# HCI Lecture & Practical

Human Computer Interaction

**WS 2015/16**

Uni Siegen, Professorship for CSCW and Social Media

# Outline of the lecture

**The history of der Computer science**
Our roots

**Classic usability ("suitability for use")**
**Basics** | Usability | User Experience | Methods

**Current approaches and Praxeology**
Work(place) studies & ethnography | Participatory Design &
Sociability | Praxeology & Appropriation | History | Methods

**Emergent Approach: Infrastructuring**
A holistic look at Human-System-Interaction
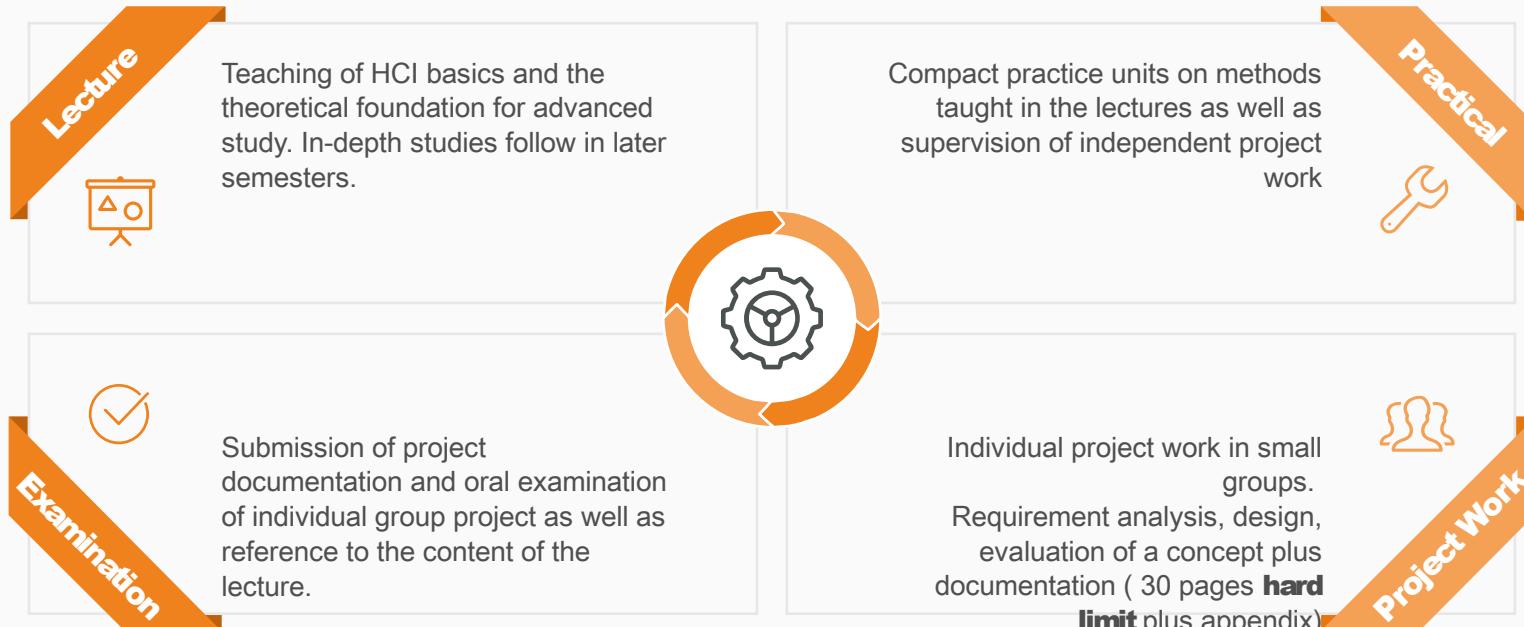
**Theoretical Basics**
In-depth study of existing material based on primary literature

# The Logic of the Lecture

Theory, Practice and Test

**Lecture**

Teaching of HCI basics and the theoretical foundation for advanced study. In-depth studies follow in later semesters.

**Practical**

Compact practice units on methods taught in the lectures as well as supervision of independent project work

**Examination**

Submission of project documentation and oral examination of individual group project as well as reference to the content of the lecture.

**Project Work**

Individual project work in small groups.
Requirement analysis, design, evaluation of a concept plus documentation ( 30 pages **hard limit** plus appendix)

# Project work, Competition!



**"Smartwatches"**

Theme of the Usability
Challenge 2016

www.usability-challenge.de

## Usability Challenge of the German Society for Informatics

The theme for the project work is basically equivalent to the theme of the Usability Challenge. Presenting project work in the Usability Challenge is both encouraged and customary procedure. Siegen students traditionally take the first few places in the challenge – no pressure…

Optional: Presenting project work within the university.
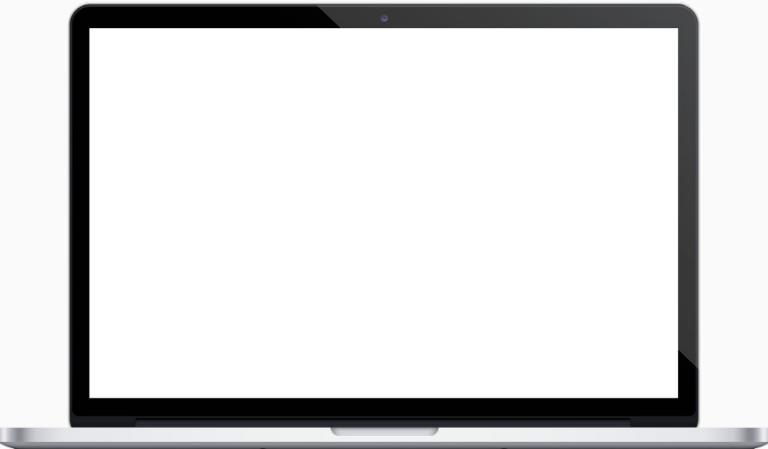
### Prize
Attending the "Human and Computer"-conference 2017"
Own presentation and tribute at the conference
500€ cash prize for the winning team
Good for reputation (personal, as well as for the degree course)

# Alternative Essay

**Extended essay on a self-selected project, approx. 20 pages**

Your task for the essay is to imagine yourself in the role of a well-informed project leader and to discuss the relevant aspects of planning product developments for your project according to the following dimensions:

1. Important social/psychological basics of interaction and applicable design principles;

2. Applicable theories for project conception and execution (learning theories, social theories);

3. Requirements analysis or participatory project implementation; and

4. Embedding and carrying out of usability evaluations.

Points 3 and 4 should cover the product or interaction aspects you discovered in the course of your empirical study.

# Course-dependent Examination

Complex examination regulations and their consequences…

## Principles

There is a strong focus on the project and documentation. Emphasis is rather placed on methodologically clean and founded accomplishment than on the final result. The oral examination revolves around the project and its (methodological) cross-references to the lecture.

| Master HCI | Master WInfo | MA IMuG | NF MeWi |
|:---:|:---:|:---:|:---:|
| **50:50%** | **50:50%** | **50:50%** | **100%** |
| **Project : Examination (graded)** | **Project : Examination (graded)** | **Project : Examination (pass / fail; ungraded)** | **Project (graded)** |

# Credit for Master HCI and WInfo

Complex examination regulations and their consequences…

**Recognition of the practical for the module "combined seminar"**

Due to the additional work generated by the individual project, the practical and the project execution are additionally counted as a seminar within the module "combined seminar". Please note: This module comprises TWO seminars, only one of which can be "filled" by the HCI-lecture. The practical pertaining to the "CSCW" lecture fills the second slot.

| Master HCI | Master WInfo | MA IMuG | NF MeWi |
|:---:|:---:|:---:|:---:|
| **50:50%** | **50:50%** | **50:50%** | **100%** |
| Project : Examination (graded) | Project : Examination (graded) | Project : Examination (pass / fail; ungraded) | Project (graded) |

# Registration Formalities

Terminology and processes at the university…

**Taking a course**
"I am participating in the course".
Important for latest course news!

**Examination registration**
"I'm taking a course-related examination".
SEPARATE from taking the course!

**Deregistration (where applicable)**
Deregistration from the examination is only possible until 7 days before the examination. After that, the examination counts as an unsuccessful attempt!

Course and examination registration as well as deregistration ONLY possible via
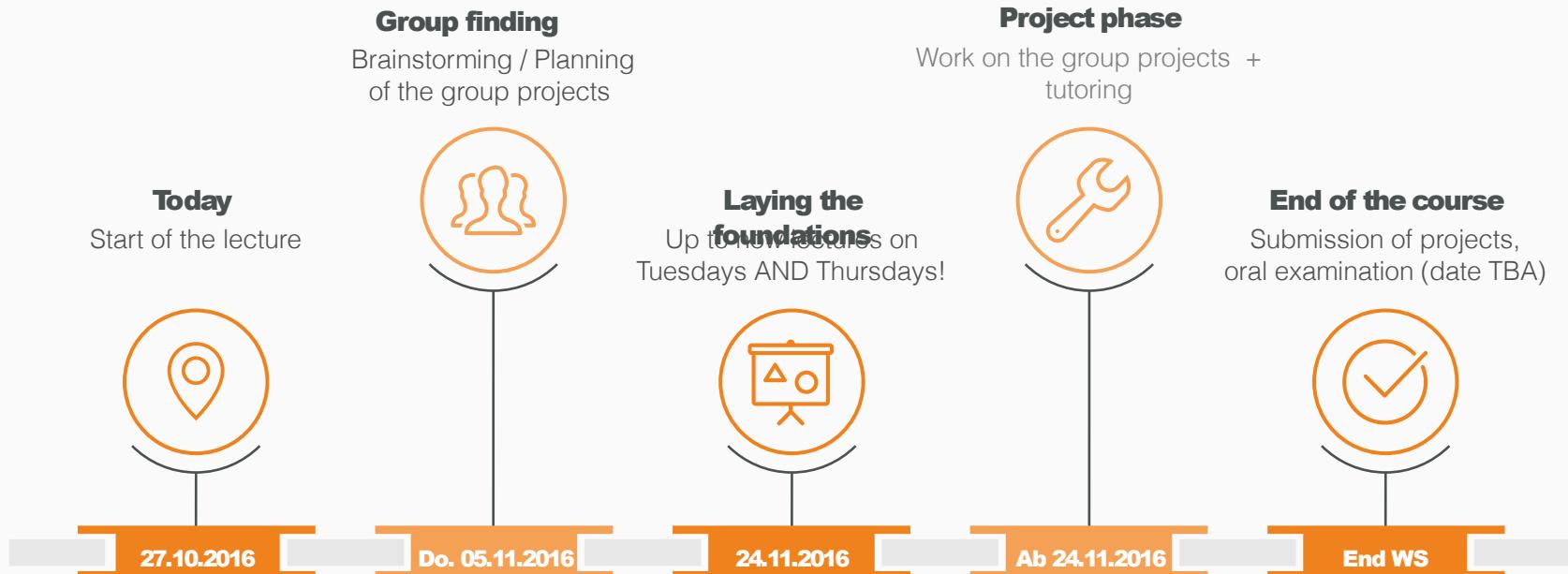
Examination office announces time limit for registering for examinations:
http://www.wiwi.uni-siegen.de/pruefungsamt

# Schedule of the course

Important dates und deadlines

**Group finding**
Brainstorming / Planning of the group projects

**Project phase**
Work on the group projects + tutoring

**Today**
Start of the lecture

**Laying the foundations**
Up to two lectures on Tuesdays AND Thursdays!

**End of the course**
Submission of projects, oral examination (date TBA)

27.10.2016 | Do. 05.11.2016 | 24.11.2016 | Ab 24.11.2016 | End WS

# Further Questions?

Channels of communication

## Contact the supervisors

- volkmar.pipek@uni-siegen.de
  Room US-F 112
- oliver.stickel@uni-siegen.de
  Room US-D 105

- thomas.ludwig@uni-siegen.de
  Room US-D 104

## LSF

- Both course AND examination registration here

- Mails addressed to everyone are sent from here!
- lsf.zv.uni-siegen.de
  → Search for "HCI" (lecture and practical have individual entries)

## Moodle

- The university's learning platform: documents + forums
- This is where you can access the lecture slides

- moodle.uni-siegen.de/course/view.php?id=5912

# Project groups

Stand 03.12.2015. Refreshed every semester and throughout each semester!

Group distribution until now. Arbitrary number allocation: helps supervisors to keep an overview, so please always mention your group number. Not all participants have joined groups / handed in project descriptions yet. It is recommended that you change this promptly, especially with regard to the grades.

**(1)** **Machine status in production settings**
Philipp Schubert, David Amend

**(2)** **Stress prevention**
Alexander Hellmann, Tanja Ertl, Simon Gruseck

**(3)** **Tactile navigation (still unclear)**
Eyyub Kumas, Ralf Meyer, Margarita Grinko, Wendy Wlasak

**(4)** **Team Eco (Environmental measurements/feedback)**
Tyrone Hocke, Katja Haußer, Michael Döll, Julia Barnick

**(5)** **Gamified fitness- / nutrition tracker (Tamagotchi)**
Florian Jasche, Jasmin Kirchhübel, Marios Mouratidis, Tim Schulte

**(6)** **Spontaneous event organisation**
Marleen Neumann, Marie Predel

# Programme for **Today**

**History of informatics**
Our roots

**Klassische Usability ("Gebrauchstauglichkeit")**
**Grundlagen** | Usability | User Experience | Methoden

**Aktuelle Ansätze und Praxeologie**
Arbeits(platz)studien & Ethnografie| Participatory Design &
Sociability | Praxeologie & Appropriation | Geschichte | Methoden

**Emergenter Ansatz: Infrastructuring**
Ein holistischer Blick auf Mensch-System-Interaktion

**Theoretische Grundlagen**
Vertiefung des bisherigen Stoffes anhand Primärliteratur

# History of informatics and HCI

Where have we come from…?



**1941**

**50s**

**First computer applications**

Zuse Z3: first programmable calculating machine.  Numerical data input via keyboard. Commands via punched tape. Output of digital numbers by means of lamps. Military use.



**SAGE Semi-Automatic Ground Environment**

Use of first screen systems for text and graphic output as well as "light guns" and "light pens" for the input of graphic data directly onto the display.

1963

64/65

## Sketchpad

Drawing on cathode ray tube screens with light pens.  Forerunner of CAD-systems. First object-oriented approaches.

## X-Y Position Indicator

Known as a mouse nowadays. Developer: Douglas C. ("Doug") Englebart.
Part of the NLS "oNLine System", that unified an extremely large number of innovations (GUI, Hypertext, Groupware, networking,… )

**monday afternoon**

**december 9**

**3:45 p.m. / arena**

Chairman:
**DR. D. C. ENGELBART**
*Stanford Research Institute*
*Menlo Park, California*

## a research center for augmenting human intellect

This session is entirely devoted to a presentation by Dr. Engelbart on a computer-based, interactive, multiconsole display system which is being developed at Stanford Research Institute under the sponsorship of ARPA, NASA and RADC. The system is being used as an experimental laboratory for investigating principles by which interactive computer aids can augment intellectual capability. The techniques which are being described will, themselves, be used to augment the presentation.
The session will use an on-line, closed circuit television hook-up to the SRI computing system in Menlo Park. Following the presentation remote terminals to the system, in operation, may be viewed during the remainder of the conference in a special room set aside for that purpose.

**1968**

**"Mother of all Demos"**

### Doug's 1968 Demo

San Francisco, 1968

On December 9th, 1968 Doug Engelbart appeared on stage at the Fall Joint Computer Conference in San Francisco to give his slated presentation, titled "A Research Center for Augmenting Human Intellect," where he spent the next 90 minutes not only telling about his work, but demonstrating it live to a spellbound audience that filled the hall.

Instead of standing at a podium, he was seated at a custom designed console, where he drove his presentation through his NLS computer residing 30 miles away in his research lab at Stanford Research Institute, onto a large projection screen overhead, flipping seamlessly between his presentation outline and live demo of features, while video teleconferencing members of his research lab linking in from SRI in shared screen mode to demonstrate more of the system.

*Click here to watch the demo at the Stanford University MouseSite*

This seminal demonstration came to be known as "The Mother of All Demos."

**WATCH THE DEMO:**

- Highlights Version (24 minutes in 10 clips, nicely done!) just the highlights, from SRI International, birthplace of the demo.

- Complete 1968 Demo (100 minutes, hi res, in 3 parts) at the Internet Archive.

- Annotated Version (100 minutes, 35 parts, excellently annotated!) to appreciate what you are seeing, from the Stanford University MouseSite – the online portion of Stanford's extensive collection of Doug's seminal work.

*Overhead shot of Doug driving the demo, superimposed on the demo projection screen*

See also the 1968 Demo Table of Contents which links to specific sections of the Demo, the Detailed Onscreen Outline used as 'slides' during the Demo, and a full transcript of the demo.

**Read the paper:** This "Mother of all Demos" was technically a talk presented at a conference. See the paper submitted to the conference proceedings to accompany Doug's presentation, A Research Center for Augmenting Human Intellect, by Doug Engelbart and Bill English, in *Proceedings of the 1968 Fall Joint Computer Conference*, San Francisco, CA, December 9, 1968, Vol. 33, pp. 395-410 (AUGMENT,3954,).

See also the poster announcing Doug's talk, the conference proceedings table of contents [pdf|html], and archive photos from the event,.

Note that most of what Doug and his team presented in 1968 was developed literally "from scratch" by a handful of researchers in the space of four years.

**TABLE OF CONTENTS** [Top]

Doug's 1968 Demo
Reflecting on the 1968 Demo
Doug and His Team
Colleagues and Press
Student Projects
See Also
From the Internet
From Doug's Lab
More

**http://dougengelbart.org/firsts/dougs-1968-demo.html**

Own screenshots / copies

## Xerox PARC

Extremely influential company!

First computer with GUI (Xerox Alto, fig.)

Further developed: Xerox Star, Ethernet, WYSIWYG, laptop, Smalltalk (programming language), laser printer

**70s**

**End of the 70s**



## Apple

Apple I, II and Lisa not very successful. First commercial success: Macintosh (1984). Important (further) developer of GUI (widgets, ZUI, exposé, core animation,...)

## Personal Computer (PC)

Hardware originally by IBM, later numerous other manufacturers ("IBM-compatible")

Software: Microsoft (DOS, OS/2, Windows)

"De facto Standard"

**80s**

**60s - today**



## Internet

Forerunner: ARPANET (military)
Internet use (academia, industry) since the 80s. Increased private use since the late 80s. Entirely new forms of communication and collaboration.

**Smart phones / mobile devices**

Numerous forerunners, mass dissemination of the current form of smart devices since 2007 (first iPhone). First extensive use of Multi-touch, gestures etc.

**2000s**

**Over time**
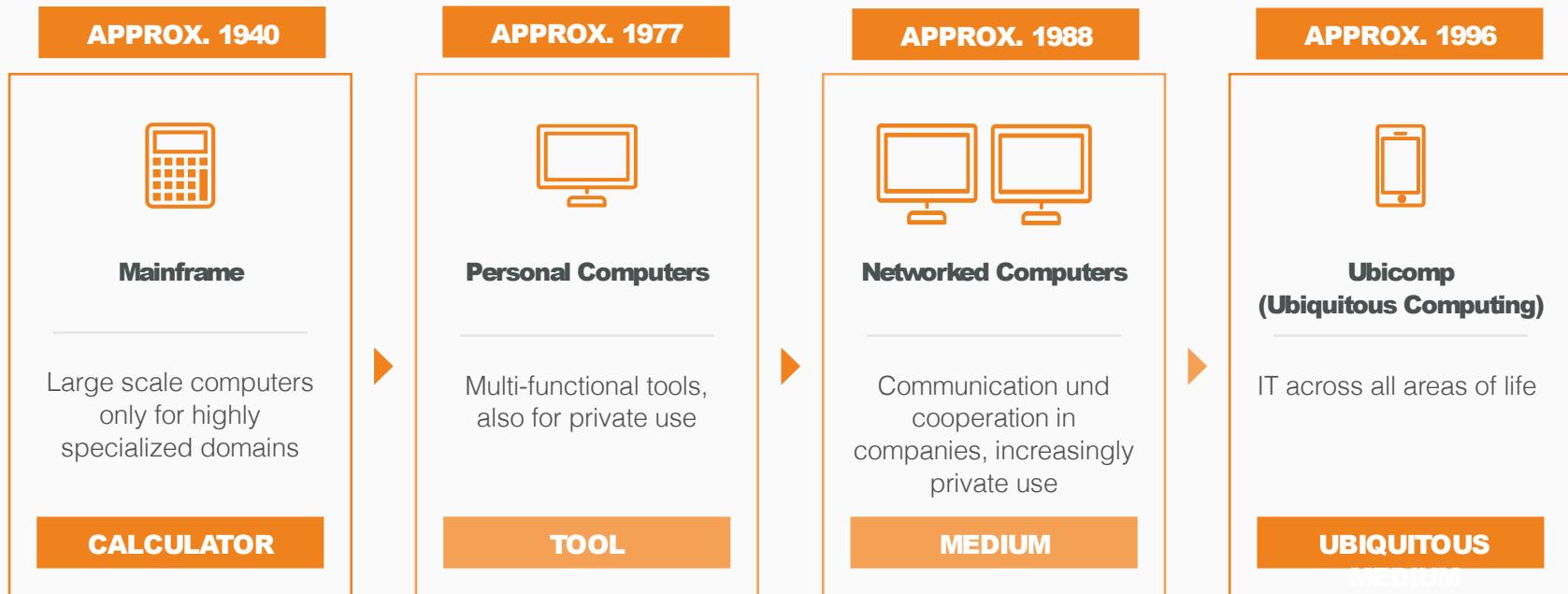


**Further important developments**

CAD / simulations
Multimedia
Gesture- / Speech recognition
Force Feedback
Virtual Reality / Augmented Reality
HTTP und WWW
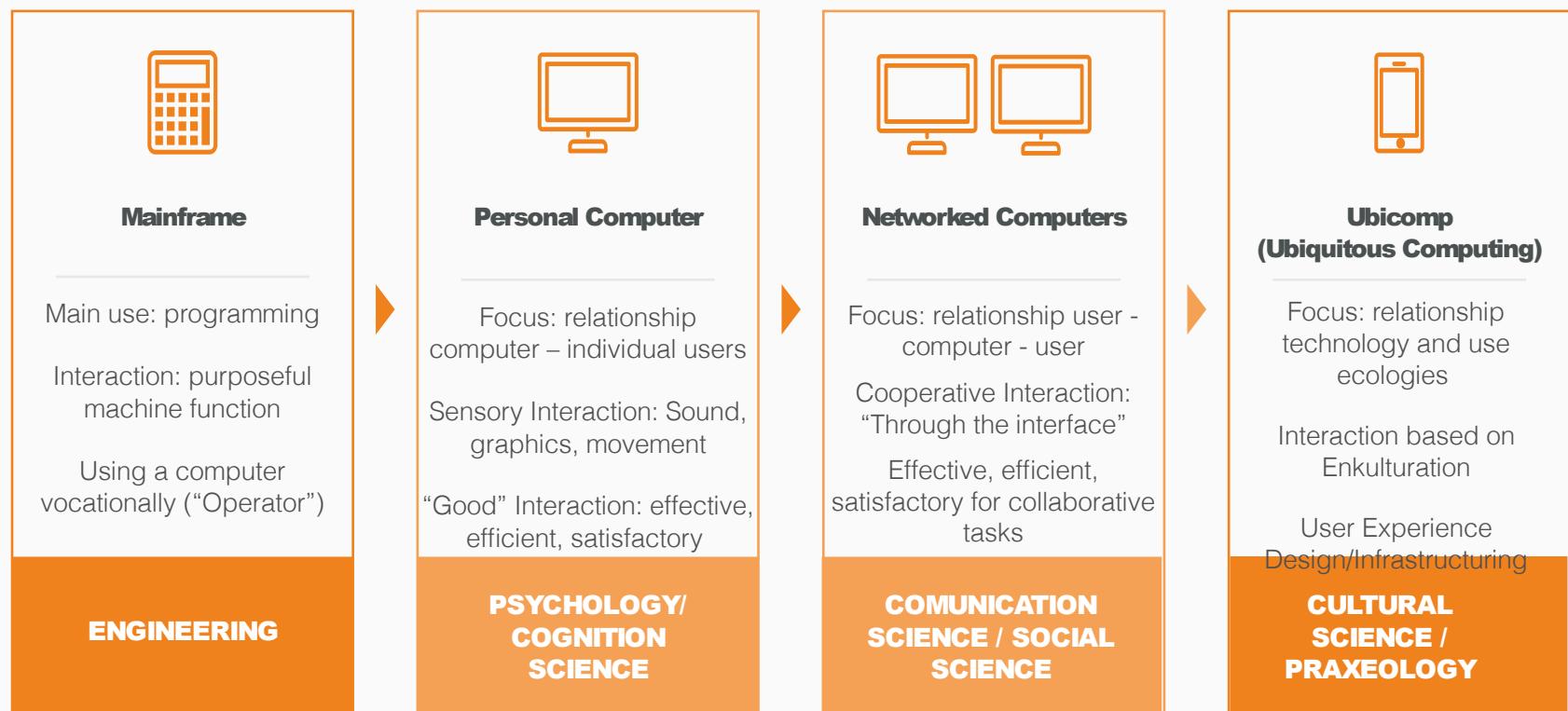
…

# Development and **Meaning**

Metaphors and changes in use in informatics and HCI

| APPROX. 1940 | APPROX. 1977 | APPROX. 1988 | APPROX. 1996 |
|:---:|:---:|:---:|:---:|
| **Mainframe** | **Personal Computers** | **Networked Computers** | **Ubicomp (Ubiquitous Computing)** |
| Large scale computers only for highly specialized domains | Multi-functional tools, also for private use | Communication und cooperation in companies, increasingly private use | IT across all areas of life |
| CALCULATOR | TOOL | MEDIUM | UBIQUITOUS MEDIUM |
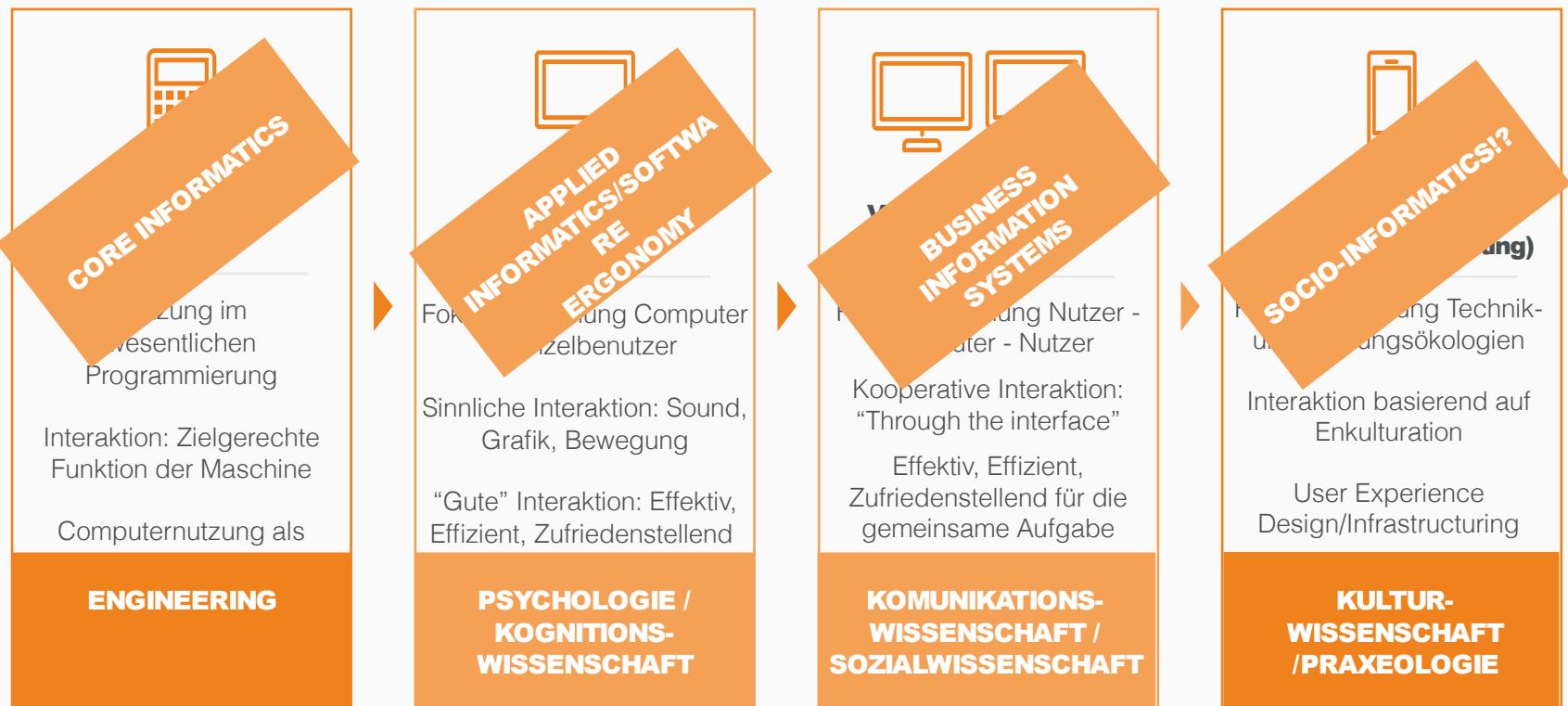
# Meaning and Methodology

Epistemological and methodical dependency on informatics and HCI

| Mainframe | Personal Computer | Networked Computers | Ubicomp (Ubiquitous Computing) |
|---|---|---|---|
| Main use: programming | Focus: relationship computer – individual users | Focus: relationship user - computer - user | Focus: relationship technology and use ecologies |
| Interaction: purposeful machine function | Sensory Interaction: Sound, graphics, movement | Cooperative Interaction: "Through the interface" | Interaction based on Enkulturation |
| Using a computer vocationally ("Operator") | "Good" Interaction: effective, efficient, satisfactory | Effective, efficient, satisfactory for collaborative tasks | User Experience Design/Infrastructuring |
| **ENGINEERING** | **PSYCHOLOGY/ COGNITION SCIENCE** | **COMUNICATION SCIENCE / SOCIAL SCIENCE** | **CULTURAL SCIENCE / PRAXEOLOGY** |

# Meaning and Methodology

Epistemological and methodological dependence of informatics and HCI

| CORE INFORMATICS | APPLIED INFORMATICS/SOFTWARE ERGONOMY | BUSINESS INFORMATION SYSTEMS | SOCIO-INFORMATICS!? |
|---|---|---|---|
| ...zung im wesentlichen Programmierung | Fok... ...ung Computer ...zelbenutzer | F... ...ung Nutzer - ...uter - Nutzer | ...ung Technik- u... ...ungsökologien |
| Interaktion: Zielgerechte Funktion der Maschine | Sinnliche Interaktion: Sound, Grafik, Bewegung | Kooperative Interaktion: "Through the interface" | Interaktion basierend auf Enkulturation |
| Computernutzung als | "Gute" Interaktion: Effektiv, Effizient, Zufriedenstellend | Effektiv, Effizient, Zufriedenstellend für die gemeinsame Aufgabe | User Experience Design/Infrastructuring |
| **ENGINEERING** | **PSYCHOLOGIE / KOGNITIONS-WISSENSCHAFT** | **KOMUNIKATIONS-WISSENSCHAFT / SOZIALWISSENSCHAFT** | **KULTUR-WISSENSCHAFT /PRAXEOLOGIE** |

# Models and **Concepts**

Successful and disseminated



**GUI**
Graphical User Interface (vs. text-based)

**WIMP**
Windows, Icons, Menus, Pointing Devices

**Direct Manipulation + Direct Feedback**
Direct influence + und feedback from GUI-Elements

**Desktop / Folder / File**
Desk and file metaphors

**WYSIWYG**
What you see is what you get

Abb: Eigener Screenshot
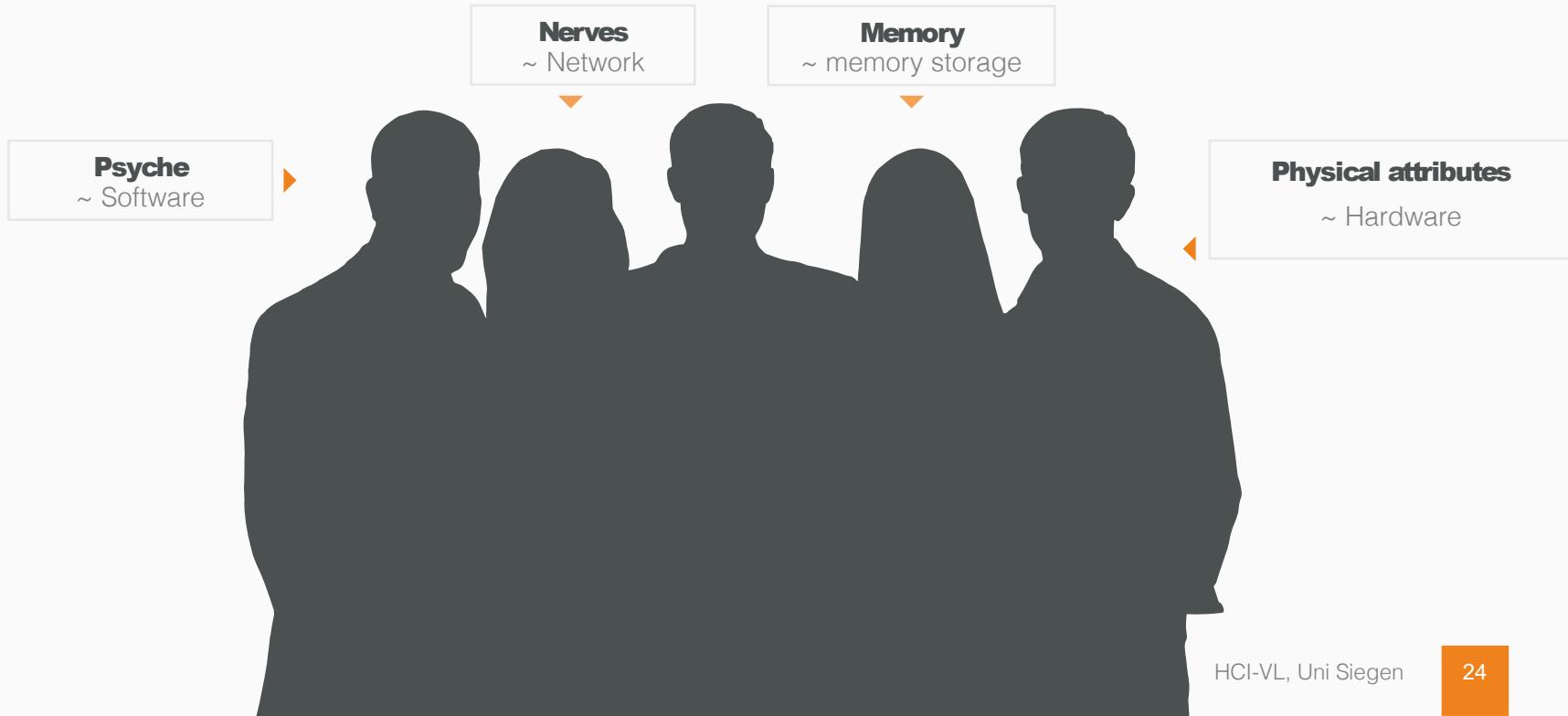
# Programme for Today

- **Geschichte der Informatik**
  Unsere Wurzeln

- **Klassische Usability ("Gebrauchstauglichkeit")**
  **Grundlagen** | Usability | User Experience | Methoden

- **Aktuelle Ansätze und Praxeologie**
  Arbeits(platz)studien & Ethnografie| Participatory Design &
  Sociability | Praxeologie & Appropriation | Geschichte | Methoden

- **Emergenter Ansatz: Infrastructuring**
  Ein holistischer Blick auf Mensch-System-Interaktion

- **Theoretische Grundlagen**
  Vertiefung des bisherigen Stoffes anhand Primärliteratur

# Humans as information processing systems

(Questionable) Analogy: Humans as a computer-type system. Exemplary "components" are labelled:

**Nerves**
~ Network

**Memory**
~ memory storage

**Psyche**
~ Software

**Physical attributes**
~ Hardware

# Affordances

What can a person do with the things shown here?

# Affordances: Expression often used unclearly

Especially in the field of usability, "affordance" is an expression often used only semi-correctly. Change in meaning ~~over~~ time:

**J.J. Gibson**
**1978**

**All possible actions**
The Ecological Approach to Visual Perception: Co-evolution between creatures and environment →
Affordance = **every** possible action that a specific creature has in relation to the observed object.

**Don Norman**
**1988**

**"Suggestions" for actions**
Affordance as the "typical" possible action for an object, e.g. "sitting" for a chair.
1999: Norman's self correction: "Perceived Affordance" (describes his meaning in a far better way).

**Bill Gaver**
**1991**

**Differentiated definition**
Different categories of affordances, especially with the aim of dissolving the confusion caused by Gibson's <-> Norman's different understandings).

# Affordances: Expression often used unclearly

Especially in the field of usability, "affordance" is an expression often used only semi-correctly. Change in meaning over time:

**Bill Gaver 1991**

**Differentiated definition**
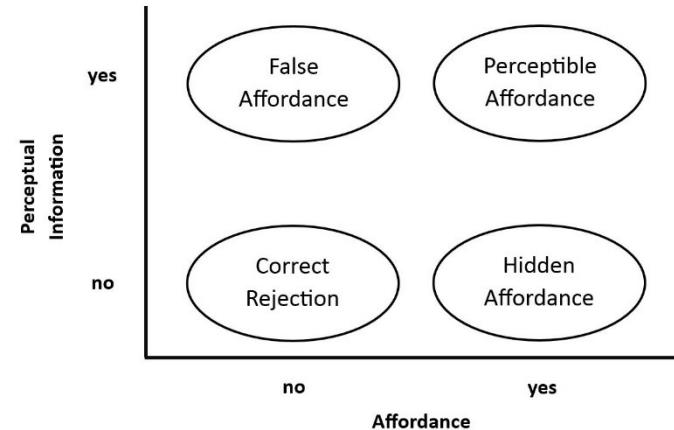
Different categories of affordances, especially with the aim of dissolving the confusion caused by Gibson's <-> Norman's different understandings). Examples:

Perceptible A.: Door perceived to be such

False A.: Wall painted (too) realistically to look like a door

Correct Rejection: Wall that doesn't look like a door

Hidden A.: Door behind wallpaper

# Affordances & Semiotics
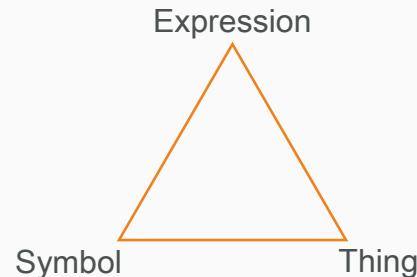
The perception of affordances is (also) linked to semiotics

## Reality, perception and communication

We perceive real things, then make ourselves a mental image (symbol) of these things and create expressions (words) which we then use to speak to others about the image. There can easily be discrepancies between reality, imagination and description.
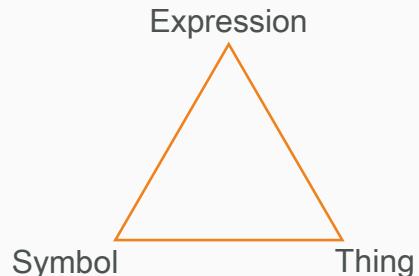
Examples of symbols:
Everywhere in this lecture…

Expression

Symbol          Thing

**Semiotic Triangle**

# Semiotics & Knowledge

How do we know what we are able to do?

## Expression



Symbol          Thing

**Semiotic Triangle**

### How does the relation between expression, symbol and thing come about?

Know-how regarding the use of artefacts arises through the interplay of current reception and historical experience.

**1** **Sensory and motor functions**
Senses: Seeing, hearing, smelling, tasting, haptics, movement; Actuatiors: Movement by muscle power

**2** **Interaction and communication**
Questioning things through trial and error. Development of use by other users.

**3** **Culture**
Conventional patterns of use; similar forms; self-evidence and reliability of use

# Affordance, reception & time

# Gestalt laws of grouping

Psychological basics

**Gestalt laws**

Habit / Expectation determines what we see.

Gestalt-theory from 1920s cognition research: rules of experience regarding shape / colour / etc.

Over 100 "laws" with the capability of mutual influence (e.g. intensification by combination and /or multiple occurrence)
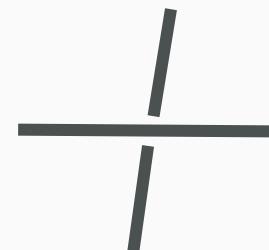
**In HCI:** Produce / avoid contexts of meaning, improve perception, reduce reaction time, improve search / recognition,…

(more in UXD, 2nd Semester)



Law of Proximity

Law of Similarity

Law of Concision

Law of the Continuous Line

# Recommendations for in-depth Study

Literature

**Good text book**
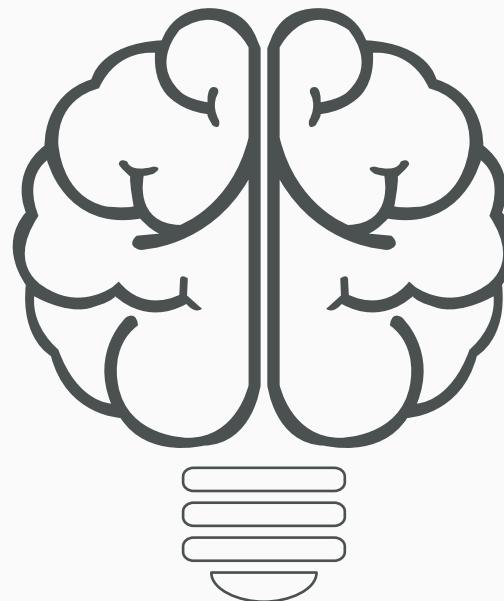
( 01 )

Cooper, A., Reimann, R., & Cronin, D. (2012). *About Face 3: The Essentials of Interaction Design*. John Wiley & Sons.

**Affordances**

( 03 )

Gaver, W. (1991). Technology Affordances. In S. P. Robertson (Ed.), Reaching through technology (pp. 79–84). Reading and Mass: Addison-Wesley.

**Gestalt, shape and philosophy**

( 02 )

Chien, J.-Y. (2006). Of animals and men: A study of umwelt in Uexküll, Cassirer, and Heidegger. *Concentric: Literary and Cultural Studies*, *32*(1), 57–79.

Available from:
http://www.concentric-literature.url.tw/issues/32_1/03_chien.pdf

# Programm für Heute

Geschichte der Informatik
Unsere Wurzeln

**Klassische Usability ("Gebrauchstauglichkeit")**
Grundlagen | **Usability | User Experience** | Methoden

Aktuelle Ansätze und Praxeologie
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Vertiefung des bisherigen Stoffes anhand Primärliteratur

# Motivation

Why is usability an individual concept in the first place?

## Preece 1994

First HCI-text book. Adaptation of systems to users – and NO LONGER vice versa. Focus on simplicity and ease of learning.

Requirements:

**Understanding**
of factors which influence the actions of users in IT-contexts

**Tools**
to support designers when creating IT

**Attainment**
of effective, efficient and safe human-machine-interaction
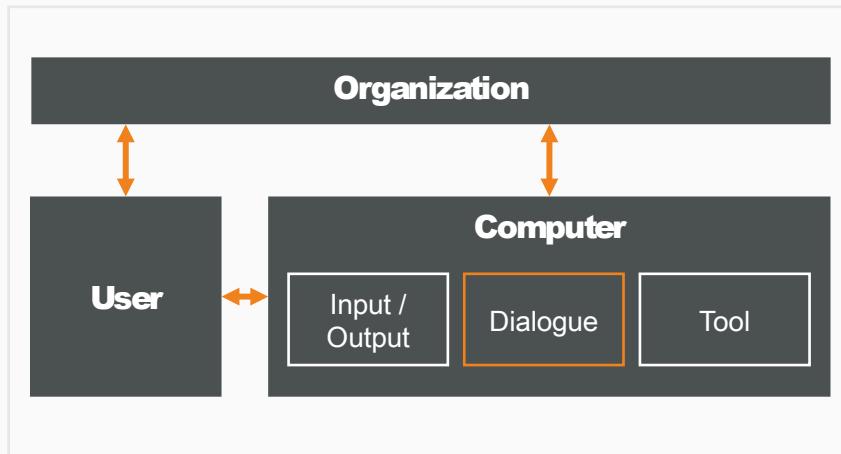
## Today's point of view:

For quite some time IT has been more than just a tool and because of this, its design is ever more important. People, but more importantly collaboration and communication, are increasingly at the forefront. "Classic" usability has already almost become outdated (more about this later).

# IFIP-Model

An early model that was ground-breaking for usability

Represents users in interaction with computers and, furthermore, the embeddedness in organizations and thus in cooperative contexts.



**Dialogue Interface**
No longer just I/O (Input/Output) and tools (programs) but now also dialogue: programming languages, support functions etc. This is new – the computer as the first human tool capable of dialogue.
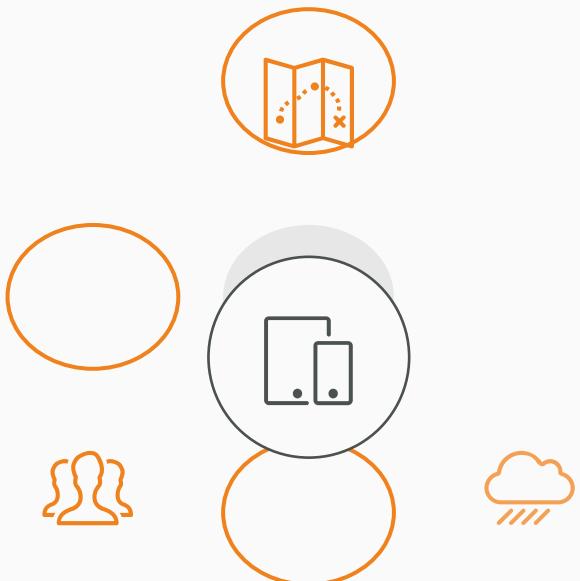
**Criticism**
Missing historical and emotional dimensions, limited interaction concept, intricacy of conventions & standards, ambiguity regarding multi-user systems.

# DIN EN ISO 9241

The"Usability-Norm". Omnipresent and important to know!

Usability = The extent to which specific users in their specific **contexts** can attain their specific **objectives** with **effectivity, efficiency** and **satisfaction**.

1. **Effectivity**
(Complete) Task fulfilment using the system possible? Yes/no?

2. **Efficiency**
Effort to task fulfilment?

Operationalization chiefly over time.

3. **Satisfaction**
Freedom from interference. Positive attitude towards users of the system. Subjective factor!

**Context**: Essentially external influencing factors (many…)

# DIN EN ISO 9241

Structure of the norm

## Why is a norm needed in the first place?

Safeguarding, comparison, basis for methodological discussions, technical jargon, … Good ideas in principle but often awkward in practice (e.g. due to the lengthy preparation when making modifications).

Above all, Part 110 (principles of dialogue) and possiby also Part 11 (usability, general definition) are practice-oriented.

| | |
|---|---|
| **Part 11: Usability** | **Part 110: Dialogue Design** |
| **Part 12: Information presentation** | **Part 17: Forms** |

| | | | |
|---|---|---|---|
| **Part 13: User guidance** | **Part 14: Menus** | **Part 15: Commands** | **Part 16: Direct manipulation** |

# DIN EN ISO 9241-110

Dialogue Design / Dialogue Principles

**Promotion of learning**

**Suitability for the task**

**Self-description ability**

**Expectation conformity**

**Error tolerance**

**Customizability**

**Controllability**

# User Experience (UX)

The "soft" factors

## Preece, Rogers & Sharp, 2002:

"User experience goals differ from the more objective usability goals in that they are concerned with how users experience an interactive product from their perspective rather that assessing how useful or productive a system is from its own perspective"

Background: Ever more complex IT is becoming part of everyday life, and every day life for humans means much more than just effectivity and efficiency. Also: it is a competitive advantage.

Emotions        Values        All kinds of subjective aims



THE USER IS A PERSON.
TALK TO THEM LIKE ONE.
USE NATURAL LANGUAGE

# User Experience (UX)

Various conceptual frameworks

Jordan (2002) describes the four pleasures in using products:

**Physio**: Direct, sensorially deducible
**Socio**: Socially mediated (e.g. mobile phone)
**Ideo**: Generally social (e.g. values)
**Psycho**: Individual/mental (e.g. "I really like it")



McCarthy & Wright (2004) describe "Technology as Experience" as a framework for the analysis of UX:

**Compositional**: How do elements of an experience fit together to form a whole?
**Emotional**: Which emotional dimensions does an experience have?
**Spatio-temporal**: Influence of space and time?
**Sensual**: How does the immediate design (e.g. haptic) and the overall atmosphere feel for us?

*Processing these aspects **in a sensemaking-process:***

**Anticipation**: Pos./Neg. preconceptions of technologies
**Connection**: First impression
**Interpretation**: How does what function?
**Reflection**: What can it be used for? Alternatives?
**Appropriation**: How does the new experience fit in with our already exisiting contexts?
**Recounting**: Passed on to/by others?

# Levels of Usability- and UX-Problems

A few examples

**Physiological Level**

Physical human-machine interaction is restricted.

**Psychological Level**

Misunderstandings between humans and machines.

**Work Context**

IT doesn't fulfil its support function / doesn't fit into the organisation.

**Emotional**
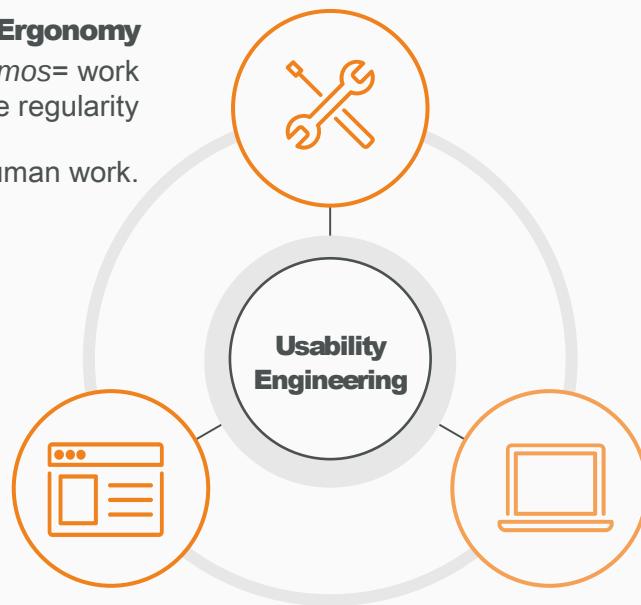
IT gives the wrong impression, is unsatisfactory in use, etc.

# Usability Engineering

= Structured Development (Methods, Tools & Processes) of IT which is fit for use. Active, no longer post-mortem!

**Ergonomy**

*Ergon* = work, *Nomos*= work
The science of the regularity

of human work.



**Usability Engineering**

**Software ergonomy**

Science of the use and fitness for use of IT. (Precursor)Expression for usability in German-speaking areas.

**Software Engineering**

Structured development (methods, tools & processes) of IT development in an industrial engineering context.

# Programm für Heute

Geschichte der Informatik
Unsere Wurzeln

**Klassische Usability ("Gebrauchstauglichkeit")**
Grundlagen | Usability | User Experience | **Methoden**

Aktuelle Ansätze und Praxeologie
Arbeits(platz)studien & Ethnografie | Participatory Design | Wertethemen & Sociability

Emergenter Ansatz: Infrastructuring
Ein holistischer Blick auf die Entstehung & Entwicklung von IT

Theoretische Vertiefung
Kognitive Ansätze | Tätigkeitstheorie | Strukturierungstheorie

# Central Usability-Instrument: Evaluations

= A review of the achievement of objectives from the user's point of view

### Ex Ante
Estimation of the use of a product before development

### Process-Evaluation
Continuous monitoring of the achievement of objectives during development

### Ex Post Evaluation
Review of the achievement of objects following development

**Various types of evaluation. All methods would be necessary for ideal usability but in practice (esp. in agency life), ex post evaluation is unfortunately often the only method stipulated / allowed / paid for.**

# Method: Thinking Aloud

Letting the user speak!

## Thinking aloud

The user is asked to express all his/her thoughts and to explain what s/he is currently doing.

## Scenario-based

Exploration (free use) or specific task (e.g. "Send a chat message").

## Roles / Tools

Moderator, minute taker, ideally at least 2 further people for implementation. Routine reording of interaction (video) plus written protocol.

## Critical Incident

A situation in which the user cannot make progress, or only with difficulty. Follow-up interviews may be appropriate fot the analysis of diffiult CIs.



Foto: D.Hornung (Uni Siegen)

# Method: Heuristic Evaluation

Several experts evaluate (examine, test and discuss where appropriate) a system based on "rule of thumb" (heuristics)

**Experts are (mainly) not the end users**

Not a universal remedy! Not all mistakes are discovered

**Economocial and fast**

In addition to being immediately usable even in very early stages

**Relatively successful**

It is often the case that just 5 experts find up to 75% of the errors (a claim made in literature. Unfortunately not totally sustainable).

# Method: Heuristic Evaluation

Best known heuristics: Nielsen's Usability-Heuristics

System status should always be transparent for users.

The system should prodtect users from mistakes and errors.

Users should be able to steer the system and have a certain level of freedom in its operation.

Support/documentation should be easy to find and appropriate (i.e. not too comprehensive).

**Only a selection. For a complete list, see:**
**http://www.nngroup.com/articles/ten-usability-heuristics/**

# Method: User abstractions

Design for the unknown user… Anticipation regarding the target group

## Market-based

- Surroundings / target group (age, spending capacity,…)
- Market segment (e.g. word processing vs DTP)

- "Good" results from the market  (e.g. standard features)

## Roles

- Geared towards organizational roles of potential users
- Competency, visibility, processes, etc.

- "Good" results from a fitting distribution of roles

## Level of experience

- Inexperienced / experienced / expert users

- Knowledge / experience as main factors

- "Good" results from suitability for prospective users

# Method: Persona

The best known form of user abstraction (can incorporate all elements of the previous slide!)

## Imaginary friends...

Persona = imaginary users, described in writing, to stimulate design concepts and focus on users.

### Several Personas

Several personas are (almost) always necessary as they stand for certain ideal types of user.

### Criticism

Often too characterized by assumption. Also leads to: Often not representative for everything outside the mainstream (LGBT, people with impairments, …).

## Complex description

A Persona HAS TO BE detailed and described in a complex way. It's not about "User X" but as realistic a character as possible, who has a name, photo, biography, and their own worries and concerns etc.

This even goes as far as some companies having personas, in the form of cardboard dummies, take part in meetings as "observers".

# Persona: Example

**Secondary Persona: Maria Müller**

Maria (Foto aus Munira (2009)) ist 18 Jahre alt und Oberstufenschülerin in der 12. Klasse des James-T-Kirk-Gymnasiums in Dresden.

**Zeitliche Abläufe:** Maria wohnt am Rande der Stadt und fährt ab und an mit dem Auto zur Schule, oft jedoch auch mit dem Bus — für letzteres benötigt sie ca. 25 Minuten. Die Zeit im Bus verbringt sie mit Musikhören und Chatten, alles an ihrem Smartphone. Sie hat an fünf Tagen die Woche Unterricht, durch ihre Kurswahl oft auch inklusive Nachmittagsunterricht und Freistunden. Diese verbringt sie oft in Pausenräumen und der Cafeteria der Schule.

**Der Unterricht:** Marias Kurse haben alle normale Klassengröße, also ca. 20 Schüler. Es gibt viel Frontalunterricht, aber auch einiges an Gruppenarbeit, wobei diese fast ausschließlich im zeitlichen Rahmen des Unterrichtes selbst stattfindet. Anforderungen an das Lernen sind unterschiedlich und reichen von anwendungsorientierten Konzepten (z.B. Mathematik) bis hin zu zumindest teilweise auf eher reproduktives Lernen ausgelegten Inhalten (z.B. Geschichte).

**Lernverhalten:** Zum Lernen, was Maria angesichts der regelmäßigen Klausuren oft tun muss, benutzt Maria regelmäßig Lernzettel mit zusammengefassten Inhalten und/oder arbeitet Aufgaben aus den Schulbüchern oder dem Unterricht durch. Karteikartenlernen nutzt sie nicht (auch wenn sie es einmal gelernt hat) – Karten benutzt sie nur zur Vorbereitung auf und zur Unterstützung während eines Vortrages o.Ä. Lernsoftware benutzt sie nicht, auch Lernplattformen wie moodle und verwandte Systeme werden nicht genutzt. Lerngruppen wie an der Universität kennt Maria eher nur vom Hörensagen.



**Abbildung 3.7.:** Maria Müller

Zahlreiche nützliche Tools im Netz, z.B.
http://makemypersona.com/
(ersetzen aber nicht das selbst mitdenken…)

# Method: Probes

"Cultural Probes" can help to understand UX

## "Contemplating" the context of use

(Cultural) Probes are packages of suitable artefacts for stimulation and documentation, e.g. diaries, cameras etc.

By using such a probe, the user himself effectively becomes a researcher. Probes – playful components – are designed in a way which is generally sophisticated and often attractive.



Focus on (subjective) user needs instead of on "hard" matrices.

# Method: Laddering

Reference to four pleasures

Jordan (2002) describes four pleasures (when dealing with products):

**Physio**: Direct, sensorily detectable
**Socio**: Socially mediated (e.g. mobile phone)
**Ideo**: Generally social (e.g. values)
**Psycho**: Individual/cognitive (e.g. "I think it's nice"

Can be elicited by iterative interview techniques. Stops when there are no moe plausible answers.

*Participant*: I want to be able to choose something that expresses my own tastes.

*Researcher*: Why do you want to be able to express your own tastes?

*Participant*: I want to be an individual, not just go along with the crowd.

*Researcher*: Why do you want to be an individual?

*Participant*: I just do.

# Method: AttrakDiff

An attempt to make UX quantifialbe

**www.attrakdiff.de**

Differentiation of the criteria which characterize a product (and the impressions which emerge from its use)

**Questionnaire**
Online, free, convenient

**Degree of familiarity**
Very widespread (also in commerce)

**Evaluation**
Automatic online evaluation



Auswertung

Auswertung II

Nachfolgend finden Sie Wortpaare, mit deren Hilfe Sie die Beurteil... Gegensätze dar, zwischen denen eine Abstufung möglich ist.

Ein Beispiel:

unsympathisch ○ ○ ○ ○ ● ○ ○ sympathisch
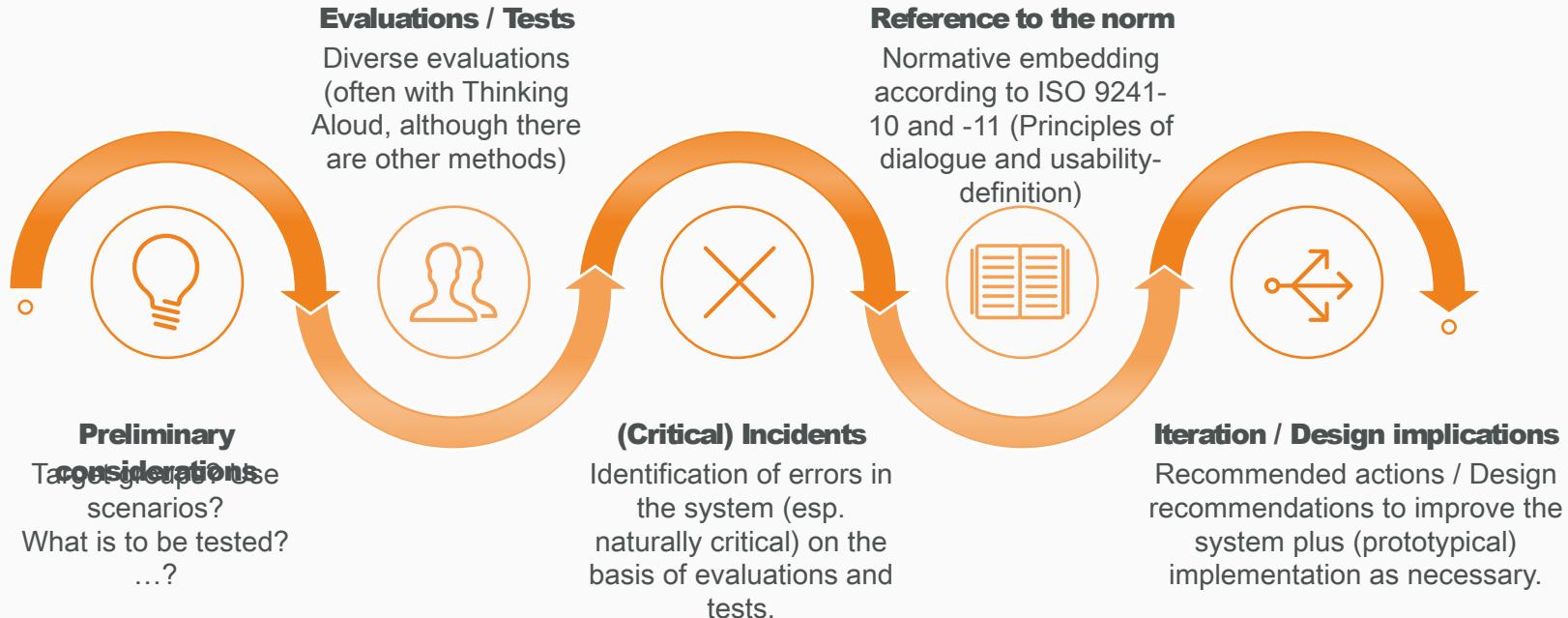
Diese Bewertung bedeutet, dass das Produkt eher sympathisch, a...

Denken Sie nicht lange über die Wortpaare nach, sondern geben S... Sinn kommt. Vielleicht passen einige Wortpaare nicht so gut auf da...

Dateneingabe (Fragebogen, Likert-Skalen)

# Methods in the Process: Usertest

"Usertest" – although unclear in meaning, this is an expression which is often used and mainly describes a process ~~of the~~ following kind:



**Evaluations / Tests**
Diverse evaluations (often with Thinking Aloud, although there are other methods)

**Reference to the norm**
Normative embedding according to ISO 9241-10 and -11 (Principles of dialogue and usability-definition)

**Preliminary considerations**
Targetgroup? Use scenarios?
What is to be tested?
…?

**(Critical) Incidents**
Identification of errors in the system (esp. naturally critical) on the basis of evaluations and tests.

**Iteration / Design implications**
Recommended actions / Design recommendations to improve the system plus (prototypical) implementation as necessary.

# This was only an **impression!**

Case-specific usability and UX-methods should always be selected. The diversity is enormous. ist riesig. A few ~~starti~~ng points:

**Method finder**

A variety can be found on the internet, e.g. http://usability-siegen.de/qualifizierung.html

**01**

**Usability-Quartet Game**

Method cards by the GermanUPA (Professional body of Usability experts)

Will be handed out during the practical work

**02**
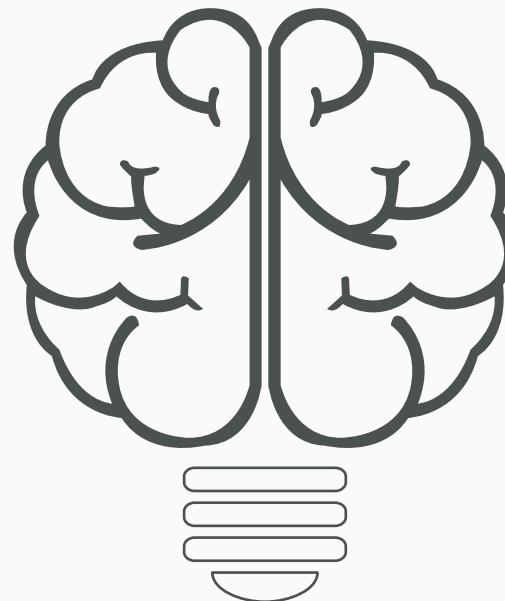
**Text books**

Snyder, C. (2003). *Paper Prototyping: The Fast and Easy Way to Design and Refine User Interfaces*. Morgan Kaufmann.

Cooper, A., Reimann, R., & Cronin, D. (2012). *About Face 3: The Essentials of Interaction Design*. John Wiley & Sons.

**03**

# Exercise: Usertest with Thinking Aloud

Oerview

Even though user tests are often not conducted in labs (nor should they be), they are still scientific tests with a superordinated structure and rules. However, the onl provde te framework – everything else has to be decided case specically, test for test.

**① Preparation**
Define test scenrios (unless you want to evaluate the whole application). Define and distribute roles. Carry out the test. Define and assemble tools.
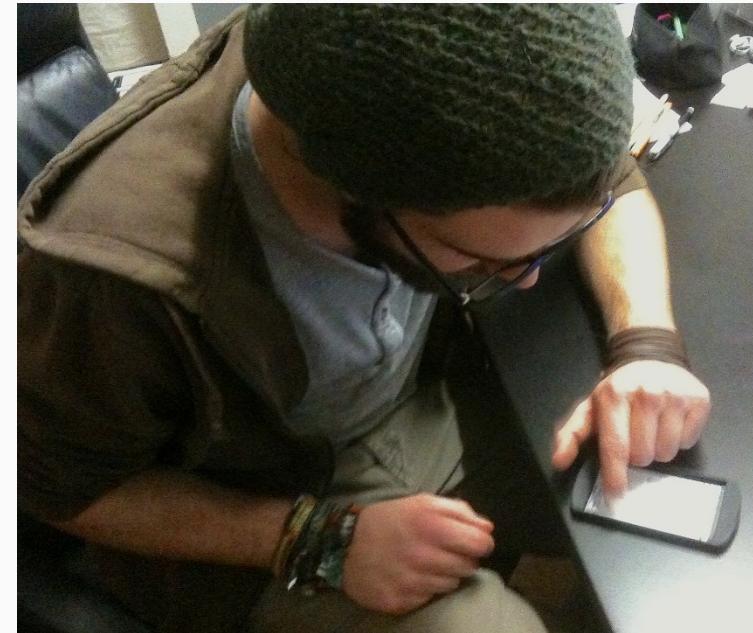
**② Execution**
Introduction, clarification, consent (principles of good scientific practice!). Carry out the test and document.

**③ Analysis**
Compare notes, comparison between sessions, conspicuous places etc. (using social-scientific methods if approprieate).



Foto: D.Hornung (Uni Siegen)

# Excercise: Usertest mit Thinking Aloud

Preparation

Define test scenrios (unless you want to evaluate the whole application). Define and distribute roles. Carry out the test yourself.



### Scenarios / Tasks
What is of interest? Describe tasks or plan to give oral instructions for users. Ethical considerations?

### Roles
Usual and minimum: one moderator and one observer each, more roles if necessary.

### Tools
Software for screen recording, computer, audiorecorder, camera,… (smart phones can be used for a lot of images)

Foto: D.Hornung (Uni Siegen)

# Exercise: Usertest with Thinking Aloud

Execution

### Introduction, clarification, consent

Introduce, explain the scientific context and epistemological interest, affirm anonymity, explain Thinking Aloud, provide opportunity for questions, have any consent forms signed.

### Carry out test(s)
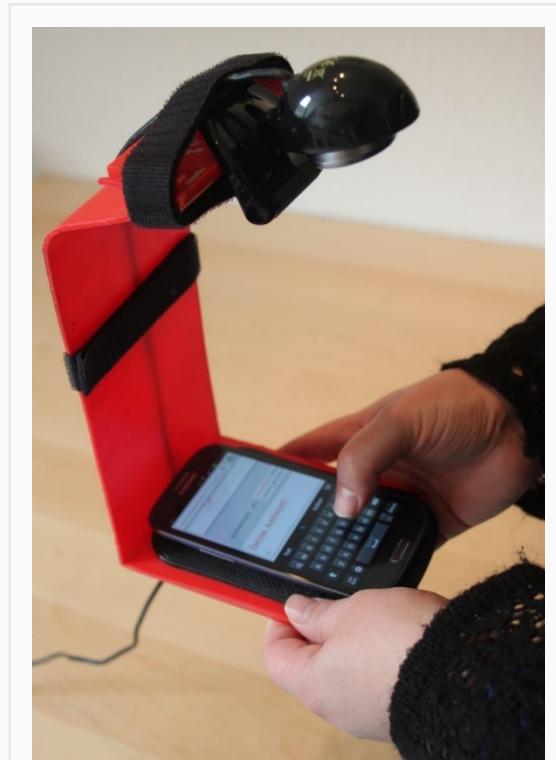
Introduce scenarios / tasks, then let users execute them. It is important that the moderator refrains from participation (but is on hand if help is needed, esp. when requested).

Important: encourage users to think aloud if necessary!

### Documentation

The observer makes notes, screen recording, audio, directs the webcam onto the test persons (if in use), …



Foto: 3D-printed usability testing camera sled - D.Hornung (Uni Siegen)

# Exercise: Usertest with Thinking Aloud

Analysis

Again, there is no standard procedure here.
Conventional methods include e.g.:

**Triangulation / comparisons**
Comparisons of several sessions / users, comparison of notes<->recordings, moderator's impressions<->test person's impressions,…

**Social scientific analyses**
Coding, iterative refinement, etc. (see ethnographic methods). Hoever, rarely used here in any depth.

**Critical Incidents**
Indentify particularly important errors and prioritize. These should emerge from the comparisons as well as from a comparison with the scnarios / tasks.

**Tabelle 5.2.:** Ergebnisse Usertest

| Foto | Beschreibung |
|------|--------------|
|  | **Problem:** Das Icon *Kommentar hinzufügen* wurde nicht erkannt oder fa… interpretiert. |
|  | **Lösung:** Abhilfe soll ein verbessertes Icon schaffen, das eine stilisierte Sprech… sowie ein Plus-Symbol zeigt. |
|  | **Problem:** In der Bewertungsansicht wurden die Sterne häufig als Favor… Funktion interpretiert. |
|  | **Lösung:** Vermutlich der Tatsache geschuldet, dass jeweils nur ein S… sichtbar war. Das soll vermieden werden, indem immer drei hellgraue St… sichtbar sind von denen jeweils die gewählte Anzahl gelb eingefärbt ist. |

# Recommendations for consolidation

Tools, example documentation and

## Examples

**01**

Documentation provided by teams in precious years can be found in Moodle. It is worth taking a look!

## Practitioners' Tips

**03**

*Dealing with users:*
http://www.nngroup.com/articles/talking-to-users/

*User-Tests, general:*
http://www.usabilityblog.de/2015/05/neues-aus-dem-ux-lab-101-dinge-an-die-man-bei-der-durchfuehrung-von-usability-tests-denken-sollte-teil-12/

## Tools

**02**
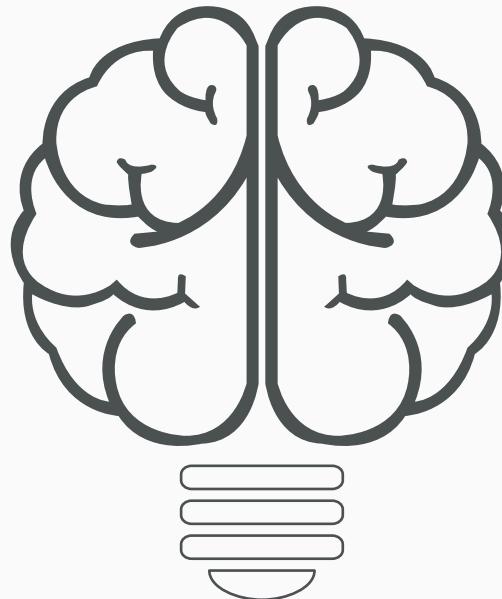
Notepad, pen and brain!

Use a smart phone as an audiorecorder and camera (don't forget a tripod if required)

*Screen recording, fast & free:*
Windows: e.g. Rylstim
 Screen Recorder OSX & iOS:
Quicktime
Android: $adb shell screenrecord

But: There's a whole lot more (!) cheap / free tools out there – check out App stores etc. as required

*Special Usability-Test-Tools:*
Windows: Morae (roughly 2000€…)
OSX: Silverback (under 100€)

# Programm für Heute

- **Geschichte der Informatik**
  Unsere Wurzeln

- **Klassische Usability ("Gebrauchstauglichkeit")**
  Grundlagen | Usability | User Experience | Methoden

- **Aktuelle Ansätze und Praxeologie**
  **Arbeits(platz)studien & Ethnografie** | Participatory Design |
  Wertethemen & Sociability

- **Emergenter Ansatz: Infrastructuring**
  Ein holistischer Blick auf die Entstehung & Entwicklung von IT

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  Kognitive Ansätze | Tätigkeitstheorie | Strukturierungstheorie

# Work(place) studies

Basic idea: HCI takes place (nowadays often, in the past more or less permanently) against the background of a work situation (everyday practice

▸ **Background & context**

Aim: To understand everyday practices which are to be "incorporated" into IT. It is important to understand them so that requirements can be defined and evaluated.

▸ **Pioneers: Xerox Parc**

Rooted in anthropology (psychology, sociology). In the past, applied to the design of photocopiers.
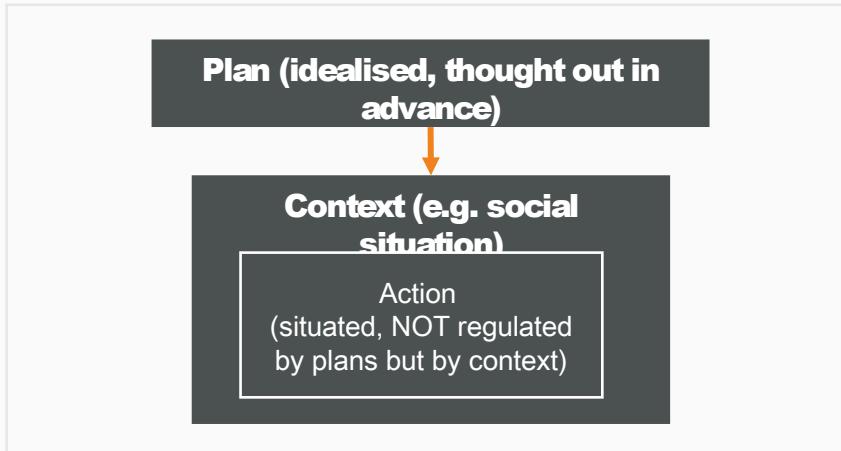
▸ **Office Discipline**

Ethnography (unlike psychology) provides methods which allow the examination in context without "disturbing" the surroundings. The aim is to describe real practice (as opposed to ideal / official practice).

# Plans & Situated Action

A methodical foundation for Work(place) studies



**Plan (idealised, thought out in advance)**

↓

**Context (e.g. social situation)**

Action
(situated, NOT regulated by plans but by context)

Pioneer: Lucy Suchman

### Cognitive Models (esp. from psychology)
People's behaviour driven by intellectual models, purpose, aime, motication etc. Explained by theories.
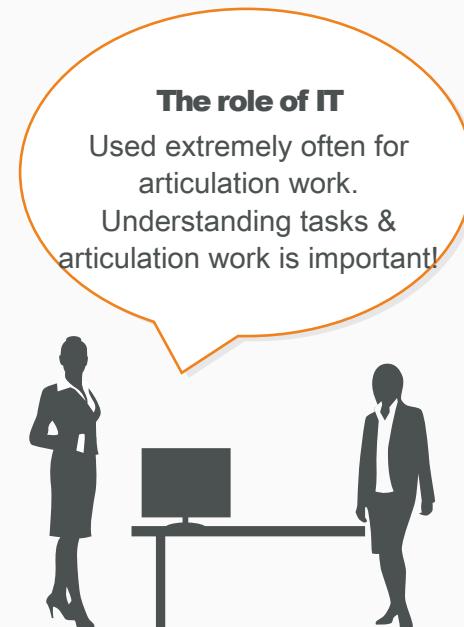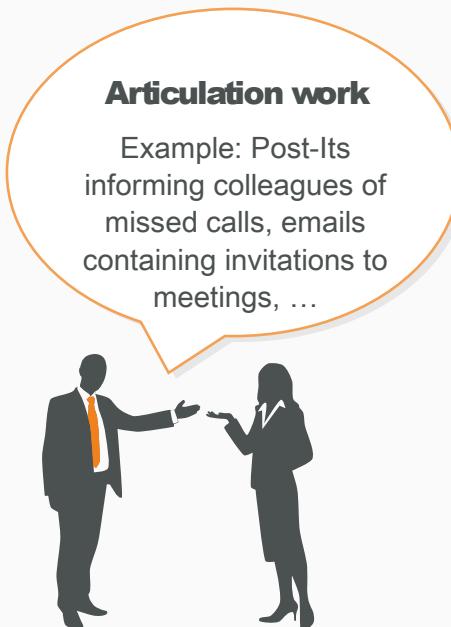
### Ethnographical approach
Practical orientation: "What is happening here?" vs. "which theories correspond to what is happening?".

Origins lie in the research of indigenous peoples "from the inside" –participation in the field is an integral part of this method! Its principal direction is ethnomethodology: "We cannot recognize one objective, actual practice but rather the actor's intended practice".

# Coordination processes: Articulation work

Articulation work = The (meta) work necessary for the coordination of other work elements.

**Articulation process**

Composition & holding together of work elements, von Arbeits-Elementen, sequences, etc.: Interaction between people!

**Articulation work**

Example: Post-Its informing colleagues of missed calls, emails containing invitations to meetings, …

**The role of IT**

Used extremely often for articulation work. Understanding tasks & articulation work is important!

# Method: Observation

Basic method of ethnography

Often interesting: the difference between what is said and what is done: Idealistic <> factual behaviour as well as uncovering "tacit knowledge" (knowledge which is embedded in culture and often not (able to be) expressed)

**Roles?**
Observing: distanced, results are therefore possibly more authentic vs. participatory: allowing more inquiry.

**Observation plan**
Focus, duration, location, termination conditions, ethics, (confidentiality, legalities,...)

**Data collection**
Field notes: (Almost) always important!
Audio / Video complemented.

# Method: Interview

Second basic model of ethnography

Questioning in a dialogue. Essential forms are:
open (unstructured) interviews,
narrative interviews (initial question then "story"),
semi-structured interviews (leading questions),
structured interviews (concrete questions).

### Roles?

Do not interrupt unnecessarily. No suggestive questions. No pre-formulated answers. No pressure! Rather take a passive role.
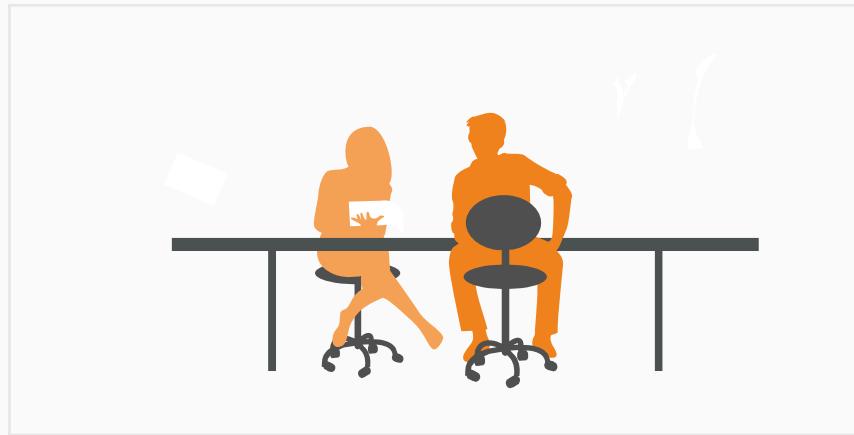
### Parameters

Chose a suitable location. Justified selection of participants. Take previous interviewees as experts.

### Data collection

Recordings (mainly only audio) and field notes.

# Method: Audio/Video analysis

Richer media for documentation and illustration

Recordings can either be used as the primary source of data or to supplement / illustrate field notes and results, possibly to third parties (but: observe privacy!)
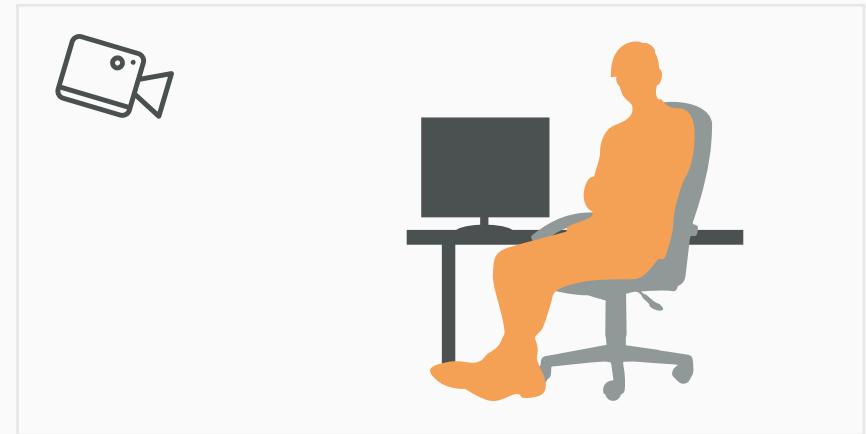
**Audio: Unproblematic on the whole**
Influences interview partners to a lesser extent. Important: check the equipment (batteries etc.)

**Videoanalysis**
Needs to be thought through well! Poses a risk for privacy. Large data sets (complex analysis). Limited to the camera's viewfinder. Hawthorne-Effect (Adapting behaviour to what is anticpated to be "desirable" behaviour)

# Method: Virtual Ethnography

Exploitation of internet media infrastructure for ethnographical studies

Online surveys tend to be closed and often
anonymous. Also: observations of online-interaction,
e.g. in chats/social networks.
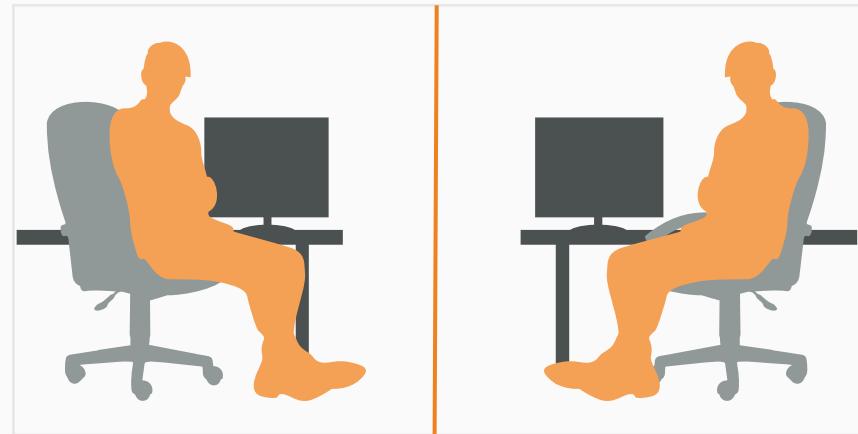
**⊖ Problems**
Representative? Credible? Participation in the
field poses a different challenge for
researchers to classic ethnography.

**⊕ Advantages**
Often large amounts of data which are
easy to collect. Make observation of –
extremely important – domains possible
in the first place.

# Analysis ethnographical data

Systematic interpretation – Coding, analyisng… Generalizing?

AimI: To avoid randomness (possible...?). Iterative analysis by refining codes. Recommended: Coding together with people who were not involved in the study (Inter-Coder-Reliability!)

**(1) Transcription**

Transferring recordings into text. Incorporate spoken and other expressions ("hmm", noteworthy facial expressions,..). Time stamp!

**(2) Coding**

Read the text several times and assign codes ("tags", catchphrases) to relevant passages.

**(3) Find topics / categories**

"Coding of the codes". Find more general topics for several codes.



**Interviewer:** #00:01:10-4# Kannst Du kurz erklären, wer Du bist und was Du hier in der Firma machst??

**MM:** #00:01:18-3# Äh ok, Name Mike Müller (..) ähm hier bin ich jetzt als Produktmanager mit Schwerpunkt auf unsere neue Reihe von Home Automation Software tätig. Wir entwickeln hier meist (.) naja (grinst), also mehr oder weniger nach Scrum. Also, das ist ein wenig (…) komplex (lacht), wir sind in der Umstellung von traditioneller Entwicklung (unverst.) in Richtung agil, aber das dauert eben (lacht), daher bin ich irgendwo zwischen PM und PO.

| P... | ROLLE | |
| S... | PROZESSMODELL | |
| Umste... | WEG VON WASSERFALL | |
| PO | ROLLE | PM | ROLLE |
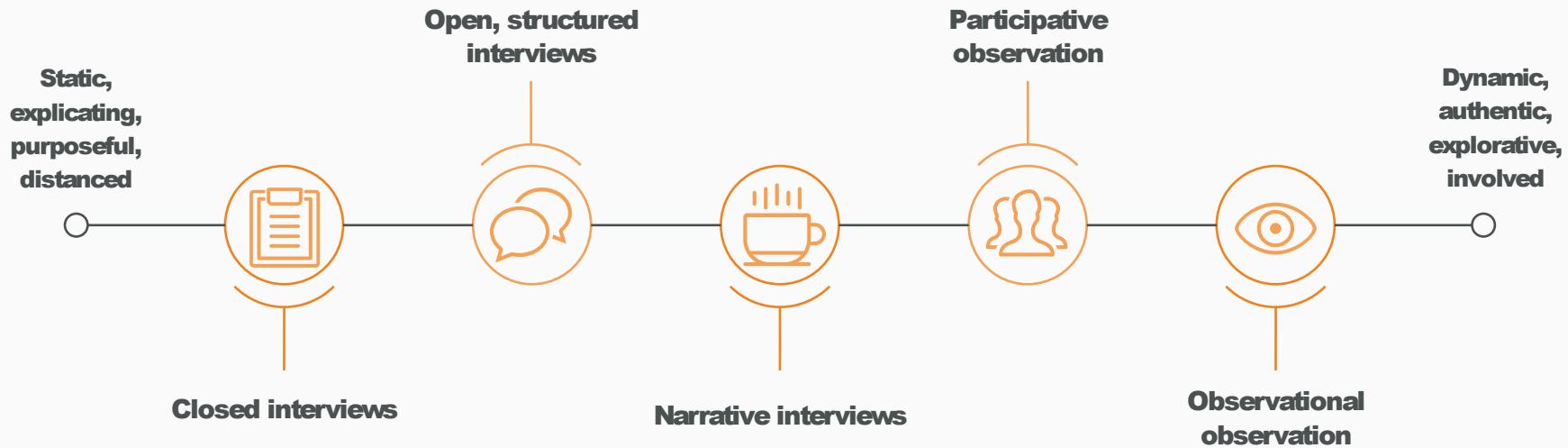
Beispiel für Codierung (im Anfangsstadium)
Mehr in „Usability & Empirische Designmethoden"

Problems: requires a lot of effort. Compromise: partial transcriptions (to verify / consolidate field notes)

# Scale of the involvement of ethnographical methods

In an ideal world: Ethnograph always deeply involved in the field (enculturation). Unfortunately not always possible…



**Static, explicating, purposeful, distanced**

**Open, structured interviews**

**Participative observation**

**Dynamic, authentic, explorative, involved**

**Closed interviews**

**Narrative interviews**

**Observational observation**

# Intensify methods!

Bottom line: ONLY practice allows ethnographic methods to be learnt really well!

**Textbook**

**01**

Helfferich, C. (2010). *Die Qualität qualitativer Daten: Manual für die Durchführung qualitativer Interviews*. Springer DE.

(very understandably written introduction to more than just interviews)

**About analysis (written very understandably):**

**02**
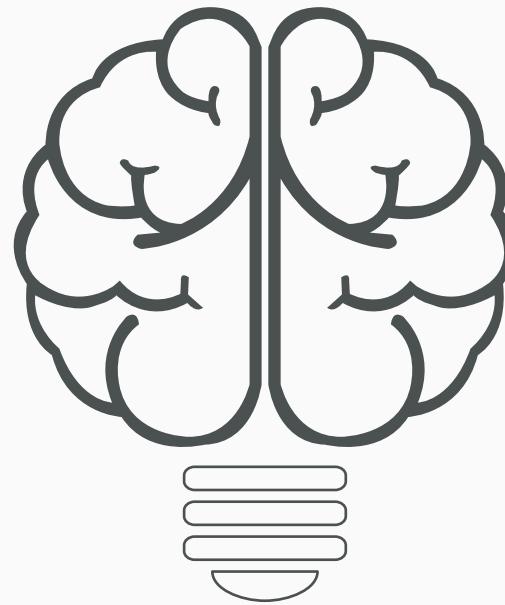
Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*, 77–101.

Found here:
http://eprints.uwe.ac.uk/11735/2/
thematic_analysis_revised

**Generalisability?**

**03**

Crabtree, A., Tolmie, P., & Rouncefield, M. (2013). "How Many Bloody Examples Do You Want?" Fieldwork and Generalisation. *Proceedings of the 2013 13th European Conference on Computer-Supported Cooperative Work, ECSCW'13*, (Keith 1992), 21–25.

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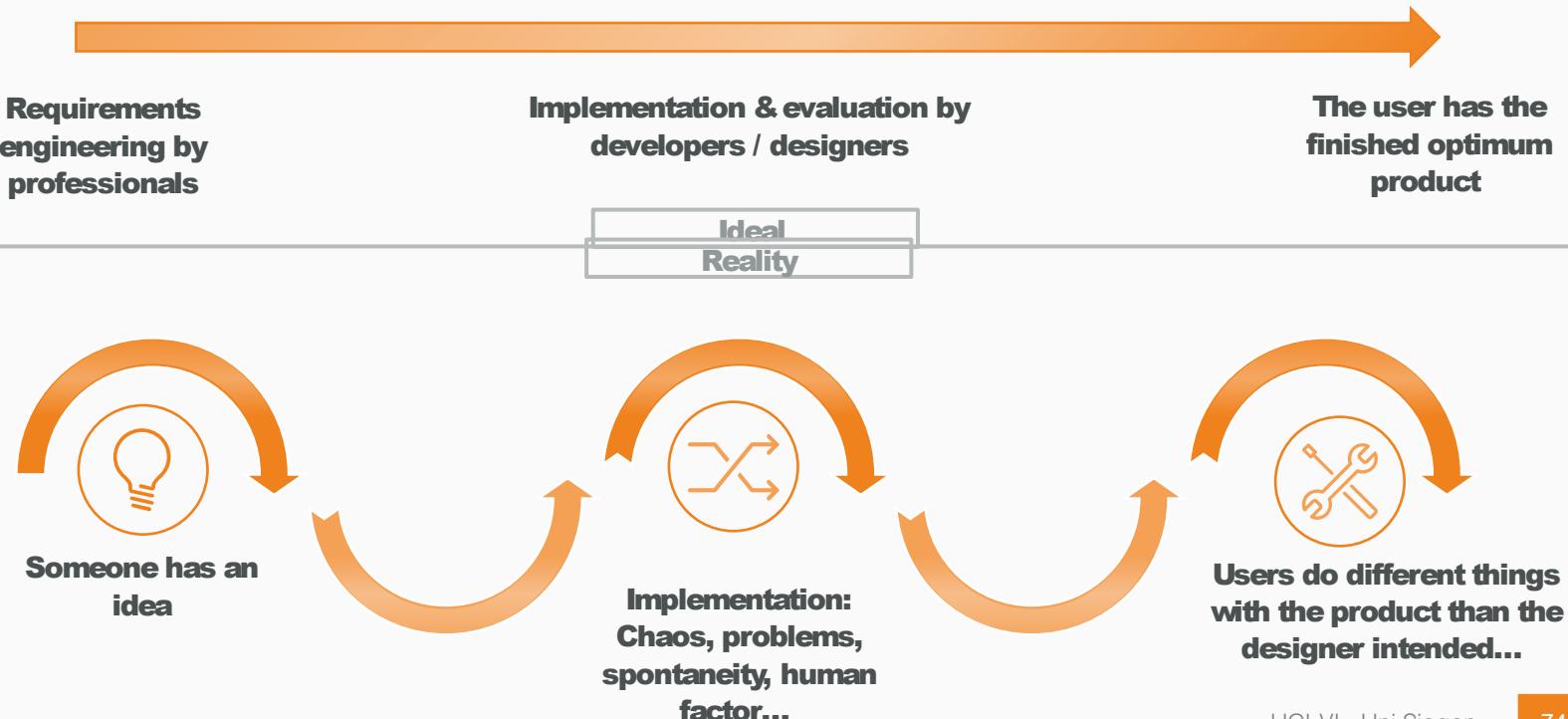
Theoretische Vertiefung
Kognitive Ansätze | Tätigkeitstheorie | Strukturierungstheorie

# Project plan vs. Reality

The basics of Participatory Design: ideal-typical plans of development processes do not work in reality:



**Requirements engineering by professionals**

**Implementation & evaluation by developers / designers**

**The user has the finished optimum product**

Ideal

Reality

**Someone has an idea**

**Implementation: Chaos, problems, spontaneity, human factor…**

**Users do different things with the product than the designer intended…**

# Review: History and Perspectives of PD

Two different trends (Europe <> US)

## Europe (Scandinavia)

- Union background (Co-creation of the workplace)
- Fear of rationalization (elimination) of jobs  and maintenance of occupational work and safety standards
- Development from creative techniques

## USA

- Pragmatism / Economy: Improved product = more profit

- Development from the improvement of process models
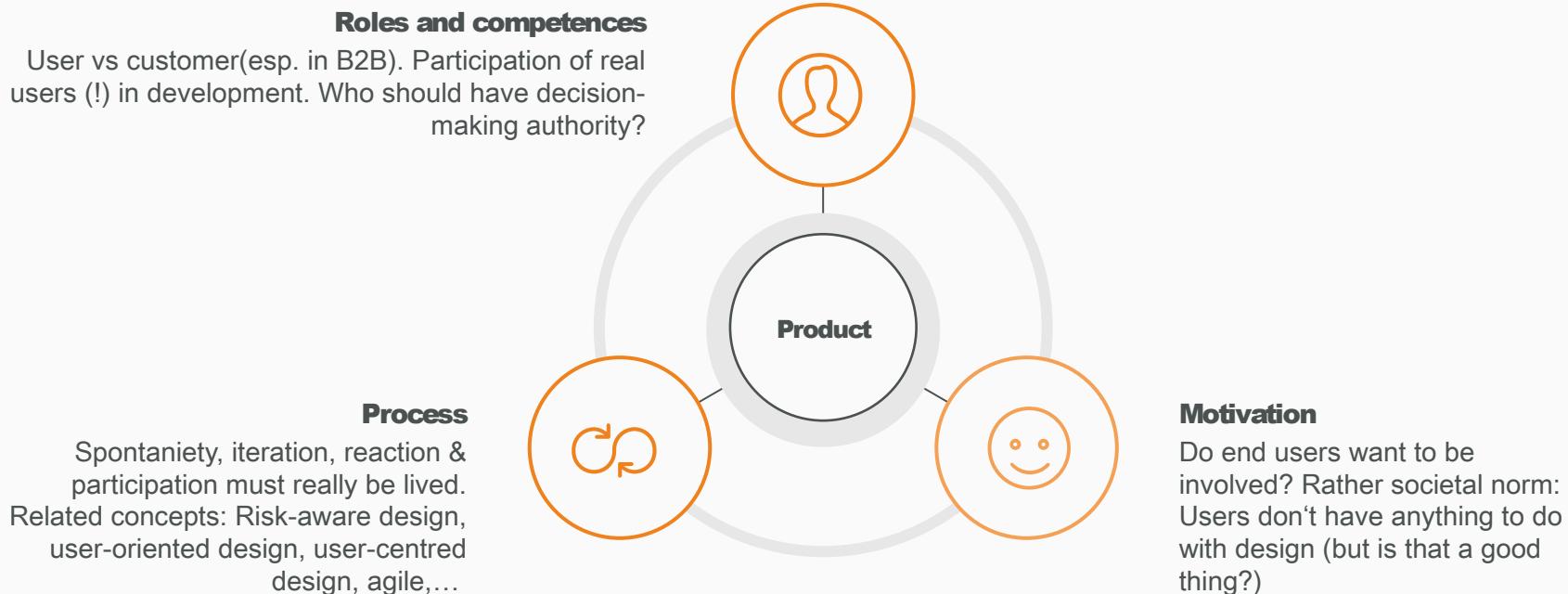
## User Driven Innovation

- Put users' ideas for the improvement of products into use

- Includes aspects of both Scandinavian and US PD

# Participatory Design (PD)

Active user integration in the development of the conscious(!) intermingling of roles (Designer <?> User)

**Roles and competences**

User vs customer(esp. in B2B). Participation of real users (!) in development. Who should have decision-making authority?

**Product**

**Process**

Spontaniety, iteration, reaction & participation must really be lived. Related concepts: Risk-aware design, user-oriented design, user-centred design, agile,…

**Motivation**

Do end users want to be involved? Rather societal norm: Users don't have anything to do with design (but is that a good thing?)

# Methods: Diverse!

There is no such thing as "the" standard-PD-method. The choice structuring of methods is ALWAYS product-~~speci~~fic!

Our role in PD-processes: Moderators / mediators (channeling of communication). Rather deploy ethnographic methods, ensuring that there is as little predisposition as possible and that preferably no suggestive methods are employed. The reason for this is that the range of user reactions is limited / determined by the methods used.

**Example: Moderated creative techniques**
Future workshop, organizational theatre (focusing on a playful  "what if" approach)
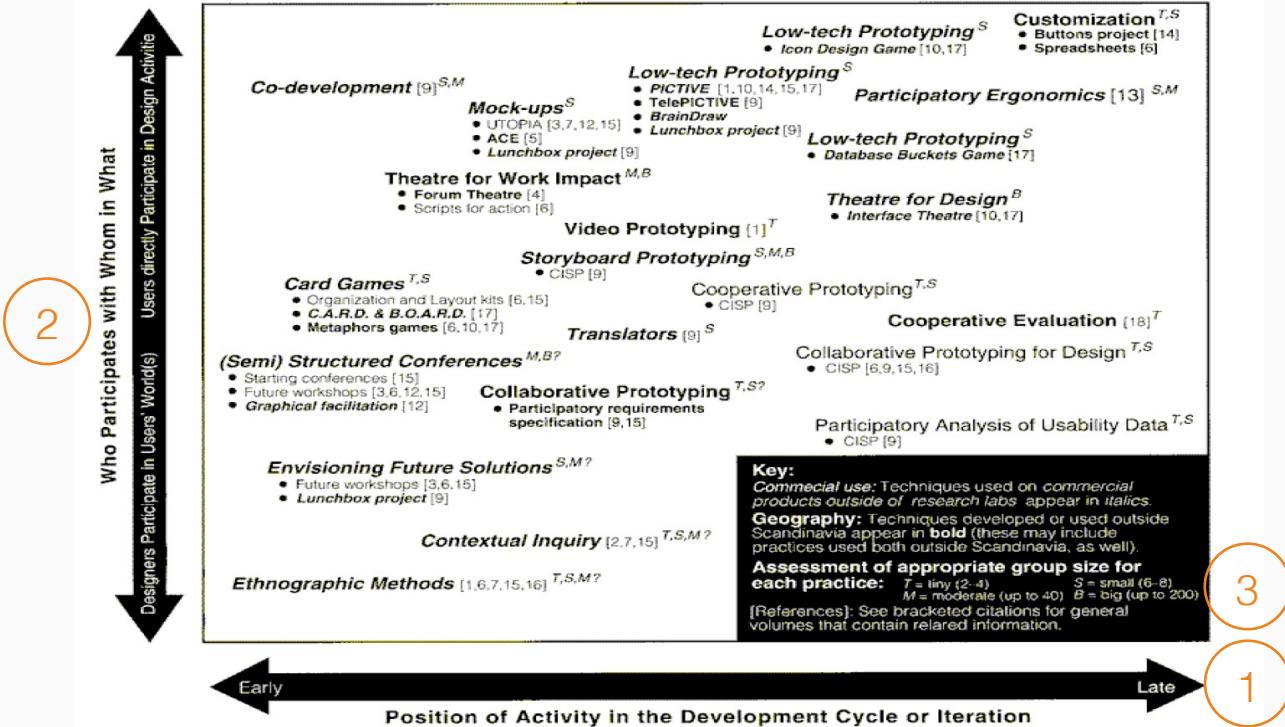
**Example: Represemtation of techniques**
Joint (Paper-)prototyping, generally working with very rough mock-ups or similar, so that creativity isn't limited too much.

End-user development / Appropriation support: Always allow dialogue, feedback and co-creation of technically direct IN products and involve users permanently.

# Classification of PD-methods

Three crucial factors:
1. Point in time in the process, 2. Type of collaboration, 3. Group size

# Example: PD of spoons

Illustration of a "PD Frame of Mind"

… Can the spoon possibly be anything other than simply an eating utensil for you or for anyone else? A medium? Can novel new uses be discovered (which were not intended in the design?)



**When you eat soup…**

…do you see yourself as a spoon "user"? Would you be interested in designing / evaluating a new spoon? While eating?





… If you (perhaps conjointly with other spoon users) have considered an innovative new spoon, maybe a spoon manufacturer would be interested in it? Of maybe you will become a spoon manufacturer yourself?

… If your spoon broke, would you wait for a new spoon before ever eating soup again? Would you use a fork? A straw? Would you repair your spoon?



…Maybe there are other environments, practices and contexts which are less spooncentric and which completely different questions can be asked?

# Criticism of PD

The event's communication channels

## Participation?

- What does that really mean, anyway?

- Difficult in work situations (Pressure to produce)

- Which qualifications are necessary? What knowledge is relevant?

## Developer's point of view

- PD focuses primarily on the user perspective

- The developer's perspective is also important for technology…

## Design towards technology

- PD is IT-focussed. Can / should IT solve all problems?

# Programm für Heute

- **Geschichte der Informatik**
  Unsere Wurzeln

- **Klassische Usability ("Gebrauchstauglichkeit")**
  Grundlagen | Usability | User Experience | Methoden

- **Aktuelle Ansätze und Praxeologie**
  Arbeits(platz)studien & Ethnografie | Participatory Design | **Wertethemen & Sociability**
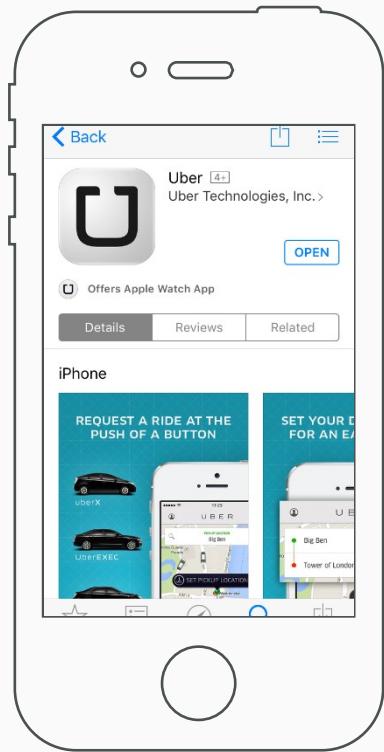
- **Emergenter Ansatz: Infrastructuring**
  Ein holistischer Blick auf die Entstehung & Entwicklung von IT

- **Theoretische Vertiefung**
  Kognitive Ansätze | Tätigkeitstheorie | Strukturierungstheorie

# Design and Values

Design is also always "political"

Changes in interaction-realities also bring about changes in stress conditions and power structures - example: For whom does (new) IT provide opportunities and for whom does it make work? Access/ changes to information? Privacy? Trust? Transparency? Responsibilities? Possession and ownership? Equal treatment? Sustainability?

**Conscious Design**

Comparison of old / new interaction and consideration of winners / losers

**Participatory Design does not solve all problems**

Emancipation-competence, participation-burocracy, (heartfelt) costs for participants regarding *possible* futures, being tired with participating

**Design for social environments**

Sociability as design with regards to the social framework

# Sociability: Designing for ubiquitous social media

Sociability as a concept is a direct result of the mobile, ubiquitous internet: interaction everywhere



**Facebook is bigger than China...?!**
1.4 billion active users every month. Dimension and legal basis extremely complex and often unclear.

**Sociability**

From psychology: The ability to blend into a society and to work together effectively with others. But: Influencing others can also be destructive.

For interaction concepts: How can (good?!) sociability be achiebed by design?

# Sociability: Designing for ubiquitous social media

Design aspects from Baumann(2007)

### Siupport existing pracice

*"i.e. supporting practice that exists or could exist within the social group that is the intended audience of the social software system."*

### Orientation to real world experiences

*"i.e. finding or creating metaphors that relate to the real world."*

### Supporting the development of an identity

*"i.e. providing the community with the mechanisms that allow for the development of an online identity. "*

### Supporting self-realization

*"i.e. creating mechanisms that allow users to tap into the collective wisdom and experience and use it for their own benefit, learning process and self-actualization."*

# Sociability: Designing for ubiquitous social media

Design aspects from Preece (2000) as well as from Preece & Shneiderman (2009)

### Community problem areas

*Registering / entering the community?*

*Trusting (technical) security*

*Governance*

### Design for Reading

*Motivation and incentive for users to consume / read content regularly*

### Contributing to a Community

*Motivation and incentive for users to generate active content themselves and to help shape the community*
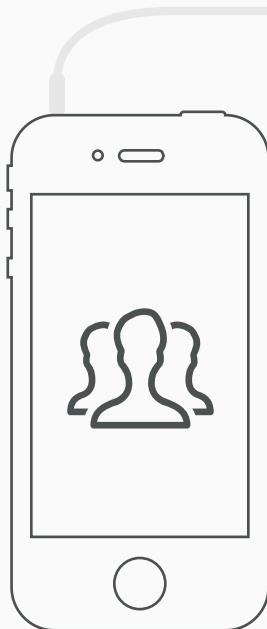
### Collaboration

*Motivation and incentive for users to collaborate with others to generate content and develop the community further*

Preece, J. (2000): "Online communities: Designing usability, supporting sociability". New York: Wiley.
Preece, J., Shneiderman, B. (2009): "The Reader-to-Leader-Framework: Motivating Technology Mediated Social Participation". In: "Transactions on Human-Computer Interaction"

# Value Sensitive Design (VSD)

Aim: The development of a proactive (!) methodology to allow human values in design processes

## Values ≠ Usability

Usability is essential for design that supports values, but it is not sufficient.

Example: a computer virus with good usability for the black hat, "comfortable" GPS surveillance of truants…

## Interactional Theory

Technology varies in its suitabilty to support specific values (technology is not value neutral but is also not necessarily value-specific) This suitability is one of the things VSD focuses on.

Example: Manhattan Project

## Design for…

... Egoism

... Self-development

... Collectivism

... Free (software) ideology

And much more (see the work of Batya Friedman)

# VSD: Methodology

A conceptual overview

Fundamentally important: Consideration of  *direct* and *indirect* Stakeholders (immediately / indirectly interacting with the system which is to be designed **und davon beeinflusst**). Iterative and integrative application of the following methods:

**Conceptual research**
Philosophically informed analyses of the intended /  involved / influenced values.
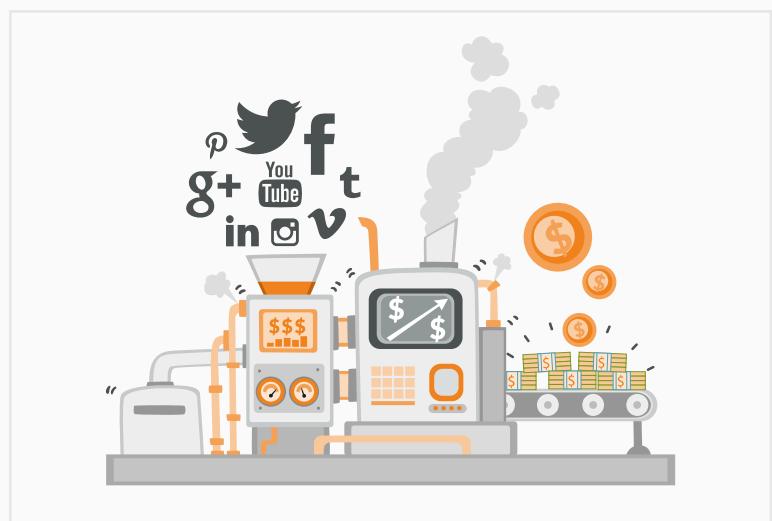
**Technical research**
Identify or develop technical mechanisms and iexamine their suitability for the intended values.

**Empirical reserach**
The application of social-scientific methods to discover who the stakeholders are, what their values are, how these values can or should be prioritised…

# VSD case example

Navigating railway stations (in Berlin) for the blind

**VSD considerations**

Direct stakeholders: Blind people

Indirect stakeholders: Train drivers, other passengers, families and friends, helpers

Values: Independence, safety

**Results from a VSD perspective**

Only moderate conflicting goals, mainly cost vs. use as well as regarding dependability and questions of distribution of the app

# The topic of values in
# software development

Further examples in addition to sociability & VSD

## Accountability & control

Who is responsible and liable? Who checks to see that these obligations are being observed?

## Right to the protection of information

Which rights do individuals / organisations have regarding information about themselves? How can these rights be protected? Which commitments are involved?

## System quality

Regarding data / system quality, which standards are required to protect the rights of individuals and the security of society?

## Property rights

Infringements are easy, persecution is difficult. How can property be protected? What can is to be understood by property in (collaborative) digital domains?

## Quality of life

Which values and institutions should be retained? Which values and behaviours should be promoted?

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# Theories and Methods

Basics

## Motivation of this chapter

On the one hand, the term "infrastructuring" should be communicated; however, this chapter is also concerned with the general understanding of where the differences between theories and methods lie and how methods can develop from theories. This is important for all of us scientifically-working designers to know!

## Theories in science

Theory: The main scientific construct of all sciences concerning humens and their behavior. The best possible description of facts / correlation. Not perfect, often resulting from empiricism. Intermeshed with other theories and refined in this way.

Intention of theories: Purely analytical work. Problem for us (and related disciplines): We make design decisions and don't just analyse.
→ We need methods.

**Theory**
Concepts which prioritise the relevant aspects of their field of design.

**Theory to method**
But: The "relevant aspects" of a theory are not always congruent with the relevance for the method. Which theory helps me where and when?

**Method**
Each method relates to a theory.

# Infrastructuring – one possible new theory

Motivation (very generalized) and basics: criticism of classic development processes (similar to PD)

## Classic procedure

Design → introduction → use

Professionals decide when, where and what is to be designed .

However: Users are creative *in situ*, alter IT, use it in a different way than was planned, esigner ≠ user,…

## Expanding the term "design"

All goal-oriented activities, whether of individuals or groups, which aim to change something (an IT system). It is irrelevant **who** these people are.

# Infrastructuring – one possible new theory

Theoretical principle: Verortete Zurechenbarkeiten and infrastructures

## Verortete Zurechenbarkeiten

Suchman (1994,2002): Criticism of Designer <> user (see previous slide)

Observation: "Design from Nowhere" and "Detached Intimacy"

Advocates the acknowledgement of **all** parties concerned in the (further) development of IT under consideration of their individual perspectives. "Artful integration" of all these activities and "partial translations" instead of standardisation

## Infrastructu3r
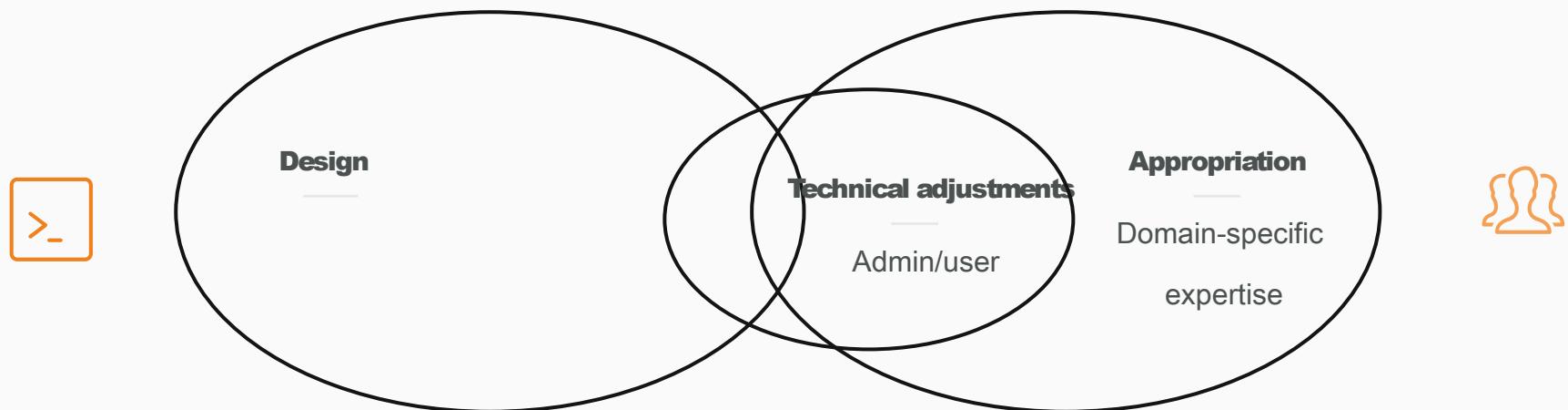
Star&Bowker (2002), Star&Ruhleder (1996): Infrastructure should be understood as the relationshop between uses and IT, not just as a simple compilation of IT.

Infrastructure runs "beneath" other structures and only becomes visible on "breakdown". Eight essential characteristics (next slide).

# Creative activities which result in Usage

Not only designer creativity (left), also user creativity...

**Design**

**Technical adjustments**

Admin/user

**Appropriation**

Domain-specific

expertise

# Infrastructure

8 central characteristics

Embedded in other social and technological structures

Transparent in invisibly supporting work

Have a spatial and temporal reach or scope

Comprises taken-for-granted artifacts and organizational arrangements learned as part of membership

Plug in other infrastructures and tools in a standardized way, and are modified by scope and conflicting (local) conventions

Shape and are shaped by the conventions of practice
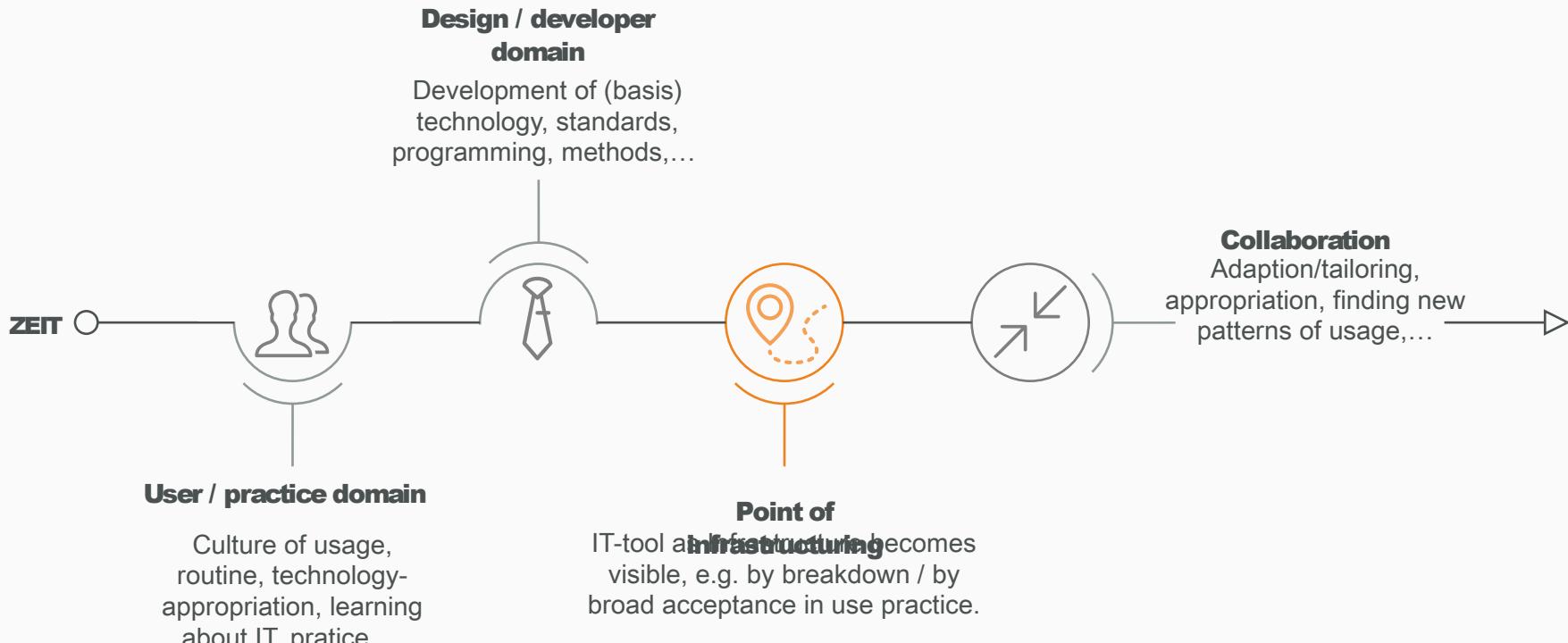
Do not grow de novo but wrestle with the inertia of the installed based and inherit strengths and limits from that base

Normally invisible, become visible upon breakdown

# Infrastructuring – intended by practice

Infrastructuring as a holistic view of IT



**Design / developer domain**
Development of (basis) technology, standards, programming, methods,…

**Collaboration**
Adaption/tailoring, appropriation, finding new patterns of usage,…

ZEIT

**User / practice domain**
Culture of usage, routine, technology-appropriation, learning about IT, pratice,…

**Point of Infrastructuring**
IT-tool an infrastructure becomes visible, e.g. by breakdown / by broad acceptance in use practice.

# Infrastructuring – one possible new theory

Case example: the discovery of a navigation-app as we know it today

Development of (multi-) touch (since the 70s!),
Microelectronics, the development of a navigation app

Configuration and integration into practice (infrastructure gradually becomes invisible again)

ZEIT

PDAs for professionals, developing a new consciousness of the limitations of current systems (Symbian, Stylus etc.)

"The discovery of usage":
By breakdown: forgotten the map
By innovation: saving routes
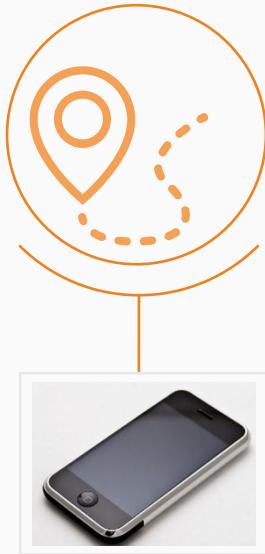
# Infrastructuring and innovation

Infrastructuring doesn't see itself as cyclical/iterative but recognizes chaos, spontaniety and coincidence. "Waves in a pond"

# Infrastructuring and innovation

Infrastructuring as a framework for innovation

Point of infrastructuring as the central element in der question of when and how design takes place: range of technologies meets usage intention. Important: Initiative of designers **and** end users. See breakdown and innovation as an opportunity for design.



### Response activities

News of breakdowns / innovations gets around and can prompt new innovations (see previous slide). But: element of chance.



### Coping / recovery after breakdown

Infrastructures have to support improvisation and resiliance.



### From reflection to planning for the future

Support a broad spectrum of creative activities, adaptation of methods and tools is necessary.

# Infrastructuring: from the theory to the method

Considerations of the requiorements of infracturing methods

**Complement, moderate and expanding the view.**

Infrastructuring methods should complement design methods, e.g. from moderating 'users' to regular activities towards the improvement of infrastructure (not forcibly restricted to IT). Also: encourage dialogue between the domains.

**A close link to infrastructure**

Infrastructuring methods should take the characteristics of infrastructure (see slide on this) into account, e.g.: recognizing the embedding of IT in social affairs, IT etc. → interdisciplinarity, networking, dialogue,… Support in making invisible tasks and structures visible as well as in articulating breakdowns is also essential.

# Infrastructuring: embedding tools!

Motto: Support opportunities

**Historicality**

Support ways of appropriation, e.g. by holding up and visualizing configurations over a longer period of time

**Sytems as flexible as possible**

The basis of all good IT-support

**Decision support**

When decisions are necessary, agreement should be possible

**Articulation support**

IT dialogue (both online and in real life) should be possible

**Facilitate demonstrations**

Create channels for demonstrations and mutual support between users. Also: devise opportunities for observation.

# Infrastructuring: embedding tools!

Motto: Support opportunities

## Explanations

Make an opportunity to explain why a system acts tjhe way it does. Also from user to user, as necessary.

## Facilitate simulations

Create the opportunity to assess what the effects of (new) usage would be in exemplary (or real) surroundings without running the risk of personal / serious

## Delegation

Delegation in Konfigurations-prozessen ermöglichen & Fern-Konfiguration bereitstellen

## Allow exploration

An expansion of the simulation aspect. Exploration – collaboratively, if possible - should be encouraged

## (Re-)Design support

Keep up the dialogue with designers and inform them about appropriation, new usage patterns etc.

# Infrastructuring: Case example 1

An example of method and tool integration from our own work
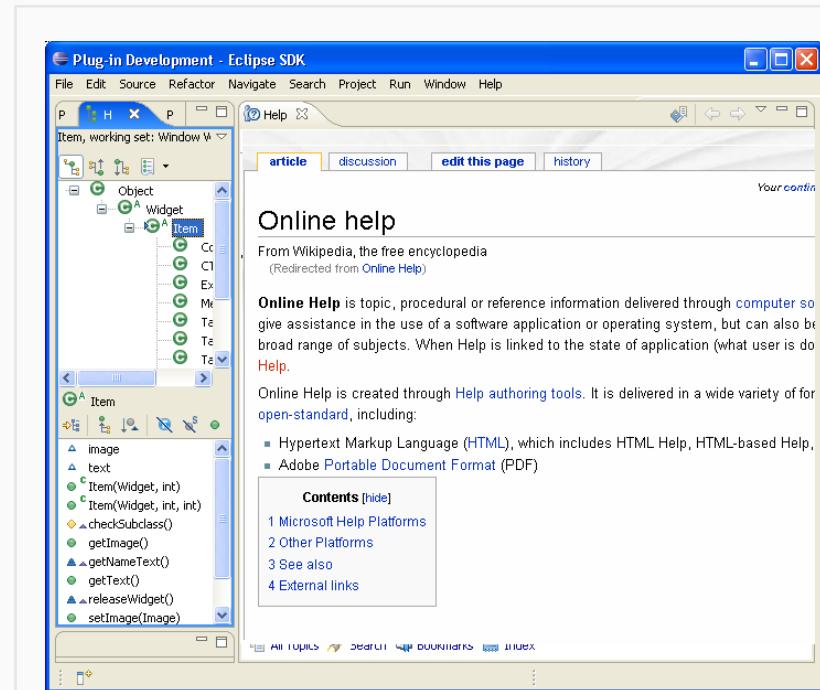
**Integration of configuration & discourse**
Infrastructuring aroundEclipse by…

… Partial and extendable Eclipse configurations (IDEs are generally individually configured very strongly according to company specifications).

… Discourse in Eclipse directly possibly (Wiki), also close integration of Eclipse and Wiki

A variety of such work here (Pipek, Stevens, Draxler, Boden,…)

# Infrastructuring: Case example 2
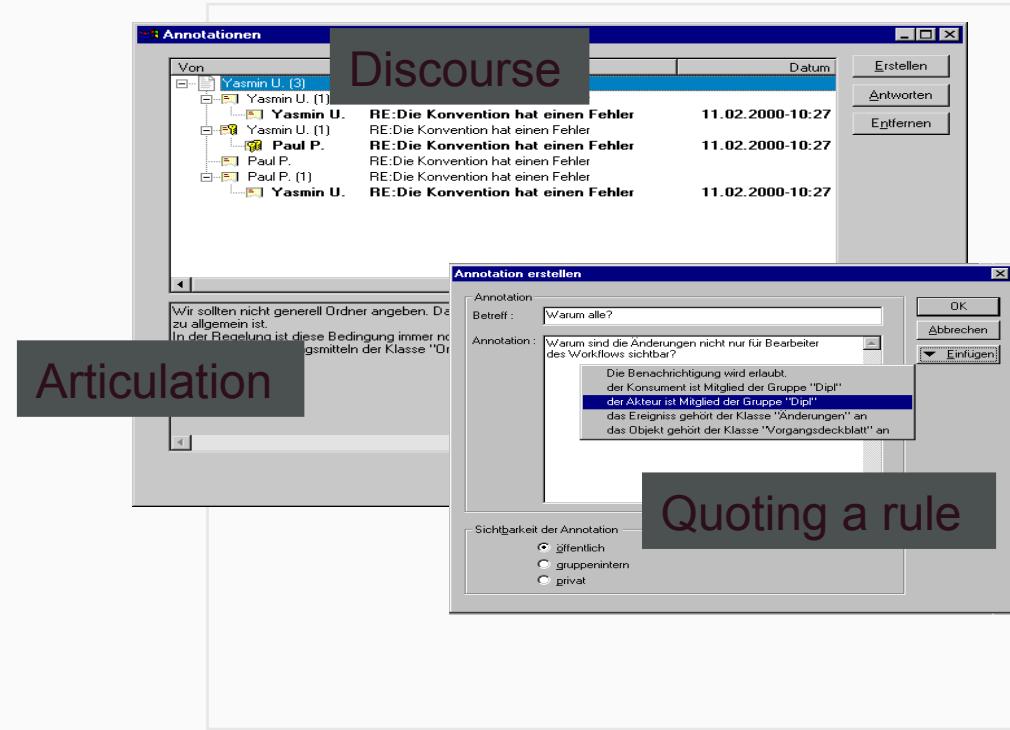
An example of method and tool integration from our own work

**Integration of configuration & discourse**

- Approach: Integrate Tailoring/Configuration and Discourses: Results (Pipek 2005)

- discourse and quoting support useful
- concept complexity hardly reduced
- articulation of concerns regarding tailoring alternatives still 'difficult'
- Support a 'Virtual Community of Tool Practice'

Discourse

Articulation

Quoting a rule

# Infrastructuring: Case Example 3

An example of method and tool integration from our own work: Beyond tool integration
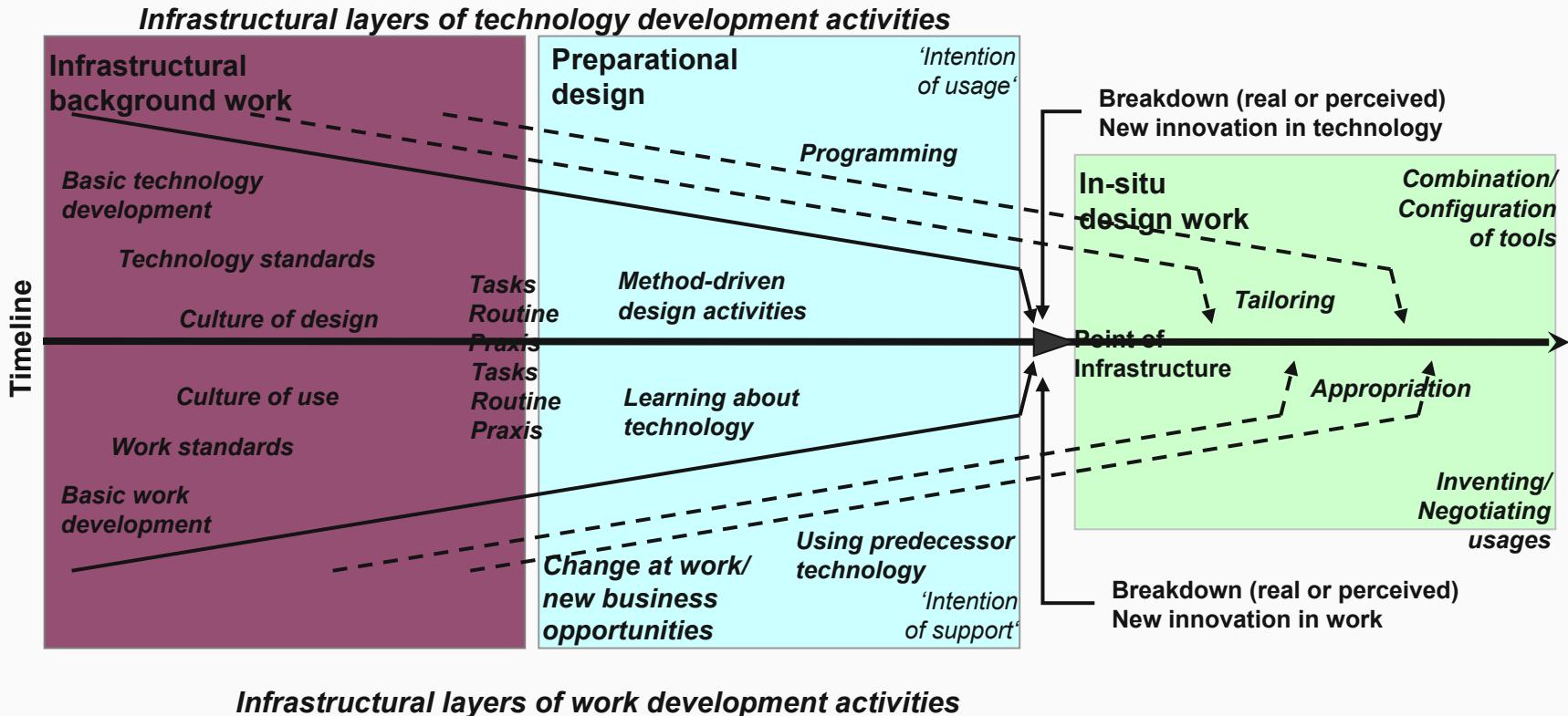


**Integration of configuration & discourse**

- Goal: Capture a rich picture of breakdown/innovation scenarios

- Toolset for self-documentation: Cameras, stickers, forms, snapshot tool
- Support discussions between users and between users and designers
- Nice side effect for research: Sustainable/visible communication
- Evaluated e.g. in five SME using SAP software

# Infrastructuring: Overview of a Theory

*Infrastructural layers of technology development activities*



**Infrastructural background work**

- *Basic technology development*
- *Technology standards*
- *Culture of design*
- *Culture of use*
- *Work standards*
- *Basic work development*

*Tasks Routine Praxis*

*Tasks Routine Praxis*

**Preparational design**

*'Intention of usage'*

*Programming*

**Method-driven design activities**

**Learning about technology**

**Change at work/ new business opportunities**

*Using predecessor technology*

*'Intention of support'*

**In-situ design work**

*Combination/ Configuration of tools*

*Tailoring*

**Point of Infrastructure**

*Appropriation*

*Inventing/ Negotiating usages*

**Breakdown (real or perceived) New innovation in technology**

**Breakdown (real or perceived) New innovation in work**

**Timeline**

*Infrastructural layers of work development activities*

# Infrastructuring: As matters stand

An overview of the current position of the theory, methodology etc.

### Benefit

Understanding of design during use / by users, equality, changing to the meta-level not just driven by designers

### Methodology

Not yet fully derived. Self-evident: Qualitative, ethnographical methods. Historical analyses? Inclusion of technology/standards?

First approach: Activities which change the condition in one of the 8 characteristics of infrastructure.

### Theoretical connections

Linkage to activity and structurations theory (more on this later)

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**Kognitive Ansätze** | Tätigkeitstheorie | Strukturierungstheorie

# **Cognitive** Approaches

Basics



Figure 3.2 Extended stages of the information processing model (adapted from Barber, 1988).

**Goal of the lecture from here**

Clarification of the theoretical principles and interrelation of aspects learned until now (classical usability, more modern approaches etc.) verdeutlichen.

**Cognitive approaches**
**Basis**: Examination of the physiological and psychological aspects of awareness

**Aim**: "Good" software supports people in their perception and manipulation of relevant aspects of the environment

**Differentiation:** "How do we perceive?" vs. "How do we understand?"
→ cognitive scientific approaches

Cognitive considerations are the foundation of  software ergonomy / usability engineering



Figure 3.4 The human processor model (adapted from Card et al., 1983).

# Methods: GOMS

One of the first "Usability" methods (not so common today)

Quantification of the use efficiency of systems over time which require interaction. Foundations: systematically developed tables ("A mouse click takes X seconds, keyboard entries take N seconds",…). Problem: Decoupling of qualitative and quantitative aspects, separation of functionality and interface.

**G**  Goals

**O**  Operations
Concrete operations (Keystrokes etc.)

**M**  Methods
Related sequence of operations

**S**  Selection Rules
Choices

```
[select*:      M: Verschieben durch Tastenkombination
                    O: Selektiere Objekt
                    O: STRG+X
                    G: Gehe zu Zielordner
                          O: Finde Zielordner
                    O: STRG+V

               M: Verschieben durch Kontextmenü
                    O: Selektiere Objekt
                    O: Rufe Kontextmenü auf
                    O: Wähle Cut-Eintrag im Kontextmenü aus
                    G: Gehe zu Zielordner
                          O: Finde Zielordner
                    O: Rufe Kontextmenü auf
                    O: Wähle Paste-Eintrag im Kontextmenü aus

               M: Verschieben durch Drag & Drop
                    O: Selektiere Objekt
                    G: Gehe zu Zielordner
                          O: Finde Zielordner
                    O: Verschiebe Objekt

      select]
```

| Tastenkombination: | |
| --- | --- |
| M | 1,35 |
| D (Objekt) | 1,20 |
| B (Objekt) | 0,20 |
| K hold (Strg) | 1,00 |
| K (X) | 0,70 |
| K release (Strg) | 0,30 |
| K hold (Strg) | 1,00 |
| K (V) | 0,70 |
| K release (V) | 0,30 |
| **Gesamt:** | **6,75** |

| Kontextmenü: | |
| --- | --- |
| M | 1,35 |
| D (Objekt) | 1,20 |
| B right (Objekt) | 0,30 |
| D (Cut) | 1,20 |
| B (Cut) | 0,20 |
| B right (Zielordner) | 0,30 |
| D (Paste) | 1,20 |
| B (Paste) | 0,20 |
| **Gesamt:** | **5,95** |

| Drag & Drop | |
| --- | --- |
| M | 1,35 |
| D (Objekt) | 1,20 |
| B hold (Objekt) | 0,10 |
| B release (Objekt) | 0,10 |
| **Gesamt:** | **2,75** |

# Cognitive instruments: Metaphors

Infrastructuring as an innovation framework

**Metaphors everywhere…**

In HCI, metaphors are often used to demonstrate functionality. The basis for this: the request for and use of metaphors in the communication with users, comparison of diverse metaphors for the analysis of difficulties in understanding and conflicts.

### Finding suitable metaphors

The aim is often to demonstrate 'new' functionality without having an equivalent in the real world. However, the understanding of metaphors is shaped by the cultural and social background of designers and users.
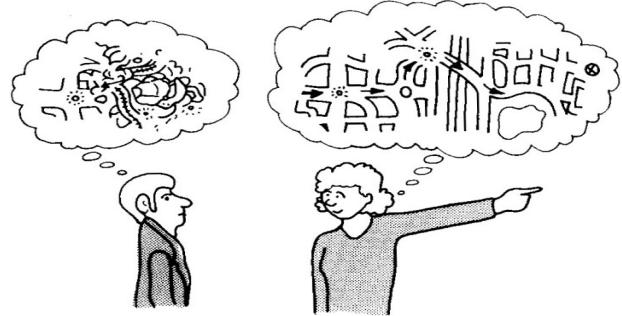
### Types of metaphor

Verbal / auditive / visual / compound / …
Interface metaphors should combine what is already familiar with new functionalities
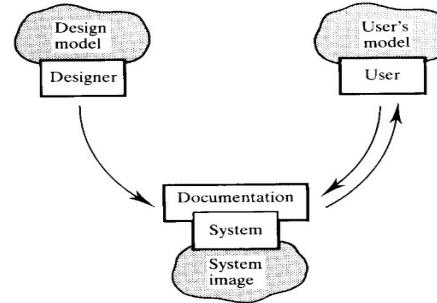
### Interesting:

The dominance of navigational structures vs. The dominance of metaphors as semiotic signs

'If the organism carries a ''small-scale model'' of external reality and of its own possible actions within its head, it is able to try out various alternatives, conclude which is the best of them, react to future situations before they arise, utilise the knowledge of past events in dealing with the present and future, and in every way to react in a much fuller, safer, and more competent manner to emergencies which face it.'

(Craik, 1943, p. 57)

**Figure 7.3** The design model, the user's model and the system image (Norman and Draper, 1986, p. 46).

# Cognitive instruments: Mental Models

= Representation of reality and one's own options for action which can inform real or imaginary actions

# Distributed Cognition

Knowledge at that time: Purely cognitive models probably won't be sufficient

"Cognition in the wild" (Hutchins 1995, 1990): Cognitive approaches only stem from individuals. Good: Human-computer interaction. Bad: Human-human interaction mediated by computers. Alternative: Distributed cognition as cognitive processing in the group.
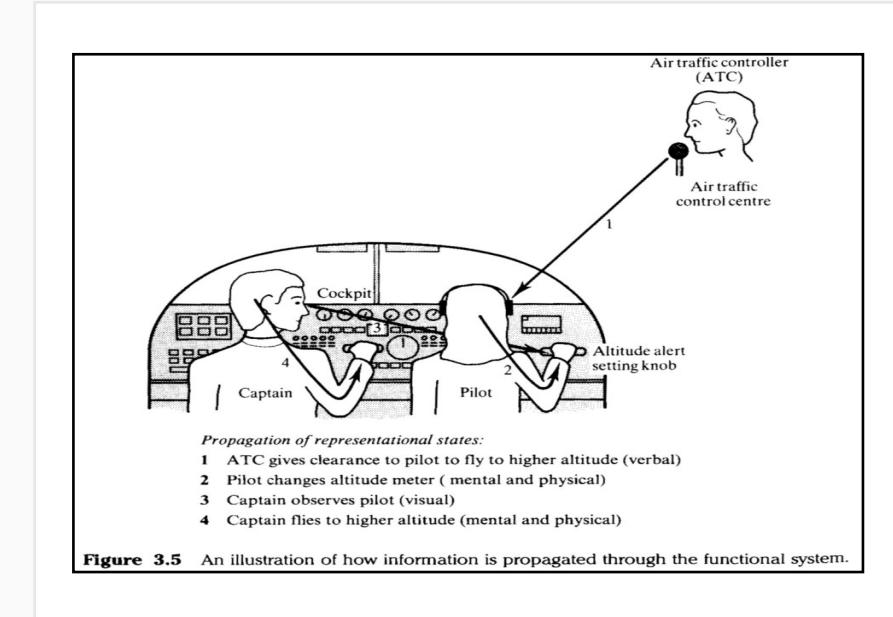
**Focus of the analysis**

Interplay of the various functional components and actors. A particular focus on the flow and transformation of information as well as on the inclusion of technical, social and organizational aspects. Addtionally: the compilation of representational  states of objects and media.



Figure 3.5    An illustration of how information is propagated through the functional system.

**Example: Co-operation in the cockpit**

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# Activity Theory (AT)
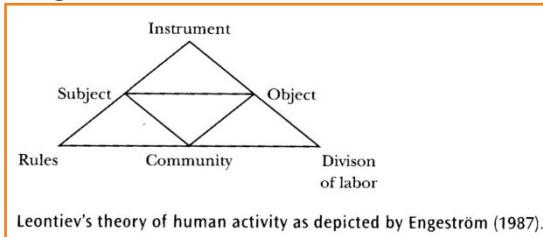
History / Why AT, actually?

**Problem situation**
Cognition psychological HCI concentrates on users and interface. Interaction e.g. with other people, context, culture, groups…. Is rather neglected

**Observable deficits in cognition psych. HCI**
Interfaces for "general experts" (often according to images of the designer) / Validation is often concentrated on new users and not on experienced users / focus is on desired state, not actual state (due to task analysis) / Scenarios often only construed for one-computer-one-person (whereas in reality there are often more) / Users are only objects of study, designers



Leontiev's theory of human activity as depicted by Engeström (1987).

**History of AT**
Father: Russian Psychologists Vygotsky 1962 and Leontiev 1978.

Unity and indivisibility of consciousness and activity: people live in an objectively measurable reality which forms all subjective phenomena, i.e. subjective phenomena can be understood by observing objective reality. Analysis of social systems by considering how people treat artefacts and their real and socially ascribed attributes.

Key roles of 'tools/instruments' as 'historical', use of <span style="color:red">mediierende</span> artefacts for the manipulation of objects: *Real*: hammer, pen, etc. *Imagined*: calendar classification, TV programme structure etc.

Transfer to IT: *Developmental Work Research* (Engeström 1987, Kuutti and Arvonen 1992) / *Through the interface*: Bodker 1991 / Overview in Nardi 1996

# AT: Goals / Advantages

6 central advantages

Inclusion of a historical perspective

Analysis and design of a work practice under consideration of qualifications, wok environment, division of labour etc.

Analysis and design under consideration of actual usages and complex user interdependencies: inclusion of artefacts as a mediator

Inclusion of the development of user knowledge and usage in general

Activation of users in the design process

There is no need to restrict studies to the level of 'general users'; specific practical background can be addressed

# AT: **Basics**

Differences between Vygosky and Leontiev
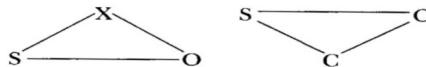
### **V** Vygotsky

Object of investigation: Activity. Subject S does something with object O

Not only determined by S and O but by instruments which are culturally shaped

Technical instruments (tools) and psychological instruments (signs in a semiotic sense)



Triangles of activity. On the left is human activity mediated by artifacts (Vygotsky); on the right socially mediated activity (Leontiev).

### **L** Leontiev

From a natural-historical perspective: Aus naturgeschichtlicher Perspektive: Community as a construct which mediates culture and history

# AT: Levels of activity (Leontiev)

Differences between Vygosky and Leontiev
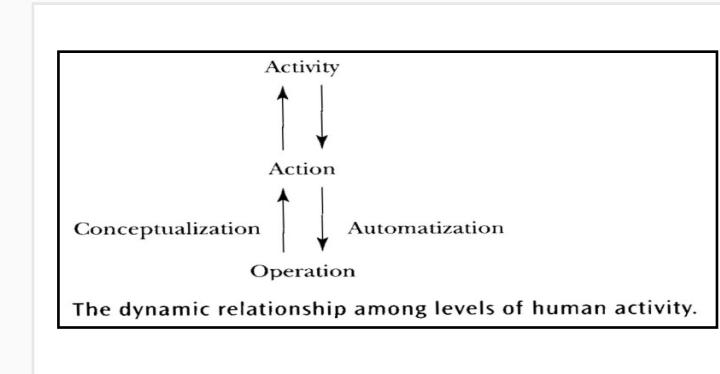
**(L)** **Activities:** The satisfaction of a need by a material or an object. Motive: View and expectations of the object. *Why is something done?*

**Actions:** Realize actions. Are objectively measurable. Run according to the agent's conscious goals. *What is being done?*

**Operations:** Realize actions in sequences. Carried out unconsciously. Basic stock of the agent's repertoire of actions. Culturally learnt but potentially determined by environment and framework conditions. *How is something being done?*

**Behavioural frameworks are flexible (learn!):** Automatization / internalization: Actions become operations (e.g. gear shift in a car). Re-conceptualisation: (Unconscious) Operationen become (reflected) actions (e.g. following breakdowns). Activity in one context can be an operation in another.



Activity

Action

Conceptualization          Automatization

Operation

The dynamic relationship among levels of human activity.

# Developmental Work Research

Basics
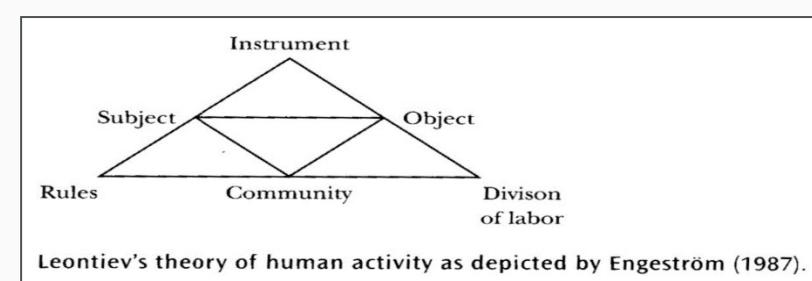
**Triangles according to Leontiev/Engeström:** Activities to webs of activity linked via subjects, objects, instruments etc. Development of an activity by by resolving contradictions/conflicts. *Internalizing* and *externalizing* instruments:

*I*: Internalization of real instruments: Abacus  -> mental arithmetic
*E*: The use of real artefacts/instruments to support internal activities: Using an abacus for high numbers; speaking aloud for work coordination
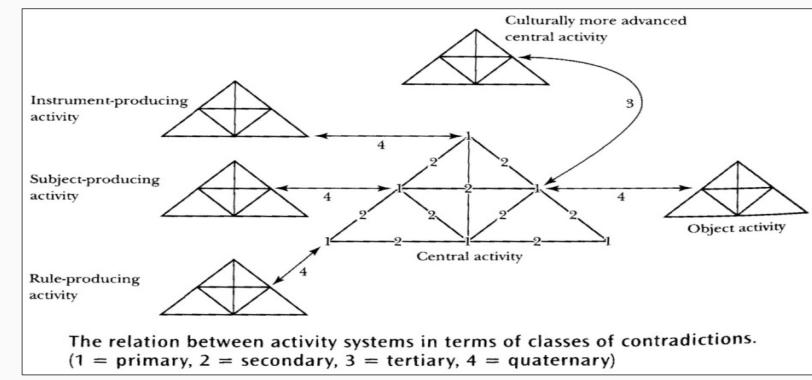
**Contradictions/conflicts and the development of activities:**
Conflicts give rise to the further development of activity systems (new instruments, rules etc.).

Fundamental conflict (1): Distinction between usefulness and the exchangeable value of an instrument or object

Further: Conflict between the corner points of the triangles (2, e.g. subject and instrument), conflict between neighbouring activities (4, e.g. SE and software usage), conflicts between real and imaginable activities (3)



Leontiev's theory of human activity as depicted by Engeström (1987).



The relation between activity systems in terms of classes of contradictions. (1 = primary, 2 = secondary, 3 = tertiary, 4 = quaternary)

# AT: Mediierung of work through better instruments

Negative: If you have a hammer, everything looks like a nail.
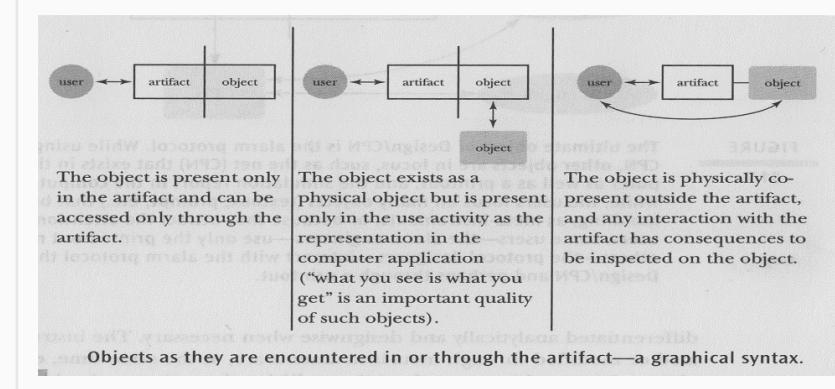
Mediierende effect of instruments/artefacts on the example of software, e.g. cooperative word processing

Mediation of coordination: Visualisation of the activities enables the co-ordination of the co-operators

Mediation of output expectations: Usage of new text lay-outs

Mediation of styles of work: Reference to the potential for the concurrent manipulation of texts

Relationship between subject - object - instrument



The object is present only in the artifact and can be accessed only through the artifact.

The object exists as a physical object but is present only in the use activity as the representation in the computer application ("what you see is what you get" is an important quality of such objects).

The object is physically co-present outside the artifact, and any interaction with the artifact has consequences to be inspected on the object.

Objects as they are encountered in or through the artifact—a graphical syntax.

# AT: Application possibilites in HCI

Case example I

Further development of activity networks

Context menus/"Direct manipulation" to describe the 'zone of proximal development' (also Bardram and Bertelsen 1995)

The shaping of user interfaces (Beaudouin-Lafon 2000)
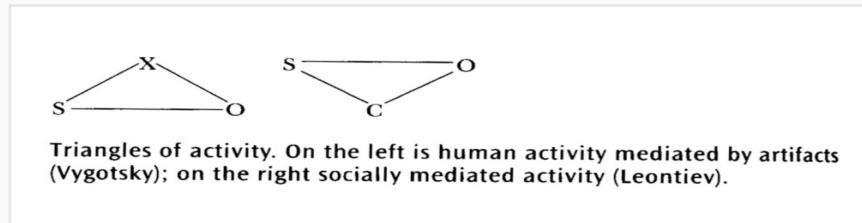
The understanding of screen elements (Drop-down-Menu, scroll bar, radar navigation etc.) as artefacts for the manipulation of objects (e.g. text documents)

The understanding of input devices (mouse, keyboard, joystick etc.) as artefacts for the manipulation of screen elements

The design of software systems (Susanne Bodker)

The development, supported by theory, of styles of user interface

Theory-supported check lists for requirement analysis



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# AT: Application possibilities in HCI

Case example II: Check lists

**Check lists (e.g. Korpela et al. 2000)**

*Activity related questions:*
Outcome: Which produt/services?
Object/Process: Raw materials and their contribution to the product?
Instruments: Which tools, abilities, knowledge?
Subjects: Who is doing what, exactly?
Social relationships/menas: Which conventions, rules, division of labour, communication rituals?

*Activity network related questions:*
Outcome: Who needs the product/service, and what for?
Object/Process: Where do the raw materials and their contribution to the product originate?
Instruments: Where do tools, abilities and knowledge come from and how are they generated?
Subjects: How do subjects obtain their useful abilities?
Social relationships/means: How are conventions, rules, division of labour and communication rituals "produced"?



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# AT: Application possibilities in HCI

Case example III: Analysis of a change in focus (Bodker 2004)
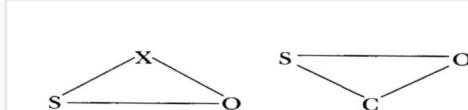
Special attention paid to the change of focus: Change of object/instrument

Why? Aim? Which object, mediated how? Which instrument and mediated how?

Social level: Conflicting purposes, instruments, objects? Change of focus from where to where? Breakdown or voluntary?

Reason for the change?

Investigation based on various levels of activity categories



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# AT: Summary

Advantages, scope and limitations

**AT focuses on artefacts**
Instruments and products with which agents interact.
Therefore easily empirically ascertainable (!?)

**AT makes it possible to see and assess the role of computer applications as tools for action :**
To avoid technical tunnel vision, the focus is on agents, actions and artefacts:  reflections remains (relatively) neutral regarding work equipment and results
Instruments, their embedded action culture and their history of supersession open up historical perspectives action systems
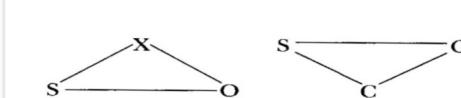
**AT is also a cultural learning theory**
Consideration of development steps against a historical background

**AT initially only a mental framework which must be completed methodologically:** Good analytical methodological basis. Implementation of AT perspectives in design is not easy. Pragmatism? Design orientation?



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# Programm für Heute

**Geschichte der Informatik**
Unsere Wurzeln

**Klassische Usability ("Gebrauchstauglichkeit")**
Grundlagen | Usability | User Experience | Methoden

**Aktuelle Ansätze und Praxeologie**
Arbeits(platz)studien & Ethnografie | Participatory Design | Wertethemen & Sociability

**Emergenter Ansatz: Infrastructuring**
Ein holistischer Blick auf die Entstehung & Entwicklung von IT

**Theoretische Vertiefung**
Kognitive Ansätze | Tätigkeitstheorie | **Strukturierungstheorie**

# Gidden's Theory of Structuration (ST)

Structuration theory

## Division of perspectives

Social phenomena can be described as the result of human action. Human action can be understood by objective, exogenous socio-cultural framework conditions. Aim: The integration of both perspectives ("Die Konstituierung der Gesellschaft", Giddens 1984)

## Duality of Structure

Social structures as results and limitations of human actions

## Why is it interesting for HCI?

Studies have shown both the enabling and constraining character of information systems.

The production/introduction of information systems as structure-creating action.

# ST: Sructure types and modalities

Basics
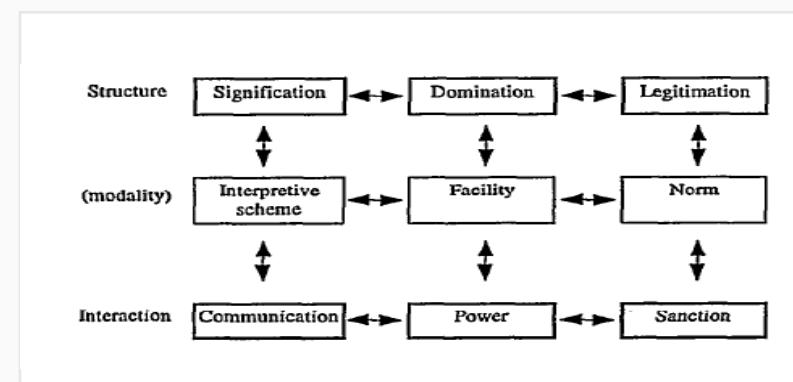
**Structure types**: not distinctive categories of analysis, mutually influencing. Interaction with agents through three modalities: Interpretation schemata, resource processing facilities and norms

**Signification**: Production of meaning through language/character sets (semantic codes, interpretation schemata, discoursive practice) e.g. price label in a shop: Detailed description, utility, exchange value; Bank notes: exchange value; Interpretation schema allows the equivalence of values and amount of money to me understood. Regulation by communication.

**Domination**: Production of power by controlling resources, e.g. money provides the power to speed up the handing over of goods Regulated by the exercise of power

**Legitimation**: Creation of a moral order by embedding in norms, values and standards, e.g. (re)negotiation of the advertised prices common/uncommon depending on cultural values. Regulated by sanctions.

# ST: What is "structure"?
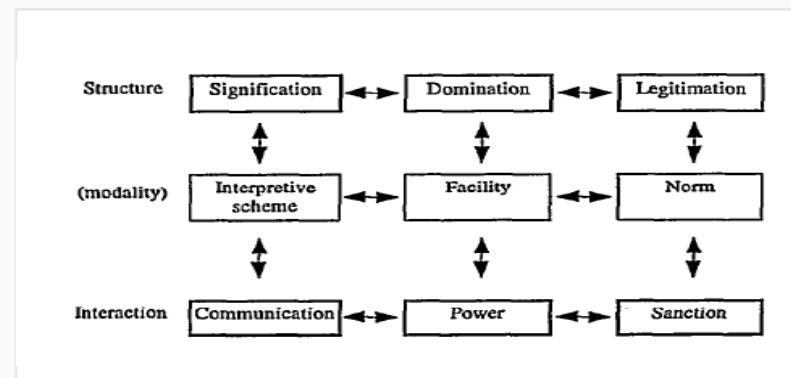
Central term and characteristics

**Structure is not objective** 'because' it exists solely through human actions. Humans are in a state of reflexive consideration regarding their situation and the omnipresent potentials for change. Where is the "structure" in information systems?

**Definition of structuring:** Systems are the reproductive relationships between agents or collectives (organized as social practices). *Structure* is (or rather structural characteristics are) rules and resources which emerge as characteristics from systems. *Structuring* is the entirety of the parameters which influence the continuity or modification of structures and therefore the reproduction of systems (Intricacies of the definition first appear when compared with other sociological theories).

**Main points of criticism**: Wachsweiche Behandlung des Strukturbegriffs, Reference to the action (Agency)



| Structure | Signification ↔ Domination ↔ Legitimation |
| (modality) | Interpretive scheme ↔ Facility ↔ Norm |
| Interaction | Communication ↔ Power ↔ Sanction |

# ST and HCI

Naive approaches

**Orlikowski 1992: Structure is embedded in information technology:**
Structure emerges from the actions of programmers. Strucure is relatively hard wired in information systems. The results of the analyses of the effects of IT: Techno-determinism – the behaviour of users is governed by the embedded structures
Studies e.g. on the introduction and ussage of Groupware

**Scheepers and Damsgard 1997**: Comparison of the sructural characteristics of diverse intranets. Result: Recommendations for the set-up of in-house intranet

Table 1: Overview of analysed cases

| Structural Dimension | National Semiconductor Corporation | SAS Institute | ORNL/LMES | Bectel Group Inc. |
|---|---|---|---|---|
| Signification | Initial lack of mutual *signification* structure for the intranet. | Lack of shared signification structures lead to initial rejection. | WebWeek launched to establish shared structures of *signification*. | Top management support ensured shared *signification* structure. |
| Domination | Management threat to put an end to the intranet implementation. | Management intervene in direct support for the intranet. | The working group realizes that it needs management support. | Domination structures applied to ensure uniform layout and standards. |
| Legitimization | The champions interact with management acknowledging existing power structures and that intranet *technology* is in line with organizational values and norms. | Intranet implemented in accordance with social structures and norms. | The intranet fits well with some parts and poses a challenge to legitimization structures in other parts. | Homogenous fit with legitimization structures enabled a smooth intranet implementation. |
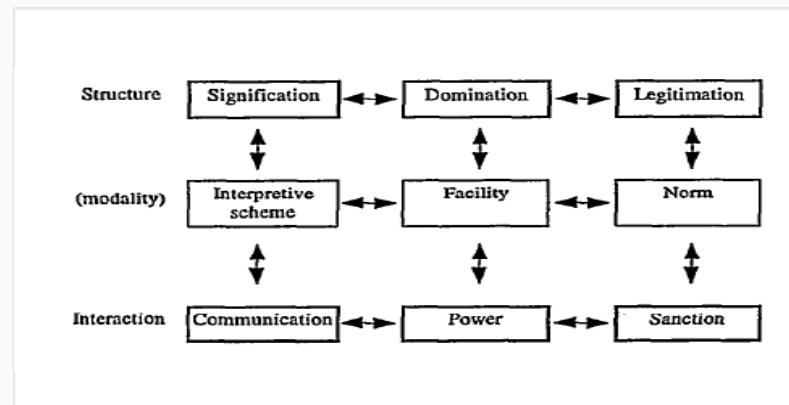
# ST and HCI

Adaptive Structuration Theory (AST), De Sanctis and Poole (1990, 1994)

**Target statement**: "Given an innovative information technology and further sources of social structures n1 to nk as well as pertinent appropriation structures and task-oriented decision processes, IT is used as intended."

**Method**: Analysis of the 'structural features' of the technologies and the 'spirit'. Structural features: e.g. a voting algorithm in a system which supports decision making. *Spirit*: the quantity of values and aims which form the basis for the implementation of 'structural features'. *Appropriations*: immediately visible activities which testify to underlying structuration processes. *'Appropriation moves'*: activities of groups who adopt the 'structural features' of the IT-designers' usage intentions either as intended ('faithful') or not ('unfaithful').

**Criticism:** The result is a positivistic framework (the acceptance of an objective cause-effect relationship which need only be empirically proven). Has but little in common with Giddens descriptions (e.g. immateriality of structure), see Jones 1999.

# ST and HCI

Orlikowski (1992, important correction 2000)
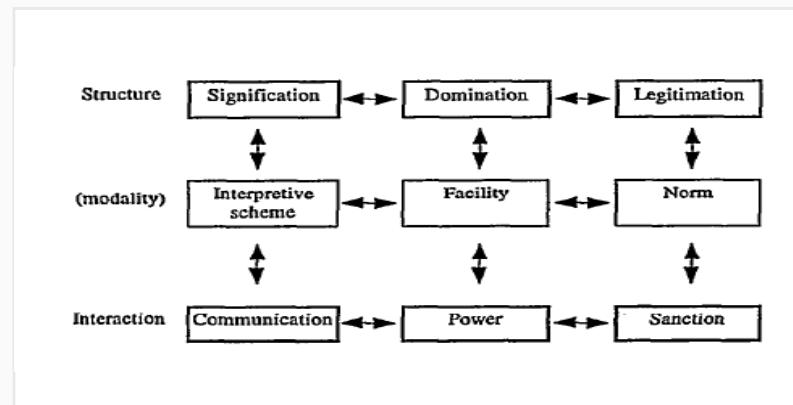
**1992: Duality of technology:** Technologies as material artefacts but not in focus. Decoupling of activities makes it possible to perceive artefacts as the result of human activity. The interpretation of artefact usage is free but limited by functionality. The institutionalisation of structure.

**Correction 2000:** Only the perceived and regularly used characteristincs of technology influence structurisation. Not technology but the use of technology creates struture. The use of technology is emergent, not only shaped by designers but also by user activities.
Institutionalisation only "for now".

*Methodological execution:*
Qualitative empiricism: The use of ethnographiocal and ethnomethodological methods, focusing on the lines of conflict which are described by the concept of the duality of technology.

# Theory & ethnographical methods in HCI

Empirical practice is always a compromise with a field of application



**Theories** deliver focuses and guidelines for interpretation.

**Ethnographical methods** deliver empirical tools.
Caution: Ethnography does not always deem the use of its methods for theorising appropriate!

**Cognitive approaches:** *Focus*: Explicating mental models. *Methods*: Rather explicating and distanced, context rather unimportant. *Interpretation*: The search for common features and differences in actors' mental models

**Action theory** *Focus*: Artefacts/instruments and their interaction
*Methods*: More involved, the context is important and is to be (Rules, Community, Division of Work). *Interpretation*: the identification of activity networks and their dynamic/development

**Structuring theory:** *Focus*: The consideration of structuring processes (in particular modalities). *Method*: Rather involved, long term studies. *Interpretation*: Relatively free according to the modalities

# Done! From now on: Project work

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