Methoden zur Normenkonformitätsprüfung im Rahmen von ISO 9241

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Usability Methods

Usability inspection is the name of a set of highly cost-effective methods for finding usability problems and improving the usability of a user interface design by inspection.

Topics to be covered include...

- **Definition of usability inspection,**
- **the heuristic evaluation method,**
- **other inspection methods.**
- **Relation between usability inspection methods and user testing.**
- **Severity of usability problems found by usability inspection.**
- **Cost-benefit chrarcteristics of usability inspection methods.**
- **Positioning inspection in the usability engineering lifecycle.**

Evaluation

Assessing the usability of an existing design

- **finding usability problems (to fix them)**
- **formative evaluation: improve interface, find good/bad parts**
- **summative evaluation: are goals met?**

Only one part of the usability engineering lifecycle
(task analysis, goal setting, design, prototyping, iteration, field studies, etc.)

Inspection methods

- **pluralistic walkthrough [Bias 1991]**
  - – define a scenario (linear path through interface)
  - – get users, designers/developers, usability specialists in one room
  - – show user interface one screen at a time (e.g., overheads)
  - – have participants write down problems before discussion
  - – discuss the screen (let users speak first)

    {may use designer/developer as 'living manual' for early help}

- **standards inspection [Wixon, Jones, Tse & Casaday 1994]**
  - – have a standard expert inspect interface for compliance

    {may cover most of standards without much task knowledge}
- **consistency inspection [Wixon, Jones, Tse & Casaday 1994]**
  - – team of designers/developers (one from each project) inspects a set of interfaces

    for more than one system/application, one at a time
- **feature inspection [Bell 1992]**
  - – imagine typical user task
  - – list sequence of features used to accomplish the task
  - – check for long sequences, cumbersome steps, additional knowledge, etc.
- **cognitive walkthrough [Polson, Lewis, Rieman & Wharton 1992]**
  - – imagine typical user task
  - – use the system to perform the task, 'defining' the correct solution sequence
  - – hand-simulate user's problem solving process at each step
  - – check if user's goal/memory leads to the defined solution sequence
- **quantitative metrics [Rauterberg 1994]**

Evaluation methods

- **highly informal evaluation: heuristic evaluation**

Look at interface and make lists of its problems [Nielsen and Molich 1990]:

– according to checklist of established usability heuristics

– may also apply any additional usability knowledge

Two or more passes through interface:

– inspect flow of interface

– inspect each screen (dialog box, system message, etc.), one at a time

Typical session length: 1–2 hours.
May use observer to help evaluator and note problems mentioned.
Afterwards: aggregate lists of problems from multiple evaluators

- **informal evaluation: usability inspection**

Goals to be met in a somewhat systematic way:

– generate list of usability problems (main goal)

– contribute to building design rationale (artifact inspection)

– provide feedback in design courses [Nielsen et al. 1992]

– evolve a parallel design [Nielsen 1993]

Tools support for inspection:

– mostly none

– online forms for cognitive walkthroughs [Lewis et al. 1992]

– online/hypertext guidelines/standards documents

– CSCW tools for team heuristic evaluations

(show panel to be discussed for annotation/drawing/pointing)

- **structured evaluation: usability tests**

Frage:

Gibt es Methoden zur Normenkonformitäts-prüfung im Rahmen der ISO 9241 ?

Antwort:

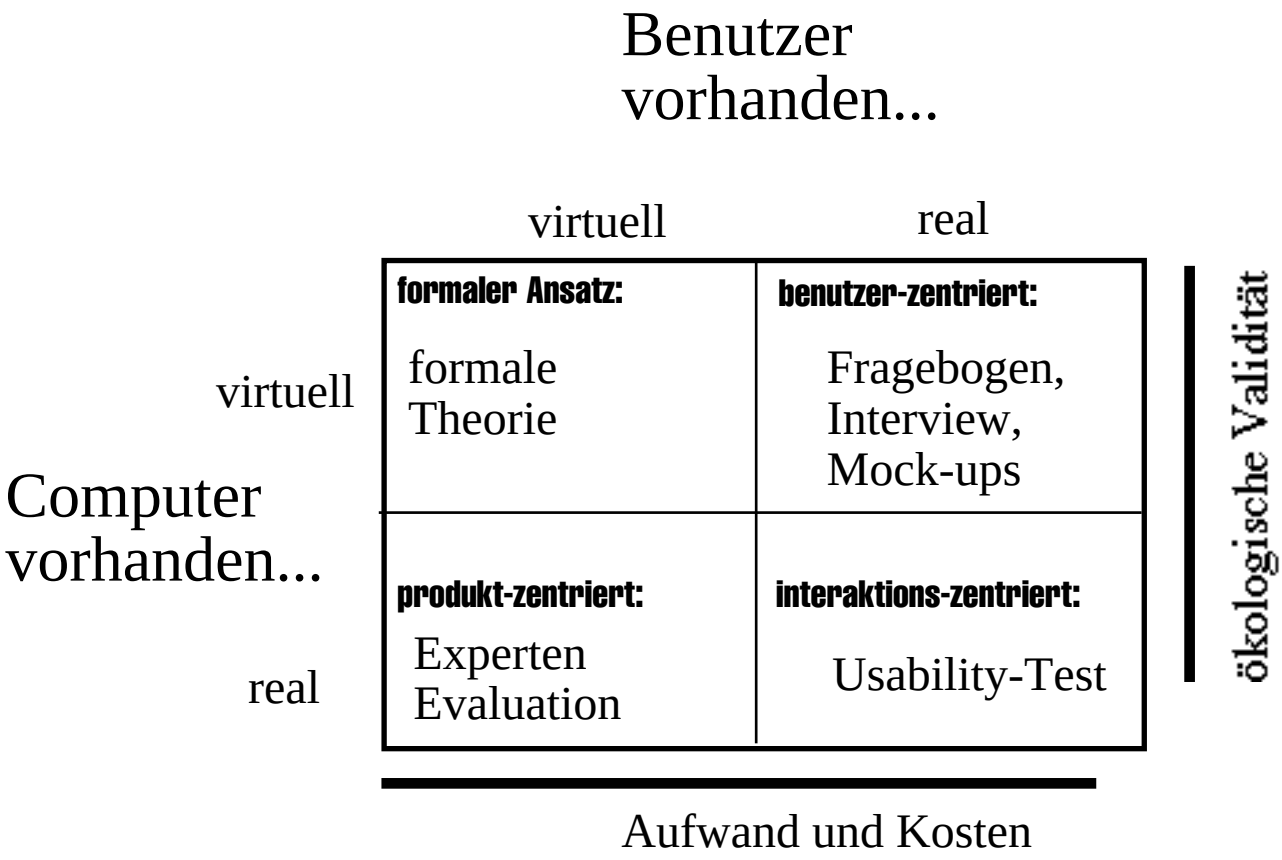
Nein !

Begründung:

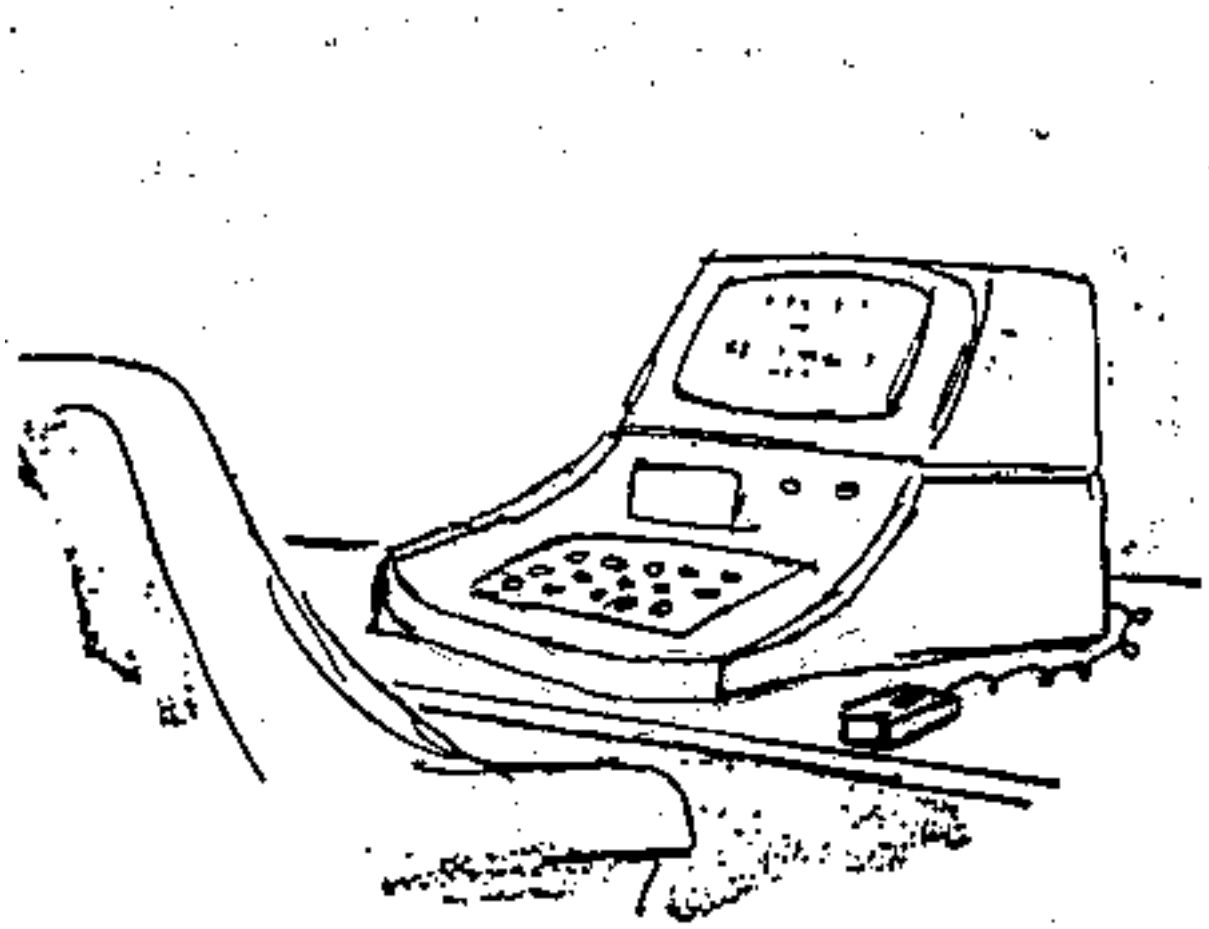
Die ISO 9241 enthält keine ge-"normten" Metriken mit zugehörigen Grenzwerten.

Was nun?

Methoden zur Qualitätssicherung

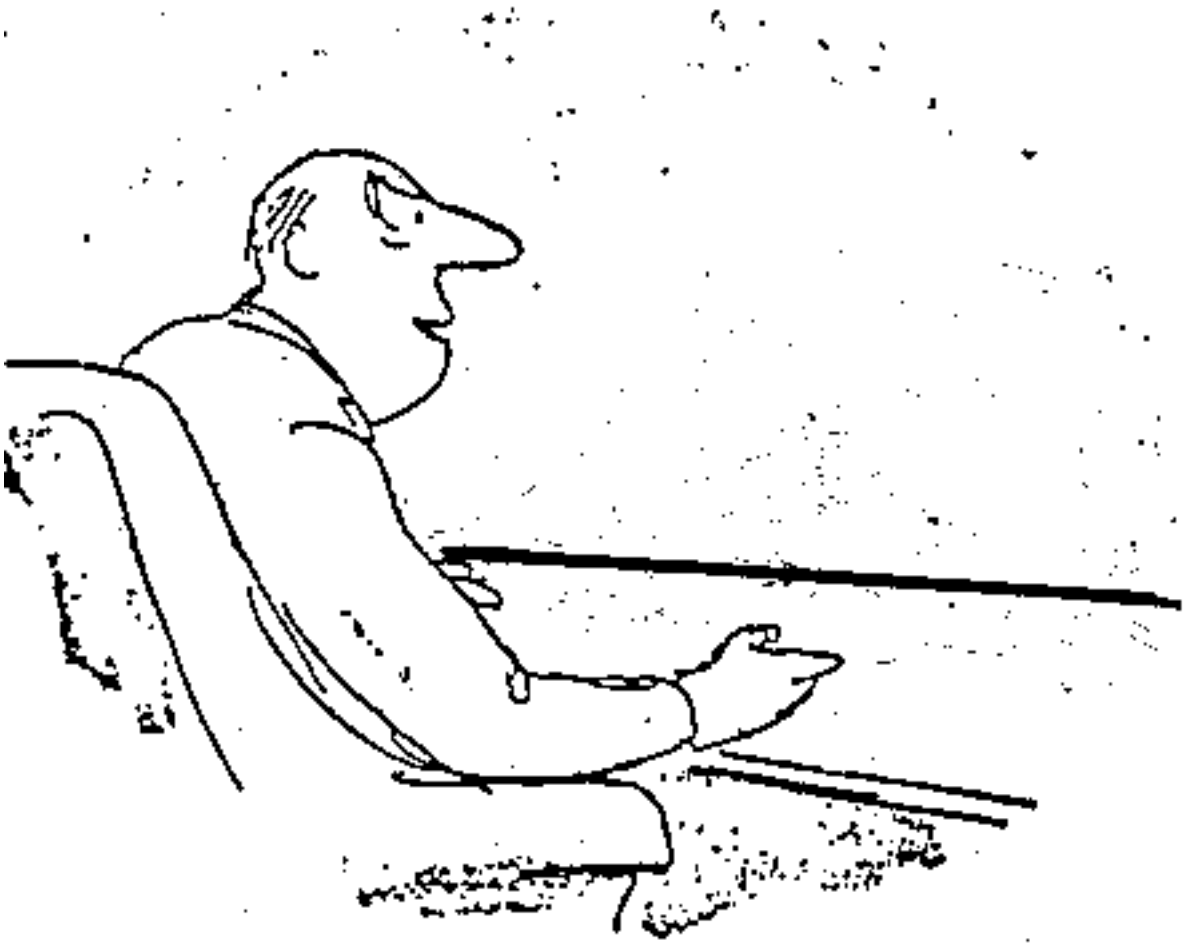


der produkt-zentrierte Meß-Ansatz



- Checklisten
- Experten-Evaluation

der benutzer-zentrierte Meß-Ansatz



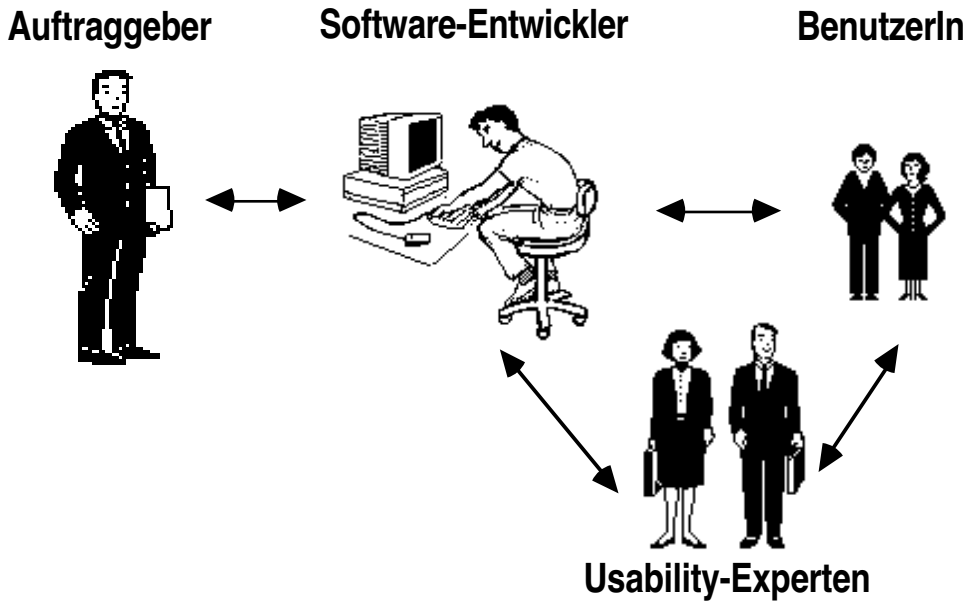
- mündliche Befragung (Interview)
- schriftliche Befragung (Umfragen)
- Diskussionen (zB. in Workshops)

interaktions-zentrierter Meß-Ansatz

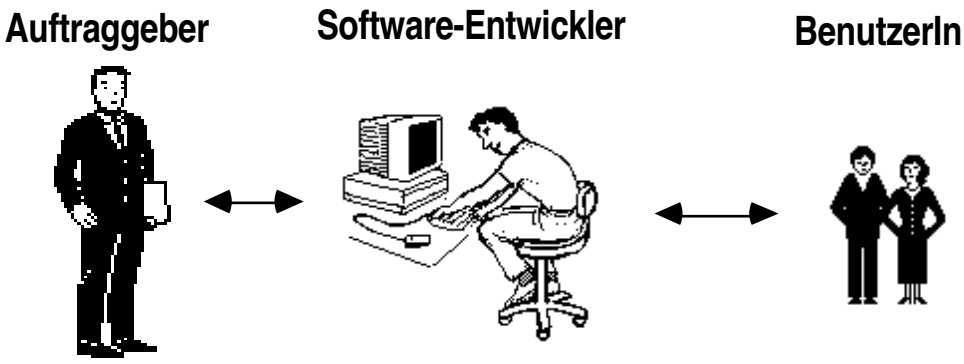
- aufgaben-orientierte Usability-Tests
- induktive Usability-Tests (formative evaluation)
- deduktive Usability-Tests (summative evaluation)

Modell-1

Modell-2

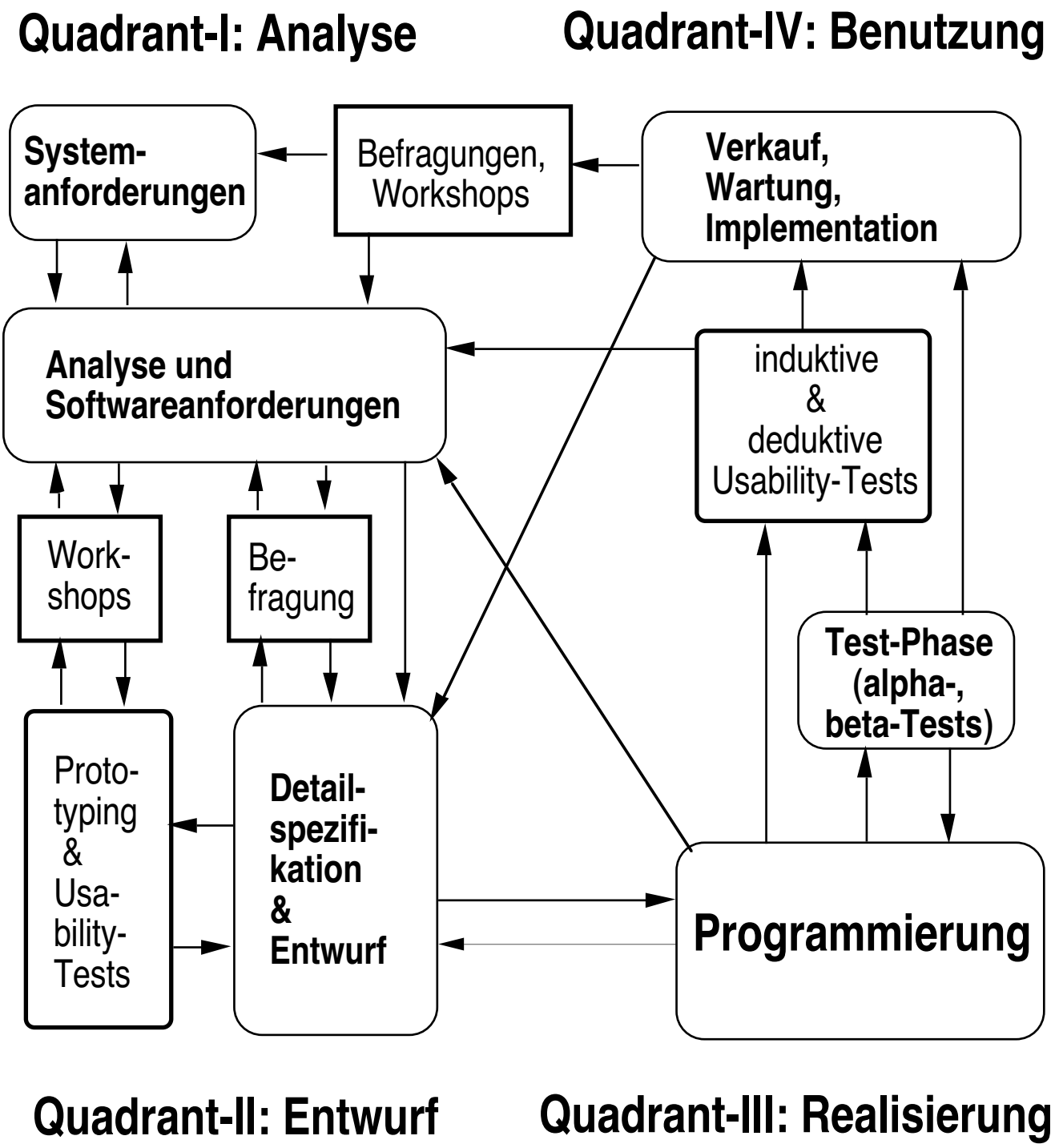


Modell-3

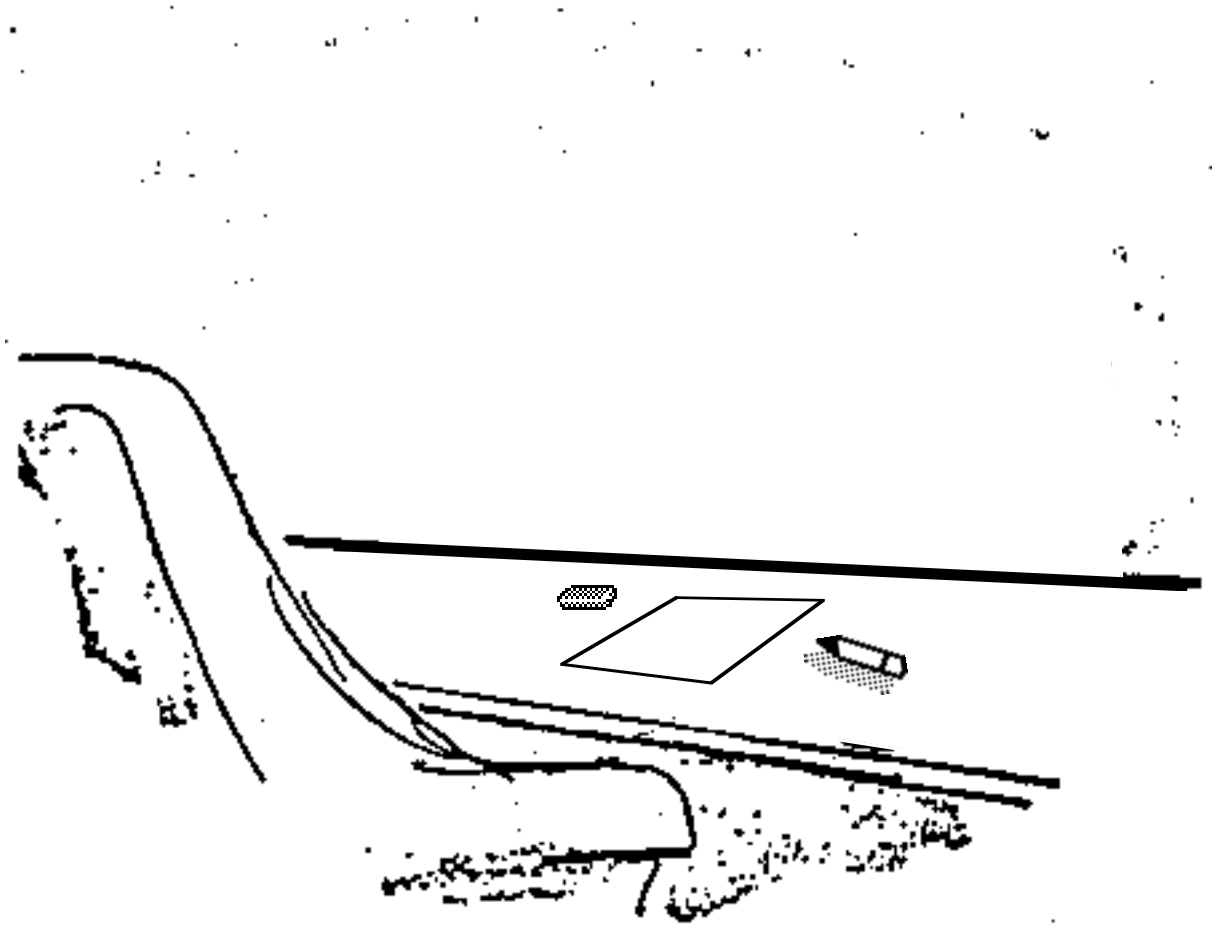


Das Quadranten-Modell

[BOSS-Projekt, Rauterberg 1991]

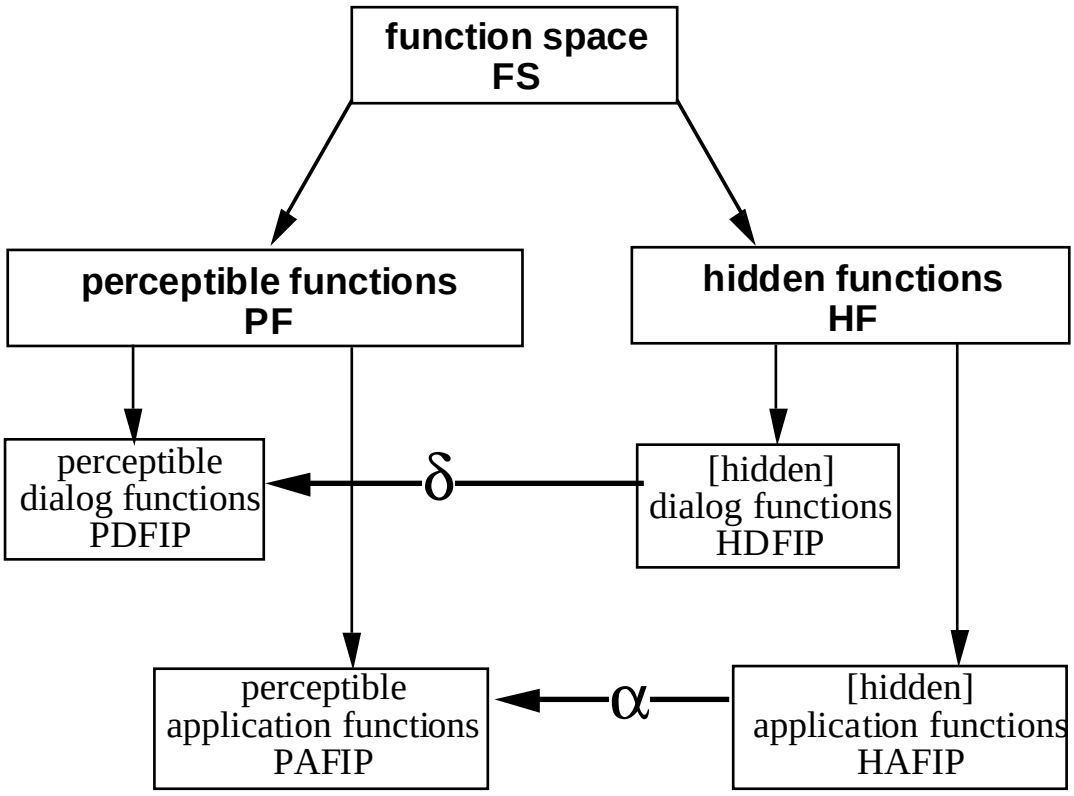


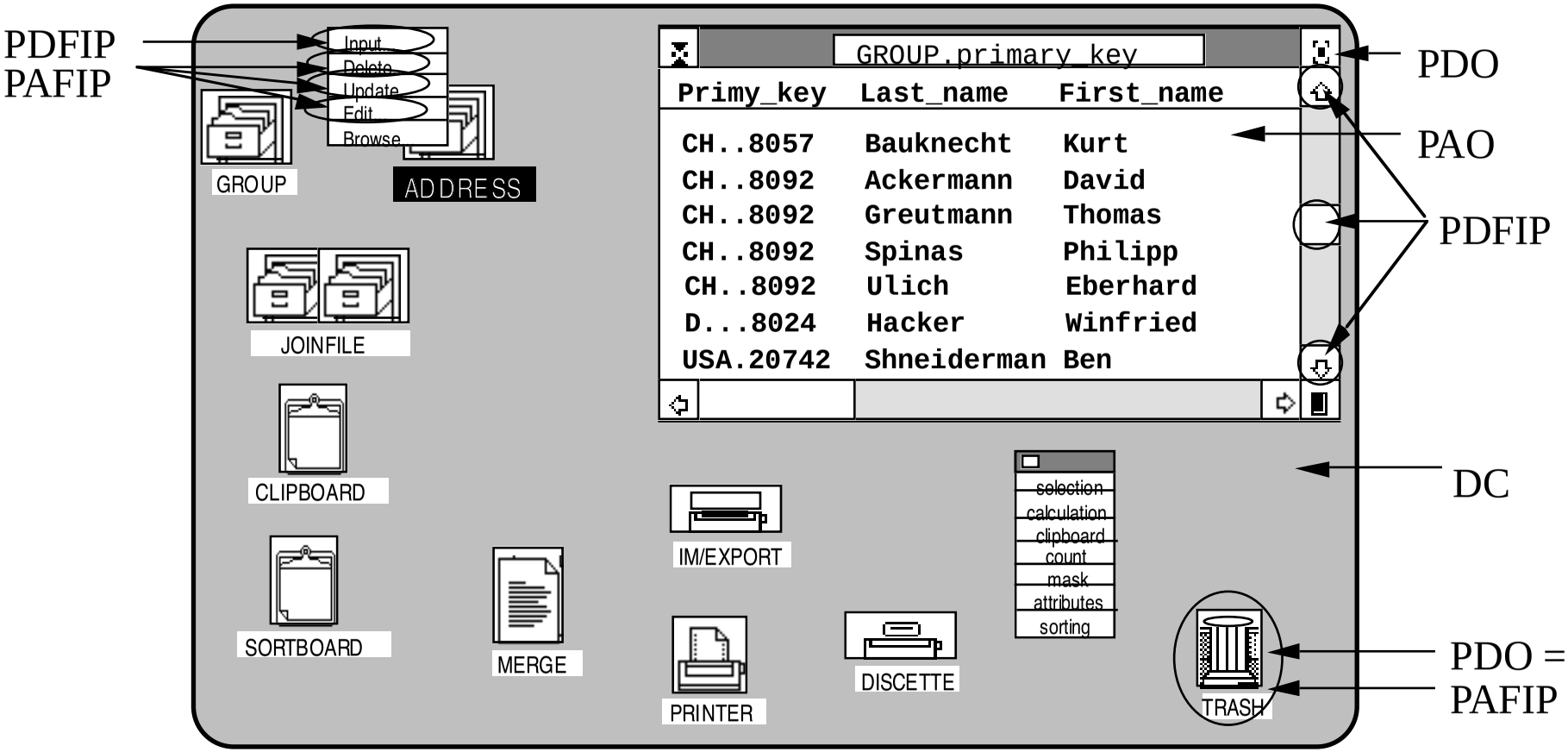
ein formale Gestaltungs-Theorie



- **Metriken**

An abstract concept to describe usability aspects




PDFIP
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SORTBOARD
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calculation
clipboard
count
mask
attributes
sorting
TRASH
GROUP.primary_key
Primy_key Last_name First_name
CH..8057 Bauknecht Kurt
CH..8092 Ackermann David
CH..8092 Greutmann Thomas
CH..8092 Spinas Philipp
CH..8092 Ulich Eberhard
D...8024 Hacker Winfried
USA.20742 Shneiderman Ben
PDO
PAO
PDFIP
DC
PDO =
PAFIP

quantitative measure of "feedback":

$$FB = 1/D \sum_{d=1}^{D} (\#PF_d / \#HF_d) * 100\%$$

quantitative measure of "interactive directness":

$$ID = \{1/P \sum_{p=1}^{P} min[lng(PATH_p)] \}^{-1} * 100\%$$

[visual] feedback (FB)

interactive directness (ID)	**low**	**high**
low	batch	menu interface **MI**
high	command language **CI**	**desktop style** direct manipulation **DI**

The outcomes of nine (9) different comparison studies between command (CI) and menu (MI) interfaces.

"CI < MI" means that the average usage/preference with/for MI is better than with/for CI;
"CI = MI" means that there are no published data to decide;
"CI > MI" means that the average usage/preference with/for CI is better than with/for MI;
"sig." means that $p \leq 0.05$; "not sig." means that $p > 0.05$

Reference	interface	skill level	usability metric	outcome	result
Streitz et al. (1987)	CI, MI	beginner	task solving time	CI < MI	sig.
Chin et al. (1988)	CI, MI	beginner	subjective rating	CI < MI	sig.
Ogden & Boyle (1982)	CI, MI, HY	beginner	preferences	CI < MI	sig.
Roy (1992)	CI, MI	advanced	error rate	CI < MI	sig.
Roberts & Moran (1983)	CI, MI, DI	experts	task solving time	CI < MI	sig.
Chin et al. (1988)	CI, MI	experts	subjective rating	CI < MI	sig.
Peters et al. (1990)	CI, MI, DI	experts	slips	CI < MI	sig.
Peters et al. (1990)	CI, MI, DI	experts	recognition errors	CI < MI	sig.
Peters et al. (1990)	CI, MI, DI	experts	efficiency	CI < MI	sig.
Ogden & Boyle (1982)	CI, MI, HY	beginner	task time	CI < MI	not sig.
Roy (1992)	CI, MI	advanced	task solving time	CI < MI	not sig.
Antin (1988)	CI, MI, KMI	advanced	subjective rating	CI < MI	not sig.
Hauptmann & Green (1983)	CI, MI, NO	beginner	task solving time	CI = MI	not sig.
Hauptmann & Green (1983)	CI, MI, NO	beginner	number of errors	CI = MI	not sig.
Hauptmann & Green (1983)	CI, MI, NO	beginner	subjective rating	CI = MI	not sig.
Whiteside et al. (1985)	CI, MI, IO	beginner	task completion rate	CI > MI	not sig.
Antin (1988)	CI, MI, KMI	advanced	preferences	CI > MI	not sig.
Roberts & Moran (1983)	CI, MI, DI	experts	error-free task time	CI > MI	not sig.
Whiteside et al. (1985)	CI, MI, IO	advanced	task completion rate	CI > MI	sig.
Streitz et al. (1987)	CI, MI	advanced	task solving time	CI > MI	sig.
Antin (1988)	CI, MI, KMI	advanced	task completion rate	CI > MI	sig.
Whiteside et al. (1985)	CI, MI, IO	experts	task completion rate	CI > MI	sig.

The outcomes of twelve (12) different comparison studies between command (CI) and direct manipulative (DI) interfaces.

"CI < DI" means that the average usage/preference with/for DI is better than with/for CI;
"CI = DI" means that there are no published data to decide;
"CI > DI" means that the average usage/preference with/for CI is better than with/for DI;
"sig." means that $p \leq 0.05$; "not sig." means that $p > 0.05$

Reference	interface	skill level	usability metric	outcome	result
Altmann (1987)	CI, DI	beginner	task solving time	CI < DI	sig.
Karat et al. (1987)	CI, DI	beginner	task solving time	CI < DI	sig.
Streitz et al. (1989)	CI, DI	beginner	task solving time	CI < DI	sig.
Sengupta & Te'eni (1991)	CI, DI	beginner	task solving time	CI < DI	sig.
Margono et al. (1987)	CI, DI	beginner	number of errors	CI < DI	sig.
Morgan et al. (1991)	CI, DI	beginner	number of errors	CI < DI	sig.
Morgan et al. (1991)	CI, DI	beginner	time between errors	CI < DI	sig.
Karat et al. (1987)	CI, DI	beginner	error correction time	CI < DI	sig.
Morgan et al. (1991)	CI, DI	beginner	error-free time	CI < DI	sig.
Margono et al. (1987)	CI, DI	beginner	subjective rating	CI < DI	sig.
Morgan et al. (1991)	CI, DI	beginner	subjective rating	CI < DI	sig.
Torres-Chazaro et al.(1992)	CI, DI	beginner	subjective rating	CI < DI	sig.
Sengupta & Te'eni (1991)	CI, DI	beginner	efficient usage	CI < DI	sig.
Tombaugh et al. (1989)	CI, DI	advanced	subjective rating	CI < DI	sig.
Torres-Chazaro et al.(1992)	CI, DI	advanced	subjective rating	CI < DI	sig.
Roberts & Moran (1983)	CI, MI, DI	experts	task solving time	CI < DI	sig.
Peters et al. (1990)	CI, MI, DI	experts	oblivion's errors	CI < DI	sig.
Peters et al. (1990)	CI, MI, DI	experts	recognition error	CI < DI	sig.
Peters et al. (1990)	CI, MI, DI	experts	efficiency	CI < DI	sig.
Margono et al. (1987)	CI, DI	beginner	task solving time	CI < DI	not sig.
Morgan et al. (1991)	CI, DI	beginner	task solving time	CI < DI	not sig.
Tombaugh et al. (1989)	CI, DI	advanced	task solving time	CI < DI	not sig.
Roberts & Moran (1983)	CI, MI, DI	experts	error correction time	CI < DI	not sig.
Altmann (1987)	CI, DI	beginner	subjective rating	CI > DI	not sig.
Masson et al. (1988)	CI, DI	advanced	task solving time	CI > DI	sig.

Contingency tables of a meta-analysis for all data

[Cell Content: observed frequency (expected frequency)]

	MI	DI	outcome of this meta-analysis
CI better as	7 (3.9)	2 (5.1)	Chi** = 5.52, df = 1
CI worse as	12 (15.1)	23 (19.9)	p ≤ .019

	beginner	advanced+	outcome of this meta-analysis
CI better as MI,DI	2 (4.3)	7 (4.7)	Chi** = 2.95, df = 1
CI worse as MI,DI	19 (16.7)	16 (18.3)	p ≤ .086

Contingency tables only for significant differences

(SELECTION for "result" = "sig.").

[Cell Content: observed frequency (expected frequency)]

	MI	DI	outcome of this meta-analysis
CI better as	4 (2.0)	1 (3.0)	Chi** = 4.07, df = 1
CI worse as	9 (11.0)	19 (17.0)	p ≤ .044

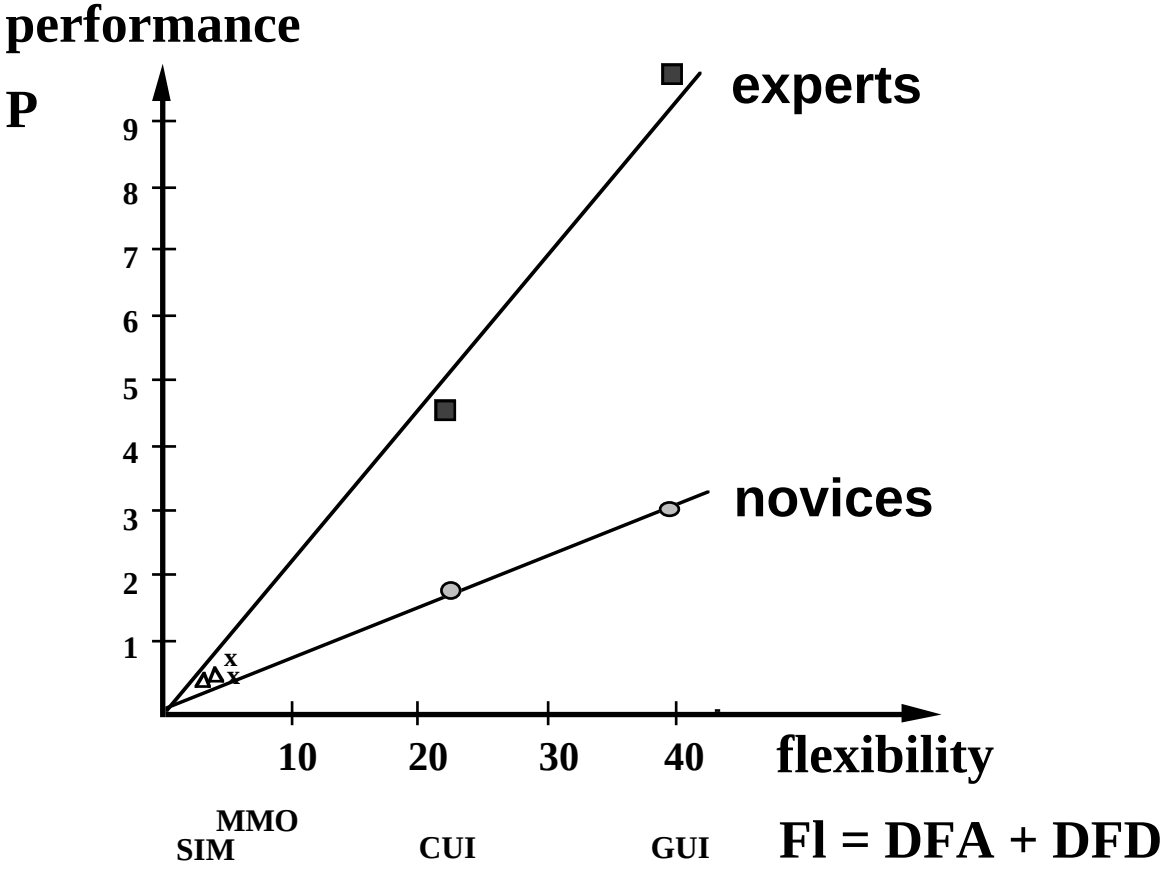
	beginner	advanced+	outcome of this meta-analysis
CI better as MI,DI	0 (2.4)	5 (2.6)	Chi** = 5.55, df = 1
CI worse as MI,DI	16 (13.6)	12 (14.4)	p ≤ .018

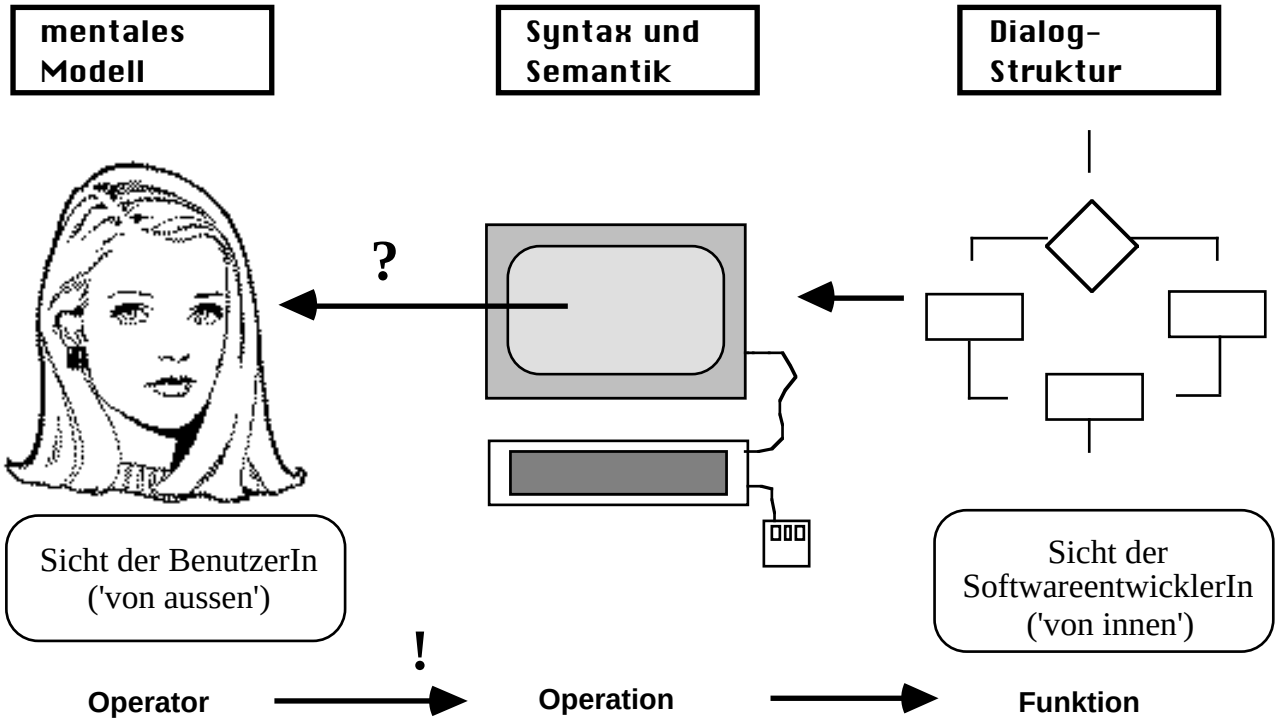
quantitative measure of "application flexibility":

$$DFA = 1/K \sum_{d=1}^{K} \#HAFIP_d$$

quantitative measure of "dialog flexibility":

$$DFD = 1/K \sum_{d=1}^{K} \#HDFIP_d$$




mentales Modell
Syntax und Semantik
Dialog-Struktur
?
Sicht der BenutzerIn ('von aussen')
Sicht der SoftwareentwicklerIn ('von innen')
!
Operator
Operation
Funktion

Bundesministerium für Bildung, Wissenschaft, Forschung und Technologie

Zukunftsorientiert handeln!

Die EU-Bildschirmrichtlinie in der Praxis

Ergebnisse aus dem SANUS-Projekt

2. SANUS - Kongreß in Bad Honnef
23. und 24. Oktober 1997

- Tagungsunterlagen -

Herausgeber: Prof. Dr.Ing. Peter Kern