REFLEXION UND AKTION: BEOBACHTUNG UND ANALYSE KOMPLEXER DESIGNPROZESSE IN DER METHODENAUSBILDUNG

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TU Delft

AGENDA

- Einleitung
- Welche Kompetenzen braucht der Produktentwickler?
- Design Theorie und Methodologie
- Reflexion: Metaprozess für Methodenanwendung
- Veranstaltung Design Theory and Methodology
- Resumee

Delft
The Netherlands

Jan Vermeer, view of Delft, 1660-61

Faculty of Industrial Design Engineering

3 departments

- Industrial Design
- Design Engineering
- Product Innovation Management
  - **Section: Design Theory and Methodology**


De Faculteit

- Section:
  Design Theory and Methodology
- Department:
  Product Innovation Management PIM
- Faculty:
  Faculty of Industrial Design Engineering IDE
- http://www.io.tudelft.nl/dmg

Design Theory and Methodology Group

WELCHE KOMPETENZEN?

Interviews (Universität Bamberg & TU Darmstadt)

METHODE

15 halb-standardisierte Interviews

3 Hierachiestufen
3 Abteilungen

THEMEN

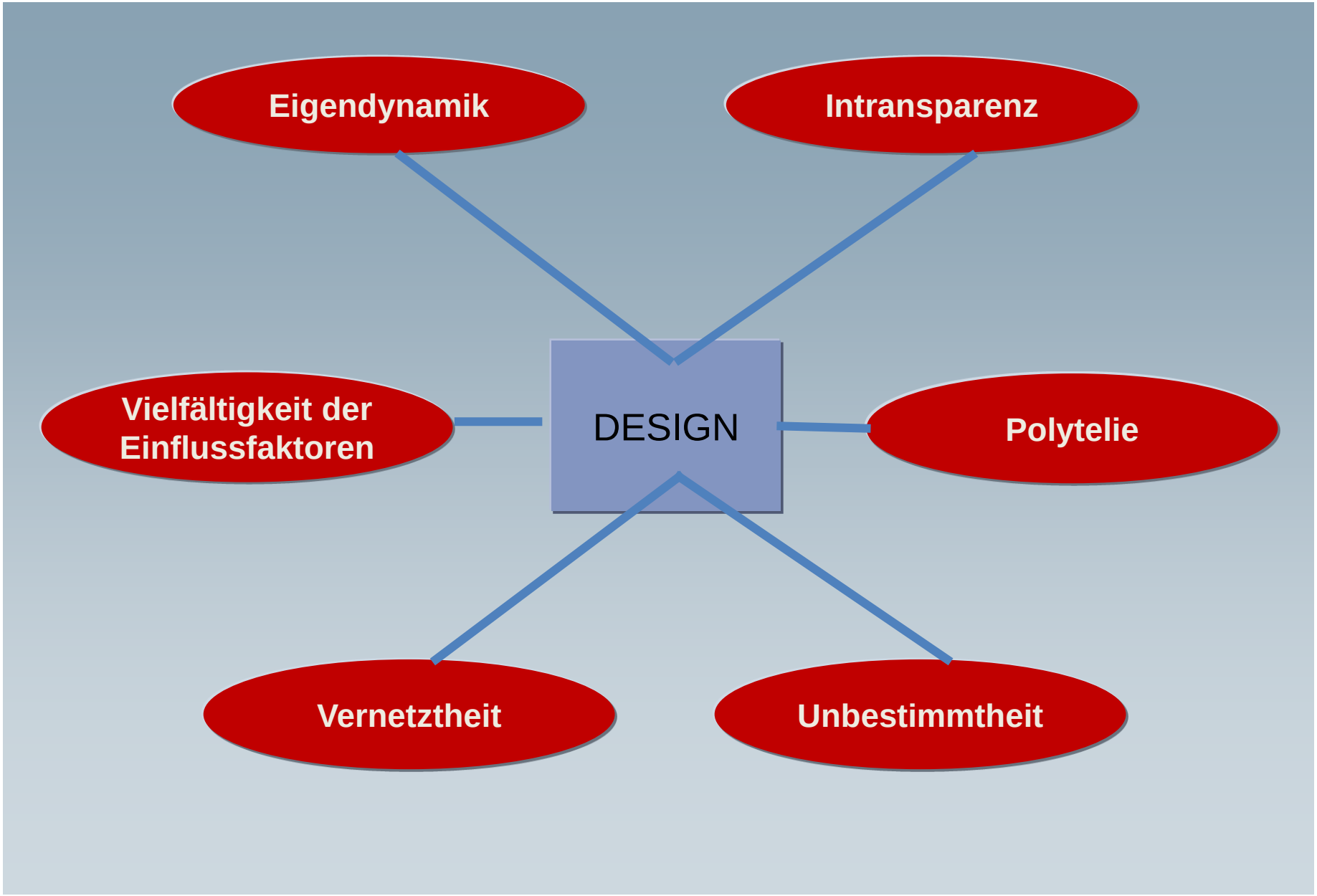
- Komplexität
- Zusammenarbeit im Team
- Zusammenarbeit zwischen Teams & Abteilungen

  Budget-Zuweisungen

  Entwicklung von Projektideen

Schwierigkeiten mit Komplexität

Topic	Aussagen
Schwierigkeiten ■ mit Intransparenz ■ mit Zieldefinition ■ mit Vernetztheit ■ bei Infosammlung ■ bei der Planung ■ aufgrund struktureller Bedingungen ■ mit unklaren Regeln und Verantwortlichkeiten ■ aufgrund der Führung	▪ Schwierigkeit, Überblick zu bekommen ▪ Geringe Informationsversorgung ▪ Unzureichende Zielkonkretisierung bei Projekten ▪ Planbarkeit gering ▪ Wegfall von Geldern ▪ Starkes Hineinwirken der Budgetsituation in Projektarbeit ▪ Verzögerte Entscheidungen ▪ Struktur erschwert Kooperation ▪ Hierarchie-Denken ▪ Schwacher Projektleiter


Eigendynamik
Intransparenz
Vielfältigkeit der Einflussfaktoren
DESIGN
Polytelie
Vernetztheit
Unbestimmtheit

CREATIVITY & INNOVATION

Einige Ergebnisse

Topic	Kritisch gesehen wird	Konsequenzen
Projekt-Bündelung	→ Trend zu größeren Projekten, die als Klammer für die einzelnen Teilprojekte fungieren	→ thematisch haben die einzelnen Teilprojekten wenig bis nichts mehr miteinander zu tun
Verhältnis Linie-Projekt	→ Spannungsverhältnis zwischen inhaltlichen Anforderungen und Interessen der Abteilungen ausgesetzt	→ darunter leidet die inhaltliche Arbeit in den Projekten // → Einfluss der Linie setzt sich häufig durch
Adhocismus anstatt Strategie	→ Trend zu kurzfristigeren Einsätzen bei Kunden	→ Langfristige Visionen gehen verloren
Problembereich Zieldefinition	→ Die Zielausrichtung wird als zentrales Problem in der Projektarbeit (sowohl innerhalb des Labs als auch mit dem Kunden gesehen)	→ Einige Ursachen: • Unklare Strategie • Interessens-Einflüsse • Faktor Kunde • Zeitdruck

Zusammenarbeit zwischen Abteilungen

Um, .. the designer and the marketing manager are just working out the last details,..

Projektarbeit allgemein

Topic	Kritisch gesehen wird
Schwierigkeiten in Projektarbeit	■ Finanzen und Zeitdruck beeinflussen häufig Entscheidungen bei Kundenprojekten
Einflüsse auf Entscheidungen	■ Firmenpolitik als häufigster Einflussfaktor bei langfristigen Projekten
Ursachen von Konflikten	■ Zeitdruck und Bereichsdenken sind häufige Konfliktursache mit Kunden

DESIGN THEORY AND METHODOLOGY

Was ist Design Methodology?

„Design Methodology aims to provide the designer with a well-structured procedure and thus to organise the design process effectively and efficiently.”

Prof. Nigel Cross

Two aspects of design methodology as discipline

1. how designing should be conducted

- develop **appropriate**
- structures, methods, techniques, and procedures

PRESCRIPTIVE

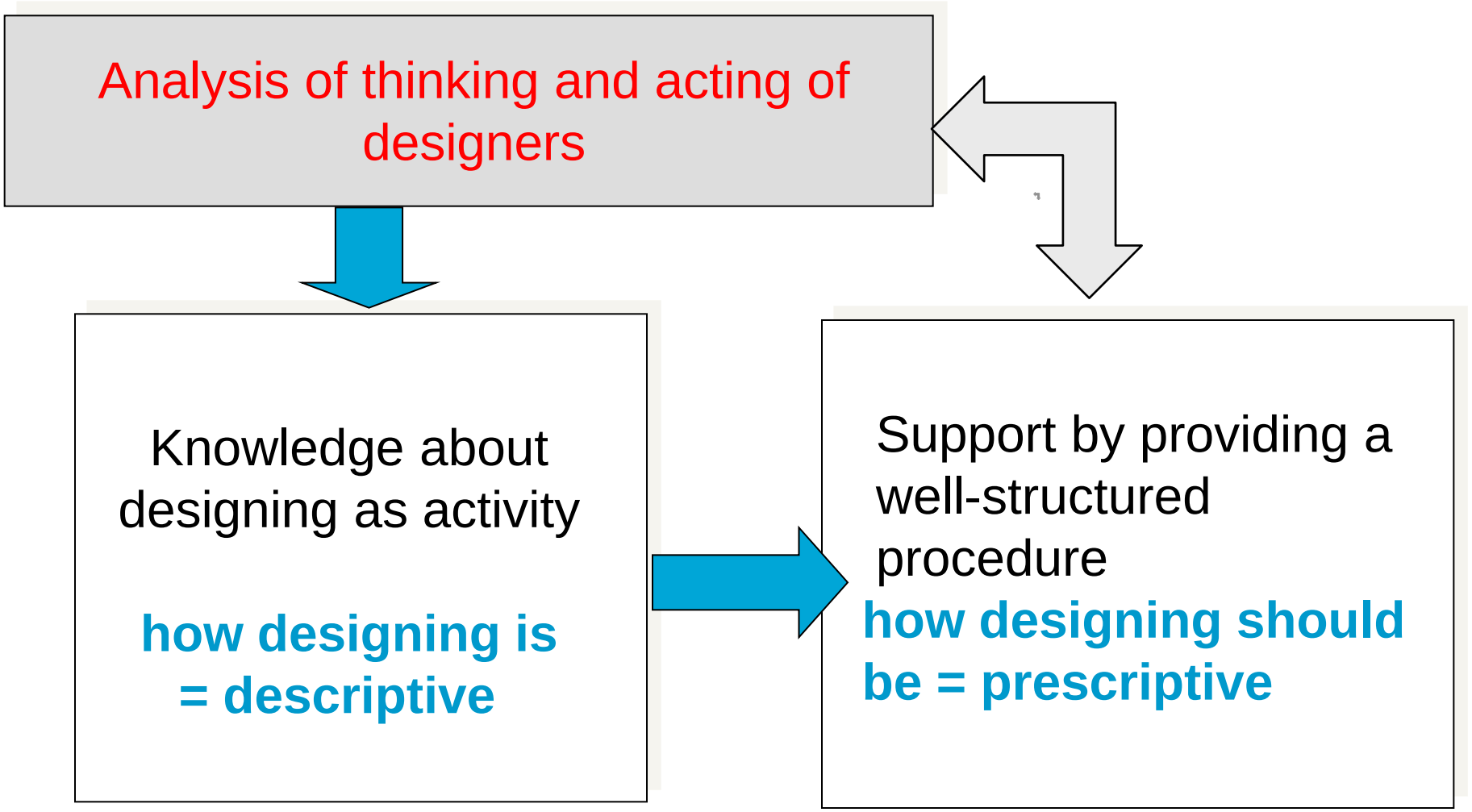
Two aspects of design methodology as discipline

2. how designing is

- how designers work and think
- influences on designers' working and thinking

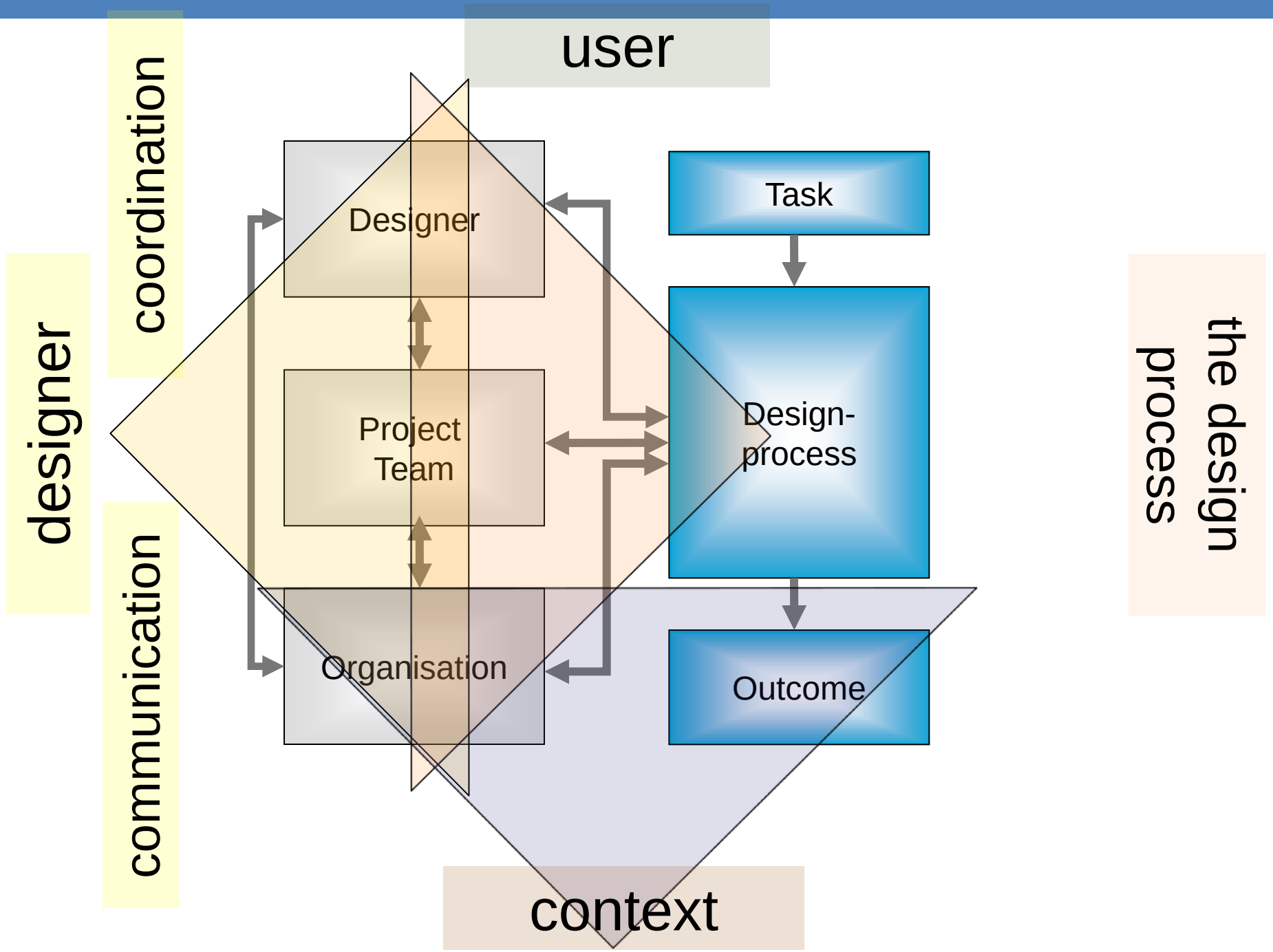
DESCRIPTIVE

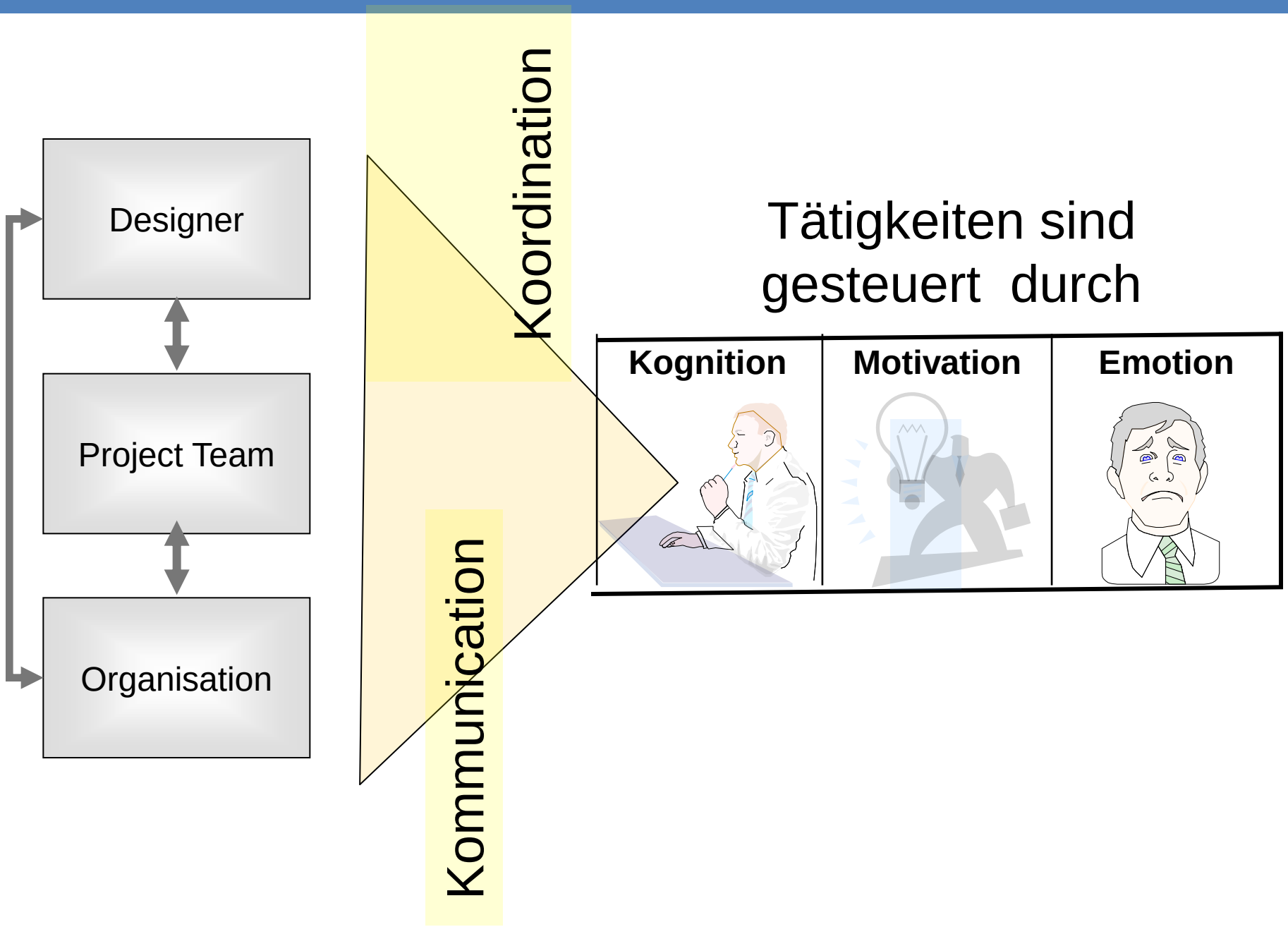
Design research



IST DAS WISSEN ÜBER DEN INDIVIDUELLEN DESIGNER AUSREICHEND?

- Kontext
- Team
- Organisation


user
coordination
designer
the design process
Designer
Task
Project Team
Design-process
Organisation
Outcome
communication
context


Designer
Project Team
Organisation
Koordination
Kommunication
Tätigkeiten sind gesteuert durch
Kognition
Motivation
Emotion

Methodology should support designing

1. in terms of the **process**:

by providing an organized set of principles, procedures and guidelines recommended for one or more phases of the design process

2. in the head of the **designer**:

by addressing a kind of meta-knowledge which enables the designer to reflect direct, evaluate and modify his/her thinking and acting while designing.

Methodology should support designing

3. as a social process by addressing the social context of designing

- team-internal factors (roles and responsibilities, diversity, leadership) and
- team-external factors (coordination and cooperation between stakeholders)

REFLECTION ALS META-STRATEGIE IN DER PRODUKTENTWICKLUNG

- Einfluss zur Veränderung von Verhalten: schwierig
- Vorurteile gegenüber Methoden
- Kreativität als Teil der Selbstdefinition des Designers

Empirische Studien

Reflexion verbessert Designleistung des Individuums

Wetzstein & Hacker (2004)

prompts to describe, explain, justify and evaluate their solutions by questions from partner significantly improved design quality afterwards

Winkelmann & Hacker (2009)

question-answering technique / checklist for requirements brought novice performance to same level as experts

Questions to stimulate reflection:

- How does this work?
- Why did you do it like this?
- Which advantages and disadvantages does this solution have?
- What could a better solution look like?

Reflexion verbessert Qualität von Lösungen im Team

- Busseri & Palmer (2000) Design Studies
- reflection / structured self-assessment half way through a design task improved outcome in teams

- **Questions for self-assessment:**
- How are group members' professional backgrounds affecting their contributions to the task?
- To what extent is the group dealing with all ideas that are raised?
- How aware is the group of its progress on the task?
- To what extent is each group member contributing?
- How organised is the group's approach to the task?

Not only procedures but also reflection

„Design Methodology aims to provide the designer with a well-structured procedure and thus to organise the design process effectively and efficiently.”

Nigel Cross

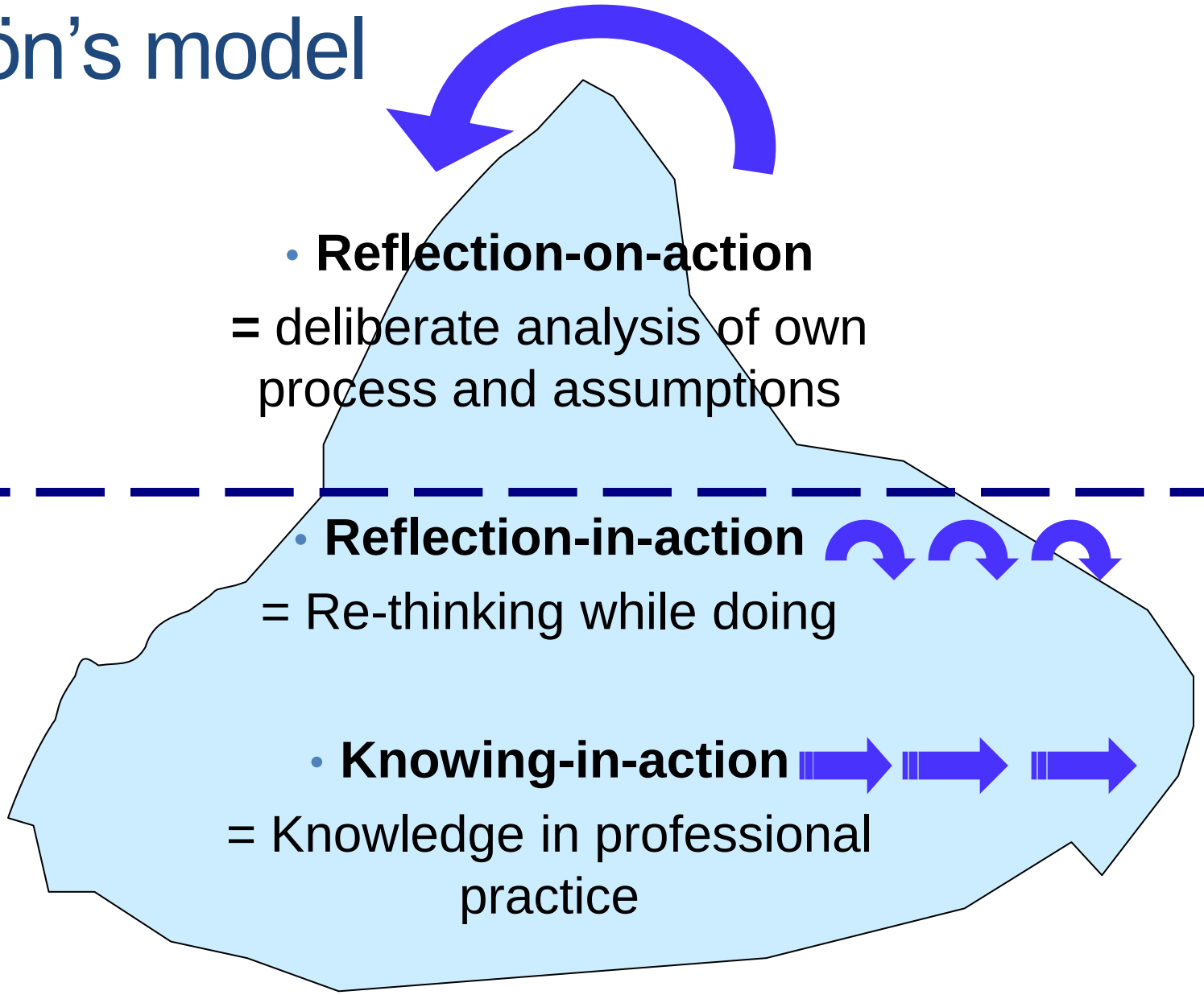
DM should encourage the designer to reflect on his/her own design process.

"Learning doesn't happen from failure itself but rather from analyzing the failure, making a change, and then trying again.“

- Reflection

INTERMEZZO: REFLEXION

Schön's model



Wann reflektieren Menschen?

“das ist anders als ich erwartet hatte, …!”

Selbstreflexion

Erfolg

Misserfolg

Inkonsistenz

= Überraschung

+

Wichtigkeit

Wann reflektieren Menschen nicht?

Keine Selbstreflexion

- Gegenwart anderer
- Misserfolg
- Leistungs-druck
- Zeitdruck
- Fehlende Kompetenz

Selbstreflexion

prospective

Analyse

Selbstinstruktion

SELBSTREFLEXION

retrospective

Rekapitulation

"So far I have started from scratch four times"

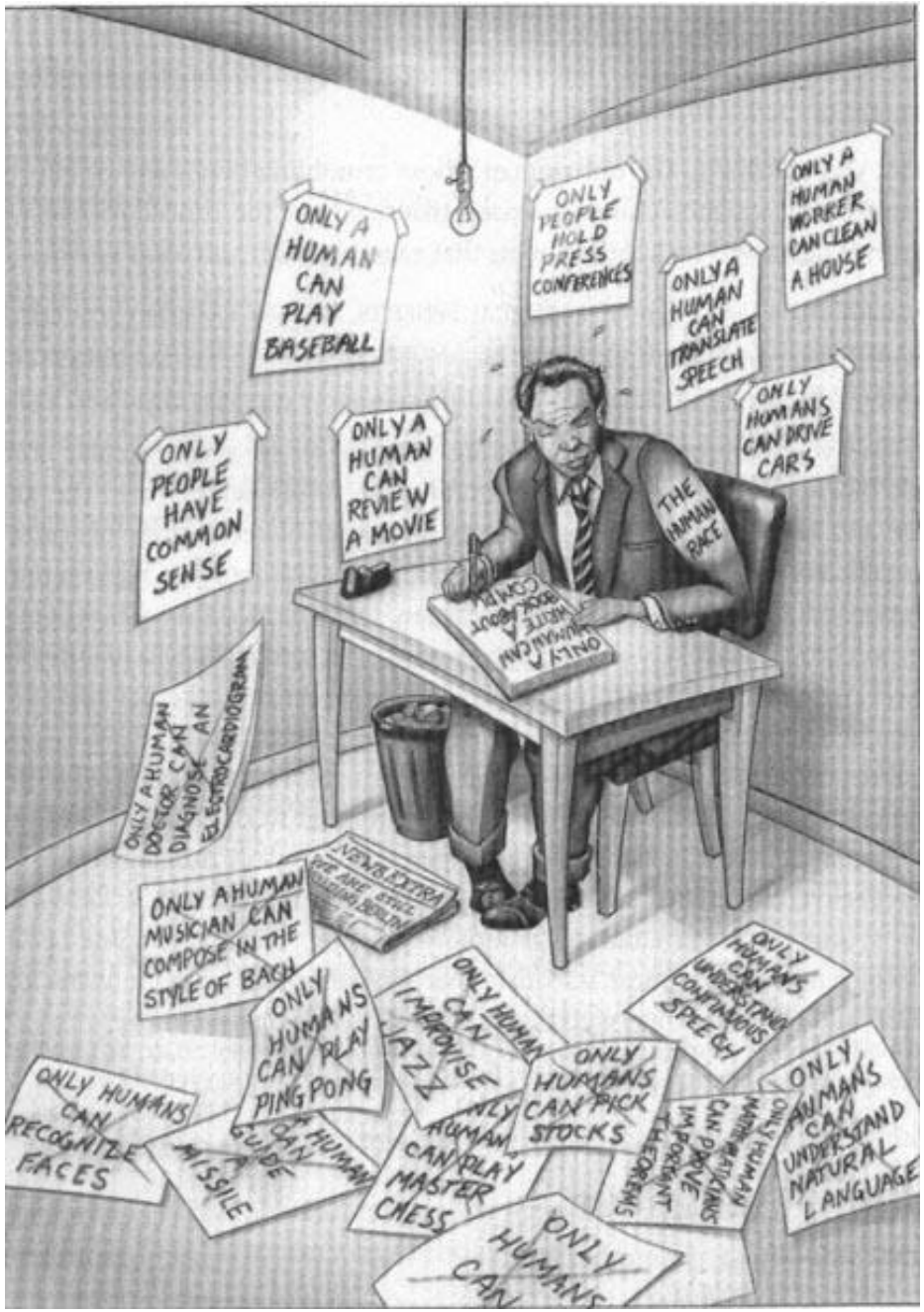
Selbstevaluation

"I am going round in circles, I have no idea what's going on"

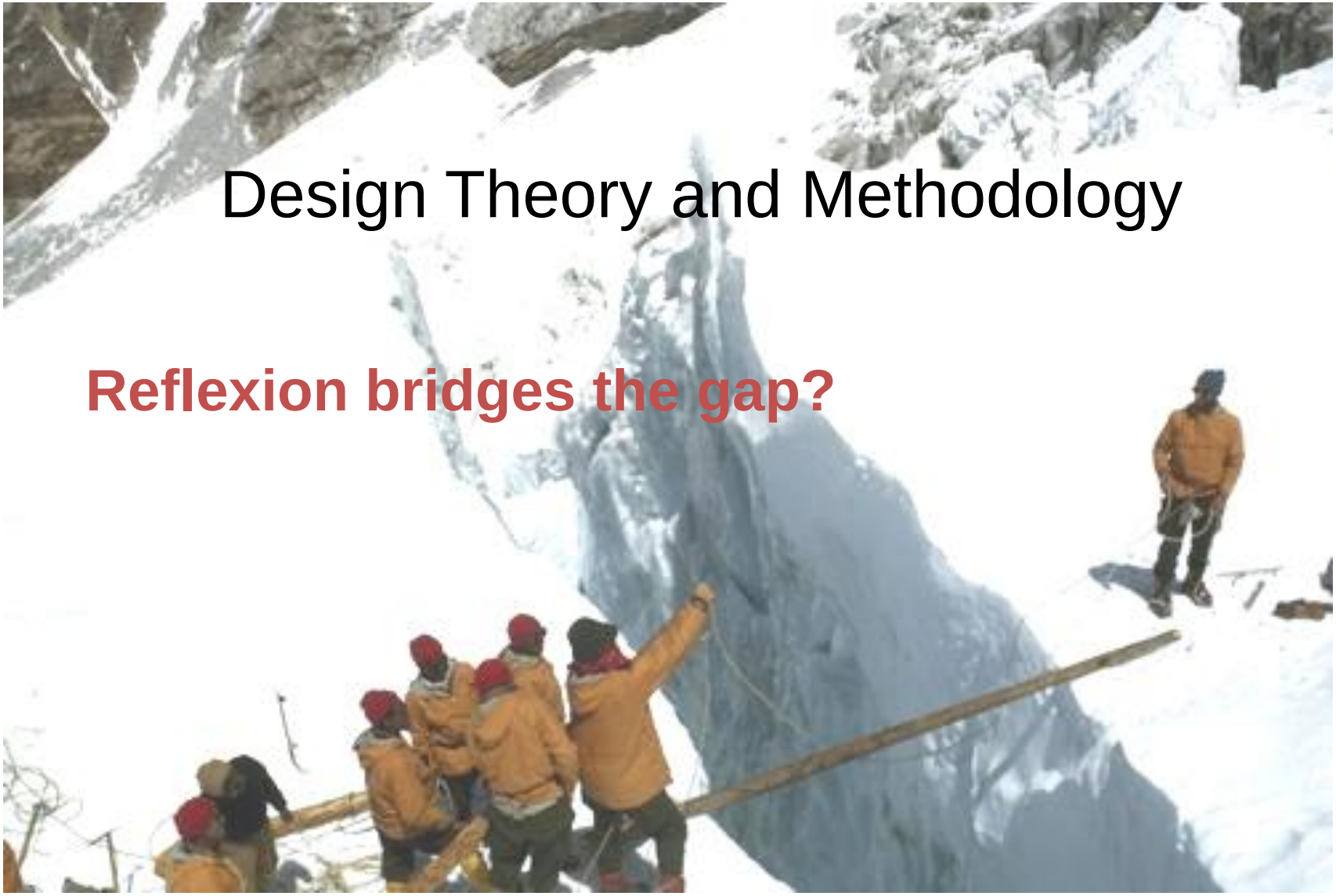
Analyse von Ursachen

searching for causes of behaviour patterns

Only humans can reflect about their own thinking processes



Design Theory and Methodology



Reflexion bridges the gap?

2009

WIE?

The objectives of the Delft Design Guide are threefold

- design students can use it as a ‘first aid’ in their design projects, managing their personal development of becoming a designer
- design tutors can use it as a reference manual to support students in their learning process
- professional designers can user the design guide as a reference manual to support their design processes.

- The Design Guide presents an overview of product design approaches and methods used in the Bachelor and Master curriculum at the faculty of Industrial Design Engineering in Delft.

- Product design at Industrial Design Engineering in Delft is regarded as a systematic and structured activity, purposeful and goal-oriented. Due to its complexity, designing requires a structured and systematic approach as well as moments of heightened creativity. In this guide we restrict ourselves deliberately to approaches we teach in Delft.

HTTP://OCW.TUDELFT.NL/COURSES/PRODUCT-DESIGN/DELFT-DESIGN-GUIDE/COURSE-HOME/

Lehrinhalte (1): Wissen

1. Theoretische Konzepte

- Design als komplexer Problemlöseprozess
  - Einschränkungen menschliches Denken und Handelns
- Design als allgemeiner Vorgehensplan
  - VDI; Pahl & Beitz; Basic Design Cycle
- Design als Kommunikationsprozess
- Design als Koordinationsprozess

Lehrinhalte (2): Reflexion

1. Beobachtung und Reflexion von Designprozesssen

   - Reflexion und Analyse des eigenen Designprozesses
   - Reflexion und Analyse von Designprozessen anderer Personen

2. Erfahrung der Bandbreite verschiedener Designprozesse in unterschiedlichen Disziplinen

DESIGN THEORY AND METHOLOGY

1.Quartal, 1. Sem. Masters Pflichtveranstaltung

- Integrated product design
- Strategic product design
- Design for Interaction

- 320-340 Studenten, ca 20-25% international

Essentials DTM Course

1. Lectures
2. Reader
3. Tutorials
4. Assignments

Vorlesungen und Tutorials

- The lectures provide
  - material and examples
  - an introduction into the assignments
  - short instructions
  - theoretical background
- The tutorials provide
  - information for assignments to be completed
  - feedback about completed assignments

Reader

1. Design theory

- What is design?

2. Structuring the Design Process

- Guidelines: examples and intentions

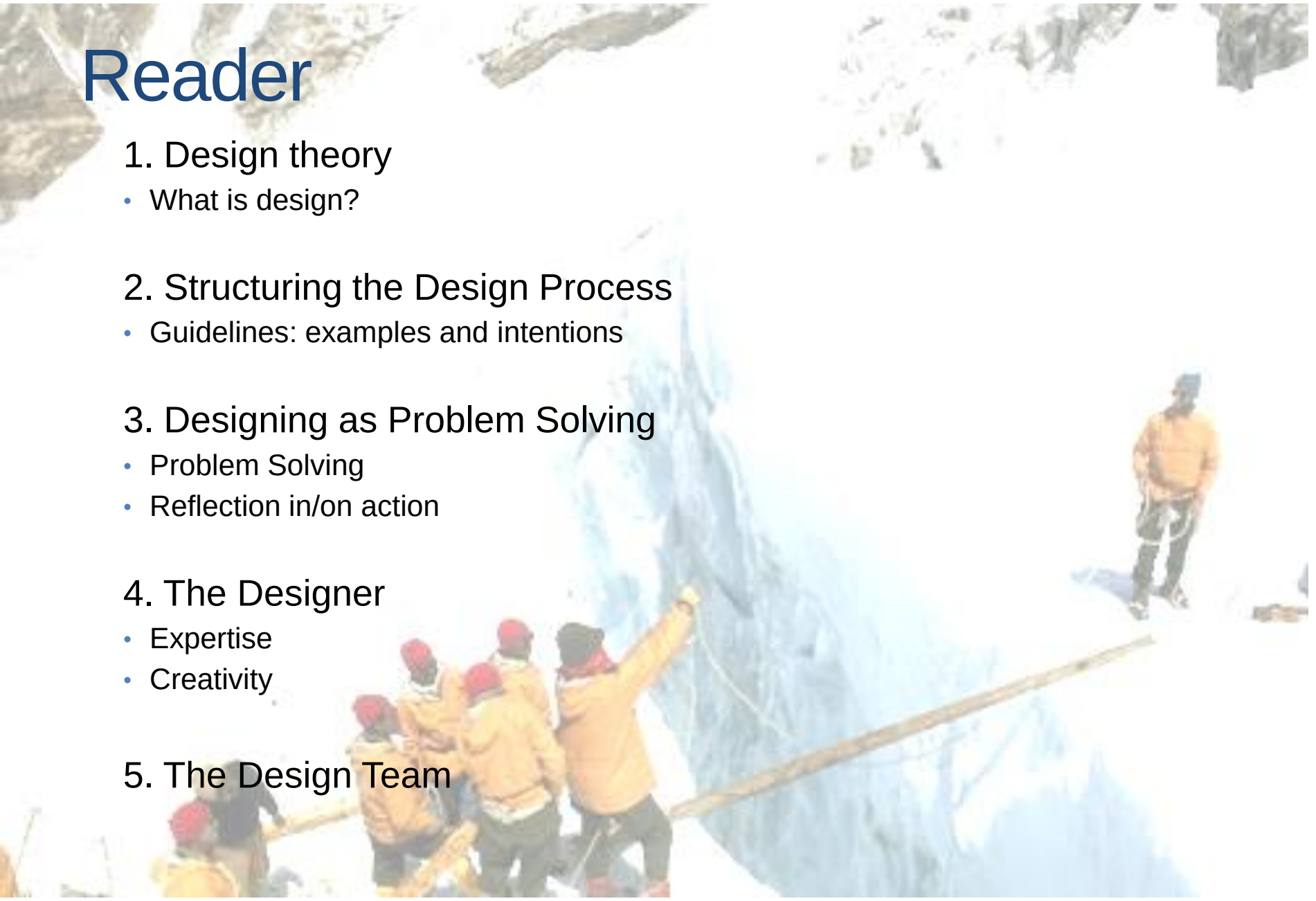
3. Designing as Problem Solving

- Problem Solving
- Reflection in/on action

4. The Designer

- Expertise
- Creativity

5. The Design Team



Assignments

- 3 Assignments
- All assignments are done in pairs.
- For each assignment it is required to read chapters in the reader.

First Assignment

Reflect on your own approach and views on designing as activity and compare it to the lectures ‘Methods in Practice’ and ‘Design Theory’

1. **Read Part I of the course reader**

2. **Individually reflect** on your own approach and view on design, f.e.:
   - How do you normally go about designing? How would you describe the process?
   - How do you think of design: do you see it mainly as art or as science, or as both, or something else? Etc.
   - Make notes and / or sketches on your views and approach.

First Assignment

3. Discuss your design approach and views **with your partner.**
   - What are the commonalities, what are the differences?
   - What do you see as the strengths and weaknesses of each?

4. Compare your individual approach and view to those presented **in the lectures 'Methods in Practice'** and **'Design Theory'** and the **literature in part I** of the reader.
   - What are strengths and weaknesses of what was presented? Are there aspects that you can also find in your own approach?

5. Write a **report** describing the individual design approach of both partners and summarise the comparison between you two, with the 'Methods in Practice' and the 'Design Theory' lecture and the literature in the reader.

Assignment 2
Video Analysis of a Design Process

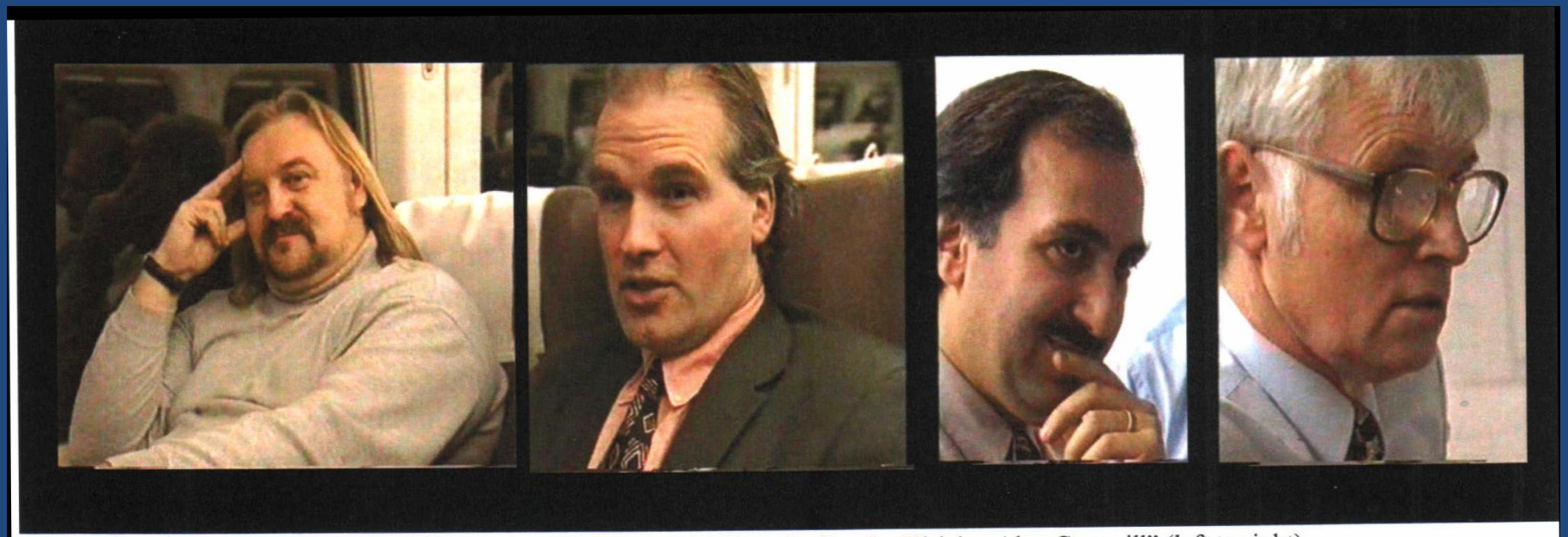
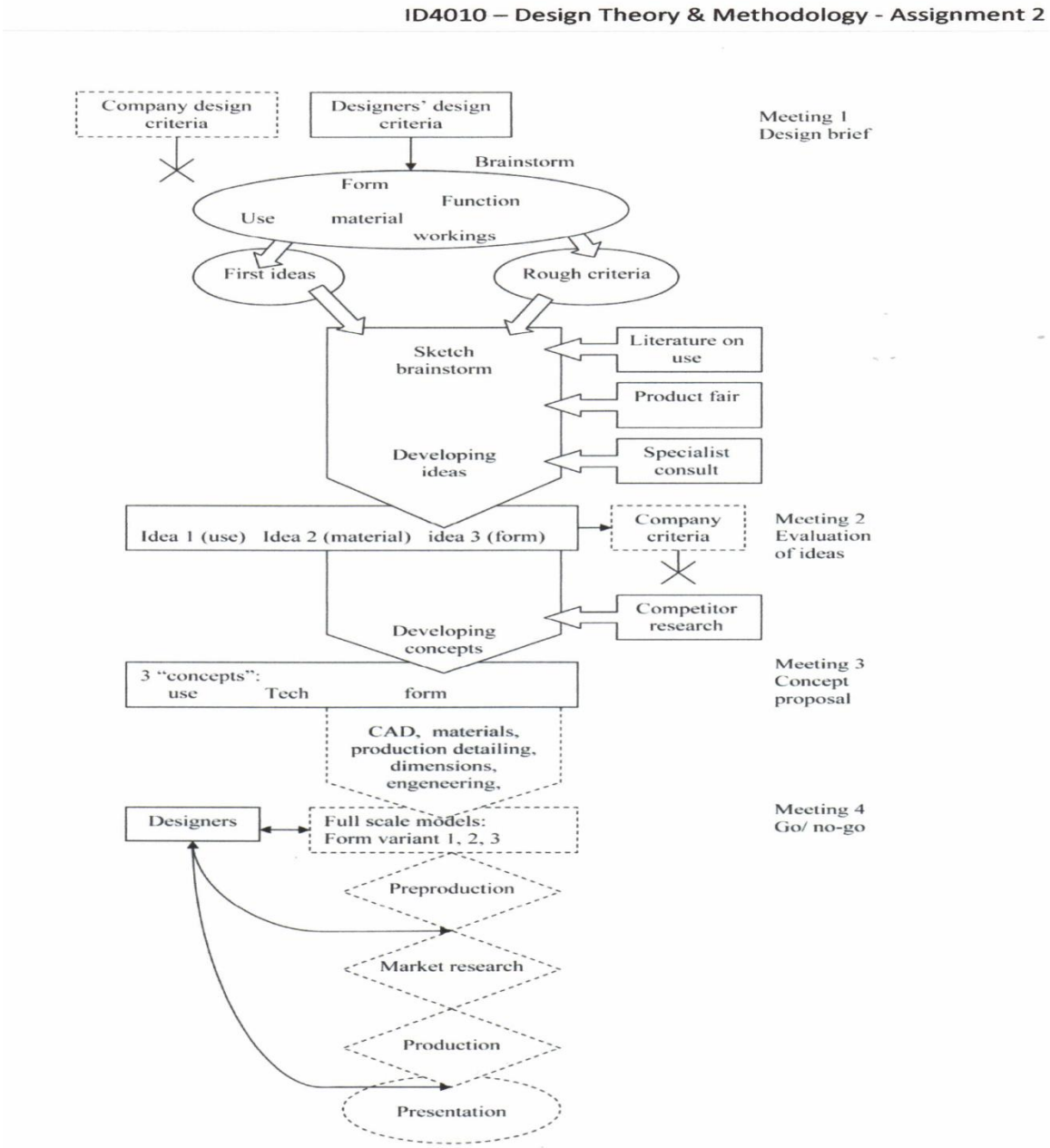


fig. 1: “The stars: Richard Seymour, Dick Powell, Charles Kiriaku, Alex Gemmill” (left to right)

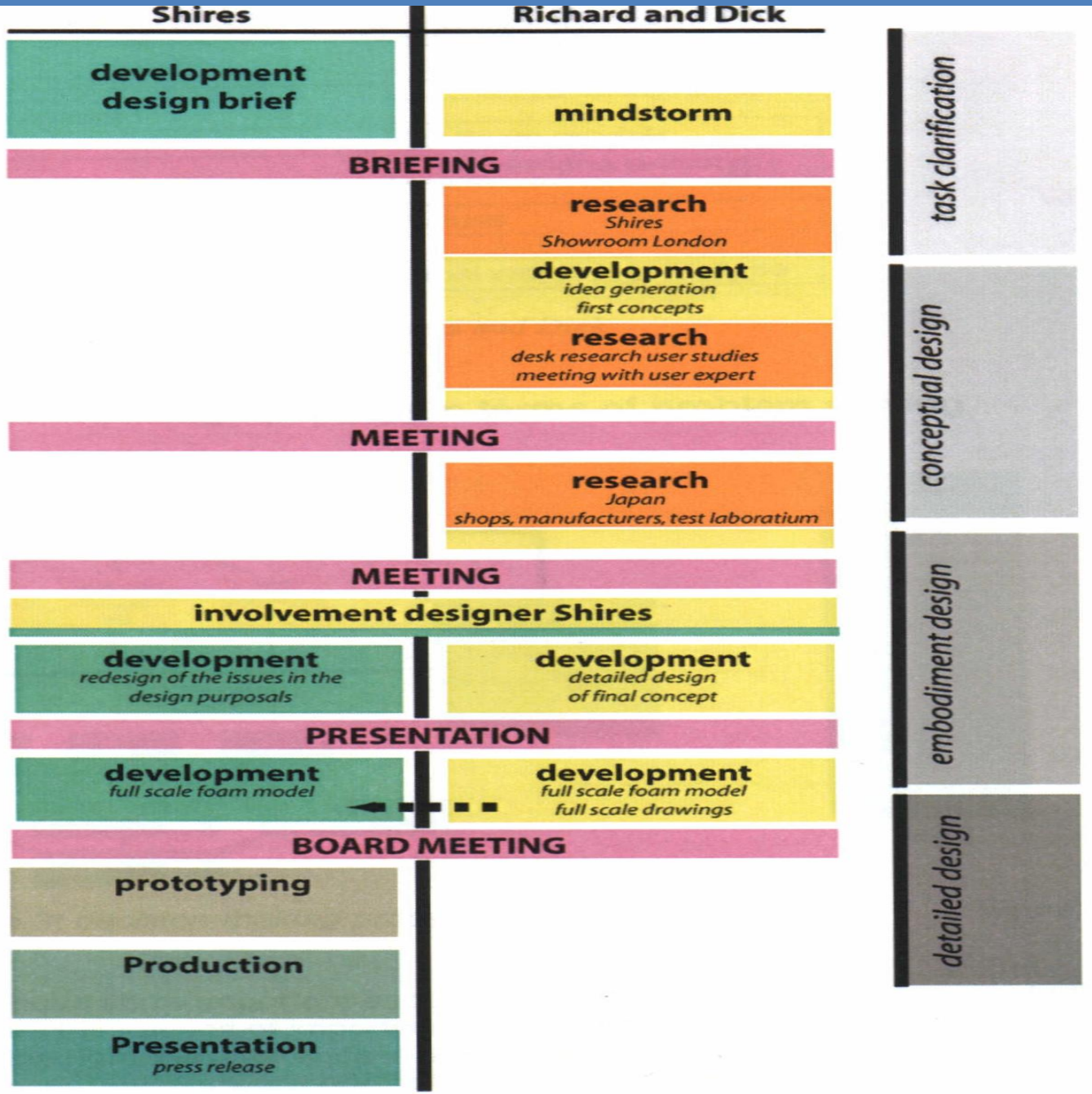
Assignment 2

1. **Produce a model of the design process in the video.**
2. **Discuss the design process in the video in terms of problem solving.**
3. **Discuss the design process in the video in terms of social aspects.**
4. **Strengths and weaknesses of the design process.**

Model


ID4010 – Design Theory & Methodology - Assignment 2
Company design criteria
Designers' design criteria
Meeting 1
Design brief
Brainstorm
Form
Function
Use
material
workings
First ideas
Rough criteria
Sketch brainstorm
Literature on use
Product fair
Developing ideas
Specialist consult
Idea 1 (use) Idea 2 (material) idea 3 (form)
Company criteria
Meeting 2
Evaluation of ideas
Competitor research
Developing concepts
3 "concepts":
use
Tech
form
Meeting 3
Concept proposal
CAD, materials, production detailing, dimensions, engeneering,
Designers
Full scale models:
Form variant 1, 2, 3
Meeting 4
Go/ no-go
Preproduction
Market research
Production
Presentation

Model


Shires
Richard and Dick
development
design brief
mindstorm
BRIEFING
research
Shires
Showroom London
development
idea generation
first concepts
research
desk research user studies
meeting with user expert
MEETING
research
Japan
shops, manufacturers, test laboratium
MEETING
involvement designer Shires
development
redesign of the issues in the
design purposals
development
detailed design
of final concept
PRESENTATION
development
full scale foam model
development
full scale foam model
full scale drawings
BOARD MEETING
prototyping
Production
Presentation
press release
task clarification
conceptual design
embodiment design
detailed design

Model

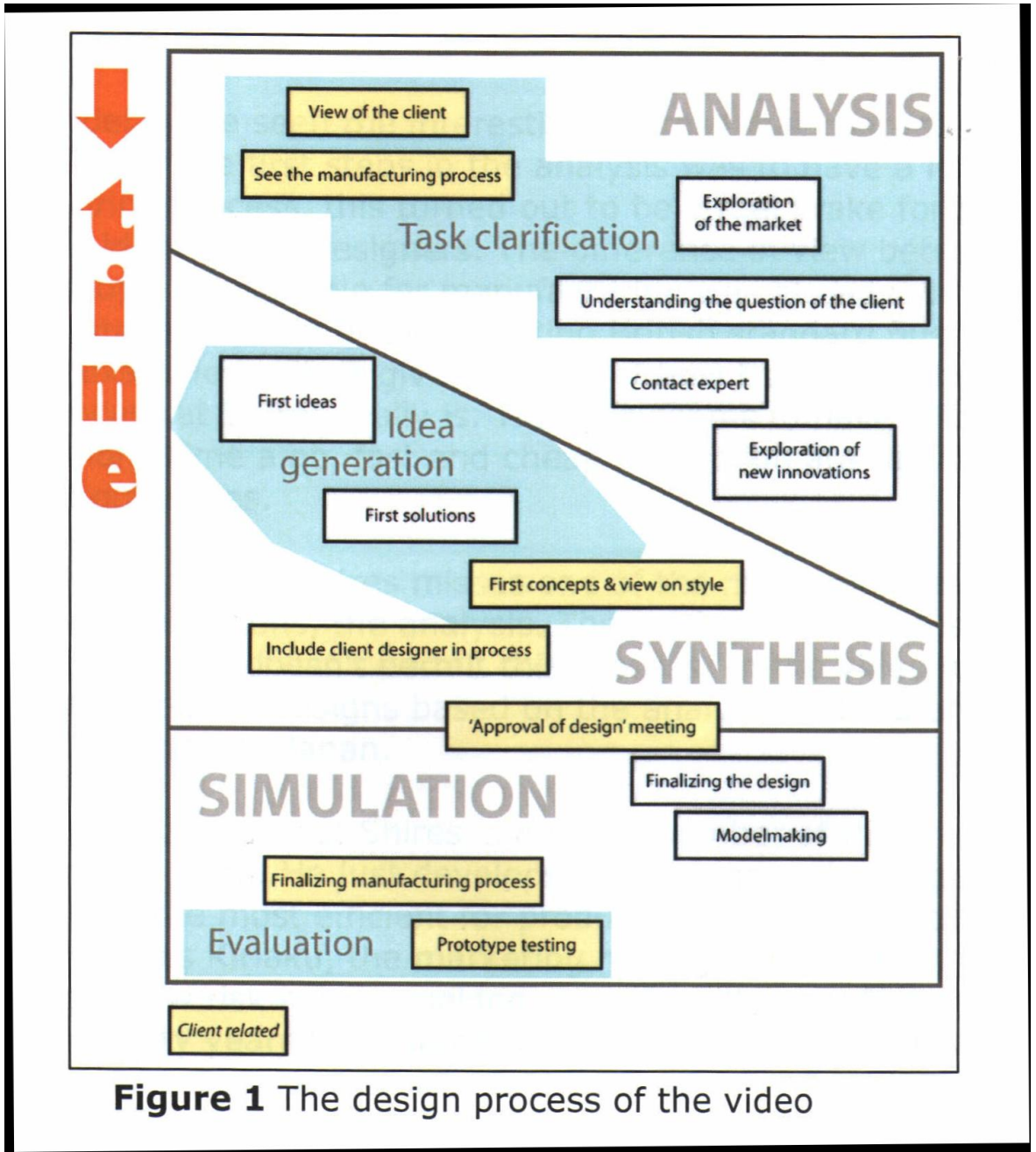


Figure 1 The design process of the video

Evaluierung: max. Anzahl der Punkte = 10

Criteria	Point available	Points achieved
1. Comparison of the design process in the video against their own individual processes: • visual representation of both students' design process; • visual representation of S&P's process including the client); • description of processes (in addition to diagrams) • discussion of processes - most remarkable things, similarities and differences between approaches)	1.5	
2. Discussion of the design process in video in terms of methods in practice (Hilti): • Seyour&Powel: external designers with inexperienced, conservative client vs. Hilt's internal product development, focus on end user via direct sales force • Hilti as structured / stage-gate process, engineering, methods as a mean to reduce risk and compensate for human limitations; deliberate about when to use which method • Seyour & Powell more opportunistic, intuitive, pragmatic, emphasis on thorough exploration of problem and solution space • challenges these different companies/industries face in light of the processes and methods they use; • discussion of S&P's and Hilti's processes - most remarkable things, similarities and differences between approaches.	1.5	
3. Analysis of process (video) in terms of design methods • give evidence of have studied part II of the reader • students sufficiently master methodological terminology • students discuss S&P's process in terms of a problem-solving model, like the basic design cycle • discuss the phases of S&P' process (and the client's process) in terms of one or more phase-models (engineering-type and/or Industrial Design Type) • demonstrate a proper understanding of similarities and differences between these models and their applicability to practice	2.5	
4. Analysis of process (video) in terms of problem solving • students discuss S&P's process in terms of general requirements of complex problem solving • refer explicitly to important characteristics of designing • discuss 1-2 limitations of human beings in regard to the designers in the video and to their own design process	2.5	
5. Formal qualities of report, use of English • structure, layout, readability • up to 1 point can be deducted for late hand-in not agreed before	2	
Total	**10**	

Third assignment

1. Identify topics of your interest

Review all your reading and assignments in the course so far, and try and draw out some general themes or specific topics that have interested you during the course.

2. Data collection

Select two designers to interview with your prepared questions, preferably from disciplines outside industrial design engineering.

Record your interviews.

3. Analysis

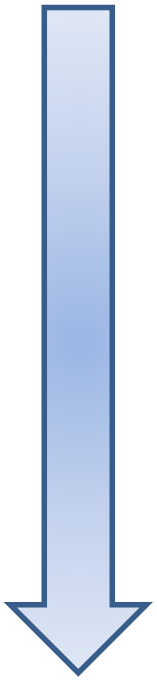
Listen back to your interview recordings; don’t rely on remembering what was said! Make notes from your recordings. Try and relate what was said by the designers to the themes you identified earlier. Describe the results of the interviews in your own words.

Design Theory & Methodology

Assignments

1. Describe your own design process
2. Observe, describe and analyse the design process of other designers.
3. Interview designers from different design disciplines

Focus on



the own design process

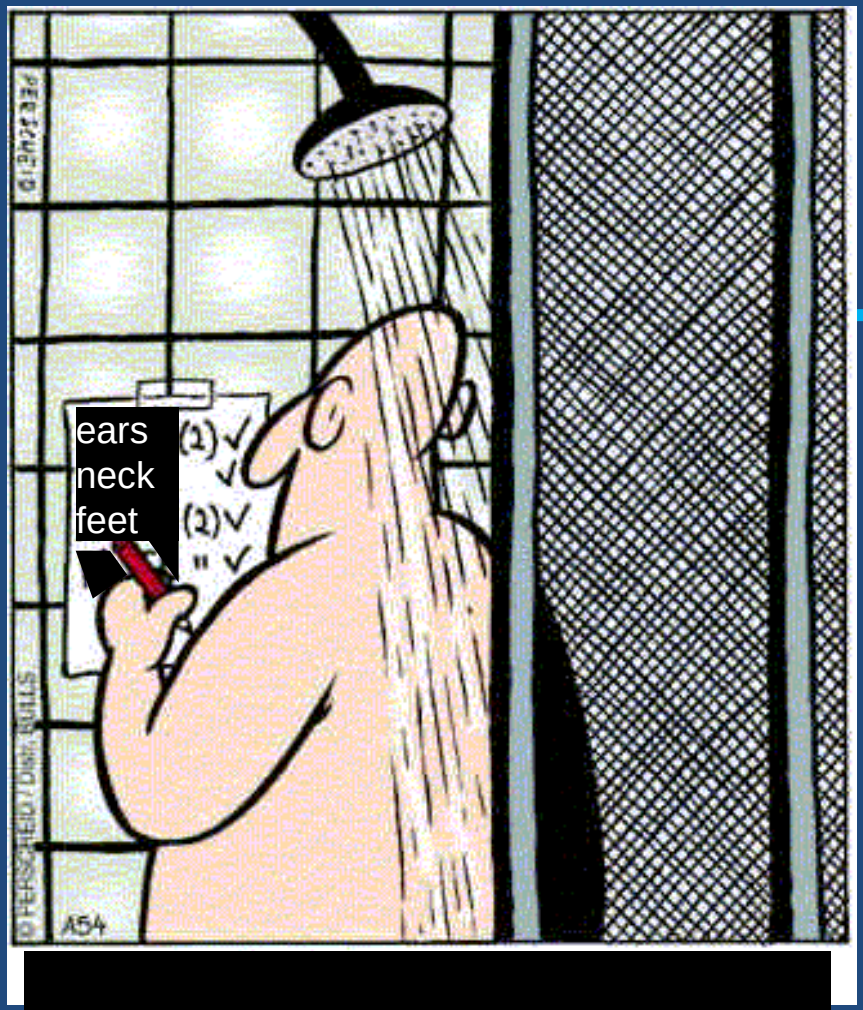
the design process of others

broadens the view

Students' evaluation

Lectures	Reader	Assign-ments
+	0 bis -	++

Methoden sind wichtig aber:



Sapere aude!

„Habe den Mut dich deines eigenen Verstandes zu bedienen!“

Immanuel Kant (1783)

Structuring and Reflection

the aggregation of elements to patterns

- reduces complexity
- enhances repeatability
- increases certainty

the analysis of the own thinking and acting

- ❖ increases complexity
- ❖ enhances repeatability
- ❖ decreases certainty

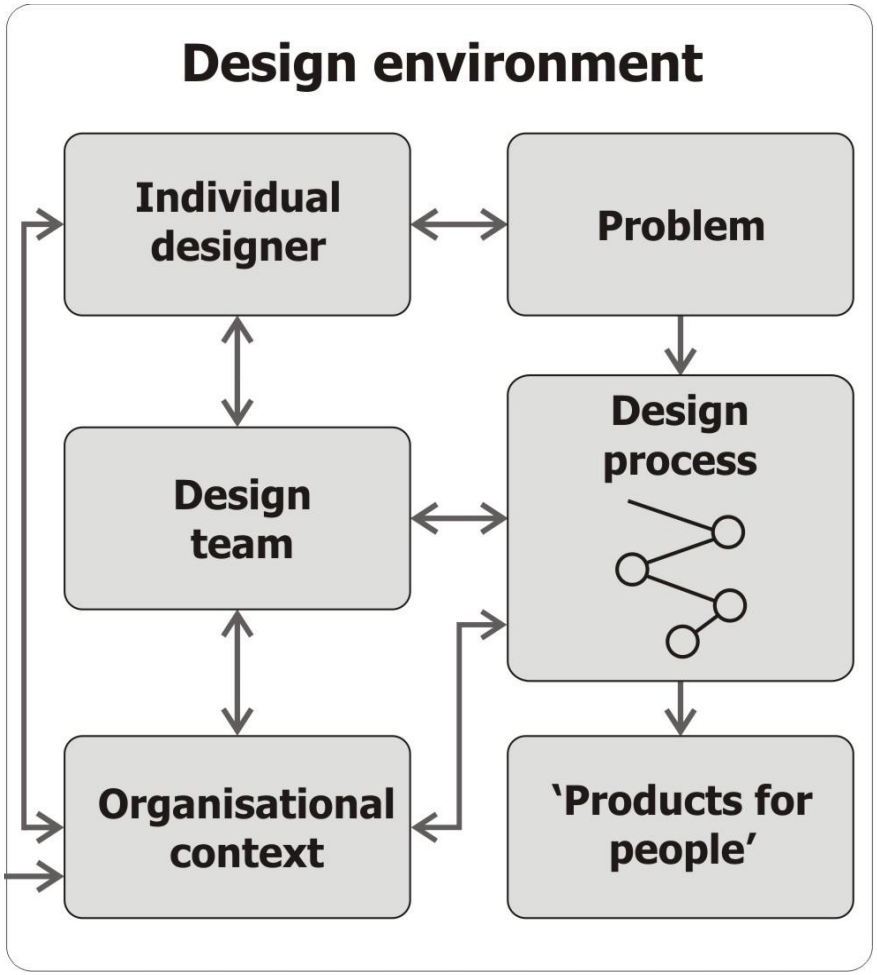
1. hierarchical: abstract – concrete
2. part-whole: subproblem - problem
3. sequential: time - related
4. procedural: if …. then

Faculties at the TU Delft

- Aerospace Engineering
- Applied Sciences
- Architecture
- Civil Engineering and Geosciences
- Electrical Engineering, Mathematics, Computer Science
- Industrial Design Engineering
- Mechanical, Maritime and Materials Engineering
- Technology, Policy and Management

- *caca. 16000 Students*

Designing as a network of influences



- characteristics of the task
- individual designer
- team or project context
- organisational context
- design process
- the product as the result

Assignment 1/1:
Own Approach to Design Methods

- In the lectures about ‘Methods in practice’ and ‘Design theory’ you will hear about different approaches on the design process. In this assignment we ask you to reflect on your own approach and views as compared to these presentations.

1) Read Part II of the course reader:

Chapter 1 Deyan Sudijc: Art

Chapter 2 Taeke de Jong: Criteria for scientific study and design

Chapter 3 Willemien Visser: Design: one but in different forms

Chapter 4 Petra Badke-Schaub et al.: Design Thinking

Assignment 1/2:
Own Approach to Design Methods

2) Individually reflect on your own approach to design and write down notes and/ or sketches of your views and approaches:

How do you normally go about designing? How would you describe the process? What is the first thing you do when you get an assignment? How do you do when you get stuck?

What do you think of the role of methods as supporting the design process? Do you make use of methods in your design process? If so, during which parts of the process or for what activities are methods helpful for you and in which parts they are not? How do you define a design method anyway?

What do you think of design: do you see it mainly as art or as science, or as both, or something else? Do you see designing as more structured activity or as an opportunistic creative process? Do you see the designer or the team as the decisive factor in the design process?

Assignment 1/3:
Own Approach to Design Methods

3) Discuss your design approach with your partner who might have a different educational background than you. What are the **commonalities**, what are the **differences**? What do you see as the **strengths** and **weaknesses** of each?

4) Compare your personal approaches to those presented in the lecture ‘Methods in Practice’ and 'Design Theory' and the literature in part I of the reader. (The lectures are available on Blackboard.)

What do you see as the strengths and weaknesses of the presented approaches?

Are there aspects that you can also find in your personal approach? Is there anything you would like to investigate or try in the future?

Are there recommendations in the models that you think would not work for you and why? Is there anything that you do not agree with at all?

5) Write together with your partner a **report** describing the individual design approaches of both partners and summarise the comparison between you two, with the ‘Methods in Practice’ lecture, the ‘Design Theory’ lecture and the literature in the reader.

Second Assignment

In this assignment you will analyse a design process presented on film in terms of human problem solving and human behaviour in social context. The fact that the process recorded involves professional designers, and not a process you have been involved with, means that you can be more objective and critical about what you see.

The title of this film is "Designs on Your Loo". It lasts 50 minutes and was made in 1998 in collaboration with the Design Council in the UK

1. Study the reader part I (Design as problem solving) and part Three (Reflection, Frames and Shared Cognition) and make notes about core learning points from each chapter.

2. Watch the film all the way through. Discuss what you have seen. Some questions to think about might be: what were the key points in the film? What surprised you about the design process? What went well, what was problematic?

Second Assignment

3. Watch the film again. This time pause at the points in the process that seem interesting in terms of problem solving and social context. Make sure you take good notes about what is happening, where possible use the quotes from the film to back up your arguments.

4. Visualise and describe the design process that you have observed in the video.

5. Identify elements of problem solving and human limitations as discussed in the reader part I. List 2-3 examples and show how your observations relate to the theory in the reader.

6. Find examples of the influence of social context on the design process, such as differences in “object worlds” or shared cognition between the design team, the client, users, or cultural differences. List 2-3 examples and show how your observations relate to the theory in the reader.