Usability Engineering & User Experience

Imke de Jong, 9 mei 2018

Chapter 2
UNDERSTANDING AND CONCEPTUALIZING INTERACTION

Chapter 3
COGNITIVE ASPECTS
Previously

Usability en user experience goals

Preece et al., 2002 – Figure 1.7
Today

From Idea / Problem to Product
- Understanding the problem space
- Conceptualizing the design

Cognition and interface design
- Cognitive processes
- Cognitive frameworks
Chapter 2

UNDERSTANDING AND CONCEPTUALIZING INTERACTION

From Idea / Problem to Product
Understanding the Problem space

Questions to ask:
• What problems do people have?
• What do you want to create? What are our UX and usability goals?
• Will it achieve what you hope it will? If so, how/why?
• What problems could your development cause?

Discussing this works best as a team!
Problem space?
Russische man overleden bij ongeluk met VR-bril

Gepubliceerd: 23 december 2017 12:43
Laatste update: 27 december 2017 11:34

Een 44-jarige Russische man uit Moskou is overleden na een ongeluk waarbij hij een virtualrealitybril droeg. Het is voor het eerst dat er een dodelijk ongeluk gebeurt met een VR-bril.

Dat meldt het Russische persbureau TASS. De man werd donderdag in zijn huis gevonden.

De man liep volgens de Russische Onderzoekscommissie door zijn appartement heen met de headset op zijn hoofd. Hij struikelde en viel tegen een glazen tafel aan. Zijn verwondingen waren zo ernstig dat hij ter plekke stierf.

Wat de man precies bekeek op zijn headset en welke VR-bril hij gebruikte, is niet duidelijk. Er is een onderzoek gestart naar het ongeluk.

Door: NU.nl
Assumptions & Claims

**Assumptions**

taking something for granted when it needs further investigation

**Claims**

stating something to be true when it is still open to question
Assumptions? Claims?
Problem space: Assumptions

Taking something for granted when it needs further investigation, e.g.:

– People will want to watch TV while driving

– People don’t mind wearing special glasses

– People will appreciate personalized adds (e.g. Facebook)

– Flower barrettes will appeal to men if they have Bluetooth
Problem space: Claims

Stating something to be true when it is still open to question

- A multimodal style of interaction for controlling GPS — one that involves speaking while driving — is safe

- Sharing locations is possible with mobile devices

- Everything is better with bluetooth
Everything better with Bluetooth?

(geen tentamenstof)
Problem space: A framework for analysis

• Are there problems with an existing product or user experience?

• Why do you think there are problems?

• How do you think your proposed design ideas might overcome these?

• When designing for a new user experience how will the proposed design extend or change current ways of doing things?
Conceptualizing the design space

• From problem space to design space:
  – Create a conceptual model
    • Actions, relation between actions
    • Metaphors for interaction and tasks
  – Determine the interaction type
  – Make use of:
    • Paradigms
    • Visions
    • Theories
    • Models
    • Frameworks
Having a good understanding of the problem space helps to conceptualize the design space. Doing this early has benefits:

**Orientation**

Enables design teams to ask specific questions about how the conceptual model will be understood.

**Open-minded**

Prevents design teams from becoming narrowly focused early on.

**Common ground**

Allows design teams to establish a set of commonly agreed terms.
Conceptualizing the design space

• From problem space to design space:
  – Create a conceptual model
    • Actions, relation between actions
    • Metaphors for interaction and tasks
  – Determine the interaction type
  – Make use of:
    • Paradigms
    • Visions
    • Theories
    • Models
    • Frameworks
Conceptual model

“...a high-level description of how a system is organized and operates” (Johnson and Henderson, 2002, p26)

enables.....

“...designers to straighten out their thinking before they start laying out their widgets” (Johnson and Henderson, 2002, p28)

Not a description of the user interface but a structure outlining the concepts and the relationships between them
Conceptual models: Components

• Concepts that people are exposed to through the product
  – task–domain objects, their attributes, and operations (e.g. saving, revisiting, organizing)

• Relationship between these concepts

• Metaphors and analogies
  – Help to understand what a product is for and how to use it for an activity

• Mappings between concepts and the user experience
Conceptual model

<table>
<thead>
<tr>
<th>Objects</th>
<th>Attributes</th>
<th>Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calendar</td>
<td>owner, current focus</td>
<td>examine, print, create, add event, delete event</td>
</tr>
<tr>
<td>Event</td>
<td>name, description, date, time, duration, location, repeat, type (e.g., meeting)</td>
<td>examine, print, edit (attributes)</td>
</tr>
<tr>
<td>To-Do item</td>
<td>name, description, deadline, priority, status</td>
<td>view, print, edit (attributes)</td>
</tr>
<tr>
<td>Person</td>
<td>name, job-description, office, phone</td>
<td>send email, view details</td>
</tr>
</tbody>
</table>

http://boxesandarrows.com/conceptual-models-in-a-nutshell/
Interface metaphors

Franklin has a heart of gold!

He's a walking encyclopedia

You are my sunshine

Metaphor

something identify some other thing

(known) (to be illustrated)
Interface metaphors

Convention

Metaphor

≠
Conceptualizing the design space

• From problem space to design space:
  – Create a conceptual model
    • Actions, relation between actions
    • Metaphors for interaction and tasks
  – Determine the interaction type
  – Make use of:
    • Paradigms
    • Visions
    • Theories
    • Models
    • Frameworks
Interaction types

Instructing

![Image of an instructor]

Exploring

![Image of an exploring environment]

Microsoft Windows [Version 10.0]
(c) 2015 Microsoft Corporation.

C:\Users\Nimwe105>
C:\Users\Nimwe105>erase *.

funda

[Images of buildings and environments]
Interaction types

Conversing

https://www.youtube.com/watch?v=lXUQ-DdSDoE
Interaction types

**Manipulating** > Direct manipulation (Shneiderman, 1983).

- Continuous representation of objects and actions of interest
- Physical actions and button pressing instead of issuing commands with complex syntax
- Rapid reversible actions with immediate feedback on object of interest
Direct manipulation
Conceptualizing the design space

• From problem space to design space:
  – Create a conceptual model
    • Actions, relation between actions
    • Metaphors for interaction and tasks
  – Determine the interaction type
  – Make use of:
    • Paradigms
    • Visions
    • Theories
    • Models
    • Frameworks
Other sources of design inspiration

Paradigms
General approach adopted by a community for carrying out research (shared assumptions, concepts, values)

Theories
a well-substantiated explanations of some aspect of a phenomenon, e.g. about how memory works (see ch. 3)

Models
simplification of an (HCI) phenomenon intended to make it easier for designers to predict and evaluate designs (often abstracted from a contributing discipline)

Frameworks
Set of interrelated concepts and/or specific questions for what to look for. Provide advice, e.g. on how to design, steps, questions, challenges, principles, tactics
Paradigms: General approach adopted by a community for carrying out research (shared assumptions, concepts, values)

- Which questions do you ask?
- Which phenomena do you observe?
- How do you analyze and interpret results?
Framework, model or theory?

• One can contain/be based on the other

• Difference in level of rigor, abstraction and purpose:
  – Framework = set of core concepts, questions or principles to consider
  – Model = simplification of an aspect of HCI as basis for design
  – Theory = comprehensive explanations of interactions
Framework

The Designer’s Model, the User’s Model, and the System Image (Norman, 2013)
Models

Model for emotional design, uit Emotional Design: Why We Love (or Hate) Everyday Things (Norman, 2004)
# Models


<table>
<thead>
<tr>
<th>Operator</th>
<th>Description and Remarks</th>
<th>Time (sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>K</td>
<td>Keystroke or button press. Pressing the SHIFT or CONTROL key counts as a separate K operation. Time varies with the typing skill of the user; the following shows the range of typical values:</td>
<td>Best typist (135 wpm) 0.08&lt;sup&gt;a&lt;/sup&gt; Good typist (90 wpm) 0.12&lt;sup&gt;a&lt;/sup&gt; Average skilled typist (55 wpm) 0.20&lt;sup&gt;a&lt;/sup&gt; Average non-secretary typist (40 wpm) 0.28&lt;sup&gt;b&lt;/sup&gt; Typing random letters 0.50&lt;sup&gt;a&lt;/sup&gt; Typing complex codes 0.75&lt;sup&gt;8&lt;/sup&gt; Worst typist (unfamiliar with keyboard) 1.20&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>P</td>
<td>Pointing to a target on a display with a mouse. The time to point varies with distance and target size according to Fitts’s Law. The time ranges from 0.8 to 1.5 sec, with 1.1 being an average time. This operator does not include the button press that often follows (0.2 sec).</td>
<td>1.10&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>H</td>
<td>Homing the hand(s) on the keyboard or other device.</td>
<td>0.40&lt;sup&gt;d&lt;/sup&gt;</td>
</tr>
<tr>
<td>D&lt;sup&gt;n_D, l_D&lt;/sup&gt;</td>
<td>Drawing (manually) n_D straight-line segments having a total length of l_D cm. This is a very restricted operator; it assumes that drawing is done with the mouse on a system that constrains all lines to fall on a square .56 cm grid. Users vary in their drawing skill; the time given is an average value.</td>
<td>0.9n_D + .16l_D&lt;sup&gt;e&lt;/sup&gt;</td>
</tr>
<tr>
<td>M</td>
<td>Mentally preparing for executing physical actions.</td>
<td>1.35&lt;sup&gt;f&lt;/sup&gt;</td>
</tr>
<tr>
<td>R(t)</td>
<td>Response of t sec by the system. These times must be input to the model. The response time counts only if it causes the user to wait.</td>
<td>t</td>
</tr>
</tbody>
</table>
Visions: Direct manipulation...😊?
From **Idea / Problem** to **Product**

- Understanding the problem space
- Conceptualizing the design

**Cognition** and **interface design**

- Cognitive processes
- Cognitive frameworks
Today

From **Idea / Problem** to **Product**

- Understanding the problem space
- Conceptualizing the design

**Cognition** and interface design

- Cognitive processes
- Cognitive frameworks
Chapter 3

Cognitive Aspects
What goes on in the mind?

- perceiving
- thinking
- remembering
- learning

- understanding others
- talking with others
- manipulating others

- planning a meal
- imagining a trip
- painting
- writing
- composing

- making decisions
- solving problems
- daydreaming
Cognitive processes

- Attention
- Perception
- Memory
- Learning
- Reading, speaking, and listening
- Problem-solving, planning, reasoning, and decision-making
Attention

• **Selecting things to concentrate on** at a point in time from the mass of stimuli

• Allows us to **focus on information that is relevant**
  Involves audio and/or visual senses

• Ease of focusing our attention influenced by:
  – **Goals**:
    • Clear goal enables you to be selective
    • Clear goal does limit our ability to keep track of all events
  – **Salience of the information**
    • Information can be structured and presented to capture attention (borders, colors, etc)
    • Information that is readily available is more easy to focus on
Attention

Find the price of a double room at the Holiday Inn in Columbia

Find the price of a double room at the Holiday House in Bradley

<table>
<thead>
<tr>
<th>Pennsylvania</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bedford Motel/Hotel: Grinnell Courts</td>
<td>(814) 623-9511</td>
<td>S: $118 D: $120</td>
</tr>
<tr>
<td>Bedford Motel/Hotel: Holiday Inn</td>
<td>(814) 623-9006</td>
<td>S: $129 D: $136</td>
</tr>
<tr>
<td>Bedford Motel/Hotel: Midway</td>
<td>(814) 623-8107</td>
<td>S: $121 D: $126</td>
</tr>
<tr>
<td>Bedford Motel/Hotel: Penn Manor</td>
<td>(814) 623-8177</td>
<td>S: $119 D: $125</td>
</tr>
<tr>
<td>Bedford Motel/Hotel: Quality Inn</td>
<td>(814) 623-5189</td>
<td>S: $123 D: $128</td>
</tr>
<tr>
<td>Bedford Motel/Hotel: Terrace</td>
<td>(814) 623-5111</td>
<td>S: $122 D: $124</td>
</tr>
<tr>
<td>Bradley Motel/Hotel: De Soto</td>
<td>(814) 362-3567</td>
<td>S: $120 D: $124</td>
</tr>
<tr>
<td>Bradley Motel/Hotel: Holiday House</td>
<td>(814) 362-4511</td>
<td>S: $122 D: $125</td>
</tr>
<tr>
<td>Bradley Motel/Hotel: Holiday Inn</td>
<td>(814) 362-4501</td>
<td>S: $132 D: $140</td>
</tr>
<tr>
<td>Breezewood Motel/Hotel: Best Western Plaza</td>
<td>(814) 735-4352</td>
<td>S: $120 D: $127</td>
</tr>
<tr>
<td>Breezewood Motel/Hotel: Motel 70</td>
<td>(814) 735-4385</td>
<td>S: $116 D: $118</td>
</tr>
</tbody>
</table>
Attention

Tullis (1987) found that the two screens produced quite different results

- 1st screen - took 3.2 seconds to search
- 2nd screen - took an average of 5.5 seconds to search

• Why, since both displays have the same density of information (31%)?

• Spacing
  - In the 1st screen the characters are grouped into vertical categories of information making it easier
  - In the 2nd screen the information is bunched up together, making it hard to search
Multitasking and attention

• Can you execute multiple tasks without one or more of them being detrimentally affected?

![Diagram showing experimental setup](image)

• Ophir et al (2009) compared heavy vs light multi-taskers
  – Heavy multitasker: more prone to be distracted
  – Heavy multitasker: find it difficult to filter irrelevant information
Multitasking and attention
Design implications for attention

• Make information *salient* when it needs attending to
  – Use techniques like colour, ordering, spacing, underlining, sequencing and animation

• But, *avoid cluttering* the interface
  – E.g. Search engines and form fill-ins that have simple and clean interfaces are easier to use
Perception

• How information is acquired from the world and transformed into experiences

• Different senses:
  – Vision
  – Hearing
  – Touch
We lack control....
E.g. color contrast good? Find “Italian”

<table>
<thead>
<tr>
<th>Black Hills Forest</th>
<th>Peters Landing</th>
<th>Jefferson Farms</th>
<th>Devlin Hall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cheyenne River</td>
<td>Public Health</td>
<td>Psychophysics</td>
<td>Positions</td>
</tr>
<tr>
<td>Social Science</td>
<td>San Bernardino</td>
<td>Political Science</td>
<td>Hubard Hall</td>
</tr>
<tr>
<td>South San Jose</td>
<td>Moreno Valley</td>
<td>Game Schedule</td>
<td>Fernadino Beach</td>
</tr>
<tr>
<td>Badlands Park</td>
<td>Altamonte Springs</td>
<td>South Addision</td>
<td>Council Bluffs</td>
</tr>
<tr>
<td>Juvenile Justice</td>
<td>Peach Tree City</td>
<td>Cherry Hills Village</td>
<td>Classical Bluffs</td>
</tr>
<tr>
<td>Results and Stats</td>
<td>Highland Park</td>
<td>Creative Writing</td>
<td>Sociology</td>
</tr>
<tr>
<td>Thousand Oaks</td>
<td>Manchesney Park</td>
<td>Lake Havasu City</td>
<td>Greek</td>
</tr>
<tr>
<td>Promotions</td>
<td>Vallecito Mts.</td>
<td>Engineering Bldg</td>
<td>Wallace Hall</td>
</tr>
<tr>
<td>North Palermo</td>
<td>Rock Falls</td>
<td>Sports Studies</td>
<td>Concert Tickets</td>
</tr>
<tr>
<td>Credit Union</td>
<td>Freeport</td>
<td>Lakewood Village</td>
<td>Public Radio FM</td>
</tr>
<tr>
<td>Wilner Hall</td>
<td>Slaughter Beach</td>
<td>Rock Island</td>
<td>Children's Museum</td>
</tr>
<tr>
<td>Performing Arts</td>
<td>Rocky Mountains</td>
<td>Deerfield Beach</td>
<td>Writing Center</td>
</tr>
<tr>
<td>Italian</td>
<td>Latin</td>
<td>Arlington Hill</td>
<td>Theater Auditions</td>
</tr>
<tr>
<td>Coaches</td>
<td>Pleasant Hills</td>
<td>Preview Game</td>
<td>Delaware City</td>
</tr>
<tr>
<td>McKees Rocks</td>
<td>Observatory</td>
<td>Richland Hills</td>
<td>Scholarships</td>
</tr>
<tr>
<td>Glenwood Springs</td>
<td>Public Affairs</td>
<td>Experts Guide</td>
<td>Hendricksville</td>
</tr>
<tr>
<td>Urban Affairs</td>
<td>Heskett Center</td>
<td>Neff Hall</td>
<td>Knights Landing</td>
</tr>
<tr>
<td>McLeansboro</td>
<td>Rocky Mountains</td>
<td>Deerfield Beach</td>
<td>Modern Literature</td>
</tr>
<tr>
<td>Experimental Links</td>
<td>Latin</td>
<td>Arlington Hill</td>
<td>Studio Arts</td>
</tr>
<tr>
<td>Graduation</td>
<td>Pleasant Hills</td>
<td>Preview Game</td>
<td>Hughes Complex</td>
</tr>
<tr>
<td>Emory Lindquist</td>
<td>Observatory</td>
<td>Richland Hills</td>
<td>Cumberland Flats</td>
</tr>
<tr>
<td>Clinton Hall</td>
<td>Public Affairs</td>
<td>Experts Guide</td>
<td>Central Village</td>
</tr>
<tr>
<td>San Luis Obispo</td>
<td>Heskett Center</td>
<td>Neff Hall</td>
<td>Hoffman Estates</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Which is easiest to read and why?
Design implications

- Icons should enable users to readily distinguish meaning.
- Bordering/spacing are effective ways of grouping information.
- Sounds should be audible and distinguishable.
- Speech output should enable users to distinguish between the set of spoken words.
- Text should be legible and distinguishable from background.
- Tactile feedback should allow users to recognize and distinguish different meanings.
Memory

Two stages:

- Encoding
- Retrieving

Strength of encoding:

- Selection of information (filtering)
- Processing & interpretation of information

Ease of retrieving:

- Context is important (e.g. where, when)
- Recognition is easier than recall
Example: we remember less about objects we have photographed than when we observe them with the naked eye (Henkel, 2014)
Memory: Retrieving

• Context affects the extent to which information can be subsequently retrieved

• Can be difficult to recall information encoded in a different context:

  “You are on a train and someone comes up to you and says hello. You don’t recognize him for a few moments but then realize it is one of your neighbors. You are only used to seeing your neighbor in the hallway of your apartment block and seeing him out of context makes him difficult to recognize initially”
Memory: Interfaces

• Command-based interfaces require users to recall from memory a command from a possible set of 100s of commands.

• GUIs provide visually-based options that users need only browse through until they recognize one.

• Web browsers, etc., provide lists of visited URLs, song titles etc., that support recognition memory.
Memory: The problem with the classic ‘7 ± 2’

George Miller’s (1956) theory of how much information people can remember, our memory capacity is limited. Many designers think this is useful finding for interaction design:

- Present only 7 options on a menu...
- Display only 7 icons on a tool bar...
- Have no more than 7 bullets in a list...
- Place only 7 items on a pull down menu...
- Place only 7 tabs on the top of a website page...

Inappropriate application of the theory
Unnecessary. Why?

- People can scan lists of bullets, tabs, menu items for the one they want

- They don’t have to recall them from memory having only briefly heard or seen them

- Sometimes a small number of items is good, depends on task and available screen estate
Memory: Digital content management

Growing problem for many users
– Hundreds of documents, images, music files, video’s
– Where/ how to:
  • Save them
  • Remember them
  • Find them again

Challenge: How might such a process be facilitated taking into account people’s memory abilities?
Option 1: Using recall and recognition

- We use both when searching for something:
  - Recall-directed search
    - Where did we have our keys last?
    - What is the name of the folder we put that file in?
  - Recognition-based scanning
    - Searching in the kitchen for your keys (scanning the surfaces)
    - Searching different folders for the appropriate file

- Google and Apple do this
Option 2: Memory aids

SenseCam, by Microsoft Research Labs (now Autographer)

- wearable device that intermittently takes photos without user intervention
- images stored and revisited using special software
- improved peoples memory (Alzheimers, braindamage)
Design implications

• Don’t overload users’ memories with complicated procedures for carrying out tasks

• Design interfaces that promote recognition rather than recall

• Provide users with various ways of encoding information to help them remember
  – e.g. categories, color, flagging, time stamping
Reading, speaking, and listening

• The ease with which people can read, listen, or speak differs
  – Many prefer listening to reading
    • Listening requires less cognitive effort than reading or speaking (and is more automated)
    • Dyslexics have difficulties understanding and recognizing written words
  – Reading can be quicker than speaking or listening
Applications

• Speech-recognition systems allow users to interact with them by asking questions
  – e.g. Google Voice, Siri

• Speech-output systems use artificially generated speech
  – e.g. written-text-to-speech systems for the blind

• Natural-language systems enable users to type in questions and give text-based responses
  – e.g. Ask search engine
Design implications

• Speech-based menus and instructions should be short

• Accentuate the intonation of artificially generated speech voices
  – they are harder to understand than human voices

• Provide opportunities for making text large on a screen
Problem-solving, planning, reasoning and decision-making

• Involve reflective cognition
  – e.g. thinking about what to do, what the options are

• Often involves conscious processes, discussion with others (or oneself), and the use of artefacts
  – e.g. maps, books, pen and paper
  – could lead to information overload

• May involve
  – working through different scenarios and deciding which is best option
  – using simple heuristics
Design implications

• Provide additional information/functions:
  – For users who wish to understand more about how to carry out an activity more effectively
  – Give the option to hide it

• Use simple computational aids to support rapid decision-making and planning for users on the move
Cognitive frameworks

Explain and predict the user behavior based on theories of cognition

Internal
• Mental models
• Gulfs of execution and evaluation
• Information processing

External
• Distributed cognition
• External cognition
• Embodied interaction
Mental models

• Users develop an understanding of a system through learning about and using it:
  – How to use the system (what to do next)
  – What to do with unfamiliar systems or unexpected situations (how the system works)

• Craik (1943) described mental models as:
  – internal constructions of some aspect of the external world enabling predictions to be made

• Deep versus shallow models
  – e.g. how to drive a car and how it works
Everyday reasoning and mental models

Many people have erroneous mental models (Kempton, 1996).

E.g. the ‘more is more’ principle is (erroneously) generalised to a different setting.
Gulfs of execution and evaluation
Information processing

Conceptualizes human performance in metaphorical terms of information processing stages
Information processing

Human processor Model (Card et al, 1983)
Information processing: Limitations

• Based on modelling mental activities that happen exclusively inside the head

• Do not adequately account for how people interact with computers and other devices in real world
Distributed cognition

- Concerned with the nature of cognitive phenomena across individuals, artefacts, and internal and external representations (Hutchins, 1995)
- Information is transformed through different media (computers, displays, paper, heads)
Distributed cognition: What’s involved

- The distributed problem-solving that takes place
- The role of verbal and non-verbal behaviour
- The various coordinating mechanisms that are used (e.g. rules, procedures)
- The communication that takes place as the collaborative activity progresses
- How knowledge is shared and accessed
External cognition

• Concerned with explaining how we interact with external representations (e.g. maps, notes, diagrams)
  – What are the cognitive benefits and what processes involved
  – How they extend our cognition
  – What computer-based representations can we develop to help even more?
External cognition - Externalizing to reduce memory load

- Diaries, reminders, calendars, notes, shopping lists, to-do lists
  - written to remind us of what to do

- Post-its, piles, marked emails
  - where placed indicates priority of what to do

- External representations:
  - Remind us that we need to do something (e.g. to buy something for mother’s day)
  - Remind us of what to do (e.g. buy a card)
  - Remind us when to do something (e.g. send card by date)
External cognition - Computational offloading

• When a tool is used in conjunction with an external representation to carry out a computation (e.g. pen and paper)

• Try doing the two sums below (a) in your head, (b) on a piece of paper and c) with a calculator.
  
  – $234 \times 456 = ??$
  – $CCXXXIII \times CCCCCXXXXVI = ??$

• Which is easiest and why? Both are identical sums
Design implications

• Provide external representations at the interface to:
  – reduce memory load
  – facilitate computational offloading

• For example:
  – Wizards
    • Reduce the effort of remembering which step to take next
  – Information visualizations
    • Reduce the effort to make inferences
Today

From **Idea / Problem** to **Product**

- Understanding the problem space
- Conceptualizing the design

**Cognition** and **interface design**

- Cognitive processes
- Cognitive frameworks
Vragen?