Designing a Methods Platform for Design and Design Research

Hans Kaspar Hugentobler, Wolfgang Jonas, Detlef Rahe
University of the Arts Bremen and Institute for Integrated Design i/i/d Bremen, Germany

presented at Futureground, DRS, Melbourne, November 2004

1) Motivation and purpose

"Design is a decisive factor shaping all our lives, all the time. There are few corners of our environment, or aspects of the objects and communications enveloping us that could not be significantly improved on some level in greater or lesser degree. (…) Only when we understand that all these manifestations of design are the outcomes of choices, ostensibly made on our behalf, but in most cases without our involvement, can the meaning of design in the contemporary world change. (…) Only when it is adequately understood, debated, and determined as something vital to everyone will the full potential of this human capacity begin to be realized." (Heskett 2002)

Rhetorical appeals of this kind, which point out the crucial role design could / should play, are abundant, at least since about 40 years, when the Design Methods Movement first addressed these issues (Cross 1984). But the insights hardly found their way into practice and education. Heskett's statement can be regarded as a kind of programmatic foundation for the project of designing a methods platform for design and design research:

People as the focus of design → human-centeredness
We criticize the artefact-centeredness of design with its orientation towards function, technology, aesthetics, as opposed to user-experience. We criticize the author-centeredness, aiming at the expression of self, as opposed to being in responsible service. We criticize the business-centeredness, aiming at shareholder value, as opposed to value creation for all stakeholders. We consider these too narrow approaches to designing.
The question today is more about how and why we design, and shifts from the design of artefacts to the design of systems giving access to users.

Uncertainty as the condition for planning → future orientation
Simple extrapolations of existing situations and trends are in fact not more than guesses. The "survival rate" of new designs / innovations is disappointingly low. New products fail at a rate of 85% (Source: International Manufacturing Review, July 1999). On the other hand new products account for 32% of corporate revenue, and 30% of corporate profits, on average (Source: Product Development and Management Association 1996).
Design practice has to be reconsidered in response to new technological and economic challenges. This requires design being integrated into strategic

processes. More reflective + projective, more systemic and more knowledge-supported routines are required to improve the intuitive approach.

Complexity as a problem and a chance → systems thinking
We see non-transparent and ineffective design processes with poor outcomes. Merely experience-based approaches are insufficient for the current speed of contextual change. They may support the creative generation of new ideas, but they do not provide the necessary tools for analysing existing situations, for projecting desired situations, and for managing the realization of multidisciplinary design processes. They are useless for "wicked" problems (Rittel 1972, 1992). If we really want to support the shift from designers as executants to designers as executives, who originate ideas and plan processes to put these ideas into practice, then systems thinking has to be considered an essential part of this programme.

2) Programmatic foundations (our "belief system")
Design finds itself in a mostly executing role within the strategic process of corporate and social value creation. Connectivity to other disciplines is weak. Design could indeed be the model for other future-shaping disciplines or "sciences of the artificial" (Simon 1969), but the chances and opportunities for the design profession, resulting from the "decay of expert cultures" since the 1970s, as stated by Schön (1983), have not been seized up to now.

We (still) believe that theory and methods, or: a knowledge-supported approach, is able to improve the quality of the process and the outcomes of designing as well as design's connectivity with other disciplines. We are well aware, that this is a position, which has been heavily challenged during the 1970s and 1980s. But the potentials of methodical approaches have not been realized up to now.
(This may appear strange with respect to the international debate, but makes sense in the German context.)

We do not re-invent the wheel. The greatest "expert" (sorry!) and first critic of design methods states (Jones 2003, underlined by the authors):
"… A method can be anything one does while designing: sketching alternative designs 'on the back of an envelope', calculating what are assumed to be the main parameters, formal brainstorming (and classification of the result), taking a rest, issuing a questionnaire, evaluating preliminary designs in 'affirmative groups' and, most importantly, observing and experiencing for oneself the use of existing or new designs (in real life or in simulations)... A design method is any action whatever that the designers may decide is appropriate.
…
But what are design methods you might still ask, hoping for a more theoretical definition or description. In reply I would say that the usefulness of a method (or the purpose of a whole design process, consisting of several methods in a chosen sequence or in parallel) is to provide an adequate way of 'listening to' the users,

and to the world, in such a way that the new design becomes well fitted to people and to circumstances.

I sometimes think of designing as a meta-process, occurring before the product exists, that can predict enough of the future to ensure that the design can have the same quality of rightness that we see in natural organisms, in things that have evolved naturally, 'without design'."

The methods platform, which we are aiming at is to be *human-centred*, not artefact-centred or author-centred or business-centred. Human-centred means: oriented towards all relevant stakeholders, including the so-called "end-user" as well as the so-called "designer" as the methods user. That means: we see the methodical tools as designed artefacts, which have to be used by designers and design researchers, just as mobile phones are designed and have to be used by end-users. Human-centredness requires the recognition of human users of methods.

In order to express the concept in a less "humanistic" and more systems-theoretical manner, one could argue that we have an *interface-centred* approach (Alexander 1964, Simon 1969), which means that we are interested in the design of fits within the region of *interactions* and *inter-relations* of artefacts and their contexts, the latter comprising all kinds of human users / stakeholders. This leads to a set of requirements
for the methods platform:
- combine action – reflection in close connection,
- develop flexible toolboxes, no rigid sequences,
- make the process transparent and "human",
- focus the efforts on communication,
and for designing by means of the methods platform:
- aim at the fit of design and the corporate environment,
- aim at the fit of people and the social / cultural / technological environment,
- focus on efficiently dealing with future uncertainty,
- try to take the "whole of life" (Jones 1970) into account,
- …
which finally supports the development of "designerly" ways of knowing and acting.

To put this in more operational terms: The approach is intended to be:

integrative
- of general usability for design in a broad sense (Simon 1969, Heskett 2002),
- integrating stakeholders' views, processes, cultures, values, …,
- thus creating a systemic "whole", a consensual (not true) model of the situation (Nelson and Stolterman 2003).

structured
- referring to a conceptual and processual framework (based on our "belief system", for details see below),

- providing (discrete) categories of activities for structuring the design and research process,
- with categories being containers for specific components (tools and methods).

adaptable
- allowing the flexible configuration of components into sequences and cycles,
- allowing tailored adaptation to the domains, types, conditions, perspectives and constraints (for details see below) of the respective projects,
- thus being transferable into transparent and operational project management guides and maps.

The "belief system" and thus the following methods platform is based on two main components: a *processual (epistemological) framework*, consisting of basic assumptions about learning processes, and a *conceptual (ontological) framework*, consisting of assumptions about the specific "nature" of design processes.

3) Processual framework: evolutionary learning cycles

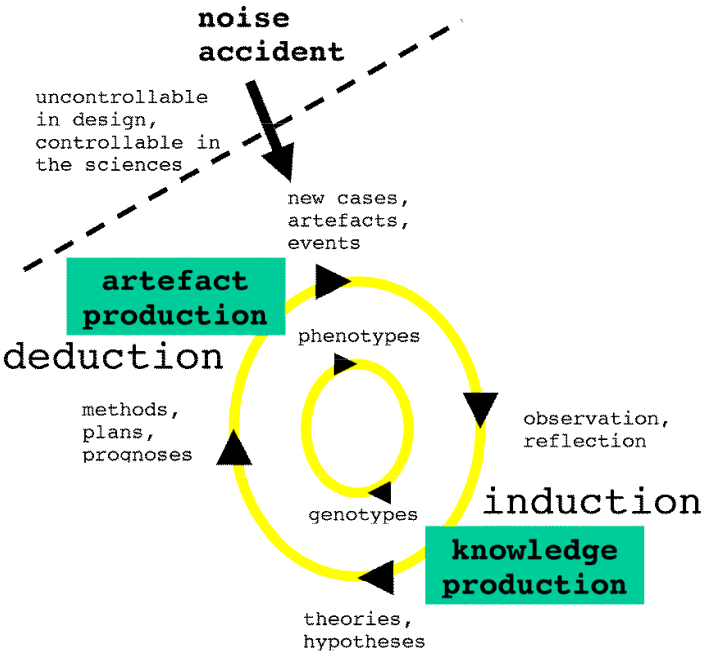

Fig.: Learning cycles (Jonas 2003).

The evolutionary model of knowledge production presents a scheme with structural identity from the molecular up to the cognitive and cultural level (Riedl 2000). The basic structure reveals a circle of trial (based upon expectation) and experience (leading to success or failure, confirmation or refutation), or of action and reflection.

Starting with passed cases, the circle consists of an inductive / heuristic semi-circle with purposeful learning from experience, leading to hypotheses and theories and prognoses about how the world works, and a deductive / logical semi-circle, leading to actions and interventions, which result in the confirmation or refutation of theories due to new experiences, etc. Internal or external perturbations (called ideas, creativity, curiosity, … or accidents, environmental changes, …) influence the circle, leading to stabilizations (negative feedback) or amplifications and evolutionary developments (positive feedback).

Kolb (1984) has developed these considerations of evolutionary and pragmatic epistemology (see also Dewey 1986 and others) into his model of experiential learning. The action research approach in the social sciences is based on this concept of action and reflection (Schön 1983, Swann 2002). Most descriptions of the design process in the Design Methods Movement tradition seem to be immediate applications of these basic feedback concepts of biological, cognitive and social learning too. Roozenburg (2002) presents a comparison of design and research as two different - and similar - types of problem-solving based on this model. The Institute of Design uses a generic process model of this kind in a number of variants based on different viewpoints and purposes such as activity-orientation, result-orientation, or planning-focus.

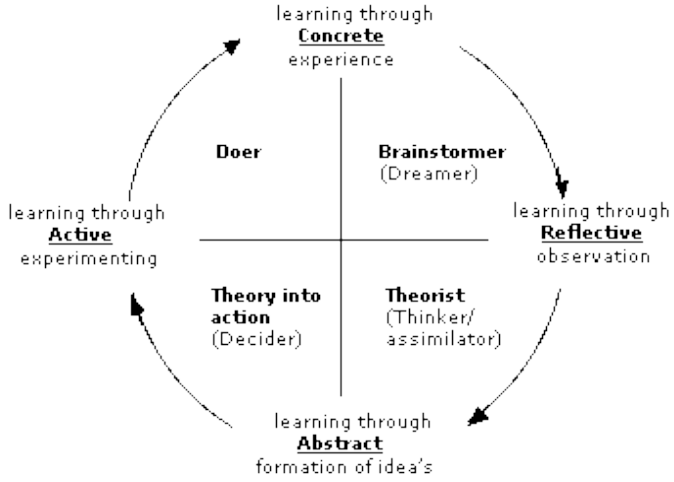

Fig.: The model of experiential learning (Kolb 1984, source of image: http://weimar.hku.nl/guido/educatingreport/kolb.htm)

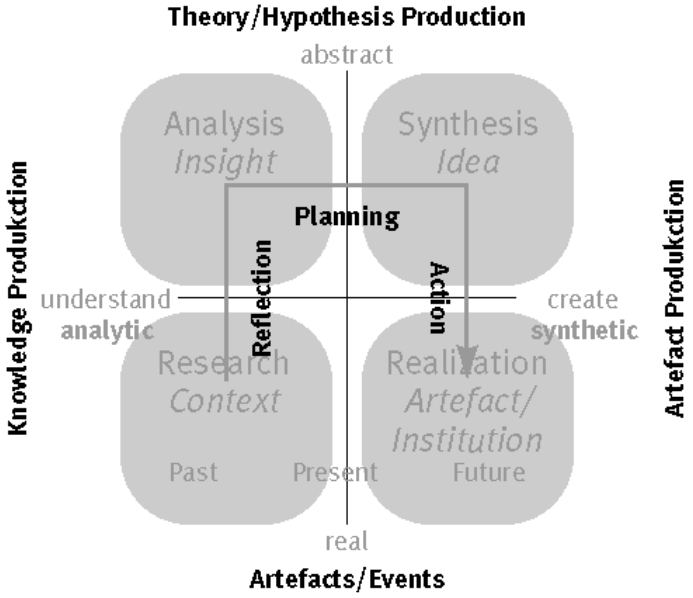

Fig: Model of the Institute of Design (Owen 1998).

We consider this common model of the design process as simplifying, because it does not properly differentiate the concepts of "problem-solving" and "change". The distinct types of inquiry and knowledge production in design: the reflective (backward-looking), the projective (forward-looking) and the productive (making) modes are combined into one single, seemingly homogeneous model of problem-solving.

4) Conceptual framework: the "nature" of designing

Designerly ways of knowing or design inquiry seems to be special (or very general?). Simon (1969) coined the term of the "Sciences of the Artificial", that have their legitimate place beside the sciences and the humanities. Nelson and Stolterman (2003) characterize design inquiry as not compatible with the existing domains of inquiry, which are:

- the true, referring to the objective facts, today mainly based on scientific inquiry, …
- the ideal, referring to norms and values, based on higher orders, spiritual systems, …
- the real, referring to the subjective particulars, based on human intention, …

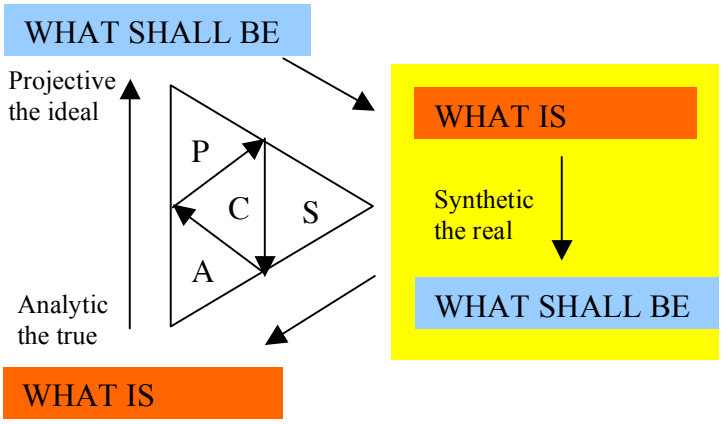

Fig.: The concept of the true, the ideal and the real (Nelson and Stolterman 2003) in connection with the design process model of ANALYSIS → PROJECTION → SYNTHESIS (Jonas 1996).

Designing, in their view, is a compound form of inquiry, acting in all three domains of gaining knowledge, thus generating "the design way" of being actively in the world. The figure shows an operational interpretation. The concept of the domains of inquiry: the true, the ideal and the real is set into relation with the process model of ANALYSIS→ PROJECTION→ SYNTHESIS (Jonas 1996), which seems to be reasonable.

The three domains gain a processual meaning in a circular design scheme, whereas the sequential model of three steps is changed into a more general circular morphology and related to the three different forms of inquiry. The central C = COMMUNICATION component is new. It is to symbolize the "human-centeredness" or the communicative, "second order", "soft" nature of the approach: reflection, integration and coordination through communication. The inner circle may be labelled "reflection in action", the outer "reflection on action". Communication produces and reproduces the design process. As soon as communication ends, the design process will end. In this sense we add COMMUNICATION as a domain (and essential processual driver) of design inquiry, which has been neglected in the past (see below).

5) Operationalizing the approach

We all know the various sequential models of the design process, leading from a "problem" to a "solution", consisting of 3-4 main steps plus feedback cycles:

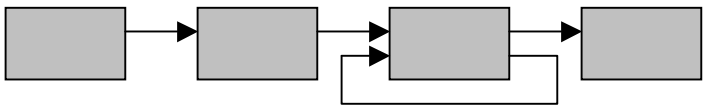

Fig.: The archetype of sequential / feedback models of the design process.

The boxes are labelled, for example:
- analysis - synthesis - realization, or
- analysis - divergence – convergence (Jones 1970), or
- analysis - projection - synthesis (Jonas 1996), or
- examination – interpretation – projection – realization (Melican 1997),
- research - analysis - synthesis - realization (Owen 1998, see above),
- analysis - synthesis - simulation - evaluation (Roozenburg 2002),
- …

The deficits both in the concepts themselves (conceived as 1st order cybernetic problem-solving models with the acting and reflecting and communicating designer excluded from the process) and in their application (conceived as algorithmic recipes, which have to be executed in a linear sequence of steps) are well known and exhaustively discussed. Nevertheless design processes have to begin and have to end, and design processes seem to consist of linear and of cyclic components.

Our operationalization is based on a combination of the processual and the conceptual frameworks, as sketched above. The table presents a scheme for collecting methods and tools, i.e. components for building tailored problem-specific design processes. Every box provides a category for storing methods and tools for the special purposes indicated by the macro level "domains of inquiry" and the micro level "steps" of research, analysis, synthesis, realization. There may be tools that fit into several boxes or that comprise more than one box.

		Steps of the iterative **micro process** of learning / designing			
		research	analysis	synthesis	realization
Domains of design inquiry, steps / components of the iterative **macro process** of designing	ANALYSIS "the true" how it is today	How to get data on the situation as it IS? → data on what IS	How to make sense of this data? → knowledge on what IS	How to understand the situation as a whole? → worldviews	How to present the situation as IS? → consent on the situation
	PROJECTION "the ideal" how it could be	How to get data on future changes? → future-related data	How to interpret these data? → information about futures	How to get consistent images of possible futures? → scenarios	How to present the future scenarios? → consent on problems / goals
	SYNTHESIS "the real" how it is tomorrow	How to get data on the situation as it SHALL BE → problem data	How to evaluate these data? → problem, list of requirements	How to design solutions of the problem? → design solutions	How to present the solutions? → decisions about "go / no go"
	COMMUNICATION "the driver"	How to establish the process and move it forward? How to enable positive team dynamics? How to find balance between action/reflection? How to build hot teams? How to enable equal participation? → focused and efficient teamwork			

Table: The toolbox, categories of design methods / tools: questions and outcomes.

		Steps of the iterative **micro process** of learning / designing			
		research	analysis	synthesis	realization
Domains of design inquiry, steps / components of the iterative **macro process** of designing	ANALYSIS "the true"	e.g. collecting data through ethno-graphic methods	e.g. analyzing collections of data	e.g. building a model of the current situation	e.g. preparing an executive summary of the situation
	PROJECTION "the ideal"	e.g. collecting data regarding future development	e.g. analyzing future trends and doing prognosis	e.g developing . scenarios	e.g. developing a scenario as a movie
	SYNTHESIS "the real"	e.g. collecting data on available technologies	e.g. fixing a design brief	e.g. testing and designing with users	e.g. using rapid prototyping tools
	COMMUNICATION "the driver"	e.g. using and applying soft skills, moderation techniques, project management tools, open space methods, team dynamic facilitation tools…			

Table: The toolbox, categories of design methods / tools: examples.

The C – domain is of special importance, because it introduces the perspective of 2nd order observation, of what we are doing and how. Communication is "the driver", which creates meaning in the process. The C – domain comprises processes / tools such as:
- creating the social foundations of a cooperative design process ("the groundless ground"),
- configuring a process, taking decisions on the selection of tools and methods),
- controlling the process by observations (of observations),
- deciding on the choice of routines and criteria of judgement and evaluation,
- introducing intuition and experiential tacit knowledge into the process,
- dealing with networks of power, rivalry, ...,
- dealing with dead-end and situations of not-knowing,
- documenting the process,
- ...

The table serves as a methods / tools storage container. We do not intend to develop new tools or methods, at least not for the moment. For indicating and selecting individual tools in order to build tailored process configurations, we need the concept of *contextual dimensions*, describing the character of the design situation at hand. We suggest as contextual dimensions:

project type
- product design
- service design
- product-service systems
- product portfolio design
- business model design
- communication design
- identity design
- environmental design

- hybrid social-technical systems design
- policy design
- …

project condition
- involvement in the process (as "author", "partner", "executor", …)
- scale and complexity of the problem,
- future orientation / time-scale (short-term, normal, utopian)
- degree of uncertainty in the process
- degree of impact / importance of the project (Schwartz, 1991)
- …

project perspective
- knowledge perspective
- performance perspective
- value perspective
- ethical perspective
- user experience perspective
- making perspective
- semantics perspective
- human factors perspective (social, cultural, cognitive, physical)
- ...

project constraint
- time ("quick&dirty", in-depth)
- budget
- legal
- people
- cooperations
- …

Every single method in the toolbox will be marked with one or more attributes per dimension. For example:
- problem-type: service design
- problem-condition: future-oriented
- problem-perspective: semantic + human-centred
- problem-constraint: very small budget

6) Tailored processes of design and design research

The considerations presented up to now are supposed to support the configuration of tailored, context-specific, yet transparent, and coherent knowledge-supported design and research processes. By means of the above mentioned dimensions and attributes, a user of the methods platform is able to specify his problem. She will then be supplied with an already reduced and problem-oriented set of tools, which can be taken to compose the own tailored process.

	a "complete" design process
	a futures studies process (without synthesis/realization)
	a "normal" design process (without proper projection)
	a "risky" design process (not properly grounded in what IS)
	an analytic process (inquiry into "the true")
	a projective process (inquiry into "the ideal")
	a synthetic process (inquiry into "the real")

Table: Types of design and design research processes.

Design research can be regarded as specific subcategory in the total design process, to a certain degree comparable to the way one may describe science as a subcategory of design (Glanville 1980). The distinctions become fuzzy. The more one limits the inquiry to single domains or even to single boxes, the more it becomes possible and important to match the standards of scientific research processes. Processes covering several boxes necessarily have to creatively deal with knowledge gaps (Jonas 2003).

These design process models can then be used as basis for transferring them into project management guides and maps. The sketch below is to indicate the possible development towards communicative tools such as, for example, business games.

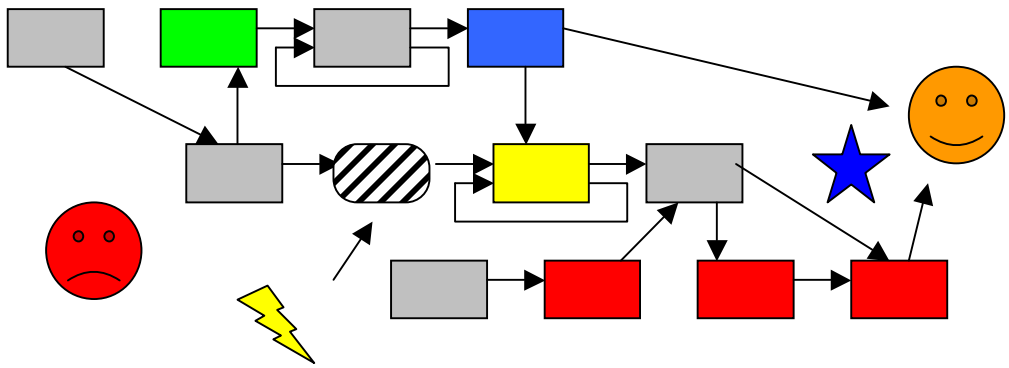

Fig.: Tailored design processes: individual process models transferable into project management schemes.

The crucial point here is not to destroy or suppress the intuitive qualities of the design process by the rational approach, but to enhance them and to make them more explicit and communicable. The basic question is: what constitutes a design process beside methods (i.e. knowledge support), and how can this still underdeveloped part of the process be supported? Probably the answer lies in the C-component of the approach, which will function as the mediating agency of rational / intuitive, explicit / tacit, … components.

7) Conclusion and next steps

Through combining two basic concepts: the general domains of inquiry and the steps of learning cycles, we have established a universal framework / platform for the description of design- and/or research-focussed problem-solving and change processes. The next step will be the development of a functional prototype: a methods toolbox for collaboratively planning and conducting specific design processes. A lot of work is still to be done:

- the development of a precise and practice-oriented operational terminology,
- the selection and standardized description of tools,
- the implementation of the toolbox,
- the knowledge supported choice of tools from the box,
- the knowledge supported link to project management tools,
- …

Meanwhile, in order to gain experience, we are using the framework in education and practice.

8) References

Alexander, Christopher (1964) *Notes on the Synthesis of Form* Cambridge, Mass.: Harvard University Press

Cross, Nigel (ed.) (1984) *Developments in Design Methodology* Chichester, New York: John Wiley & Sons

Dewey, John (1986) *Logic: The Theory of Inquiry*, Carbondale: Southern Illinois Univ. Press

Glanville, Ranulph (1980) "Why Design Research?" in: Jacques, R.; Powell, A., *Design: Science: Method* Guildford: Westbury House

Heskett, John (2002) *Toothpicks and Logos: Design in Everyday Life* Oxford: Oxford University Press

Jonas, Wolfgang (1996) "Systems Thinking in Industrial Design", *Proceedings of System Dynamics ´96*, July 22-26, 1996, Cambridge, Mass.

Jonas, Wolfgang (2003) "Mind the gap! – on knowing and not-knowing in design"**,** Proceedings of *EAD 2003*, Barcelona

Jones, John Chris (1970) *Design Methods*, 1970, 1980, Second edition 1992, New York: Van Nostrand Reinhold

Jones, John Chris "(2003) A theory of designing" (unpublished?)

Kolb, David A. (1984) *Experiential Learning: Experience as the Source of Learning and Development*

Melican, Jay (1997) *Design Methods* http://www.id.iit.edu/~jaym/desproc/desmeths.pdf (accessed 08.2003)

Nelson, Harold G.; Stolterman, Erik (2003) *The Design Way. Intentional change in an unpredictable world* Englewood Cliffs, New Jersey: Educational Technology Publications

Owen, Charles L. (1998) *Design, Advanced Planning and Product Development* http://www.id.iit.edu/papers/Owen_santiago98.pdf (accessed 08.2003)

Riedl, Rupert (2000) *Strukturen der Komplexität. Eine Morphologie des Erkennens und Erklärens*, Berlin Heidelberg New York: Springer
Rittel, Horst W. J. (1972) "Second-generation Design Methods" in: Cross, Nigel (ed.) *Developments in Design Methodology*, John Wiley, Chichester 1984 pp 317-327 (Original 1972)
Rittel, Horst W. J. (1992) *Planen, Entwerfen, Design* Hrsg. von Wolf D. Reuter, Stuttgart, Berlin:
Verlag W. Kohlhammer
Roozenburg, Norbert F.M. (2002) "A Theory is not a Thing" Proceedings of *The Sciences of Design*, Lyon, France, 15-16 March 2002
Schön, Donald A. (1983) *The Reflective Practitioner. How Professionals Think in Action* Basic Books
Schwartz, Peter (1991, 1996) *The Art of the Long View* New York: Currency Doubleday
Simon, Herbert A. (1969, 1981, 1996) *The Sciences of the Artificial* Cambridge, Mass.: MIT Press
Swann, Cal (2002) "Action Research and the Practice of Design" in: *Design Issues* Volume 18, Number 1 Winter 2002 pp 49-61