanding users, iterative design, evaluation
- Introduction to usability engineering and usability goals
- Nielsen's 10 Usability Heuristics

Suggested reading:

Rogers, Sharp, Preece. Interaction Design, Chapter 1.

Norman, D. The Design of Everyday Things, Chapters 1-2.

Nielsen's 10 Heuristics: nngroup.com/articles/ten-usability-heuristics/

References

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