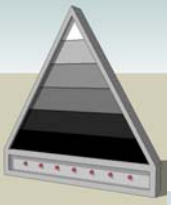
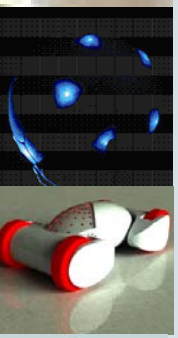
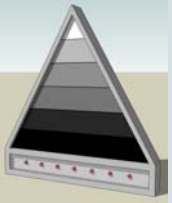
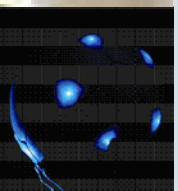




Technische Universiteit Eindhoven University of Technology

/ department of industrial design

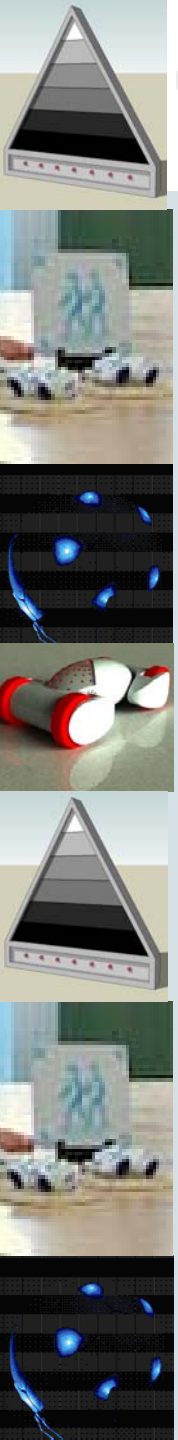
# DGB03 Introduction Design Research Inspiration for Design


Tilde Bekker / *UCE*

*Christoph Bartneck / DI*

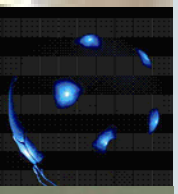
*Marco Rozendaal / DQI*

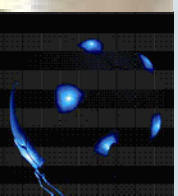
*Ilse Luyk / BPD*



# Content Today

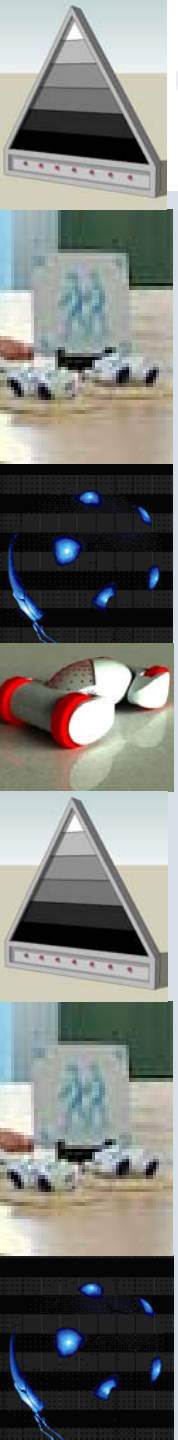
- DR assignment schedule
- Design Research intro
- DR process
- DR in the design cycle
  - early – middle – late in design
- Explanation exercise

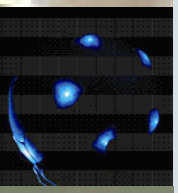
# Assignment schedule

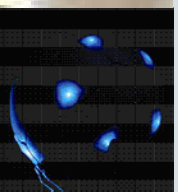
| | | |
|---|---|---|
| 1 | Intro Design Research | Tilde Bekker |
| 2 | Set-up of studies / arrange subjects | Ilse Luyk |
| 3 | Discussion session set-up / pilot | all |
| | Week no assignment | |
| 4 | Statistics lecture / data gathering | Christoph Bartneck |
| 5 | Discuss data analysis and results | all |
| 6 | Relationship design process and hand in report (deadline Friday) | Marco Rozendaal |
| 7 | Discuss approach (by students) | All/ in identity week |



# 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)

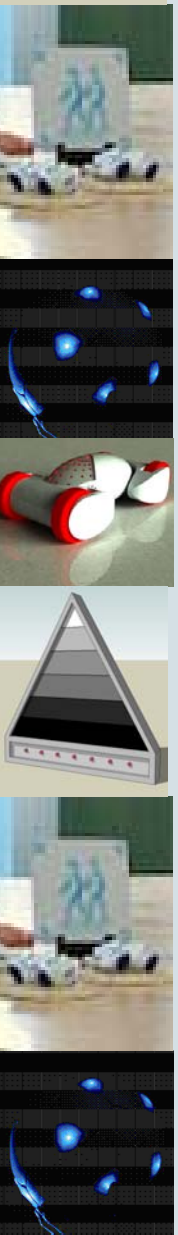
# Design Research

Design through Research

Research through Design

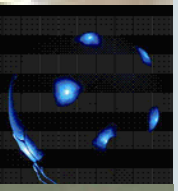
Design Research:

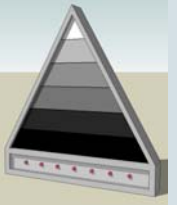
- creating products, while uncovering (design) knowledge (or vice versa)

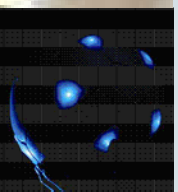


# Design Research

- 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!

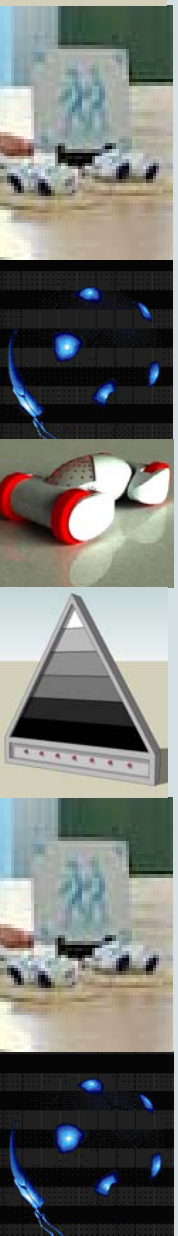







# Design Research

- [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*

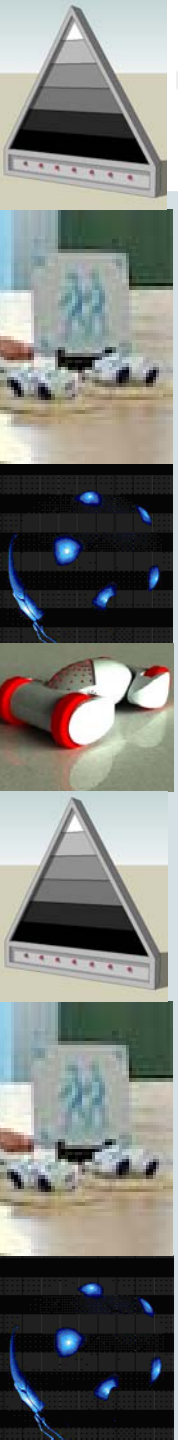
- Pure research
- Applied research

*Objectives*

- descriptive
- exploratory
- correlational
- explanatory

*Type of info sought*

- quantitative
- qualitative



# Objectives

Descriptive, to describe a phenomenon/ situation/ etc.

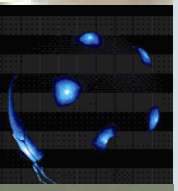
Correlational, to ascertain a relationship,

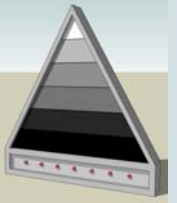
- what questions

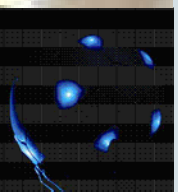
Explanatory, to explain why the relationship formed

- why and how questions

Exploratory, sometimes a pilot, when little is known





# Type of info sought: Quantitative or Qualitative

Qualitative: describes situations etc.,

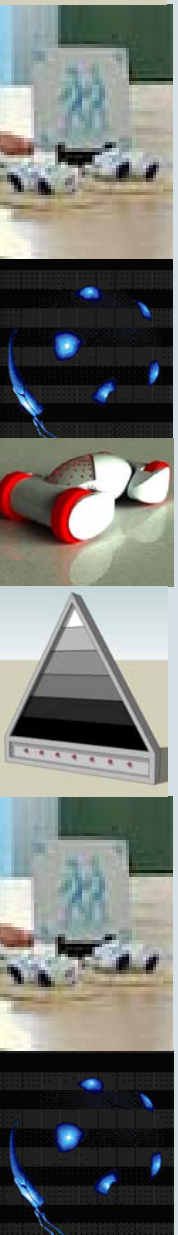
- to establish variation without quantifying it.

Quantitative: quantifies variations in phenomenon

- Determine magnitude of variation/ relationship

Depends on:

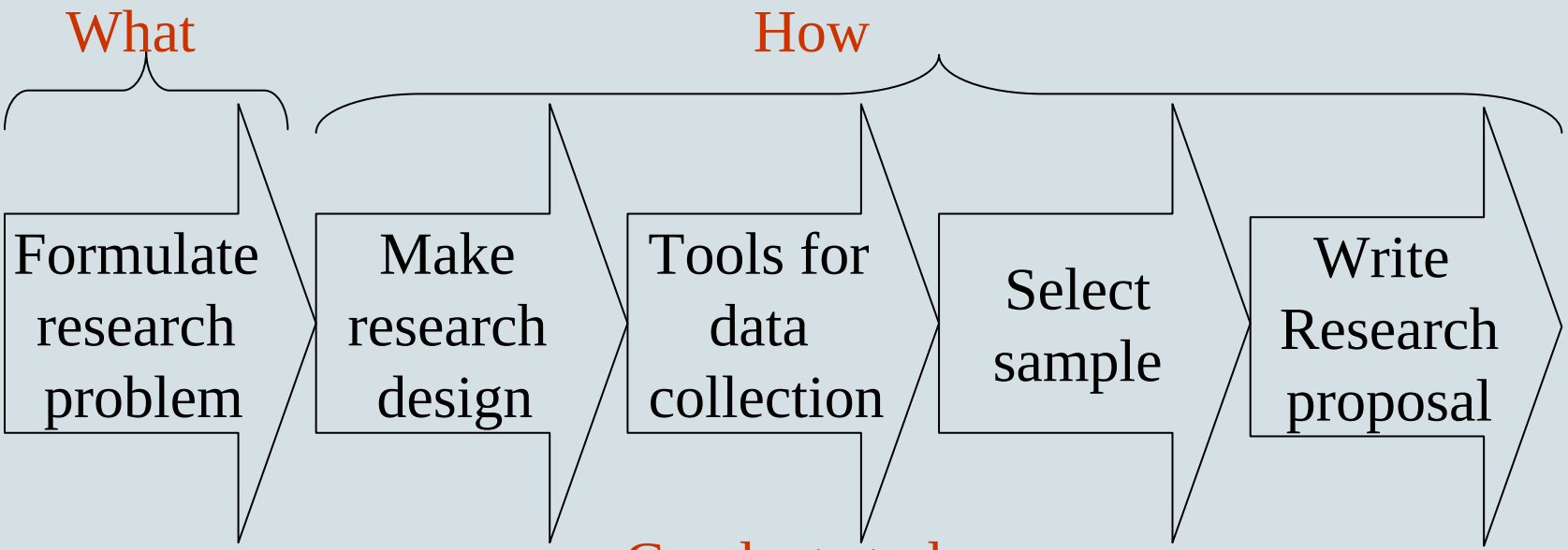
1) Purpose of study
2) How variables are measured
3) How information is analysed

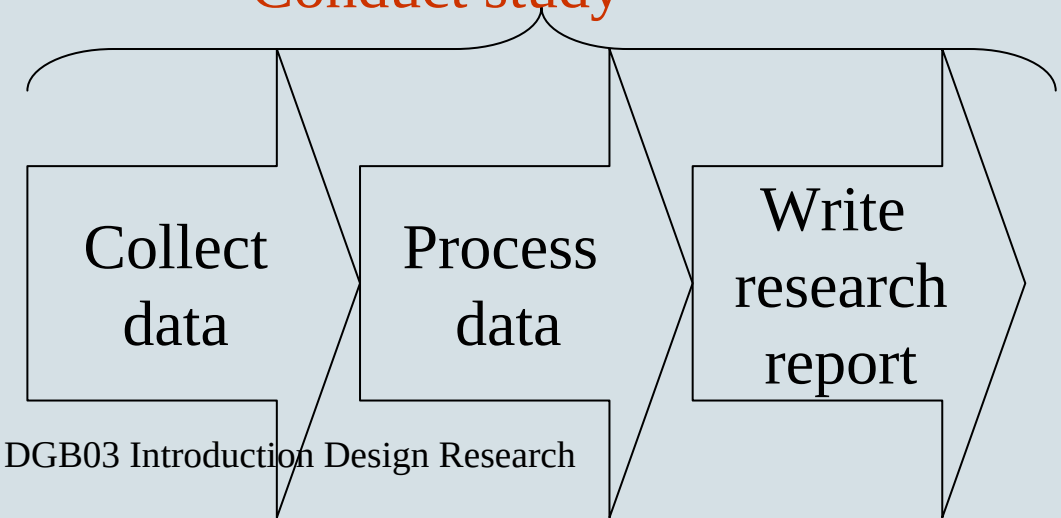


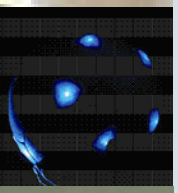
# Formulate research questions (ch 4 Kumar)

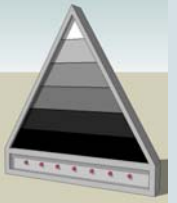
- **Identify**: MSN use
- **Dissect**: people who use msn, reasons for using msn, topics used on msn
- **Select**: reasons for using msn
- **Raise questions**: Influence of knowing people, influence of work pressure
- **Specific objectives**: impact of knowing people on frequency of use, impact of work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

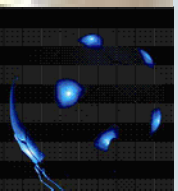
# Research process



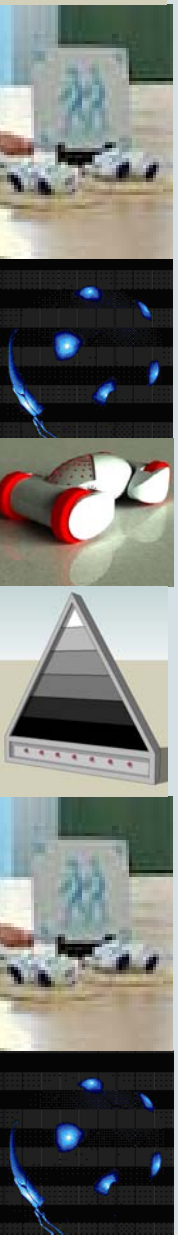







# Design Research Approach

- 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)

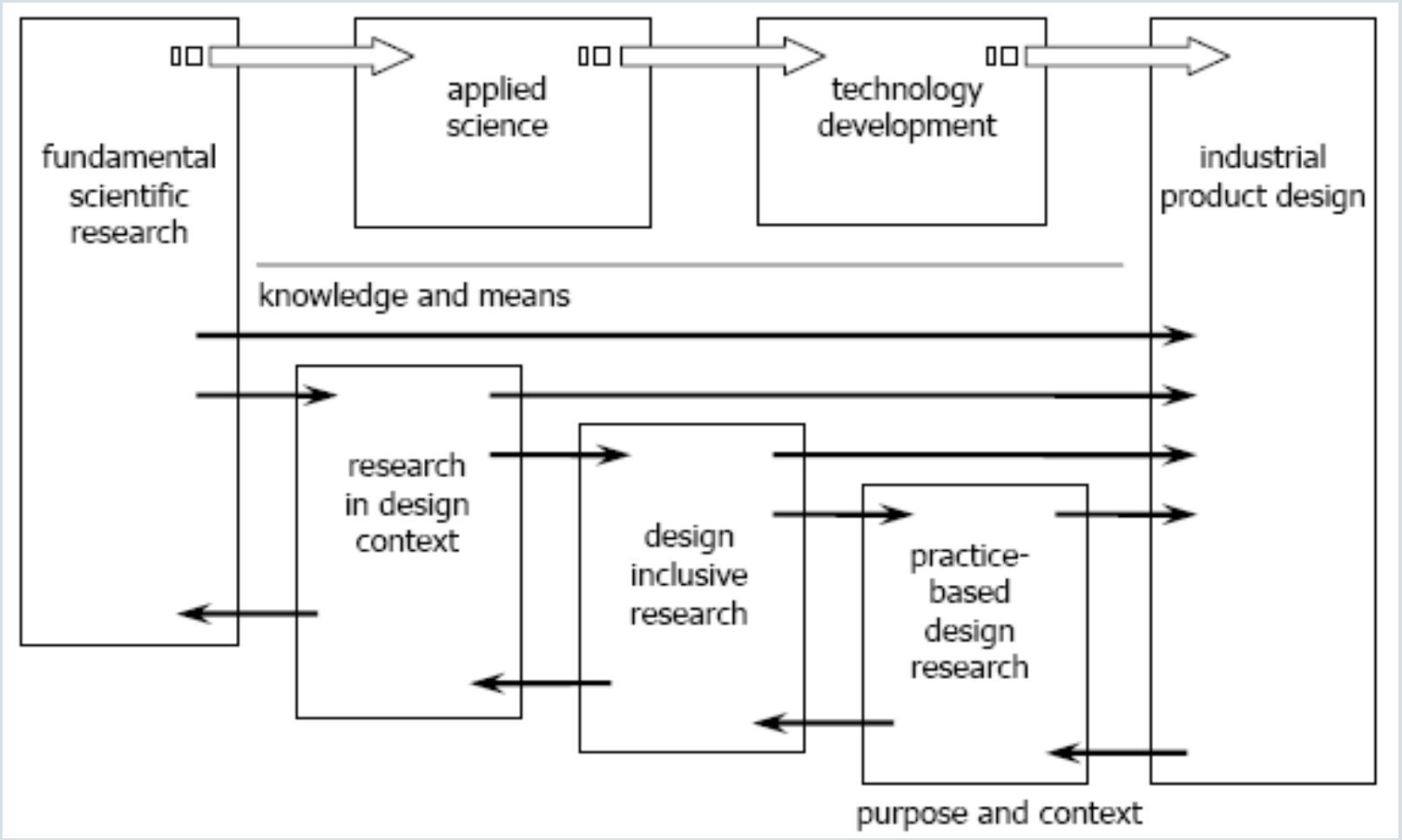
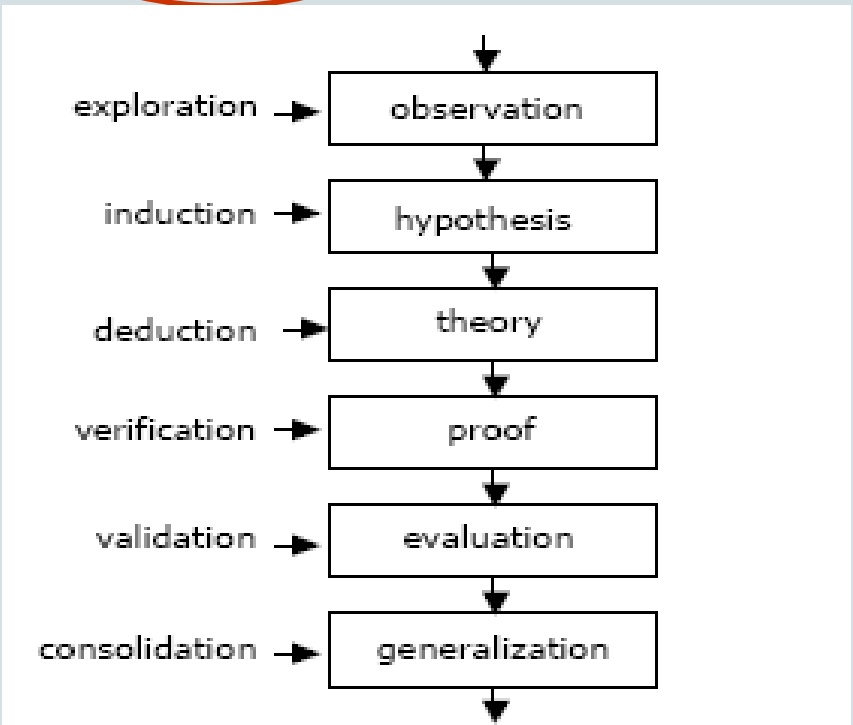


*Table 1 Levels of contextualization and amalgamation of design knowledge*

| | low | medium | high |
|---|---|---|---|
| contextualization / integration | research in design context | design inclusive research | practice-based design research |




*Major phases of research in design context*

*Table 1 Levels of contextualization and amalgamation of design knowledge*

| | low | medium | high |
|---|---|---|---|
| contextualization / integration | research in design context | design inclusive research | practice-based design research |

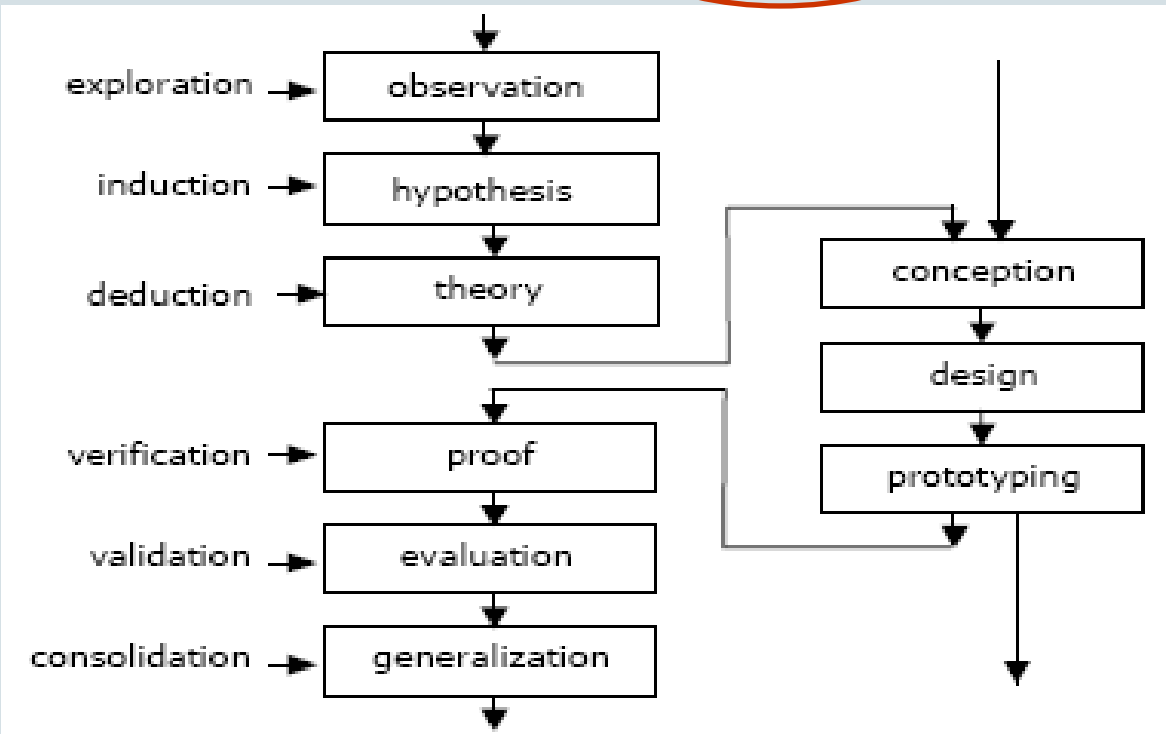



*Figure 4 Major phases of design inclusive research*

*Table 1 Levels of contextualization and amalgamation of design knowledge*

| | low | medium | high |
|---|---|---|---|
| contextualization | research in design context | design inclusive research | practice-based design research |
| integration | | | |

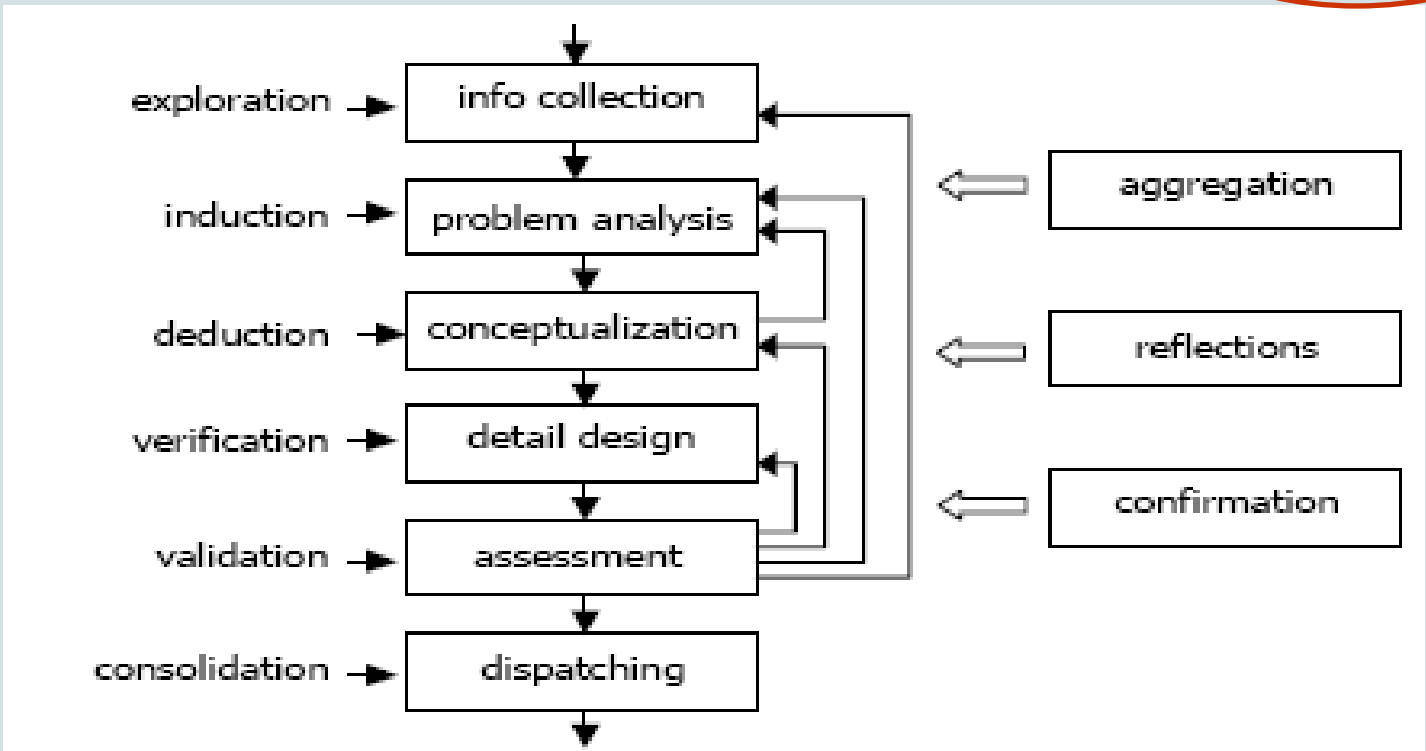
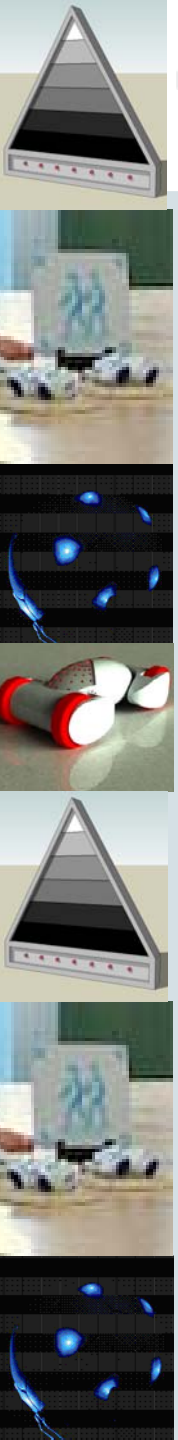
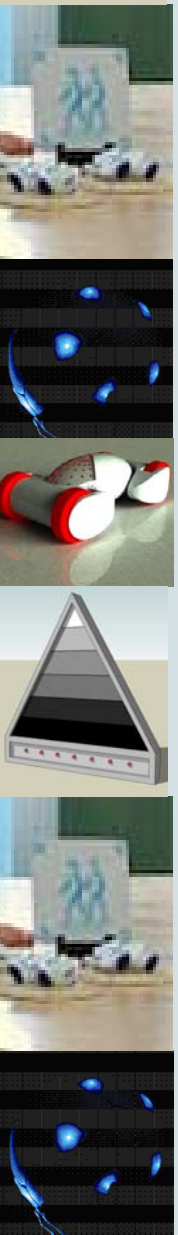



*Figure 5 Process flow of practice-based design research*



# 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

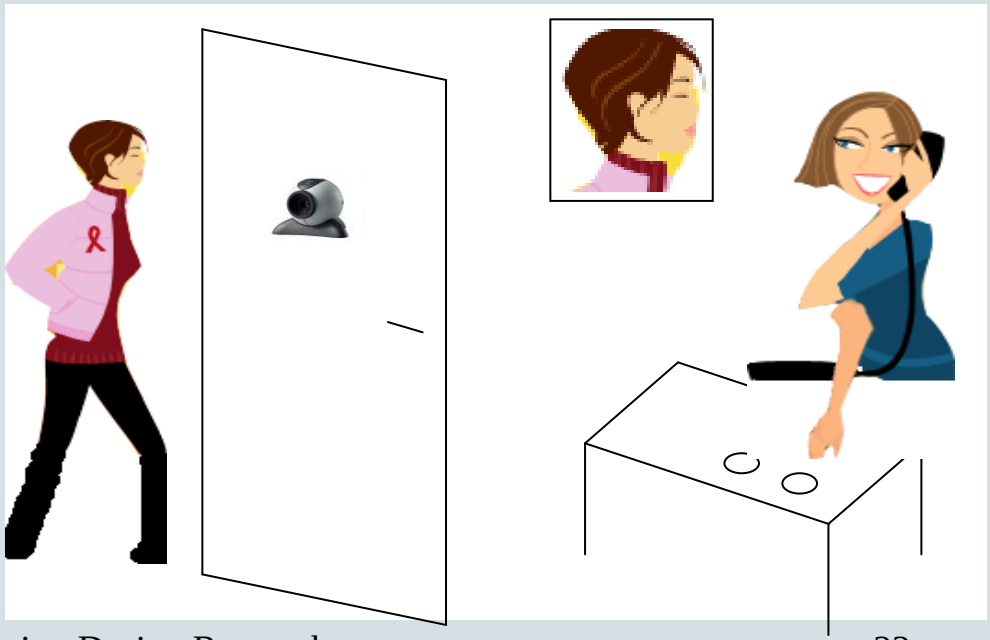


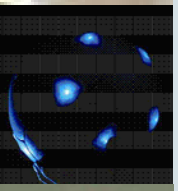
# Design Research Example- Early

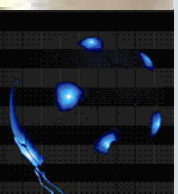
Design for Interruptions

# 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.)

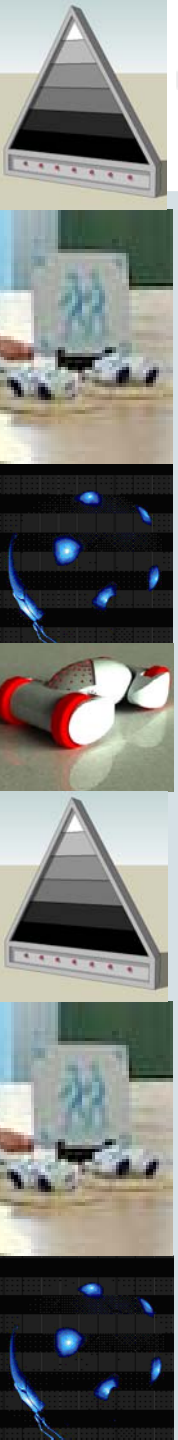


# Design Research Example- Early

- 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

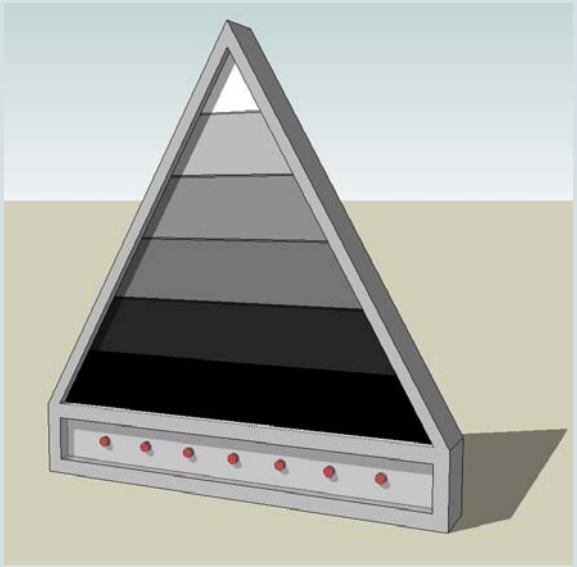


# Design Research – Plan - Coherence

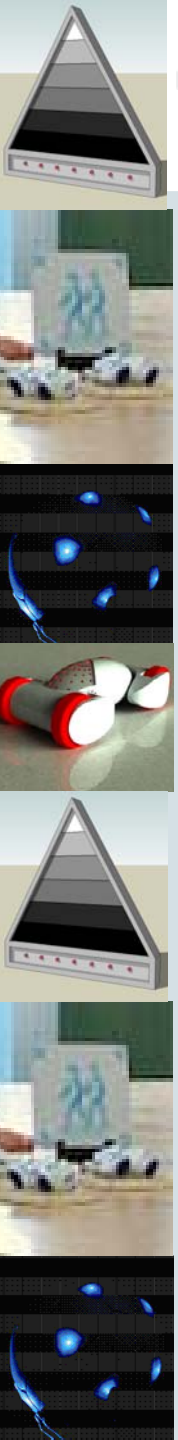
| Design Question | Method(s) | Measure | Conclusion |
|---|---|---|---|
| When? | Obervation-<br>Interview | Positive/negative behaviours<br>Questions x and y | Combine obs. and answers |
| Why? | Observation-<br>Interview | Questions x and y | Combine answers |

# 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



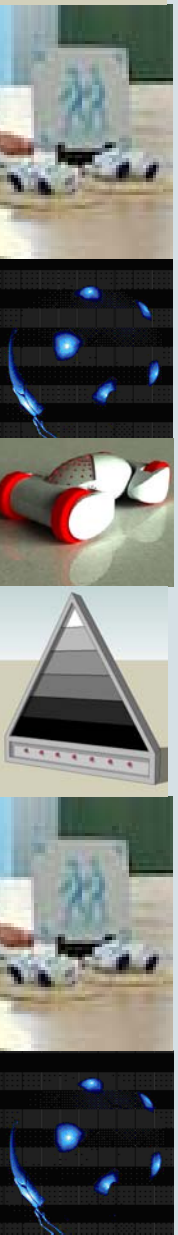
Jeroen Witjes



# 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

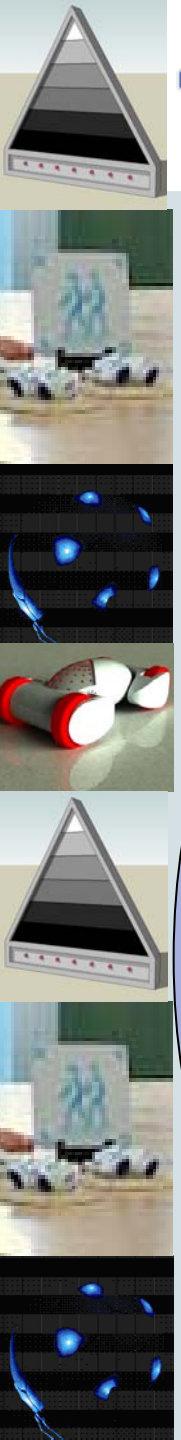
# Design Research Example: Middle

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

(Eva Hopma)

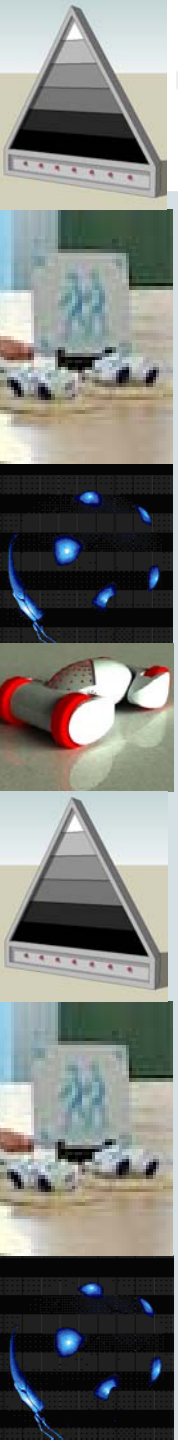
# Design Research Example- Middle

- 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



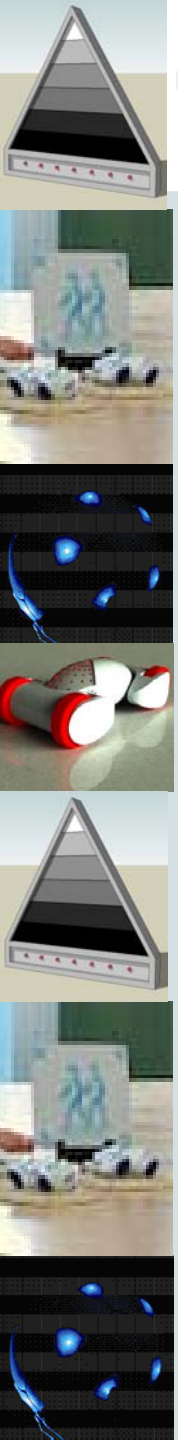
# Design Research Example

- 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



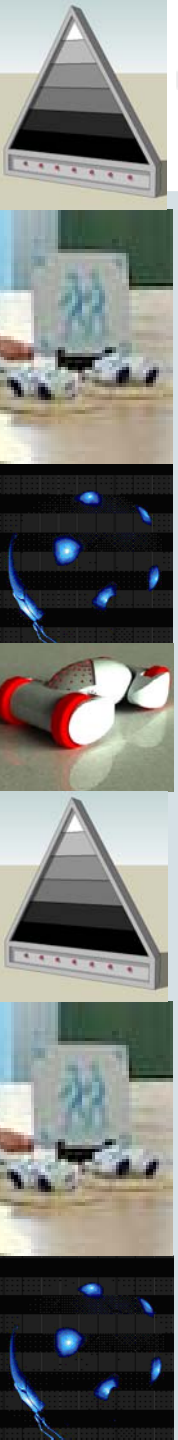
# Design Research – Plan - Coherence

| Design Question | Method(s) | Measure | Conclusion |
|---|---|---|---|
| Types and number of games | Obervation-<br>Interview | Questions<br>Questions x and y | Combine obs. and answers |
| Fun | Observation-<br>Interview | Positive comments<br>Questions x and y | 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

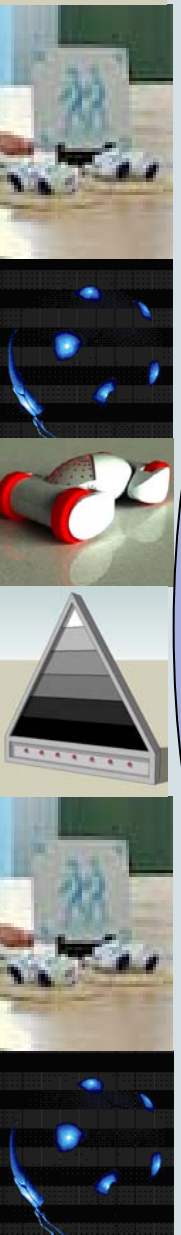
# Design Research Example- Late

- Design a communication device for elderly people -Leonie Hurkx

- Will people really use it?
- Theoretical basis:
  - Calm technology
  - Persuasion

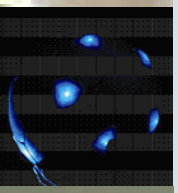
# Design Research Example- Late

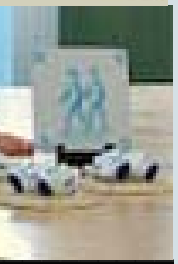
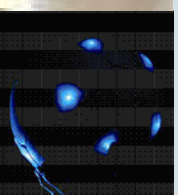
- Working prototype – …
- Communication device for elderly people - Leonie Hurkx
- Measures:
  - Understand the functionality and the feedback
  - Does the subtle cue work?
- Diary method – questions
  - Use of product
  - Consequences of use
- Interview
  - Understanding and enjoyment



# Design Research Example

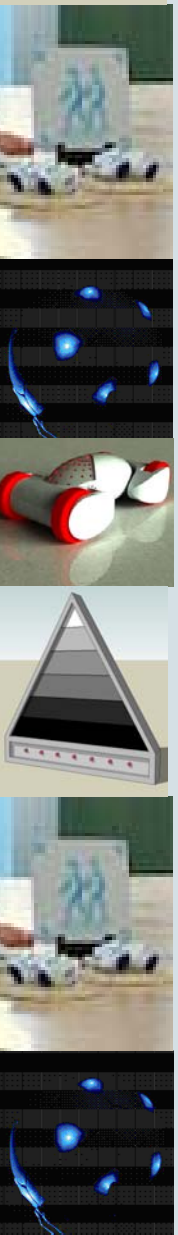
- Assumption: subtle information works to request a partner.
- Set-up:
  - Diary method and final interview
  - 2 pairs of elderly
  - Measure: questions whether elderly
    - Understand the concept and the feedback
    - Actually go and do things together
  - Answers: # elderly that understand concept, enjoy it's use (or not), would like to have it, etc.

# Design Research - Plan

| Design Question | Method(s) | Measure | Conclusion |
|---|---|---|---|
| Understand | Diary -<br>Interview | Questions<br>Questions x and y | Combine obs. and answers |
| Conse-quences | Diary-<br>Interview | Positive comments<br>Questions x and y | Combine obs. and answers |
| Appeal | Interview | Question z | Combine questions |



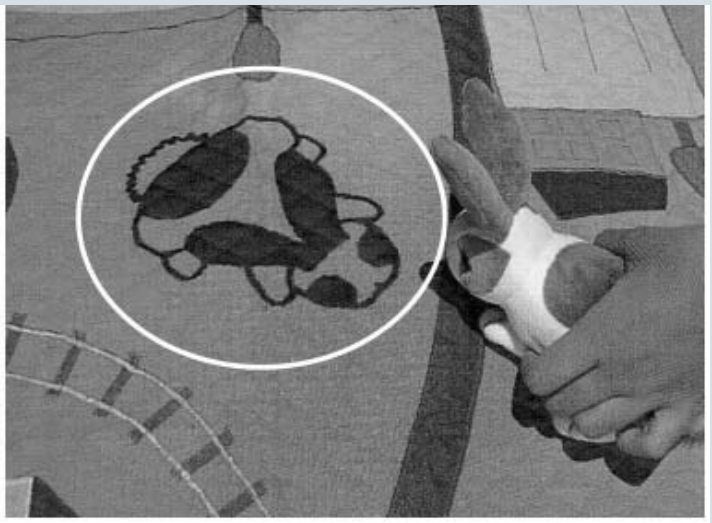
# Inspirational Design
# Researchers: Justine Cassell

Design for practising language

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

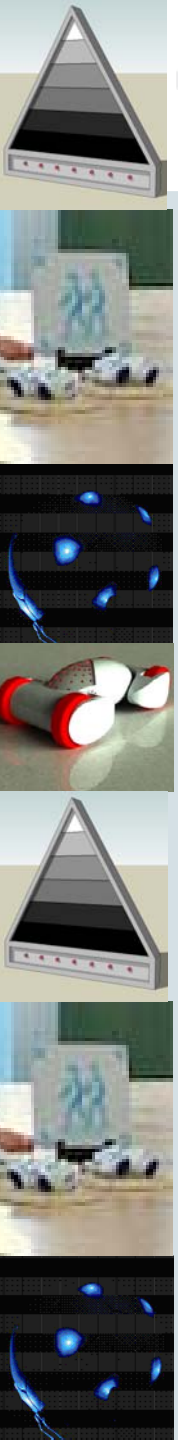
# Justine Cassell

- StoryMat
  - Literacy development
- Use real objects in stories
- Combine stories from different perspectives
  - Character-narrator



# Justine Cassell

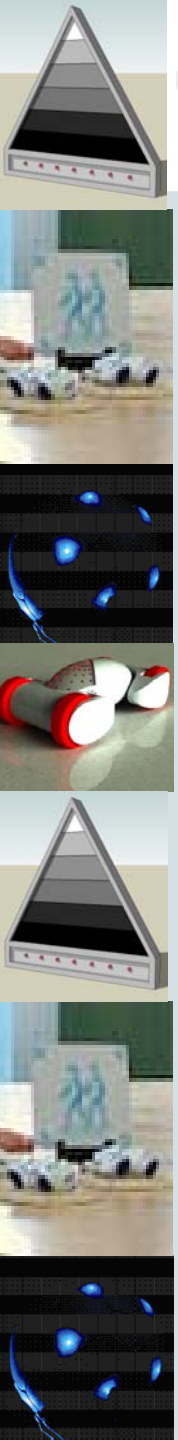
- Comparison of StoryMat with passive mat
- Positive influence on
  - Incorporating real objects in story
  - Using other children's concepts



# Outcomes of Design Research

- Improved concepts – Demonstrators
- Design knowledge

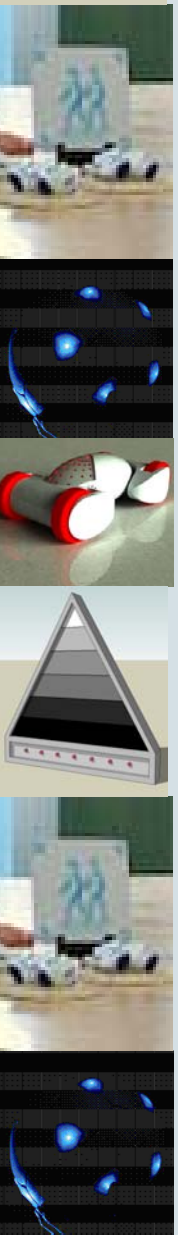
- Design Research Papers
  - Conferences
  - Journals
- Presentations and/or demonstrations
  - Conferences
  - Seminars
  - Festivals



# Other DR topics in assignment

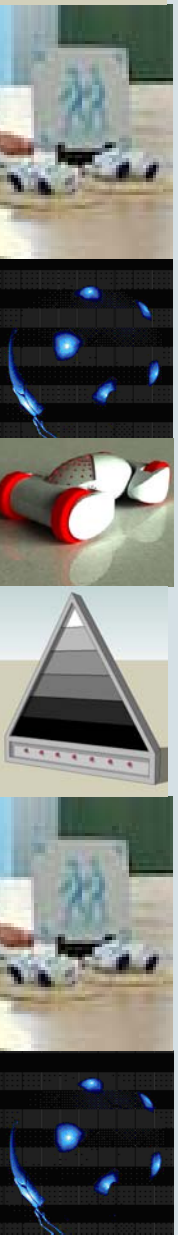
- Study set-up and subject sampling (Luyk)
- Data analysis (Bartneck)
- Relating research to design (Rozendaal)

- And more ……..



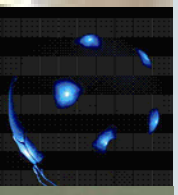
# Exercise: design research study (in pairs)

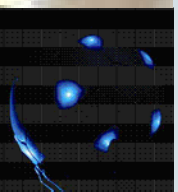
- Read background literature
- Plan a study set-up
- Gather data
- Do data analysis
- Draw conclusions
- Write up research process (deliverable)



# Study topics:

- Subjective knowledge and uability (Ilse Luyk)
- Experiencing teleworking from home (Marco Rozendaal)
- Open-ended play behaviour over time (Tilde Bekker / Janienke Sturm)

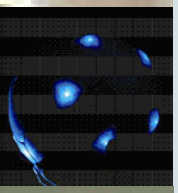



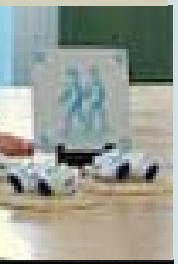
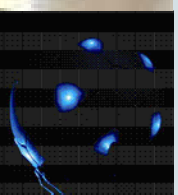



# The influence of subjective knowledge on Usability

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

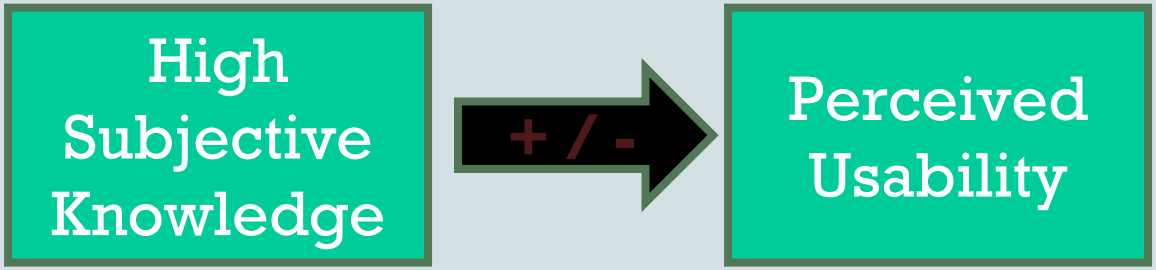
***How does subjective product knowledge of a user influence the perceived product usability in consumer electronics?***

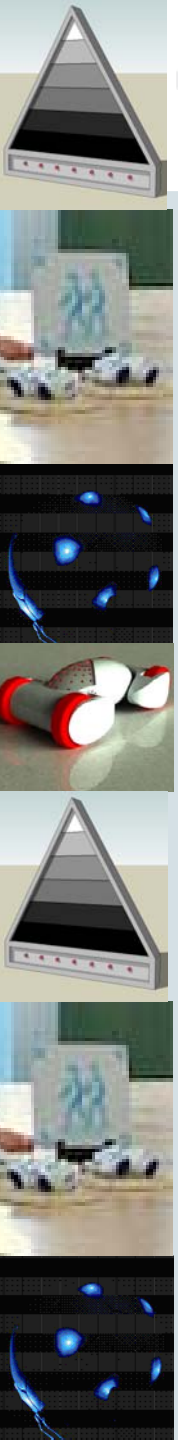
# Subjective Knowledge

- 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 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:

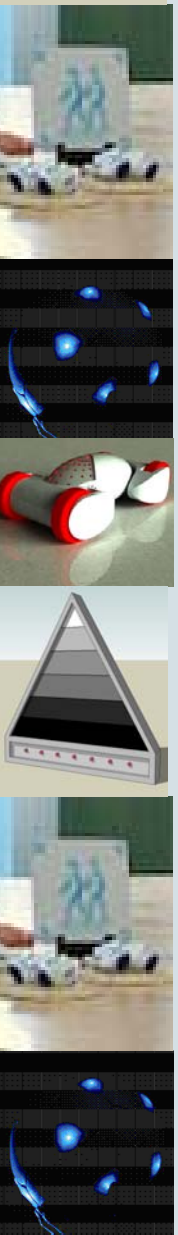
How will children's play behaviour change over time?

- 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

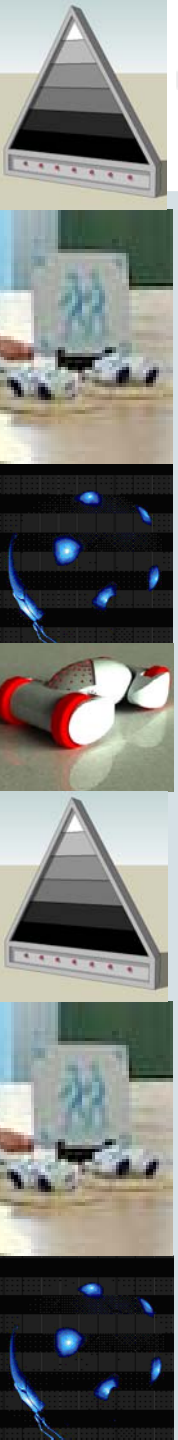
- Observations: video recordings
- Questionnaires

Code video data

- Type and number of games
- Social interaction levels (less to more)

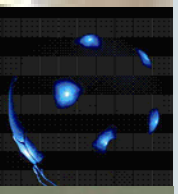
Change in behaviour:

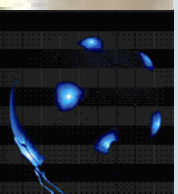
- 1st, 2nd and 3rd time use



# Students - projects - discussions

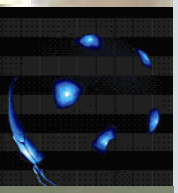
| | | |
|---|---|---|
| Loran Corsten (b21)<br>Rens van Deurssen (b21)<br>Vincent van Rheden (b21) | Discuss<br>(b22 students) | Ilse Luyk – Subjective Knowledge |
| Rico Minten (b22)<br>Fiona Jongejans (b22)<br>Frederique Oudkerk (b22) | Discuss<br>(b31 students) | Tilde Bekker – prolonged play behaviour |
| Joep Kalthoff (b31)<br>Joey van Dun (b31) | Discuss<br>(b21 students) | Marco Roozendaal – experience of teleworking |

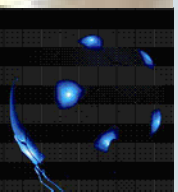



# Assignment schedule

| | | |
|---|---|---|
| 1 | Intro Design Research | Tilde Bekker |
| 2 | Set-up of studies / arrange subjects | Ilse Luyk |
| 3 | Discussion session set-up / pilot | all |
| | Week no assignment | |
| 4 | Statistics lecture / data gathering | Christoph Bartneck |
| 5 | Discuss data analysis and results | all |
| 6 | Relationship design process and hand in report (deadline Friday) | Marco Rozendaal |
| 7 | Discuss approach (by students) | All/ in Identity week |

# Resources

Literature:


- Ranjit Kumar, Research methodology, 1999.
- Imre Horváth (2007) COMPARISON OF THREE METHODOLOGICAL APPROACHES OF DESIGN RESEARCH, International Conference On Engineering Design, Iced'07 28 - 31 August 2007,Paris, France.
- Emans, B., 1990. Interviewen: theorie, techniek en training. Wolters-Noordhoff.
- Moustakas, C., 1994. Phenomenological research methods. Sage publications.