

«Human-Computer Interaction»
Introducing Human-Computer Interaction

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Freie Universität Berlin

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Overview on this Lecture

Introducing Human-Computer Interaction (why, definition, waves, user experience, dark pattern, usability, quality criteria, design activities)

Course Overview (general topic overview, syllabus)

Course Concept (course organization)

Introducing Human-Computer Interaction

Why is an understanding of HCI a critical skill?

In the past, computers were expensive and used by technical people only.

Now, computers are cheap and used by non-technically affine persons (different backgrounds, needs, knowledge, and skills).

Computer and software manufacturers have noticed the importance of making computers “user-friendly”; in other words, they should be easy to use, save people time, support decision-making, be enjoyable, etc.

More recently, by means of machine learning, computer systems became more “intelligent” - new requirements for human-machine interfaces.

Furthermore, computers are now applied in every part of our society; thus, specific challenges such as understandability, transparency, and interpretability have become more important.



"Science Finds, Industry Applies, Man Conforms"



Human

Anyone impacted by the
existence of the program



Interaction

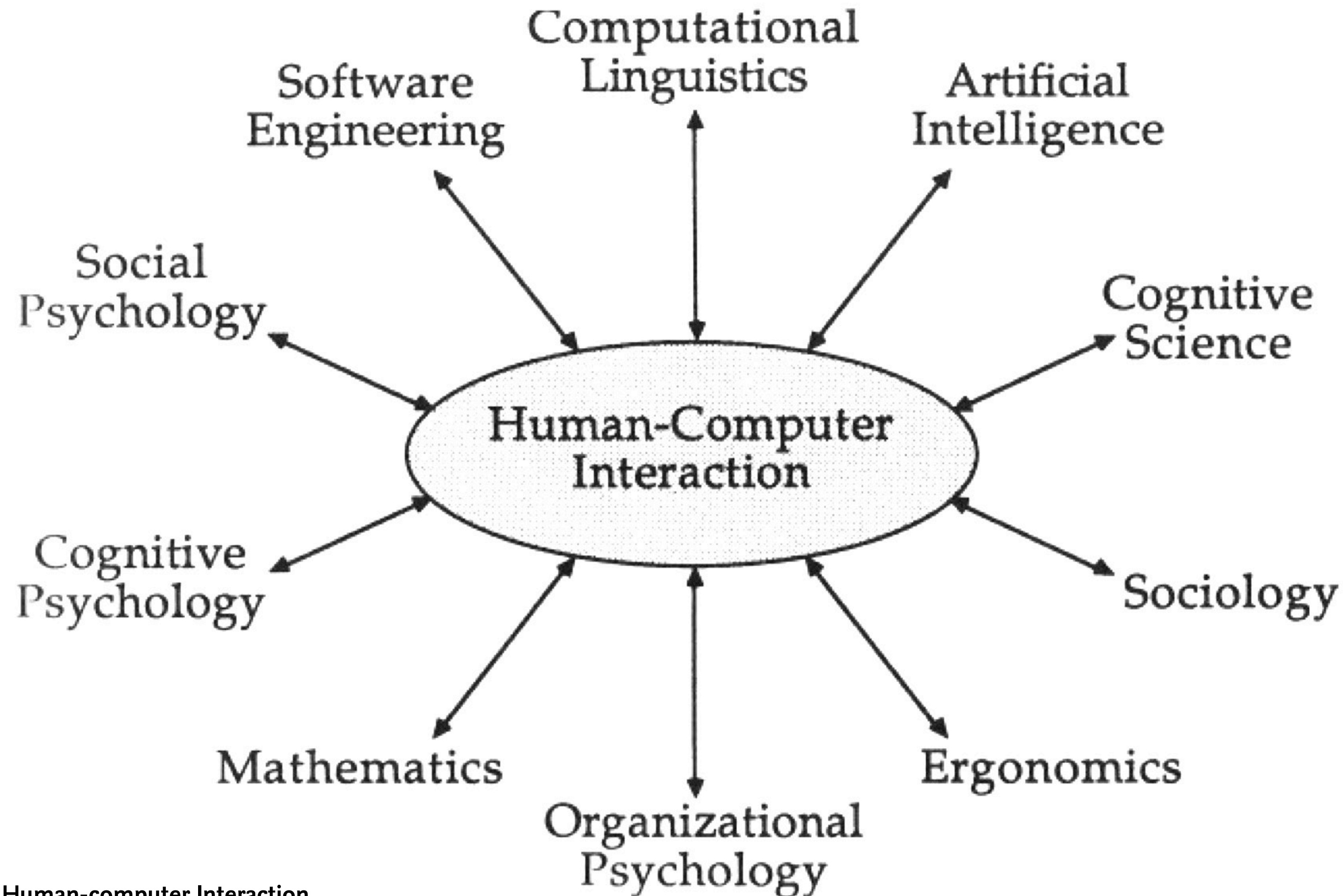
How the artificial stuff
is actually used



Computer/ User Interface

Artificial thing human is
interacting with

HCI is multi-disciplinary



Paul A. Booth (1989), An Introduction to Human-computer Interaction.

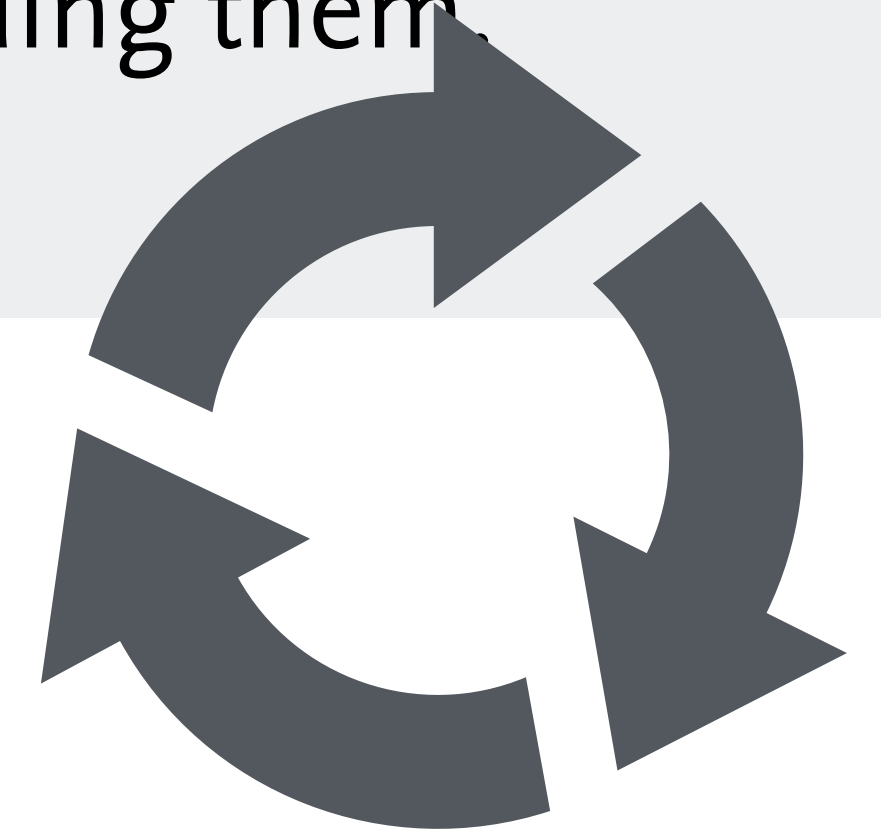




Human-computer interaction is a discipline concerned with the
design, evaluation and implementation
of interactive computing systems
for human use and with the study of major phenomena surrounding them.

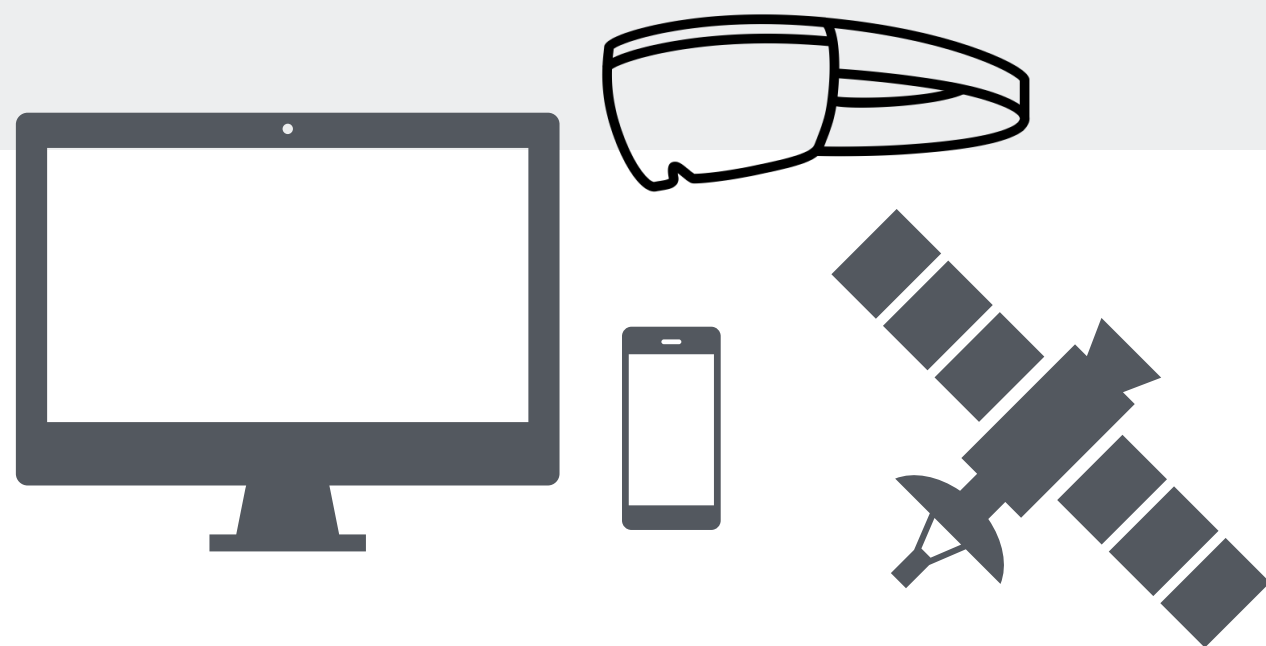


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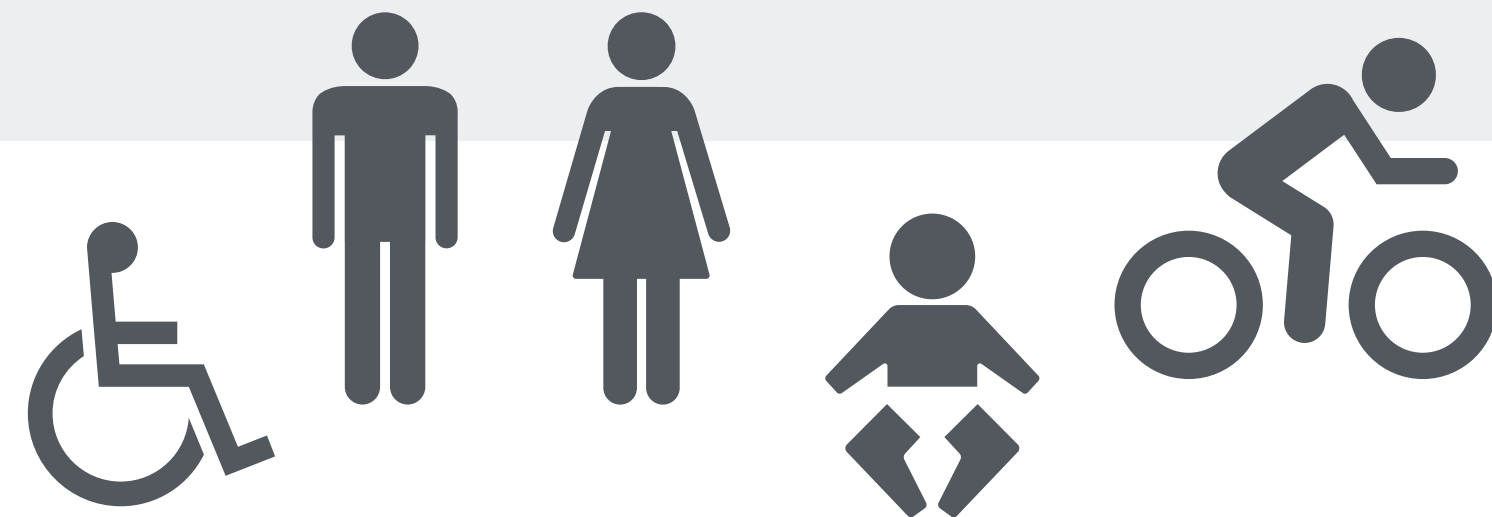
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Thomas T. Hewett et al. 1992. ACM SIGCHI Curricula for Human-Computer Interaction. Technical Report. ACM, New York, NY, USA.



Human-computer interaction is 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.



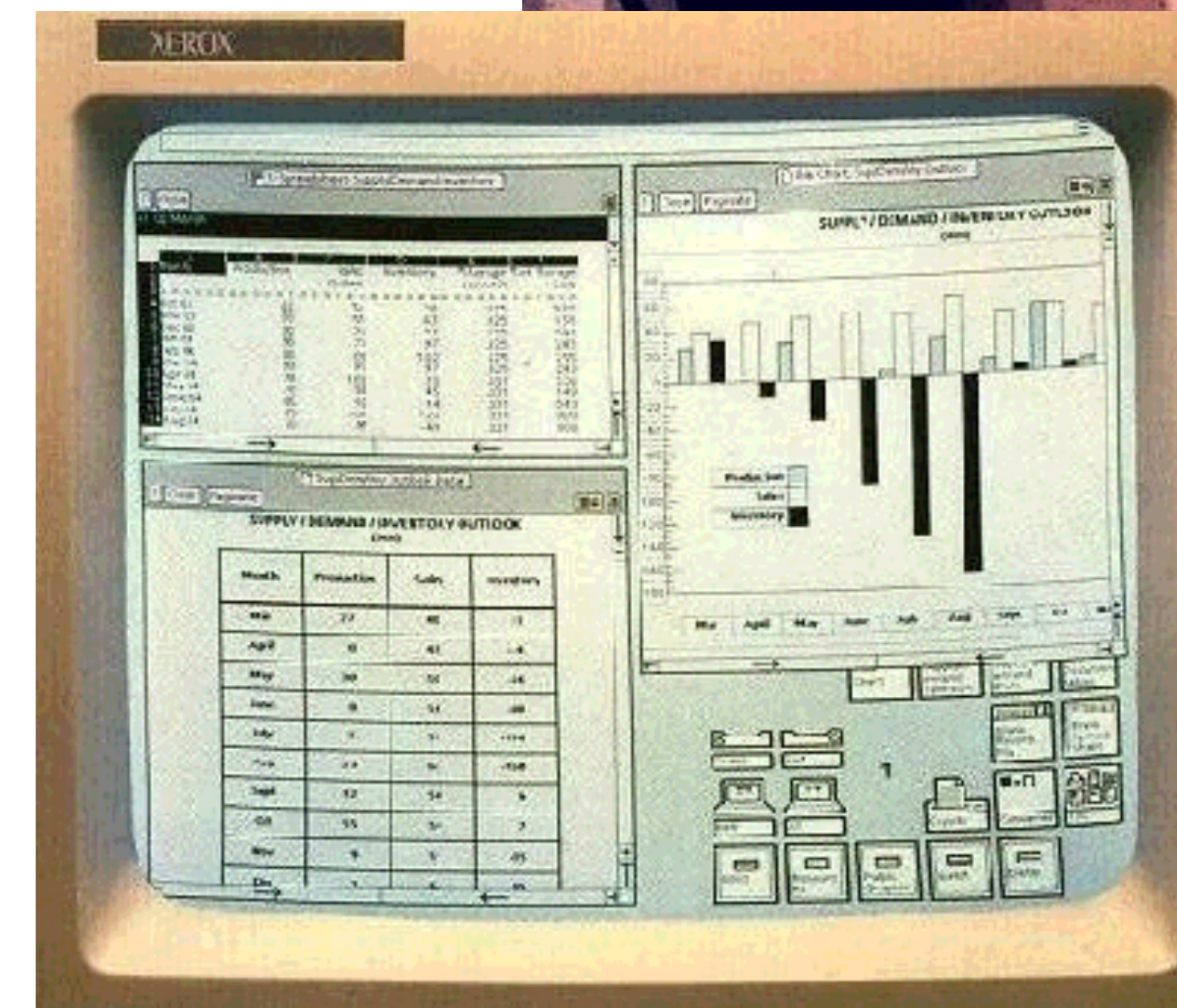


Human-computer interaction is a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the **study of major phenomena surrounding them.**



Wave 1: Desktops & mental models (1980s — 1990s)

- » 1984: The first commercially available cell phone, the DynaTAC 8000X, is created by Motorola.
- » 1985: "The term 'Internet of Things' was first conceptualized, coined, and published by Peter T. Lewis
- » Personal computers hit the mass market
- » User interface toolkits were invented (Smalltalk 80 is the first)



<https://blog.prototypr.io/the-rise-of-human-computer-interaction-hci-823dd6286e1d>

Wave 2: Collaboration & Communication (1990s — early 2000s)

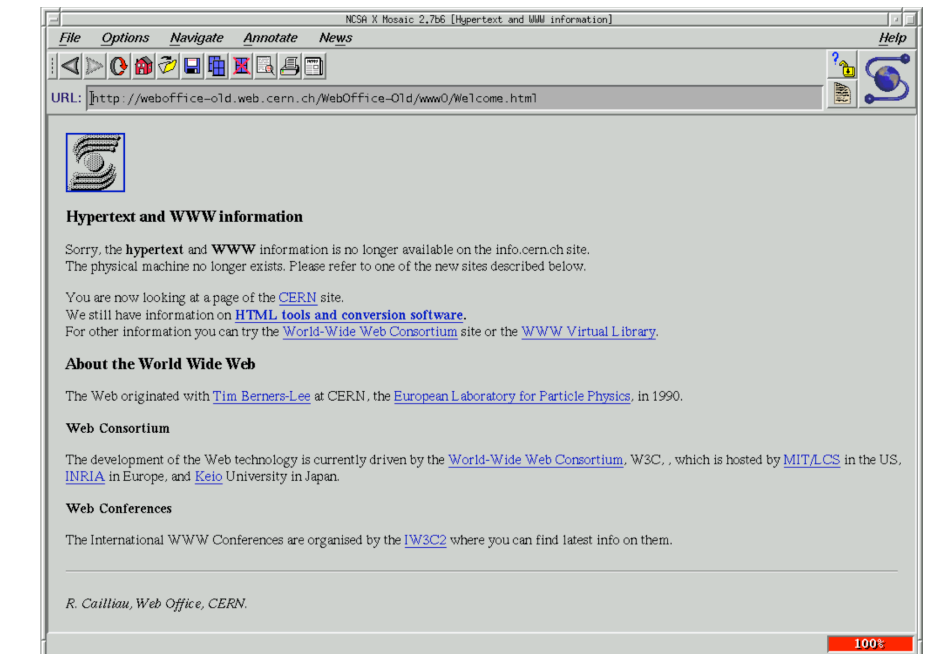
1990: The World Wide Web is first introduced to the public by Sir Tim Berners-Lee

1993: Mosaic, the first popular web browser, is introduced

1996: Palm pilot is introduced

1998: The first portable MP3 player is released by SaeHan Information Systems. 21st century

1998: Ishii pioneers tangible computing



<https://blog.prototypr.io/the-rise-of-human-computer-interaction-hci-823dd6286e1d>

Wave 3: Self-expression, social change (mid 2000s — 2010s)

2007: Apple Inc. launches the iPhone - the first touchscreen smartphone.

2009: Mobile apps hit the mass market

2011: Deborah Estrin pioneers the use of mobile technology for health

Since then: Diversification of

- » focus and impact (study of computers in many contexts, diversification of apps)
- » input and output (2015 first SmartWatch released, interaction options proliferate, new mobile interaction techniques, sensors accessibility of mobile devices)



<https://blog.prototypr.io/the-rise-of-human-computer-interaction-hci-823dd6286e1d>

User Experience

Describes how a product behaves and is used by people in the real world.

The way people feel about it and their pleasure and satisfaction when using it, looking at it, holding it, and opening or closing it.

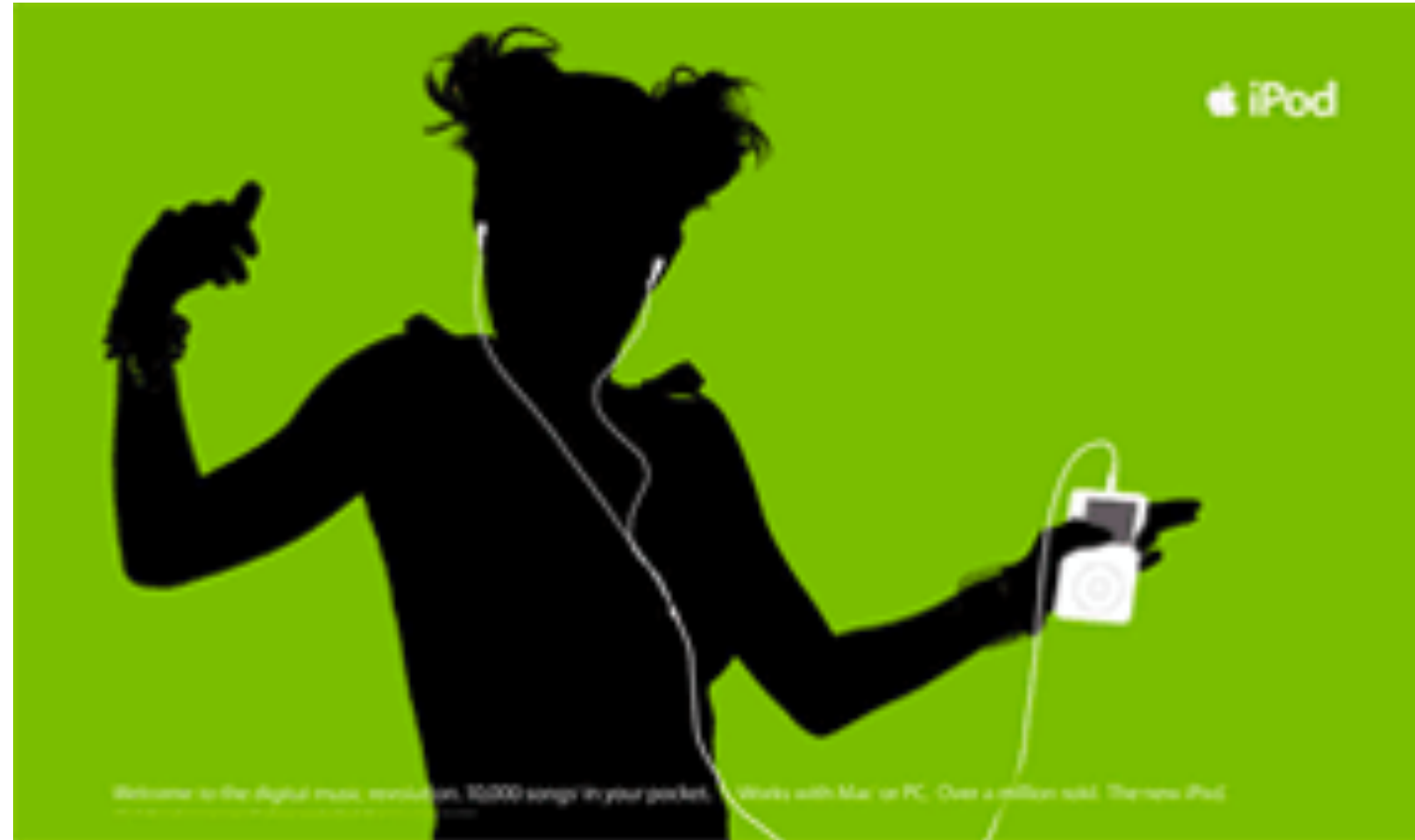
Cannot design a user experience, only design for a user experience.



Every product that is used by someone has a user experience: newspapers, ketchup bottles, reclining armchairs, cardigan sweaters.

Jesse J. Garrett: *The Elements of User Experience: User-Centered Design for the Web and Beyond*, New Riders, 2010.

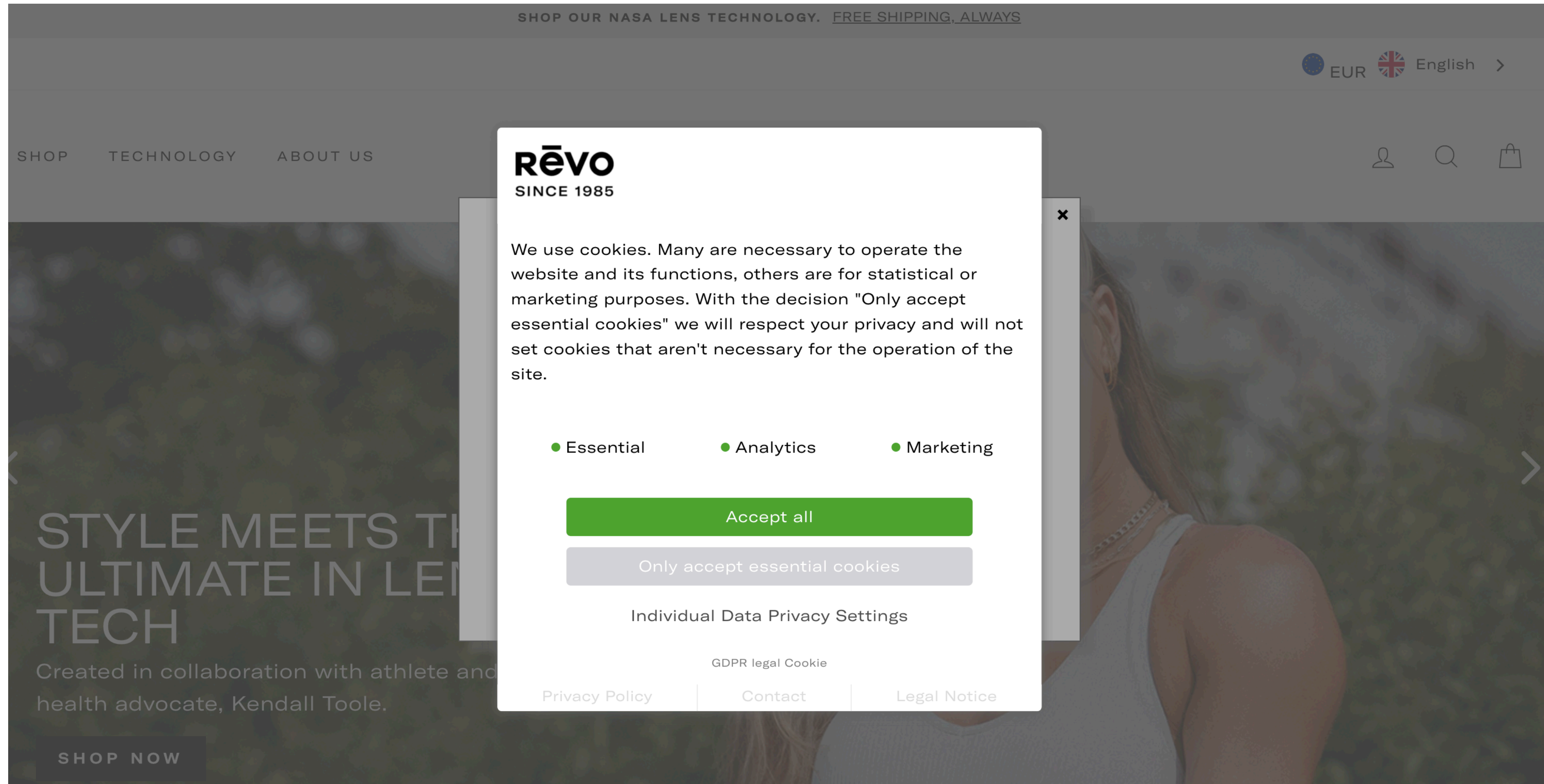
Example: iPod



Example Datafied UX - Nest Thermostat

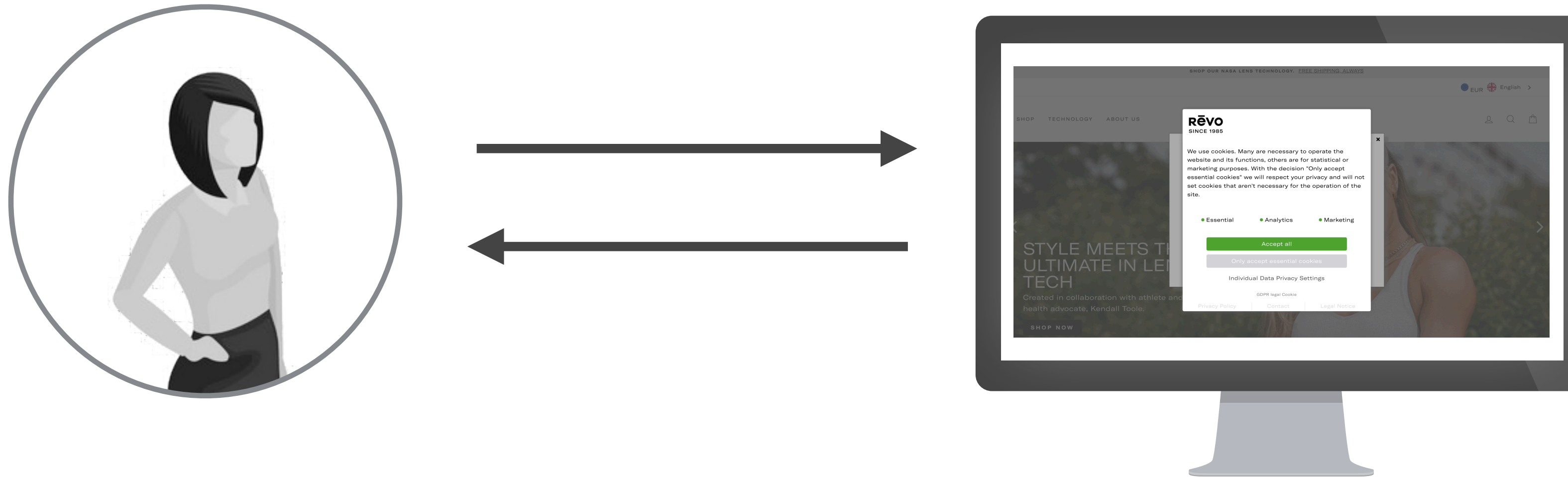


Arbitrary Example for Dark (Pattern of) UX



Gray, Colin M., Yubo Kou, Bryan Battles, Joseph Hoggatt, und Austin L. Toombs. 2018. „The Dark (Patterns) Side of UX Design“. S. 1–14 in *CHI '18*. ACM Special Interest Group on Computer-Human Interaction.

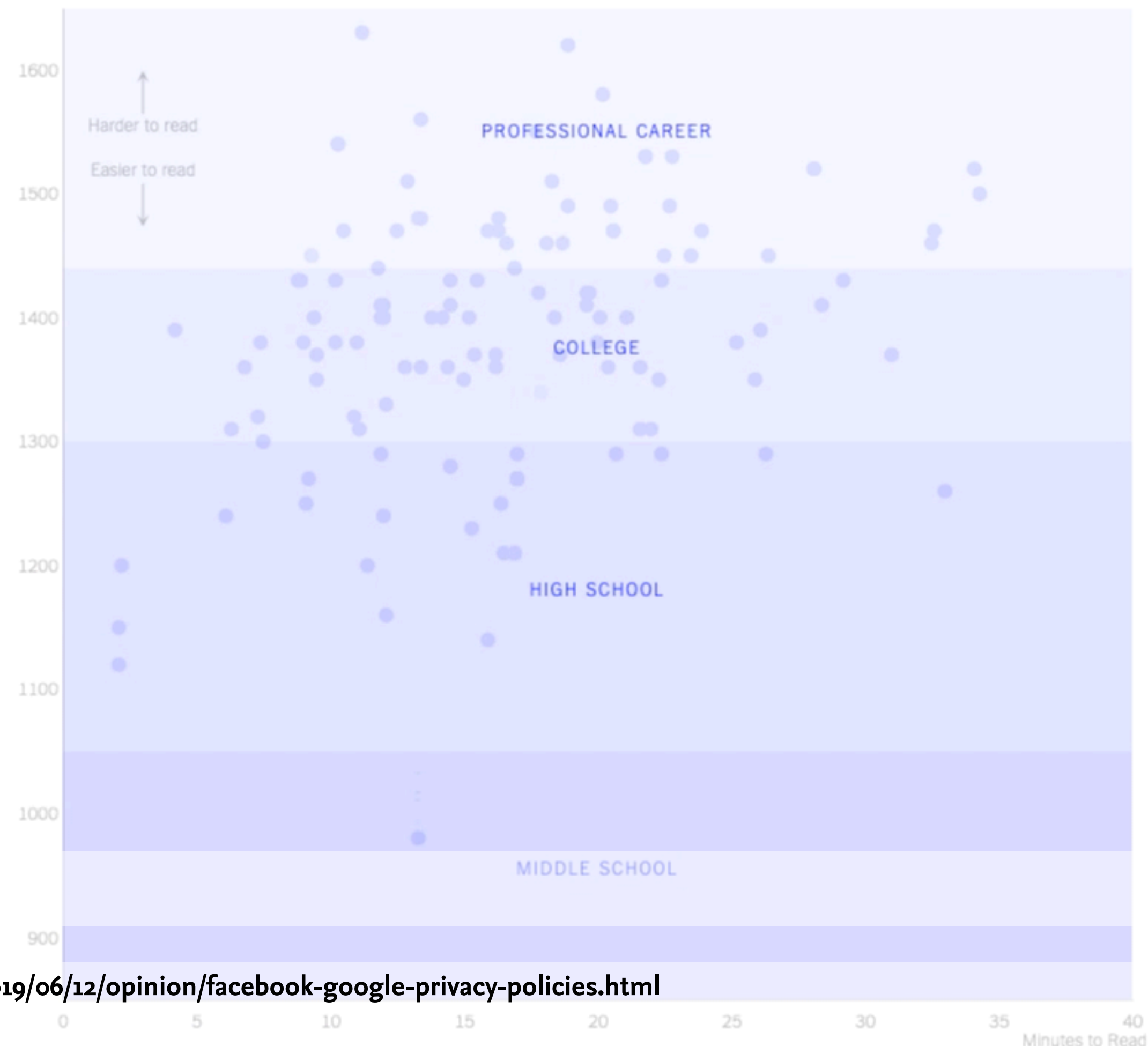
Simple Example: Cookie Banner



» Cookie banners are too complicated to use, and privacy policies are often too long and incomprehensible for the average reader.

» Privacy decisions are often made quickly and intuitively by individuals with relatively little cognitive effort.

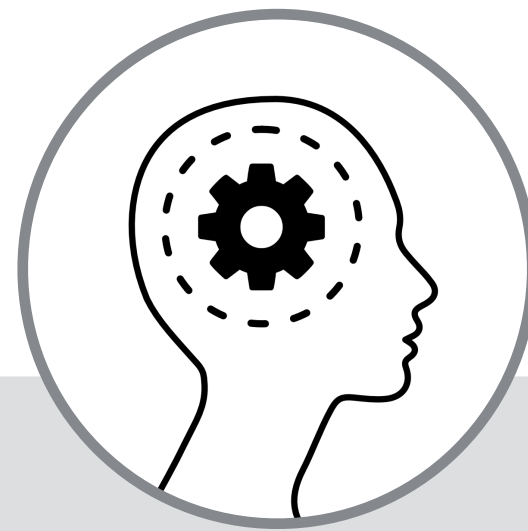
High Effort and Low Understandability



Source: <https://www.nytimes.com/interactive/2019/06/12/opinion/facebook-google-privacy-policies.html>



Two Kinds of Human Cognition



Automatic Thinking

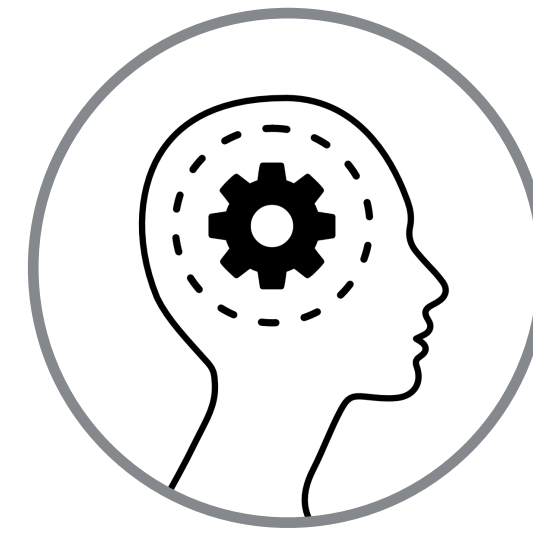
- » Intuitive understanding
- » Decisions are made instinctively, emotionally and unconsciously
- » Finds application in repeated and practiced actions



Reflective Thinking

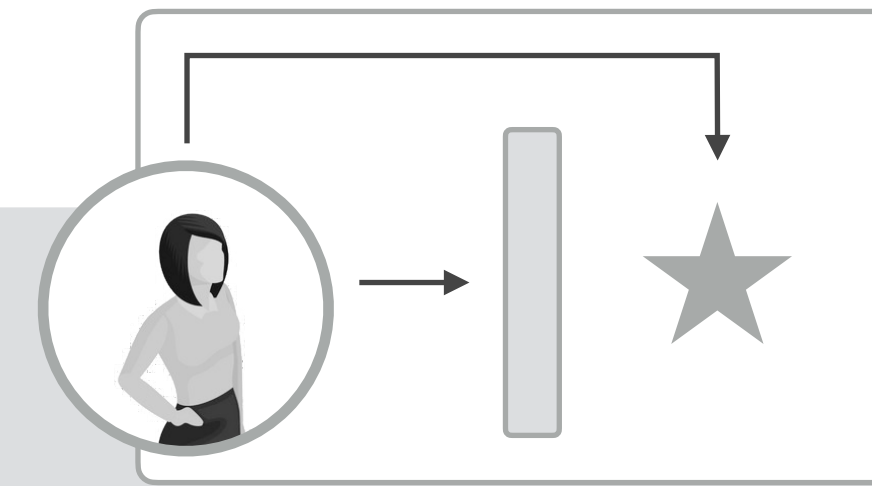
- » Logical Reasoning
- » Decisions are based on a rational process that is consciously carried out
- » Finds application in deliberate, slow and strenuous actions

Examples for Dark Patterns



Interface Inference

» User interface manipulation that favors certain actions over others

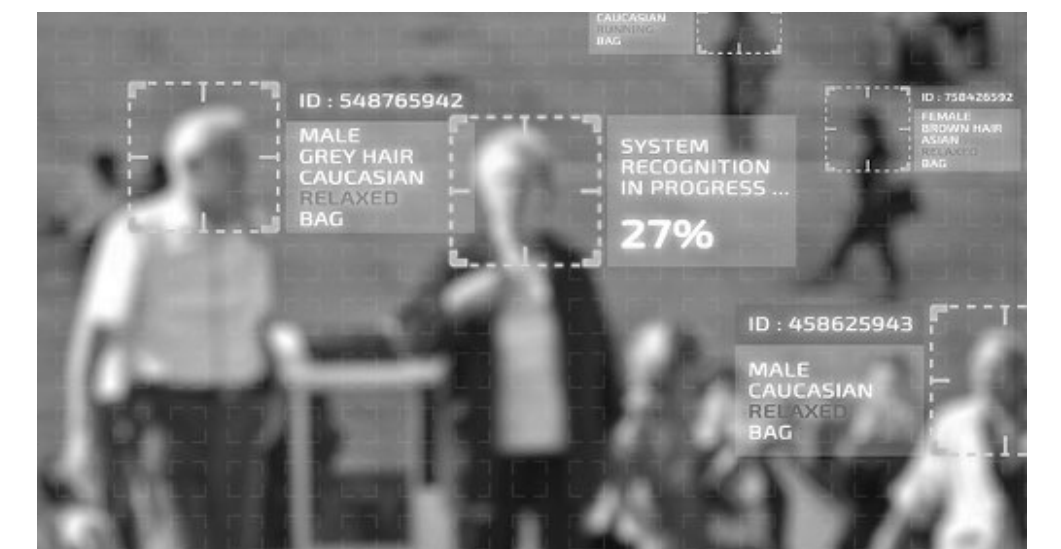
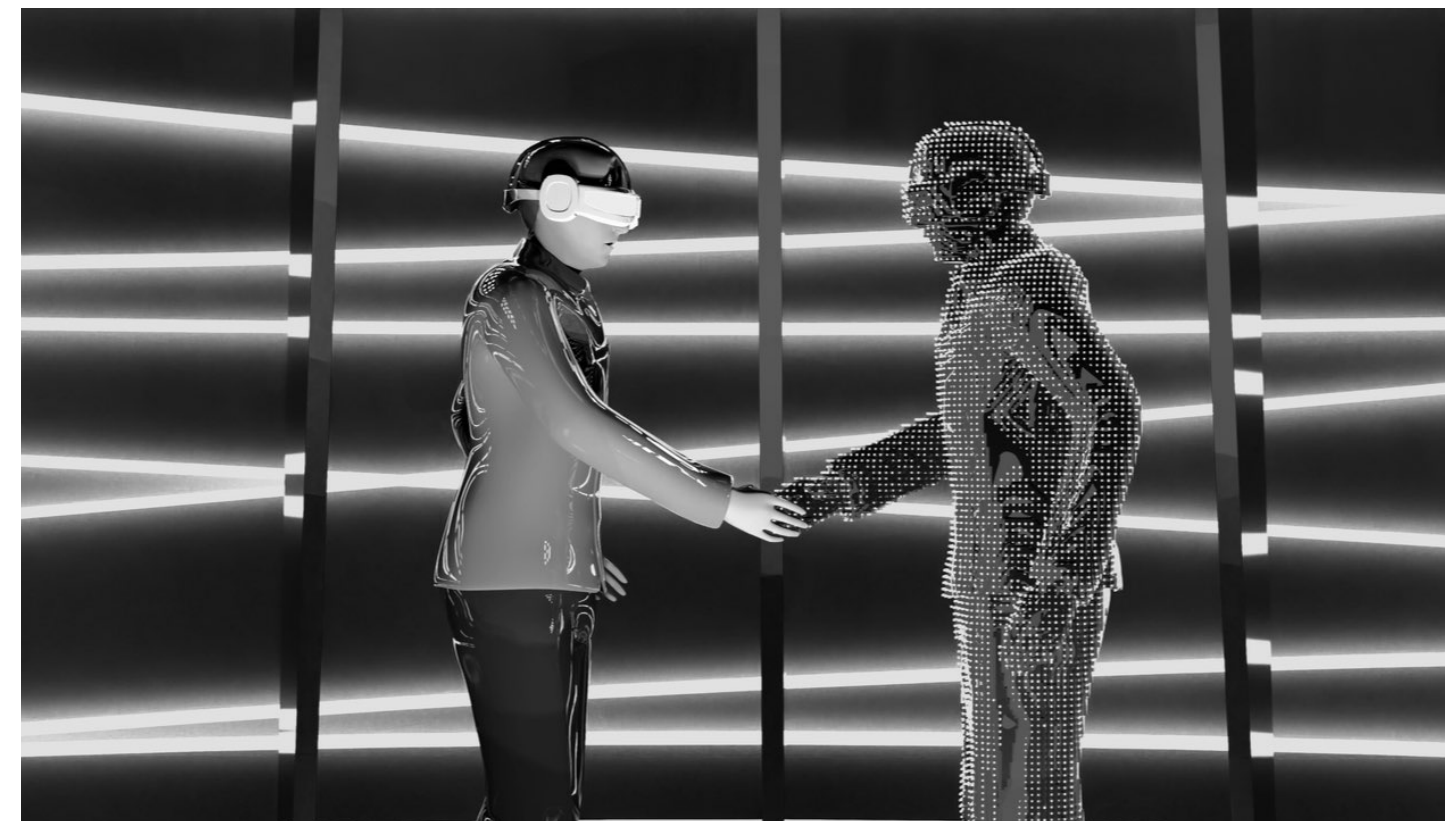
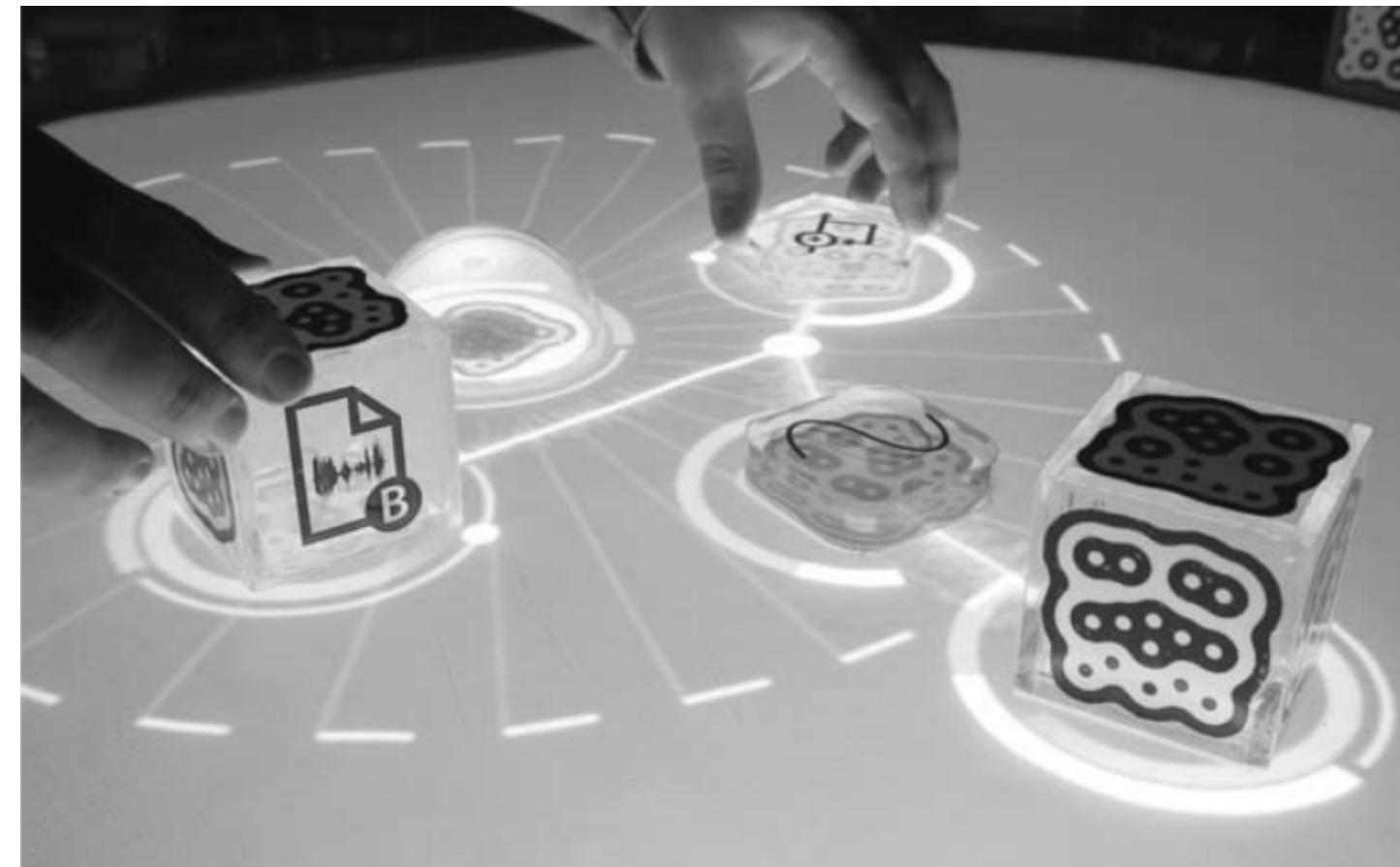


Obstruction

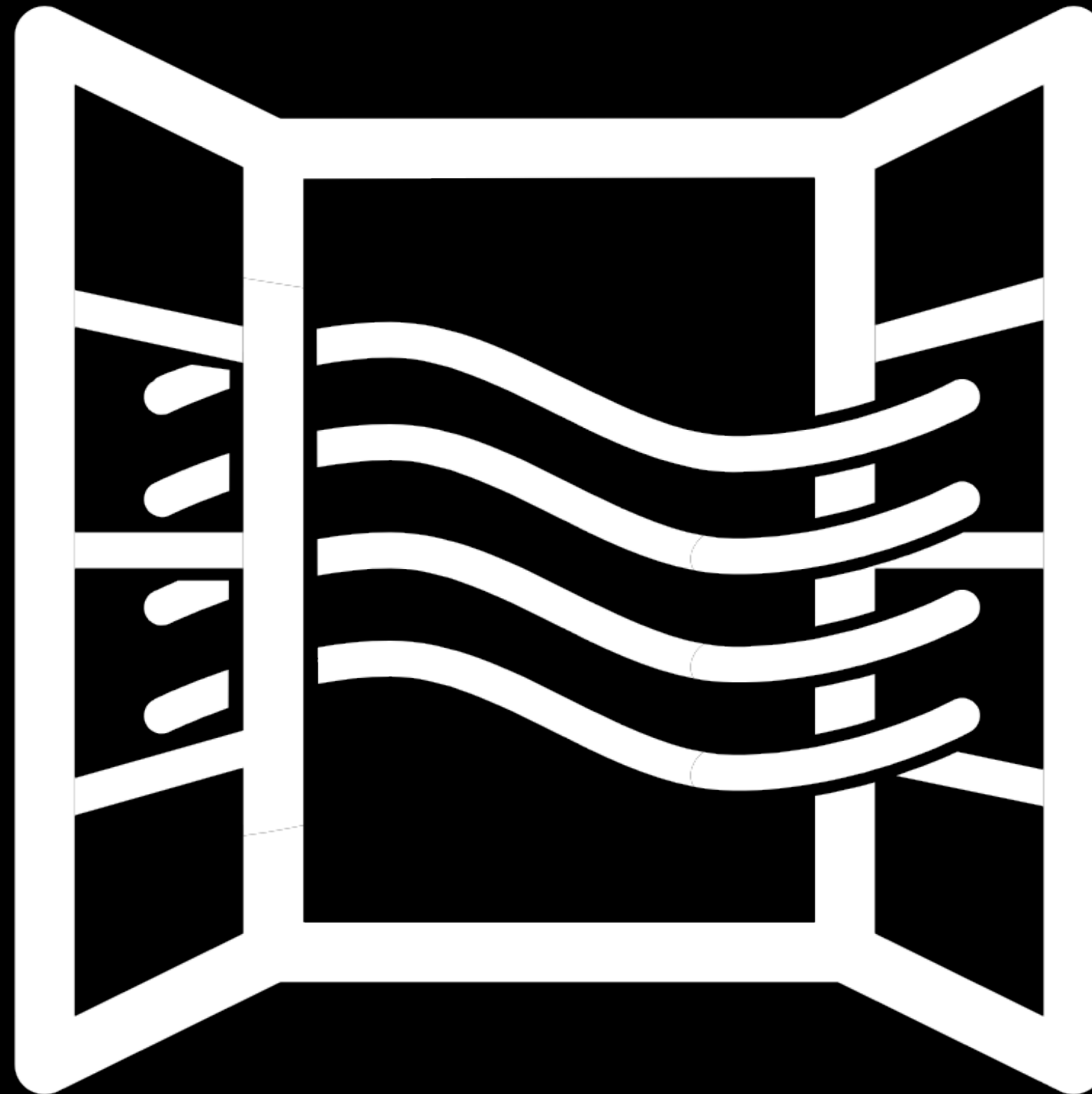
» Making a process more difficult than it needs to be

Changing World

- 📌 The end of interface stability.
- 📌 The growth of techno-dependency.
- 📌 The growth in hyperconnectivity.
- 📌 The end of the ephemeral.
- 📌 The growth of creative engagement.



Sellen, Abigail, Yvonne Rogers, Richard Harper, und Tom Rodden. „Reflecting human values in the digital age“. *Communications of the ACM*, 52, Nr. 3 (1. März 2009): 58–66.



**5 min break,
please, open the windows.**

Bewegung hilft beim Lernen!

Es kommt der Studi-Pausenexpress ...



When is a software useful?

The main question is: Does the software do what users need?

Software should consider *at least* the following aspects:

1. **Utility** = whether the software provides the features users need.
2. **Usability** = how easy and pleasant these features can be used.
3. **Usefulness** = usability + utility.

(Nielson, 2012)



Usability (ISO 9241-210)

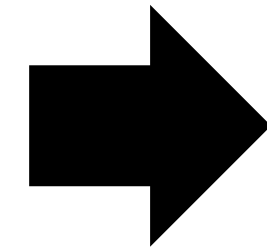


The usability of software is the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.

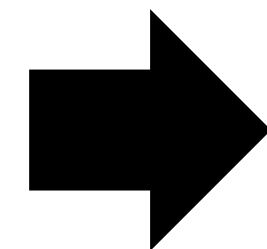
DIS, I. (2010). 9241-210: 2010. Ergonomics of human system interaction-Part 210: Human-centred design for interactive systems (formerly known as 13407). International Standardization Organization (ISO). Switzerland.

Usability of software is ...

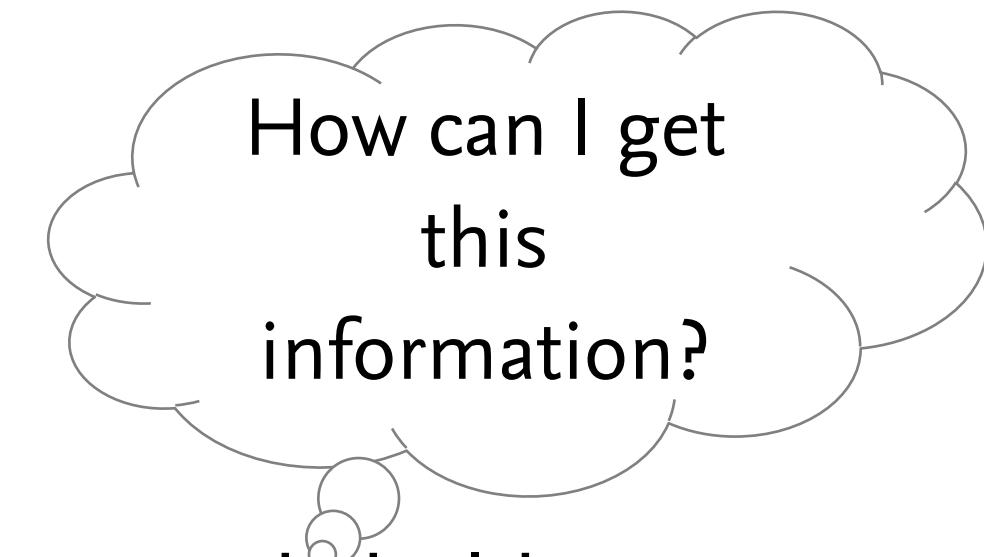
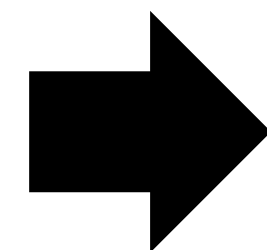
the extent to which it can be used by
a particular user ...



in order to archive specific goals in a
certain context ...



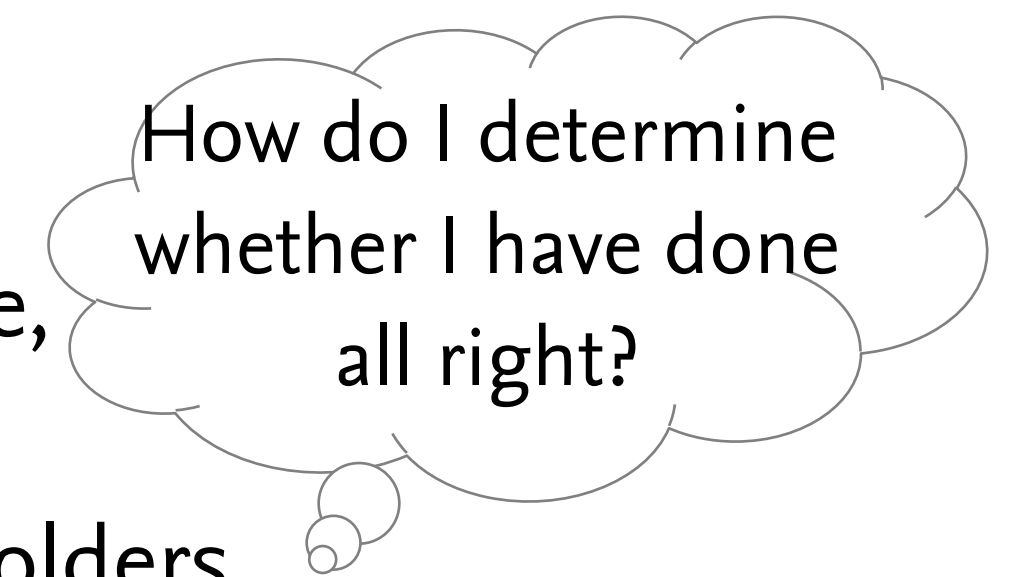
effectively, efficiently and satisfactory.



I need to know who are my stakeholders.



I need to know the objectives of my stakeholders and the context of their work.



I need to know prior knowledge, the mental model, and the cognitive abilities of my stakeholders.

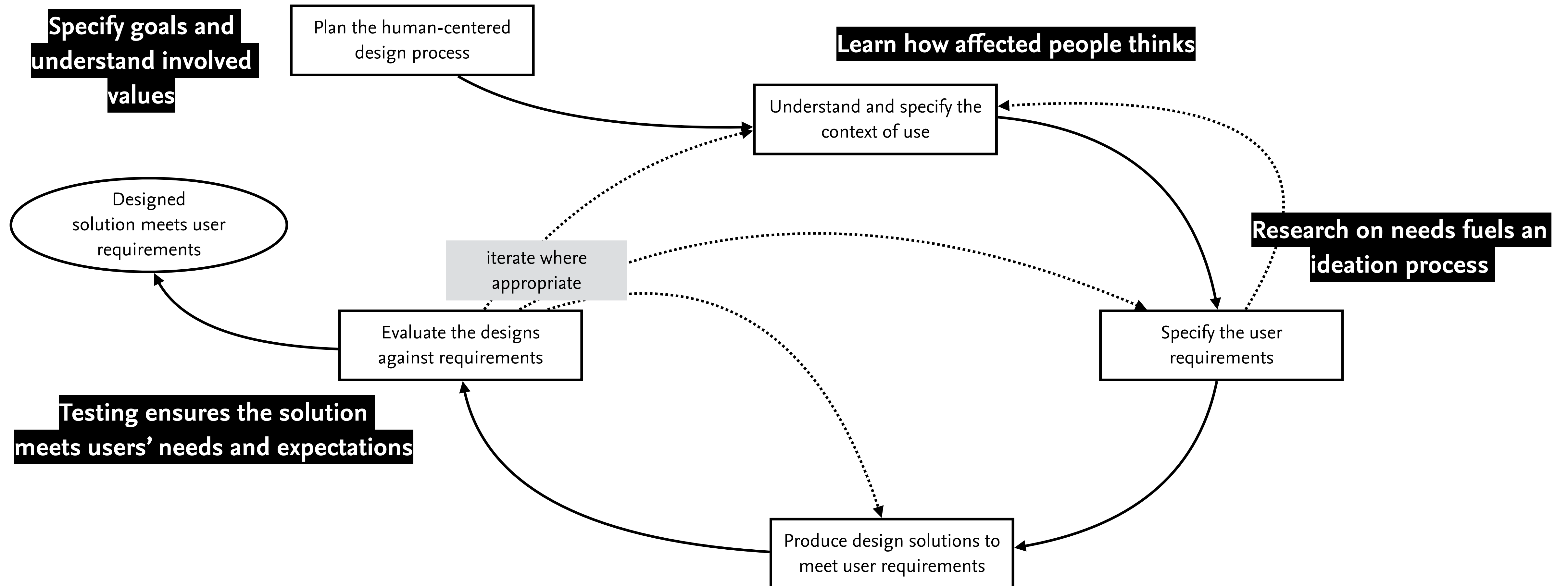
Quality Criteria of Usability

- » **Effectiveness:** Can users complete tasks, achieve goals with the product, i.e. do what they want to do?
- » **Efficiency:** How much effort do users require to do this? (Often measured in time)
- » **Satisfaction:** What do users think about the products ease of use?

Additional Quality Criteria

- » **Learnability:** How easy is it for users to accomplish basic tasks the first time they encounter the design?
- » **Memorability:** When users return to the design after a period of not using it, how easily can they reestablish proficiency?
- » **Errors:** How many errors do users make, how severe are these errors, and how easily can they recover from the errors?
- » ...

Interdependent Design Activities



DIS, I. (2010). 9241-210: 2010. Ergonomics of human system interaction-Part 210: Human-centred design for interactive systems (formerly known as 13407). International Standardization Organization (ISO). Switzerland.

Course Overview

Topics of this Course

1

User Research – *Understanding the user*

- » Determining target groups, objectives, tasks, mental models etc.
- » Methods of data collection and –analysis

2

Prototyping – *Specifying and developing the design*

- » Interaction design and information architecture
- » Information design
- » Interface and navigation design

3

Usability Studies – *Evaluating and improving the prototypes*

- » Types of usability tests and expert evaluation
- » Preparing and executing tests
- » Analyzing and evaluating tests

1	18.04.2023	—	
2	25.04.2022	Course Introduction and the Human-Centered Design Process	
3	02.05.2022	The Process of Human-Centered Design	
4	09.05.2022	Collecting and Analyzing Data	1
5	16.05.2022	Defining Requirements and Design Rationales	
6	23.05.2022	Using Requirements for Specifying a Conceptual Design	
7	30.05.2022	Model of Interaction and Principles of Good Design	2

8	06.06.2022	Inspecting Designs: Heuristic Evaluation and Cognitive Walkthrough	3
9	13.06.2022	Usability Studies and existing Measurement Instruments	
10	20.06.2022	Evaluating Designs: Usability Studies	
11	27.06.2022	Human Senses	1
12	04.07.2022	Human Cognition	
13	11.07.2022	Designing for Privacy	
14	18.07.2022	Exam	

Learning Objectives

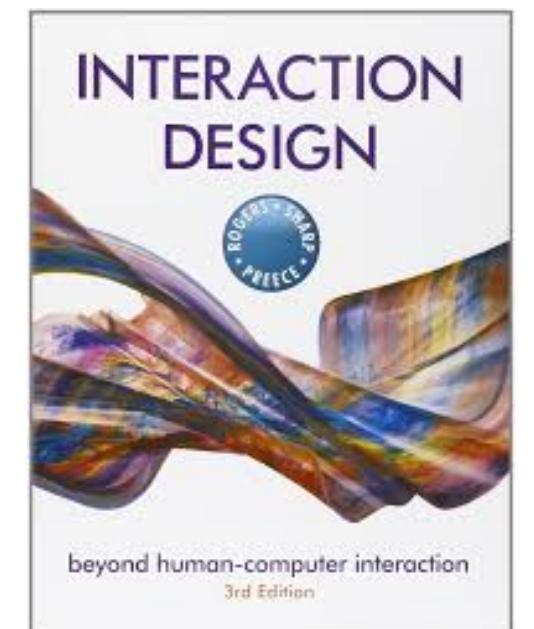
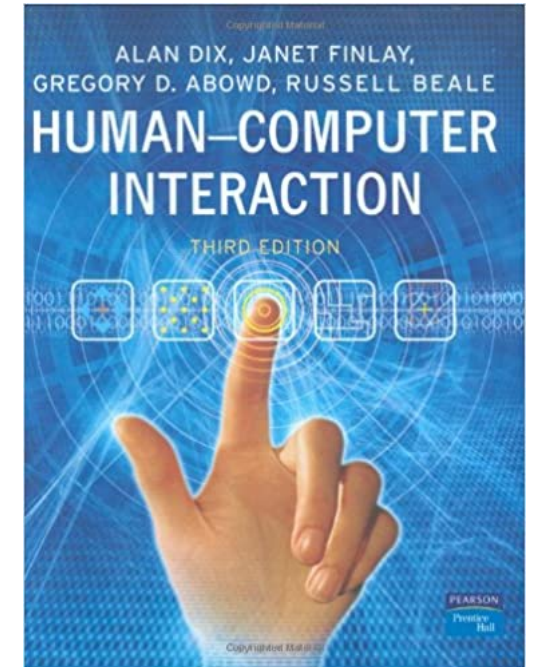
- » Apply human-centered design methods in your development practice.
- » Study humans and collect data on their activities.
- » Summarize data into conceptual models that help you to derive requirements.
- » Conceptualize, design, and prototype graphical user interfaces based on requirements.
- » Evaluate your (low and high-fidelity) prototypes in studies.

Readings

I provide a reference list and an additional reading list in each lecture. Current research results from the ACM Conference on Human Factors in Computing Systems (CHI) are also considered.

I can recommend the following main text books are:

- » Dix, A., Finlay J., Abowd G.D., and Beale R. (2004) Human-Computer Interaction. Pearson Prentice Hall.
- » Rogers, Y., Sharp, H. and Preece, J. (2007) Interaction design: beyond human-computer interaction. Pearson Prentice Hall.
- » Shneiderman, B., Plaisant, C., Cohen, M., Jacobs, S., Elmqvist, N. and Diakopoulos, N. (2016) Designing the user interface: strategies for effective human-computer interaction. Pearson Prentice Hall.



Course Concept

Scope

This course is part of the bachelor program.

We expect students to be in the 5th semester of the bachelor program (not earlier). Students should be familiar with (web) programming.

The class material is provided in English, however, we talk and communicate in German.

We will adapt this course continuously to your needs, thus, your feedback is appreciated!

HCI Course Organization

The course is organized in a lecture and an exercise.

The lecture takes place every Tuesday 10 AM - 12 AM in room 053/T9.

The exercise is every Tuesday 2 - 4 PM in room SR 009/A6.

After introducing the different topics during the lecture, you can practically apply them within a real-world project during the exercise. The topic this year is from the area of health informatics - the electronic health record.

Grading

Your final grade is based on the result of your written exam only. The **exam is on Tuesday, July 18th**, from 10 AM to 12 PM. Please register on Whiteboard!

To **actively participate** in this course, you need to fulfill the following requirements

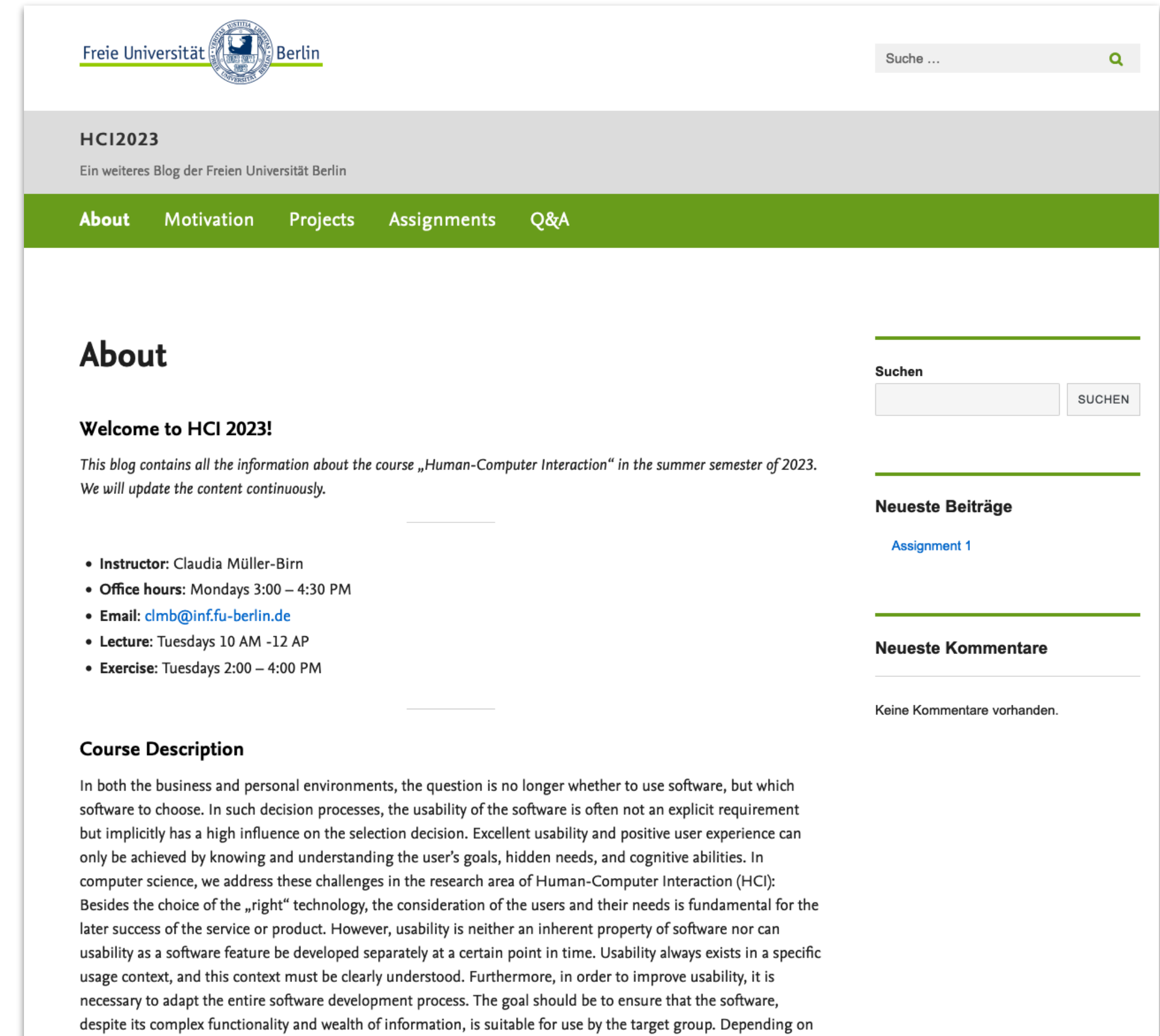
- » submit all assignments, and
- » In all these assignments, you need 60 % of all points.

You can acquire a maximum of 2 points per assignment.

- » 2 points: the quality of the submission is above average.
- » 1 point: the quality of the submission is on average.
- » 0 points: no (meaningful) submission.





Course Coordination & Communication

Our main platform for providing the content for our communication is Whiteboard and the FU Blog and coordination.



The screenshot shows the 'HCI2023' course page on the Freie Universität Berlin website. The page features a green navigation bar with links for 'About', 'Motivation', 'Projects', 'Assignments', and 'Q&A'. The main content area is titled 'About' and includes a welcome message: 'Welcome to HCI 2023!' followed by a paragraph stating that the blog contains information about the course 'Human-Computer Interaction' in the summer semester of 2023 and will be updated continuously. Below this, there is a list of course details: Instructor: Claudia Müller-Birn; Office hours: Mondays 3:00 – 4:30 PM; Email: clmb@inf.fu-berlin.de; Lecture: Tuesdays 10 AM -12 AP; Exercise: Tuesdays 2:00 – 4:00 PM. A 'Course Description' section follows, discussing the importance of usability in software development. On the right side, there is a search bar and two sections: 'Neueste Beiträge' (Latest Contributions) with a link to 'Assignment 1', and 'Neueste Kommentare' (Latest Comments) which currently shows 'Keine Kommentare vorhanden.' (No comments available).

Check Your Insights

-  What major components does the discipline of human-computer interaction (HCI) deal with?
-  How do you define usability?
-  What are the three main characteristics of usable software?
-  How do we invent a preferable future? Who needs to help design the future for us to achieve this?



«Human-Computer Interaction»

The Process of Human-Centered Design

Prof. Dr. C. Müller-Birn

Human-Centered Computing, Institute of Computer Science

Freie Universität Berlin

May 2, 2023