DGB03 Introduction
Design Research
Inspiration for Design

Tilde Bekker / UCE
Christoph Bartneck / DI
Marco Rozendaal / DQI
Ilse Luyk / BPD
Content Today

• DR assignment schedule
• Design Research intro
• DR process
• DR in the design cycle
  – early – middle – late in design
• Explanation exercise
## Assignment schedule

<table>
<thead>
<tr>
<th>1</th>
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Exercise: design research study

- In groups of 2-3 students
- Lectures and discussion sessions
- Discuss assumptions and progress
- Peer-review process (comment on other students’ process)
Design Research

Design through Research
Research through Design

Design Research:
– creating products, while uncovering (design) knowledge (or vice versa)
Design Research

• Assumptions about your design and it’s use
• Check assumptions to improve design / understand how the product is used
• Assumptions grounded in theory e.g., about human behaviour
  – E.g. positive feedback motivates people
• Knowledge not only for one situation, but also applicable to other situations!
Design Research

- [design assumption] is expected to lead to [intended behaviour/ experience]
- OR
- [theory about intended behaviour/ experience] => [design assumption] => [intended behaviour/ experience]
- E.g. [choice of terminology on buttons] =>
  - [understood by user]
- DR provides evidence that assumptions are (in) correct
Characteristics of research (Kumar, 1999)

- Controlled (no external factors)
- Rigorous
- Systematic (logical structure)
- Valid and verifiable (by others)
- Empirical (grounded in evidence)
- Critical (of procedures and methods)
Types of research

**Application**
- Pure research
- Applied research

**Objectives**
- descriptive
- exploratory
- correlational
- explanatory

**Type of info sought**
- quantitative
- qualitative
Objectives

Descriptive, to describe a phenomenon/situation/etc.

Correlational, to ascertain a relationship,
  • what questions

Explanatory, to explain why the relationship formed
  • why and how questions

Exploratory, sometimes a pilot, when little is known
Type of info sought: Quantitative or Qualitative

Qualitative: describes situations etc.,
- to establish variation without quantifying it.
Quantitative: quantifies variations in phenomenon
- Determine magnitude of variation/ relationship

Depends on:
1) Purpose of study
2) How variables are measured
3) How information is analysed
Formulate research questions (ch 4 Kumar)

- **Identify**: MSN use
- **Dissect**: people who use msn, reasons for using msn, topics used on msn
- **Select**: reasons for using msn
- **Raise questions**: Influence of knowing people, influence of work pressure
- **Specific objectives**: impact of knowing people on frequency of use, impact of work pressure
- **Check**: feasibility of study, whether it interests you
Research process

What

Formulate research problem

Make research design

Tools for data collection

Select sample

Write Research proposal

How

Conduct study

Collect data

Process data

Write research report

Tilde Bekker - DGB03 Introduction Design Research
Design Research Approach

• Make assumptions/ design questions explicit
• Plan a study
  – Select main assumptions/ design questions
  – Determine set-up: method, users, sampling, context, material, equipment, etc. (Luyk)
  – Determine what to measure / observe
  – Determine data analysis approach (Bartneck)
  – Determine how to answer design questions (Rozendaal)
  – Check coherence of study plan
Design Research Views

Very diverse approaches to design research

- Types of research questions
- Types of research methods
- How general are the conclusions:
  - Only for one design case
  - More general applicable to design cases
DR: fundamental => applied (Horvath, 2007)
Table 1  Levels of contextualization and amalgamation of design knowledge

<table>
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<td>research in context</td>
<td>design inclusive research</td>
<td>practice-based design research</td>
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Major phases of research in design context:

- exploration → observation
- induction → hypothesis
- deduction → theory
- verification → proof
- validation → evaluation
- consolidation → generalization
Table 1 Levels of contextualization and amalgamation of design knowledge

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**Figure 4 Major phases of design inclusive research**

- Exploration → Observation
- Induction → Hypothesis
- Deduction → Theory
- Verification → Proof
- Validation → Evaluation
- Consolidation → Generalization
- Conception → Design
- Design → Prototyping
Table 1  Levels of contextualization and amalgamation of design knowledge

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Figure 5  Process flow of practice-based design research
Design Research Questions - Early

• **Who is my target user group?** Scoping
  – Example 1:
    • People being interrupted in their work
  – Example 2:
    • Children between 8 and 10

• **Considerations:**
  • Age, gender, income, hierarchy, job description, affinity/interests, location, ….
  • Needs and wants: … Why?
  • Variations and similarities
  • Concrete insights
Design Research Example - Early

Design for Interruptions
Design Research Example - Early

• Design a product to support interruptions during work
• Who is my target user group?
  – People being interrupted / interrupting other people during work

• Theoretical Basis:
  – Social Psychology (hierarchies in groups, work processes, etc.)
Design Research Example- Early

- Analyse existing practice
- Who is my target user group?
  - People being interrupted / interrupting other people during work
- Why/ when do they decide to interrupt, or not?
- Why/ when do they want to interrupt?

- Methods: Interviews (different organisations) – Observations - Focus groups - …
- # of people, diversity in sample
- Type of conclusions: ‘process’ model of interruptions
### Design Research – Plan - Coherence

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<td><strong>When?</strong></td>
<td>Observation-Interview</td>
<td>Positive/negative behaviours Questions x and y</td>
<td>Combine obs. and answers</td>
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<tr>
<td><strong>Why?</strong></td>
<td>Observation-Interview</td>
<td>Questions x and y</td>
<td>Combine answers</td>
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</table>
Design Research Example- Early

• Who is my target user group?
  – People being interrupted in their work in organisation X
  – Better description of variety/similarities

• Considerations for interrupting:
  – Time, urgency, relationship with other, organisational distance

Jeroen Witjes
Design Research Questions: Middle

Example questions:

- Do the users understand the concept?
- Does it have appeal?
  - Why, why not?
  - What aspects?
- Which concept do they prefer?
Design Research Example: Middle

Design for Play
Design Research Example: **Middle**

- Open-ended play objects
- Children and collaboration
- Theoretical basis:
  - Game Design Rules
  - Modality characteristics

(Eva Hopma)
Design Research Example- Middle

• Question:
  – Influence of output modality on game created
  – Two conditions: uni-modal versus multi-modal

• Measures:
  – # of game created
  – Types of games and rules created

• Observation sheet:
  – Positive/negative comments
  – Game goals and rules

• Questionnaire/ interview
  – Understanding and enjoyment
Design Research Example

• Question: Does output-modality influence type and number of games created?

• Set-up:
  – Method: observe children play
  – 4 Groups of 4 children (order balancing)
  – Material: 4 prototypes
  – Measure: observe and question whether children
    • Types and number of games
    • Enjoyment
  – Conclusions: influence of output-modality on games created
### Design Research – Plan - Coherence

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<td>Observation-Interview</td>
<td>Questions x and y</td>
<td>Combine obs. and answers</td>
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<tr>
<td>Fun</td>
<td>Observation-Interview</td>
<td>Positive comments</td>
<td>Combine obs. and answers</td>
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Combine obs. and answers
Design Research: Late

- Do they understand the concept?
  - More detailed issues such as functionality
- Do they enjoy using it?
- What are the good parts?
- What can be improved?
Design Research Example - Late

Design for subtle communication
Design Research Example – Late

• Design a communication device for elderly people - Leonie Hurkx

• Will people really use it?

• Theoretical basis:
  – Calm technology
  – Persuasion
Design Research Example - Late

- Working prototype – …
- Communication device for elderly people - Leonie Hurkx
- Measures:
  - Understand the functionality and the feedback
  - Does the subtle cue work?
- Diary method – questions
  - Use of product
  - Consequences of use
- Interview
  - Understanding and enjoyment
Design Research Example

• Assumption: subtle information works to request a partner.

• Set-up:
  – Diary method and final interview
  – 2 pairs of elderly
  – Measure: questions whether elderly
    • Understand the concept and the feedback
    • Actually go and do things together
  – Answers: # elderly that understand concept, enjoy it’s use (or not), would like to have it, etc.
### Design Research - Plan

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<td>Understand</td>
<td>Diary - Interview</td>
<td>Questions, Questions x and y</td>
<td>Combine obs. and answers</td>
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<tr>
<td>Consequences</td>
<td>Diary - Interview</td>
<td>Positive comments, Questions x and y</td>
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<tr>
<td>Appeal</td>
<td>Interview</td>
<td>Question z</td>
<td>Combine questions</td>
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Inspirational Design
Researchers: Justine Cassell

Design for practising language

- Designs Story Listening Systems
- Uses theory about literacy to inspire and evaluate design
Justine Cassell

• StoryMat
  – Literacy development

• Use real objects in stories

• Combine stories from different perspectives
  – Character-narrator
Justine Cassell

• Comparison of StoryMat with passive mat

• Positive influence on
  – Incorporating real objects in story
  – Using other children’s concepts
Outcomes of Design Research

- Improved concepts – Demonstrators
- Design knowledge

- Design Research Papers
  - Conferences
  - Journals

- Presentations and/or demonstrations
  - Conferences
  - Seminars
  - Festivals
Other DR topics in assignment

• Study set-up and subject sampling (Luyk)
• Data analysis (Bartneck)
• Relating research to design (Rozendaal)

• And more ……………..
Exercise: design research study (in pairs)

- Read background literature
- Plan a study set-up
- Gather data
- Do data analysis
- Draw conclusions
- Write up research process (deliverable)
Study topics:

- Subjective knowledge and usability (Ilse Luyk)
- Experiencing teleworking from home (Marco Rozendaal)
- Open-ended play behaviour over time (Tilde Bekker / Janienke Sturm)
The influence of subjective knowledge on Usability

- Coach: Ilse Luyk (BPD)
- Product: Smart Phone
- Design: Laboratory User Test
- Research question:

How does subjective product knowledge of a user influence the perceived product usability in consumer electronics?
Subjective Knowledge

- **Subjective knowledge**: is people's perceptions of what or how much they know about a product class (Park, Motherbaugh, Feick, 1994)

- **Usability**: Effectiveness, Efficiency and Satisfaction (ISO 9241)
Subjective Knowledge (2)

The Influence of Subjective Knowledge???
Investigating the experience of teleworking from home - Marco Rozendaal

• Apply theory of phenomenology as a form of qualitative design research. Phenomenology: experience arise out of interplay between human faculties (body, senses, action, thought) and environment (time, space, things, people)
• Investigate peoples optimal experience of teleworking and (1) how their human faculties are involved and (2) how the current situation - in terms of rituals and tools - either enable or obstruct this experience.

Learning objectives:
• Communicating material data (photo, video and/or audio-recordings) with subjective data (in-depth interview).
• Learning to apply a phenomenological reduction analysis
• Conducting research with the aim to identifying design opportunities
Prolonged play with open-ended play objects – Tilde Bekker

Open-ended play stimulates social interaction and creativity of children

Design Research Question:
How will children’s play behaviour change over time?
• Enjoyment
• Number and types of games
• Social interaction levels
Prolonged play with open-ended play objects – Tilde Bekker

Type of game – first time use

- Assignment 31.6 %
- Tag 50 %
- Hide-and-seek 7.9 %
- Rolling 5.3 %
- Role-play 5.3 %
Methods: prolonged play behaviour

• Observations: video recordings
• Questionnaires

Code video data
  – Type and number of games
  – Social interaction levels (less to more)

Change in behaviour:
  – 1st, 2nd and 3rd time use
<table>
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<th>Students - projects - discussions</th>
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<tbody>
<tr>
<td>Loran Corsten (b21)</td>
</tr>
<tr>
<td>Rens van Deurssen (b21)</td>
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<tr>
<td>Vincent van Rheden (b21)</td>
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<td>Discuss (b22 students)</td>
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<tr>
<td>Ilse Luyk – Subjective Knowledge</td>
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<tr>
<td>Rico Minten (b22)</td>
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<tr>
<td>Fiona Jongejans (b22)</td>
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<td>Frederique Oudkerk (b22)</td>
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<td>Discuss (b31 students)</td>
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<td>Tilde Bekker – prolonged play behaviour</td>
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<tr>
<td>Joep Kalthoff (b31)</td>
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<td>Joey van Dun (b31)</td>
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<td>Marco Roozendaal – experience of teleworking</td>
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Literature:

• Ranjit Kumar, Research methodology, 1999.