

DESIGN RESEARCH

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1. Research
2. Design research
3. Research process
4. Research paradigms and theory of science
5. Research methods
6. Evaluation
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1. Research

Motivation:

1. Enhance the understanding of and knowledge about a phenomenon.
2. A problem needs a solution.
3. A solution needs application fields.

Core elements:

1. Contents (observations, facts, theories).
2. Processes (methods).

Subjects of research:

Humanities: Aspects of the human condition and human way of life.

Social sciences: Social phenomena and processes of social systems.

Behavioural sc.: Action, decision and communication processes in social/
natural systems.

Design sciences: Artificial objects or processes.

Natural sciences: Phenomena in nature.

2. Design research

“The overall aim of design research is to develop an accessible, robust body of knowledge that enhances our understanding of design processes, applications, methods and contexts (theory). Often, this knowledge helps to define best practice and workable methods in dealing with design and design related problems. (practice).” Design Council, UK

(“... there can be no straightforward causal connection between design theories and design artefacts” (Coyne, 14)

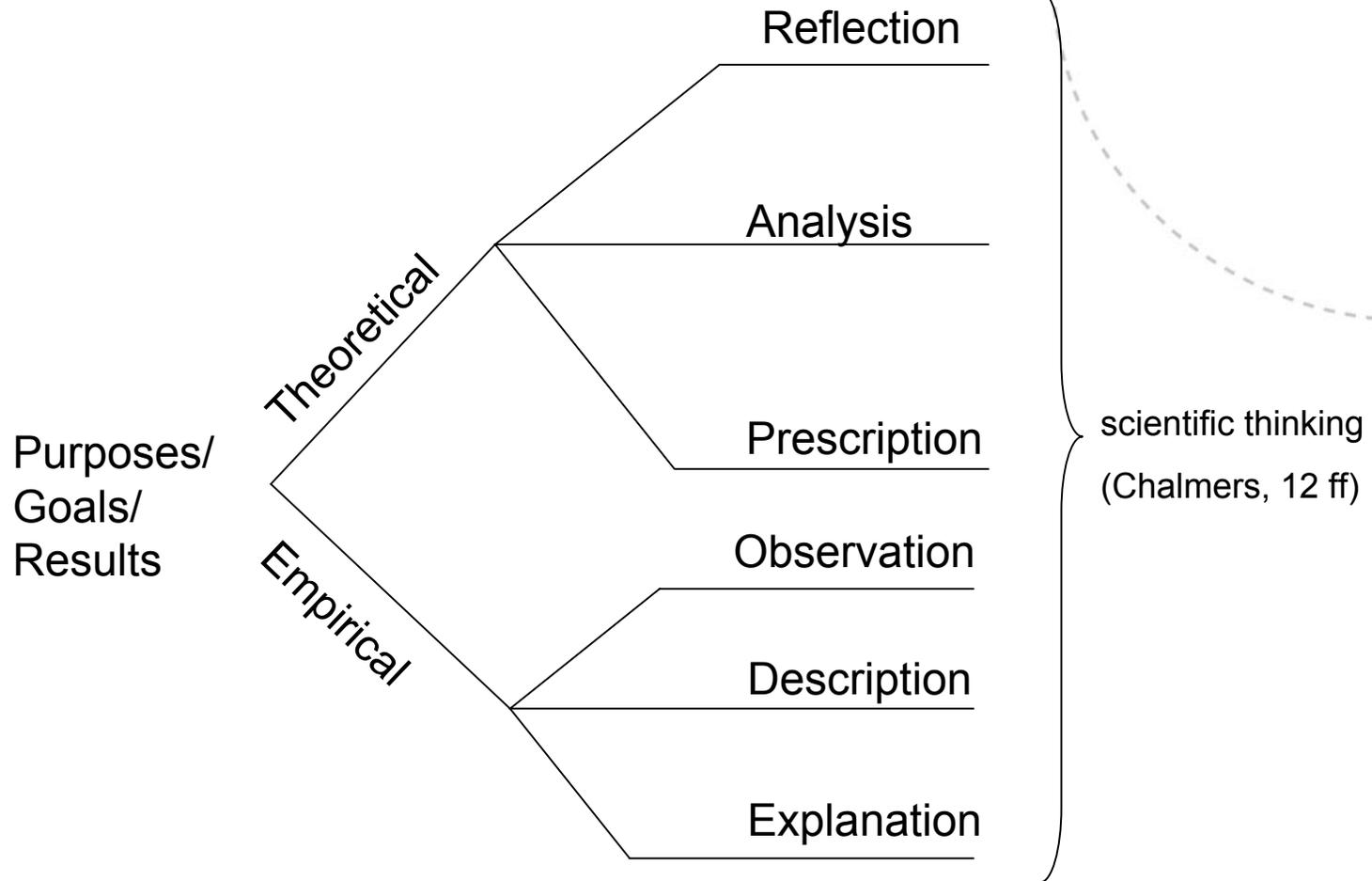
Topics:

- Theoretical studies which provide **conceptual frameworks** for design inquiries.
- Design discipline-specific research such as industrial design, which may have a **specific technical or product focus**, and can include materials and process research.
- Research into **usability, sustainability**, applied ergonomics, ethnography and other studies which focus on users´ and infrastructural needs.
Cultural and historical research related to **the role that design plays in culture**.
- Design **pedagogy** research which explores issues of learning and cognition through design.
- Design management research in the context of new product development, branding, and economic competitiveness.

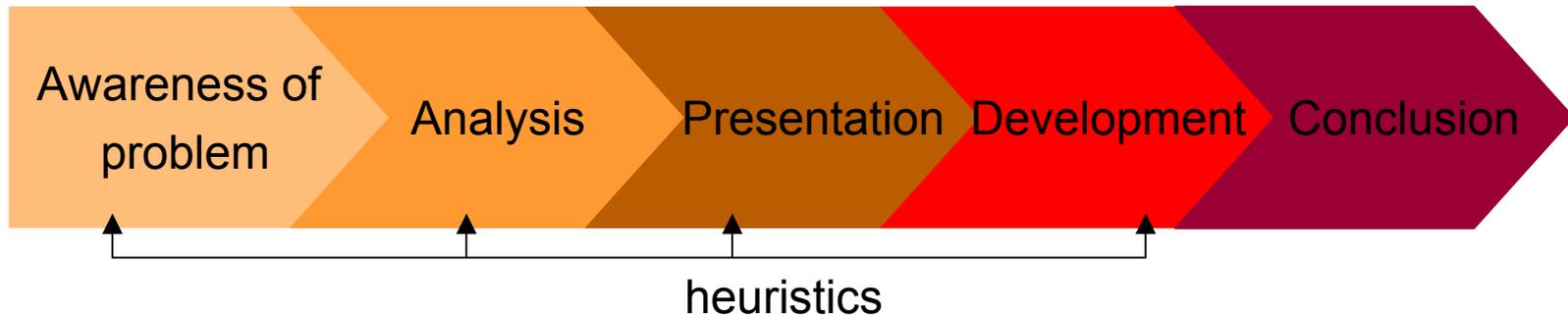
What is the main purpose of your project?

- Compare existing knowledge
- Thoroughly explore an area
- Resolve a long-standing question
- Open up a new area
- Provide a generic framework
- Develop new methodology
- Experimentally validate a hypothesis
- Provide empirical data
- Derive superior algorithms
- Develop a new tool
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Research Roadmap



3. Research process



- | | |
|----------------------------------|---|
| Reflection (R): | Recognizing and defining the phenomena (problem). |
| Observation (O): | Investigating phenomena, occurrences, contexts connected with p. |
| Description (D): | Listing of quantitative and qualitative parameter connected with p. |
| Analysis (A): | Inquiry of parameter in relation to each other and to p. |
| Explanation (E): | Outline of causes, correlations, context and consequences of p. |
| Prescription/ Design (P): | Recommendation of actions, product development, processes to improve p. |

4. Design research paradigms and theory of science

RATIONAL PROBLEM SOLVING (Simon)

Popper's model of scientific recognition

DESIGN PROBLEMS ARE WICKED (Rittel and Webber)

Hans-Georg Gadamer: Hermeneutics

REFLECTIVE PRACTICE (Schön)

Social constructivism

Herbert Simon's Science of the Artificial

Ratio:

Design is a **cognitive process of solving ill-structured problems**

It is **normative** rather than descriptive - it relates to how conditions should be rather than how they are.

“An **artifact** can be thought of as a meeting point - an **interface**... - between an "inner" environment, the substance and organization of the artifact itself, and an "outer" environment, the surroundings in which it operates.” (Kroes 295)

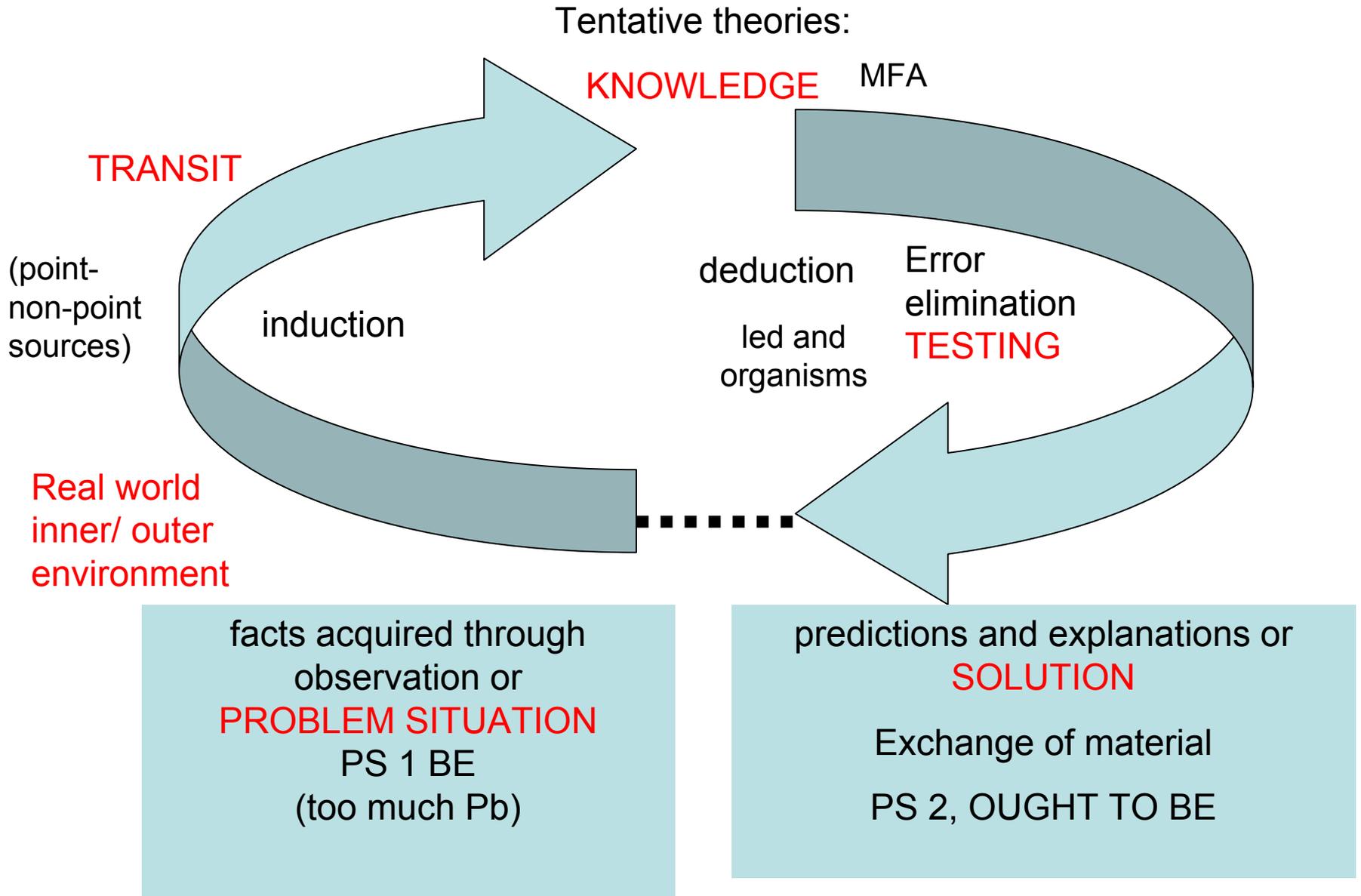
It is possible for reserach:

- A – to define a problem space
- B – to transit from state to state
- C – to represent knowledge
- D – to represent the real world
- E – to make processes practicable
- F – to test by objective criteria

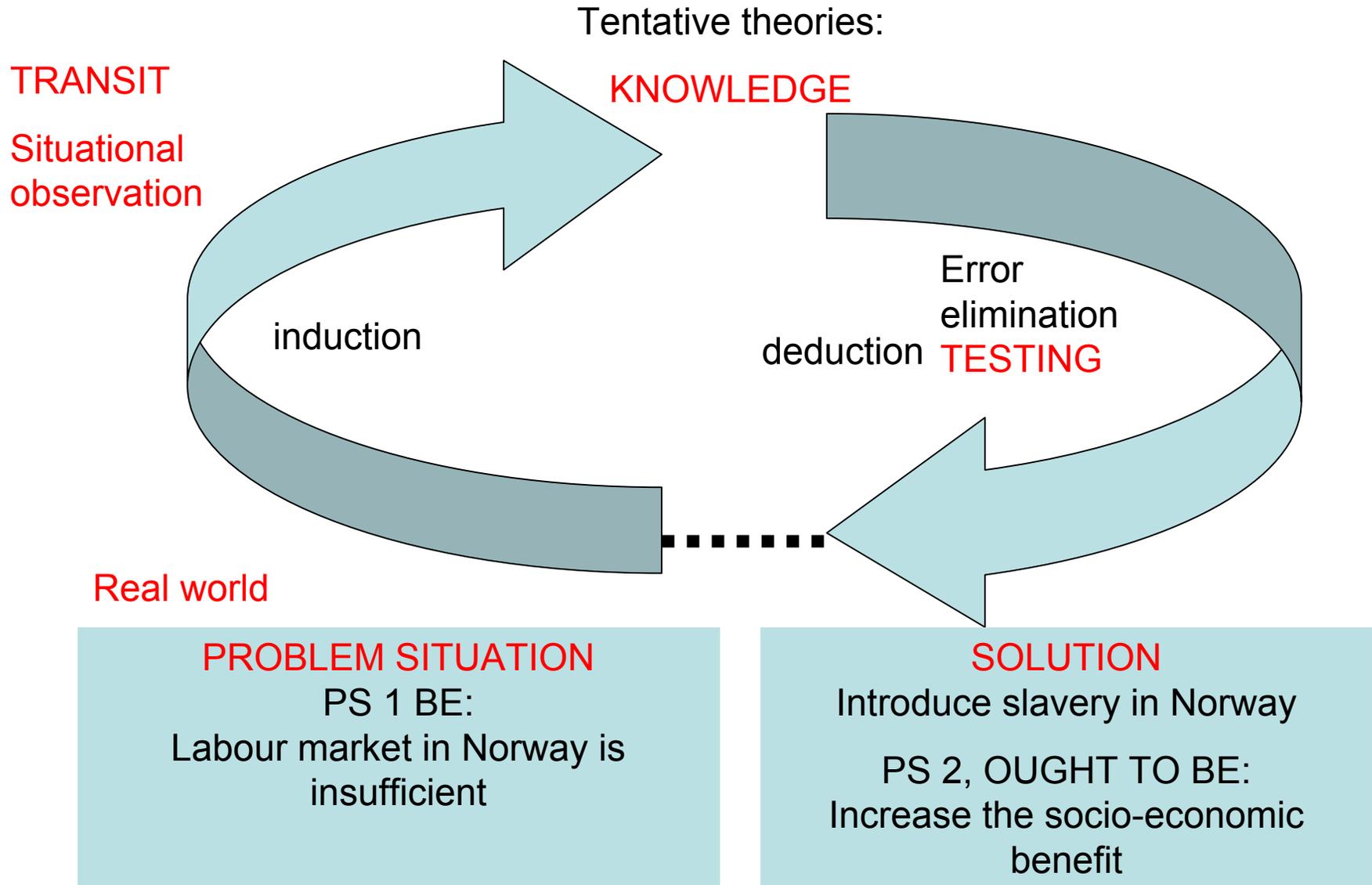
Expected results:

Satisficing solutions. This presumes that finding the optimal solution could require too much resources or the optimal solution might not even exist. Therefore one sets an adjustable aspiration level, ends the search as soon as this aspiration level is exceeded and makes a choice from a set of alternatives encountered sequentially.

Popper's model of scientific recognition



Popper's model of scientific recognition in the social sciences



Horst Rittel

Wicked problems were identified by Horst Rittel in late 1960s as characterizing social (and design) problems. The complexity of these problems is different from “puzzle-solving” in mathematics & natural science. WP also characterize the challenges of **increasing heterogeneity & value conflicts in modern society** (fragmentation of identities).

Design problems are wicked because:

- There is no definitive formulation of a wicked problem.
- Wicked problems have no stopping rule.
- Solutions to wicked problems are not true-or-false but good-or-bad.
- There is no immediate and no ultimate test of a solution to a wicked problem.
- Every implemented solution to a wicked problem has consequences.
- Wicked problems do not have a well-described set of potential solutions.
- Every wicked problem is essentially unique.
- Every wicked problem can be considered a symptom of another problem.
- The causes of a wicked problem can be explained in numerous ways.
- The planner (designer) has no right to be wrong.

Hans-Georg Gadamer: Hermeneutics

Gadamer wants "to clarify the conditions in which understanding takes place." ("Truth and Method", 1975 p.263) (see also: Rittel, Bucarelli, Russo)

Preconceptions and prejudices in the mind of the interpreter are part of any understanding. Since understanding always relates to these conditions, no reading offers a definitive or final interpretation of a text.

Gadamer develops a hermeneutic according to which the meaning of any **text** relates to the historical situations of both author and interpreter.

Hermeneutic means the formal study of appropriate methods of interpretation. The hermeneutical process is often regarded as involving a complex interaction between the interpreting subject and the interpreted object. However:

"Understanding is not to be thought of so much as an action of one's subjectivity, but as the placing of oneself within a process of tradition, in which past and present are constantly fused." (p. 258)

Donald Schön

Design is an activity. In his book *The Reflective Practitioner* (1983) Schön points to a crisis for professional practice. This crisis relates mainly to the fact that professions such as architecture, and design but also medicine and psychology are strongly dominated by **technical rationality** (TR) and its **positivist epistemology** (PE) of practice.

The problem is that PE cannot solve the dilemma of “rigour versus relevance” professionals are confronted with. This is because PE is based on analytical, empirical and logical propositions of truth within an objective world. However, professional knowledge involves also experiences, feelings and evaluations, which are not part of PE.

For Schön, problem solving (the selection of available means best suited to establish ends) is just a part of professional practice. Likewise important is problem setting, which is hardly considered by TR.

“Technical rationality depends on agreement about both ends (problem and solution). When the ends are fixed and clear, then the decision to act can present itself as an instrumental problem. But when the ends are confusing and conflicting, there is as yet no “problem” to solve. A conflict of ends cannot be solved by the use of techniques derived from applied research. It is rather through the non-technical process of framing the problematic situation that we may organize and clarify both ends to be achieved and the possible means of achieving them.”(p.41)

Schön's claim for reflective practice in design research

Framing a problem consists "knowing in action" i.e. experience, knowledge, skills and judgments which cannot be accounted for in mere scientific terms: "... skillful action often reveals a 'knowing more than we can say' (p.51). Schön asserts that PE neglects this tacit lifeworldly knowledge.

Phenomenologically, knowing in action helps the practitioner to construct a new way of setting the problem – a new frame, which she imposes on the situation.

Moreover, the practitioner enters a dialogue with the materials of the situation (p.78). In the process the designer makes tentative operational moves and the materials 'talk back' to the designer, constraining and shaping subsequent moves.

Social constructivism

The philosophical stance of social constructivism is based on the concept that we each construct our more or less private representations of reality and deal only with those constructions, which may or may not correspond to some real world.

Such a stance notes that people act towards each other and towards things on the basis of the meanings that such others and things have for them. Meanings are negotiated among social system members.

These members themselves are limited to the “construction” of a reality, which they have internally composed. Thus, people choose the environments they attend to, and their internal views shape these choices. (see also Coyne page 8,10 and Winner article)

What are the main research questions ?

How can we communicate better?

How can we make design more efficient?

How do we ameliorate error?

What is the theoretical basis of design?

How do we make better problem-solving tools?

What is the relationship between textual production and the making of artefacts?

How is the authority of the professions negotiated?

How are the boundaries between professional territories drawn?

In what ways is the computer implicated in utopian narrative?

How is authority configured through technological networks? (Coyne 13)

5. Research Methods

A **method** is a body of techniques for investigating phenomena or hypothesis to acquire knowledge.

A **methodology** is a systematized approach to select and structure methods according to the research areas, questions and results expected.

In design many disciplines with different research methodologies are involved. Therefore it is not only important to chose appropriate methods but also to combine methods in a sensible way. An additional complication here is the uniqueness of design projects.

Motivations for a research methodology:

- (Qualitatively) Control research process
- Validate research results
- Compare research approaches
- Appreciate and respect rules of good scientific practice

What methods do you chose?

Scientific areas	Natural sciences	Social Sciences	Humanities
Methods			
Scientific Observation	x	X	
Experiment	x	X	
Correlation	x	X	x
Survey	x	X	
Case Study	x	x	x
Critical Discourse Analysis		x	x

PROTOCOL ANALYSIS

Protocol analysis provides a means for eliciting persons' thoughts while they are performing a task. Protocol analyses are undertaken in real time and, if carried out in their natural environment, capture the context and important occurrences of events.

Protocols are usually carried out in a subject's own environment. Usually teams are observed rather than individuals. The researcher may take notes, record video or audio while observing the subject. The participants are requested to think aloud whilst being observed.

Critical Discourse Analysis (CDA)

CDA is an interdisciplinary approach to the study of texts, which views **"language as a form of social practice"** (Fairclough 1989, 20) and attempts "to unpack the ideological underpinnings of discourse that have become so naturalized over time that we begin to treat them as common, acceptable and natural features of discourse" ibd.

Critical discourse analysis bases on the idea that there is **unequal access to linguistic and social resources, resources that are controlled institutionally**. The patterns of **access to discourse** and communicative events is one essential element for CDA.

In terms of method, CDA can generally be described as hyper-linguistic or supra-linguistic, in that practitioners who use CDA consider the larger discourse context or the meaning that lies beyond the grammatical structure.

This includes consideration of the political, and even the economic context of language usage and production. Relates to linguistic theory of e.g. Saussure and social theory of Althusser, Foucault, Habermas and Bourdieu.

6. Evaluation

- Quantative evaluation:
 - survey methods
 - laboratory experiments
 - formal methods (e.g. econometrics)
 - numerical methods (e.g. mathematical modeling)
- Qualitative evaluation:
 - action research
 - case study research
 - ethnography
 - grounded theory
- qualitative data sources:
 - observation and participant observation (fieldwork)
 - interviews and questionnaires
 - documents and texts
 - the researcher's impressions and reactions (Bontas 2005)

7. Validity claims to results

Habermas distinguishes three types of discourses as fundamentals for justification of results/ suggestions for solutions:

1. Claim to truth provable via empirical facts, concerning the sum of existing state of affairs. (e.g. reduction of emissions, waste, energy consumption)
2. Claim to correctness discussible via pro and contra arguments, concerning situations and interactions within the social world. (networking activities, city planning, CSR etc.)
3. Claim to truthfulness explainable via subjective decision making, concerning individual experiences and attitudes.

In order to vote for a solution, one might give “good reasons” like certified facts or argumentative skills in case 1 and 2. In case 3, one cannot confirm a statement just through corresponding arguments but has to demonstrate it via consistent behaviour. If one asserts for instance to be vegetarian, eating beefsteak contradicts this commitment. It is realistic to assume that design research has to deal with all validity claims.

8. Literature/Links:

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Fairclough, Norman, Language and power, London Longman, 1989