Far Beyond Dualisms in Methodology - An Integrative Design Research Medium "MAPS"[1]

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Abstract

Design research is an academic issue and increasingly a success factor for industrial, organizational and social innovation. Efficient methodical support is crucial. The fierce rejection of 1st generation design methods in the early 1970s resulted in the postmodernist attitude of "no methods", and subsequently in the strong adoption of scientific ways of thinking for design research. The situation regarding methodology has been characterized by unproductive dualisms such as scientific vs. designerly methods, normative vs. descriptive methods, research vs. design. The potential of the early (1st generation) methods is neglected and the practical usefulness of design research is impeded. The suggestion for 2nd generation methods, conceived as discursive instruments, as discussed by Rittel and others has hardly been taken up in design. The development of MAPS is aimed at the support of practice-oriented design, innovation and research processes. The long-term aim is the development of an *integrated knowledge and communication platform for research through design*. MAPS is based upon the idea of a productive reconciliation of the strong dualisms between "scientific" and "designerly" modes of inquiry and supports the emerging concept of *design thinking*. The paper reports on the ongoing research and development process from MAPS1.0 towards MAPS2.0 and beyond.

Keywords

research through design, methodology, MAPS, integrative design research medium

INTRODUCTION

Background and context

Design Research is both an academic issue and increasingly an essential success factor for industrial, organizational and social innovation. Design and innovation in these contexts are characterized by complexity on the problem side and contingency on the solution side. The fierce rejection of 1st generation design methods in the early 1970s resulted in the postmodernist attitude of "no methods", and subsequently, after more than a decade, in the strong adoption of scientific paradigms and methods for

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[1] "MAPS" stands for Matching Analysis Projection Synthesis and is available at http://www.designprocess.de. The title refers to Chow&Jonas (2008).

design research. The potential of the early (1st generation) methods is neglected and the practical usefulness of design research is impeded as a result of the strong scientific bias. Besides, suggestions for 2nd generation methods as discussed by Rittel (1972) and others have hardly been taken up in design. The current methodological dualisms fail to address these issues as a whole. There is no doubt that design and innovation projects today are increasingly knowledge-intensive and research-based. Nevertheless uncritical adoption of scientific methods and ways of thinking is showing strains. Certain sub-problems in design research projects need proper scientific ways of inquiry, but we suggest that the scientific approach alone is not sufficient.

The request for accelerated and systematic innovation suggests a need and an opportunity to adopt design as the generic process model of innovation. The emerging paradigm of "research through design" (Jonas 2007) provides a methodological and epistemological model for bridging the gap and creating the relation between "problems" and "solutions", that means for problem definition (dealing with complexity), solution generation (dealing with contingency) and project formation (dealing with the process that generates new facts and artefacts = forms). It also holds promise to end the dualisms by integrating both. Resolving the dualisms is a must if design research is to proceed to fulfil its potential and to meet its ambitious claims:

"black"	**Or "white"**	**→ And ("the beauty of grey")**
scientific methods	designerly methods	the flexible design process structures both scientific and designerly methods to allow the integration of heterogeneous scientific contributions
"proper" research	research through design	research through design, conceived as mentioned above, is proper and rigorous design-specific research
pre-rationalization	post-rationalization	both modes of reflection are complementary and proceed in a circular relation
descriptive methods	normative methods	both methodological concepts are necessarily complementary in designing
1st order methods	2nd order methods	a 2nd order cybernetic view integrates both perspectives and resolves the apparent contradiction
control	conversation	the character of the process depends entirely on the observers´ interpretation of the situation, conversation seems to be the more effective approach
tool	medium	the character of the instrument depends on the users´ interpretation of the process, medium seems to be a more productive concept
rigourous	undisciplined	rigour in the trans-discipline of design is fairly complex and still barely understood; the hypothesis is that in trans-disciplinary endeavours such as design one has to be rigorously undisciplined in order to be relevant
research	design	essentially, research is a special mode of design, in practice there is a continuous transfer zone between the two, we have to re-discover "the beauty of grey"

Table 1: Overcoming dualisms in design research (Chow&Jonas 2008).

The challenge now is to operationalize these theoretical concepts of design thinking without destroying or suppressing the intuitive qualities of the design process by the rational approach, but to enhance them and to make them more explicit and communicable.

Questions, hypotheses and assumptions

The research questions are (a) theoretical: how to integrate design methods and scientific methods under a designerly paradigm of knowledge creation?, and (b) methodological: how to make them operable in a way which creates added value for designers and design researchers? The project is based upon the following assumptions:

a) Research THROUGH design is the appropriate paradigm of knowledge generation in design and mode-2 science today. (Glanville 1980, Knorr-Cetina 1981, Latour 1991, Nowotny et.al. 2001, Rheinberger 2001, Jonas 2007, Findeli 2008a,b).

b) There is more continuity in methodology than normally assumed. From a 2nd order cybernetic perspective, which accounts for the necessary and inevitable involvement of the designer / researcher in the process, it is possible to integrate the early (1st generation) methods as well as scientific methods into a more continuous and consistent concept of 2nd order design methodology, see fig. 1. Findeli (2006) identifies the same modes, albeit in a different terminology:

• AS: "Premier type : modèle de la théorie minimale",

• ABOUT: "Deuxième type: la théorie comme cadre interprétatif",

• FOR: "Troisième type: le design comme science appliquée",

• THROUGH: "Quatrième type: le design comme théorie située et pratique éclairée".

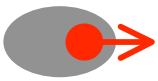
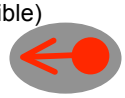
Observer position Observer looking 	Outside the design system 1st order cybernetics	Inside the design system 2nd order cybernetics
outwards	research FOR design 	research THROUGH design 
inwards	research ABOUT design 	research AS (?) design (inaccessible) 

Fig. 1: The concepts of research FOR / THROUGH / ABOUT design – as related to the cybernetic concept of observer positions with respect to the design system (where design activities take place, see Glanville 1997).

We hypothesize that in order to operationalize research through design, the instrument, which we name MAPS must provide the following functions and characteristics:

• MAPS is an instrument FOR design (→ normative, improving the process, aiming at pre-rationalization),

• MAPS is based upon assumptions that are results of research ABOUT design (→ descriptive, building on post-rationalization of existing processes / models),

• MAPS is aiming at the support of research THROUGH design (→ conversational, an interplay of different observer positions, pre- and post-rationalization).

• MAPS gives space for research AS design (→ generative, the necessarily inaccessible component of every abductive process). This is the epistemological core.

RESEARCH THROUGH DESIGN – AN EMERGING PARADIGM

Designerly ways of thinking

Findeli (2008a,b) provides a brief epistemological clarification of the much-quoted "designerly way of thinking in design". He contends that it can contribute to research in general by delivering valid and trustworthy knowledge about a part of the world considered as its specific field of knowledge. The scope or field of design research, according to Findeli, is *general human ecology.* It is the stance or epistemological bent of design research, which makes the difference: it is normative, diagnostic, prescriptive and not primarily analytical / descriptive as in the sciences. Design has a *projective* stance, the world is seen as a *project*, not an object of inquiry. And this feature is not a deficit at all (Findeli (2008b):

"Recent developments in human and social sciences have dealt extensively with the issue of objectivity as a possible and desirable horizon in research. The interpretive or hermeneutic turn has shown that objectivity is not a relevant and fruitful criterion for research in those disciplines, and that rigorous inquiry is nevertheless possible without diving into extreme relativism or scepticism. On the other hand, the pragmatist epistemological tradition - where the engagement of the researcher is also required - may also be invoked to propose a robust epistemological framework for design research, not to mention action research (renamed "project-grounded research" in design research) as one of its incarnation in methodological applications.

… definition:

Design research is a systematic search for and acquisition of knowledge related to general human ecology considered from a designerly way of thinking, i.e. project-oriented, perspective."

Elsewhere, this is usually called research through design (RTD).

3-stage models - APS

There is a myriad of design process models, as the collection from Dubberly (2004) testifies. We do not want to provide just another model but to suggest an integration. Beside this messy pluralism – if we take a more general and slightly fuzzy view – we realize that hybrid and integrative models are emerging that acknowledge the "beauty of grey" between "mere design" and "proper research" and argue explicitly for a specific epistemological status of design research. There is a striking triadic pattern showing up: a genuine design-specific structure, albeit still in diverse terminologies, of the research process emerging in various "sciences of the artificial" (disciplines dealing with the teleological / purposive transfer of an existing state into a preferred one), such as design (Jones 1970, Archer 1981, Nelson and Stolterman 2003, Jonas 2007), management (Weick 1969, Simon 1969, 1977), HCI (Fallman 2008).

author	**Phases / macro steps / components of design (research)**		
Jones 1970	divergence	transformation	convergence
Archer 1981	science	design	arts
Simon 1977 / Weick 1969	intelligence	design	choice
Nelson&Stolterman 2003	the true	the ideal	the real
Jonas 2007	Analysis	Projection	Synthesis
Fallman 2008	Design Studies	Design Exploration	Design Practice

Table 2: Triadic concepts / domains of knowing in design research indicating a generic model of the designerly research process (see also Chow 2009).

The so-called APS-approach (Hugentobler, Jonas and Rahe 2004, Jonas 2007) (APS stands for ANALYSIS PROJECTION SYNTHESIS) has been elaborated and developed into an operational tool (Jonas&Chow 2008). The underlying theoretical model consists of the hypercyclic combination of three domains of knowing ("the true", "the ideal", "the real", Nelson&Stolterman 2003) - the macro-level, and 4 steps of the basic learning cycle (research, analysis, synthesis, realization, Kolb 1984) - the micro-level. The claim is that APS represents the generic structure of a design research process in the paradigm of research through design.

APS and further …

Three generic design process models from Simon / Weick (1977 / 1969), Nelson&Stolterman (2003) and Jonas (2007) provide the basis for the further deveolpment of our theory. They are different but compatible and can be synthesized in a productive manner. Jonas´ operational "macro phases" of the design process (Analysis, Projection, Synthesis) are related to Nelson&Stolterman´s epistemological "domains of knowing" (the true, the ideal, the real). Simon&Weick´s generic steps of the management process (Intelligence, Design, Choice) are integrated, because Boland (2004) has demonstrated that it makes sense and provides further insight to consider the 3 macro steps of the design research process (which we call A, P, S from now on) in arbitrary sequence. So it is essential to mention that the 3 macro steps of the design research process are arranged not in a linear but in a circular sequence, allowing any possible punctuation of the process:

1. **intelligence – design – choice (APS): Herbert Simon´s rational man economic theory,**
2. design – choice – intelligence (PSA): the "what have I done?" manager,
3. choice – intelligence – design (SAP): the existential introvert,
4. intelligence – choice – design (ASP): the chronically disappointed manager – "if I had only…",
5. **design – intelligence – choice (PAS): Karl Weick´s sensemaking manager,**
6. choice – design – intelligence (SPA): the existential hero.

According to Boland, from the six possible combinations of punctuations it is most reasonable to put Choice (SYNTHESIS) to the last moment. Therefore the sequence 1 - APS and the sequence 5 - PAS are the only desirable ones.

"NARRATIVE 1. INTELLIGENCE – DESIGN – CHOICE

The sequence of intelligence – design – choice is Simon´s own punctuation in which intelligence recognizes a need for intervention, design makes alternatives available for consideration, and choice selects the best (satisficing) one. This is the classic view of rational man who is intentionally goal seeking and uses intelligence and forethought to guide organizational action. Our literature is full of examples showing that this model does not represent how humans actually behave. Simon "saves" this model for economists by posing that individuals are boundedly rational and do not seek best or optimal solutions as a strong economic model might suggest, but rather search for solutions until one that is "good enough" is found – the boundedly rational person therefore satisfices. This image of a satificing human, as attractive as it may be, has an undesirable consequence that follows from its temporal dynamic. In light of Simon´s own recognition of the importance of problem representation, we see that this punctuation of managing is easily trapped by the common wisdom of those in a problematic situation – its sequence begins with a pre-understanding of the situation that can promote a myopic circularity in which the way we happen to be thinking about

things becomes institutionalized in the representation and definition of the world we face. My intuition is that this way of punctuating management action leads to a finer and finer attention to problem representations that grow increasingly irrelevant to the human condition. Welfare policy, education policy, transportation policy, and most public policy issues seem to fall prey to the traps of this form of punctuation."

"NARRATIVE 5. DESIGN – INTELLIGENCE – CHOICE

Here, we have design as the shaping of things while engaged with others in the flow of action, and the producing of outcomes that are surprising to even the individual herself. Interaction with others generates equivocal enactment that is then subject to a sensemaking process. During sensemaking, intelligence is applied to order those elements of the raw action in ways that make the situation meaningful, aesthetically pleasing, and morally acceptable. This intelligence is followed by a choice of which meanings and sensemaking structures to carry forward into future enactments. This is a cybernetic system modeled after an evolutionary process, much like Weick´s sensemaking model with its pattern of variation, selection, and retention. Here, goals (if they are ever explicitly considered at all) are only understood retrospectively, and the raw, surprising enactments of design are the primary driving force of organizing. Weick´s many years of research on the sensemaking model of organizing shows how powerful this view of punctuating action is for understanding organizing behaviors both successful and unsuccessful. It is, in a sense, the antidote to the rational man model of the first narrative, grounded in a phenomenological appreciation of human action."

The distinction refers also to Lawson´s (1980) notion of scientists being more "problem-oriented" (analyzing the problem so that the solution can be derived from that) in contrast to designers being more "solution-oriented" working and thinking (generating tentative solutions until the best one emerges).

We can derive archetypical processes from the above considerations. The APS model **p**laces intelligence and goal-driven problem-solving as the driving activities (Simon 1977). Design research departing from a more or less known context, aiming at … solutions. The PAS model **p**laces design as the driving activity (Weick 1969). Design research departing from a highly unclear context, aiming at … innovations. Eliminating the doubles, we arrive at nine archetypical processes:

1	A	P	S	APS a "complete" design research process	Intelligence and goal driven problem-solving as the driving and leading activities in the design research process with / without Synthesis
2	A	P		AP a concept / futures studies process (without synthesis/realization)	
3	A		S	AS a "normal" design process (without proper projection)	
4	P	A	S	PAS a "complete" design innovation process	Design projection as the driving and leading activity in the innovation / exploration / research process with / without Synthesis
5	P	A		PA an exploration process (without synthesis/realization)	
6	P		S	PS a "risky", "speculative" trial&error process (without analytical grounding)	
7	A			A an analytic research process (inquiry into "the true")	disciplinary, domain-specific research or practice
8		P		P a projective futures studies process (inquiry into "the ideal")	
9			S	S a synthetic realization process (inquiry into "the real")	

Table 3: Nine archetypical design and design research processes.

By the way: Based upon these considerations it seems possible to describe the model of RTD as closely related to mode-2 science Nowotny et.al. characterize mode-2

science through primacy of the application context, transdisciplinary working situations, institutional heterogeneity (project-orientation), social accountability and new practices and criteria of quality control. In a mode-2 perspective there is a growing convergence of the design- and the research process; a shift from understanding to changing. We argue that it is the PROJECTION phase which integrates science and design and thus establishes the model of mode-2 science. This has to be elaborated elsewhere in more detail.

	ANALYSIS	PROJECTION	SYNTHESIS
Design			
Design Research (equals mode-2 science)			
Scientific Research (mode-1 science)			

Table 4: PROJECTION links Design & Science and establishes the model of mode-2 science.

CONCEPT OF MAPS

Distinctions of MAPS

MAPS is aimed to dissolve the toolbox' apparent rigidity and its conditioning and to provide a flexible, discursive and productive knowledge-supported medium. In the light of user experience with MAPS1.0 and against the background of deeper research into management processes (Boland 2004) and user-centered design research processes (Chow 2005) we realize the need to make the model more open and flexible. MAPS is designed to assist design researchers to specify / categorize (problem) situations, to match process patterns to the specified situation (and specify the role of design research), to select methods / tools related to the process, and to capture and retrieve design knowledge. Furthermore the new tool will assist the user in analyzing existing projects and processes (post-rationalization) as well as in configurating own processes (pre-rationalization). This contributes to the development of a knowledge base on design research processes. We consider four different functions / conditions of use:

• ‘HELP’: when experienced design researcher needs to locate quickly references on design research process, methods, tools.

• ‘INSTRUCT’: when design researcher needs step-by-step instruction on design research process, methods and tools.

• ‘PROMOTE’: when design researcher needs to explain the value and process of design research to partners and clients quickly.

• ‘COLLABORATE’: when design researcher needs to work closely with partners and clients.

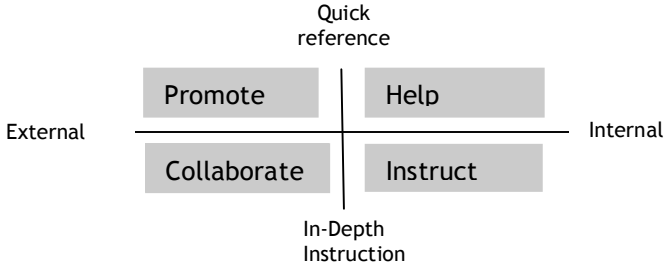


Fig. 2: MAPS provides four different functions.

The wider MAPS system

MAPS is aiming at the support of practice-oriented design, innovation and research processes. The long-term aim is the development of an integrated knowledge and communication platform for research THROUGH design. The outcomes of research through design projects are models in the widest sense: artefacts and new knowledge. MAPS assists problem specification by means of a questionnaire, which collects the main characteristics of the project. It suggests, if necessary, the use of a systemic model of the situation, which evolves during the process. MAPS provides an archive of methods. The methods are tagged according to the generic APS process model. MAPS generates preliminary process proposals, based upon the generic process model and using the outcome of the questionnaire (this is pre-rationalization). The process can be modified according to new and changing insights and requirements at any time, so that MAPS has the function of a communicative / reflective tool during the process. The final process can be documented and stored in a project archive for further evaluation and use (this is post-rationalization). Finally the growing project archive will feed MAPS and will generate new knowledge regarding the appropriate use of methods for the configuration of processes. Prototypical processes for certain situations may emerge, so that transferability of processes will be a longer-term effect of the use of MAPS.

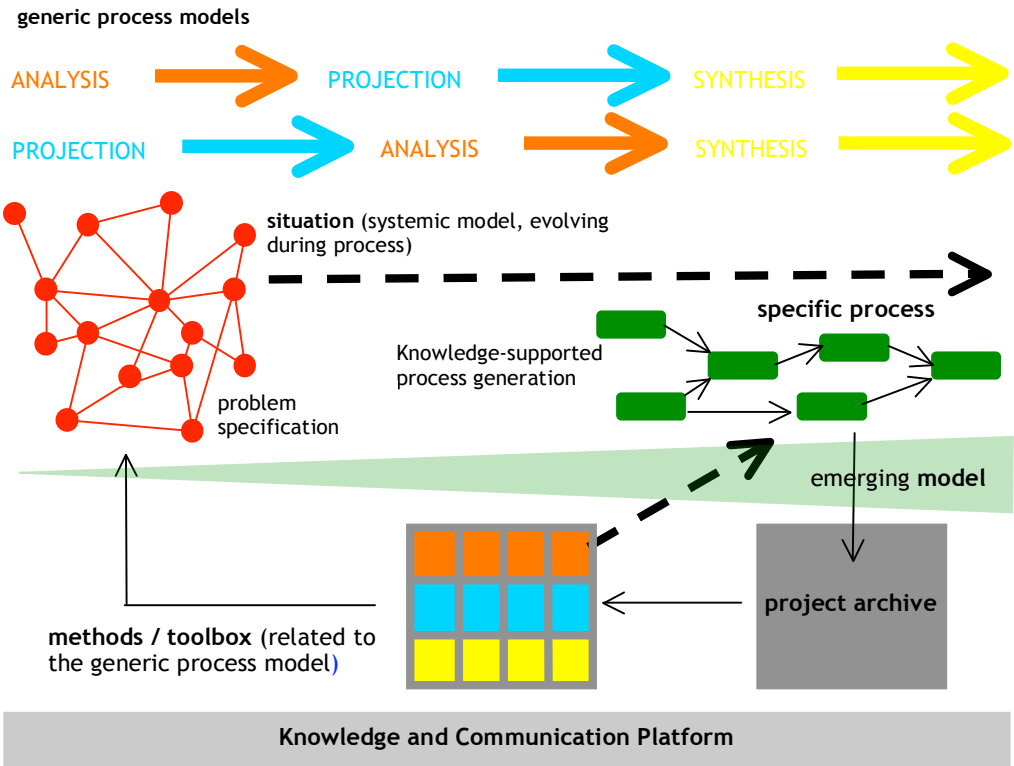


Fig. 3: The wider design concept of MAPS and its use.

OPERATIONALIZATION OF MAPS

Following from these theoretical considerations we have conducted in-depth user-studies in the context of a communication and information technological research center. Users from Business, Engineering, Design Design Research, were included.Following from these interviews, we transferred the four ideal functions as

conceived above (Fig. 2) into three demonstrative use-scenarios or working modes for MAPS. They serve as guidelines for the development of the system and the specific user-interfaces:

• "WIZARD-mode" is an assistance tool, mainly for beginners, for knowledge-supported configuration of processes. It is highly normative, using the questionnaire for the specification of process requirements.

• "PLANNER-mode" is a discursive tool / workspace for planning a process timeline for a team of experts, possibly from different disciplines. It is intensively using the methods toolbox and the methods descriptions.

• "REFERENCE-mode" is a reference tool with easy access to the methods database and the project archive and links. Effective user-generated knowledge capture and retrieval features are implemented here

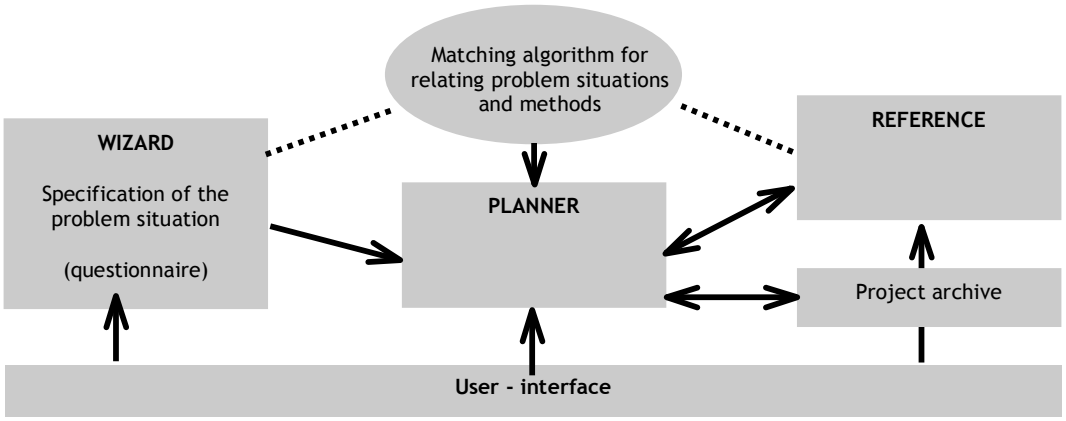


Fig. 4: Main components of MAPS2.0.

The questionnaire in the WIZARD mode is a tool for the user to specify his / her project situation. By answering the questions the user is also selecting tags that characterize the project. At the same time the tags are instruments for method profiling, that means characterizing their usability / usefulness for specific purposes. The set of tags is shared by the questionnaire (problem side) and the methods archive (solution side); they are the connecting elements. MAPS uses tags to match the situation with the suitable methods. That means for example: a problem situation can be designerly / scientific and a method can be designerly / scientific, etc. Matching the profiles of the situation and of the methods available contributes to the intelligent knowledge-supported selection of methods and tools for specific project situations. The matching algorithm for the meaningful relation of problem situations and methods is essential and still in the process of development and refinement ….

The four idealized functions (Fig. 2) are matched with users needs and made usable by three different interaction modes.

Function	**User needs**	**Mode**
Help	Easy handling (Step by Step)	Wizard
	Not so complex. Preselection of Information	Wizard
	Pre-rationalization	Wizard
	Not so interested in process, just need some advice on methods	Reference or Planner
	Favorite methods	Reference
Instruct	Archive	Reference

	Lots of in-depth information	Reference
	Search for particular method	Reference
	Fast & efficient	Reference
Promote	Access to other people's processes	Planner
	Post-rationalization	Planner
	Streamlining processes	Planner or Reference
Collaborate	Show process plan to client	Wizard or Planner
	Fix process	Planner
	Access to own history	Planner
	Reuse processes & methods	Planner or Reference

Table 5: User-centered functions and interactions of MAPS.

WIZARD is the mode for non-experts, who seek recommendation regarding the configuration of their design research process. See Fig. 5.

Julia (Design Think Tank) is a young designer who has just joined a design consultancy for a month. Her first project is to assist a senior designer to develop mobile communication for teenagers. She is very practice-oriented, creative and used to work intuitively. In her design education she has not learned to reflect and communicate her design process. But now she has to make explicit her methods and process. She is under time pressure for this short-term project and she needs to get information quickly and is looking for easy-to-understand cookbook descriptions of process and methods. Julia starts using WIZARD to get quick and plausible results. She also browses through REFERENCE and gets interested in the archived experience reports and ratings from colleagues and thinks about reusing existing templates, etc.

PLANNER is for those who have much experience in planning and carrying out projects. Users can enter PLANNER either through first using WIZARD or directly. See Fig. 6.

Barbara (Product Development) is a very pragmatic project leader with an engineering background. She leads a multi-professional team and needs to co-ordinate and to organize the group and information flow. She needs to plan in advance in details for every single project. Consensus among project members is highly important; therefore transparent and explicit communication is essential for successful teamwork. She needs clear overview of the project: what is happening when, with whom and where. Her projects are longer term with definite milestones. Moreover she is interested in new methods that improve efficiency and effectiveness. Barbara enters PLANNER, retrieves a successful project from the archive and modifies it according to the requirements of the actual project. From time to time she browses in REFERENCE in order to check out the newest methods and updates that might be useful for her team. Sometimes she also adds new methods that she finds useful to share with colleagues.

REFERENCE is for all to get information about methods. The user can search for the database of methods in various ways. Furthermore, (s)he can evaluate and comment existing methods and add own methods. See Fig. 7.

Herbert (Research Consultant) has a scientific background and is a very analytical worker. From his long consulting experience he has in-depth theoretical and practical knowledge about processes and methods. He needs and prefers scientific references, links, published case studies and literature for his work. He needs information and

sound knowledge. He likes to keep record of his own projects to show clients. Furthermore, he is permanently looking for new knowledge and he is constantly building his professional network. So Herbert is a frequent user of REFERENCE where he comments and rates existing methods, looks for interesting new methods and projects and frequently adds new methods.

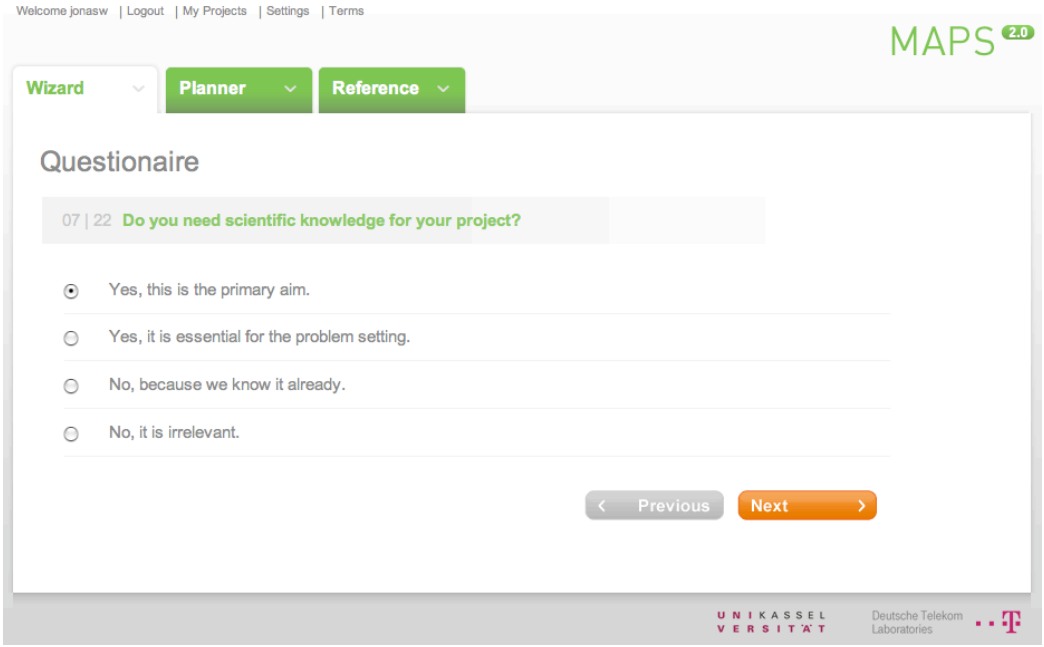


Fig. 5: Knowledge supported process configuration in the WIZARD mode.

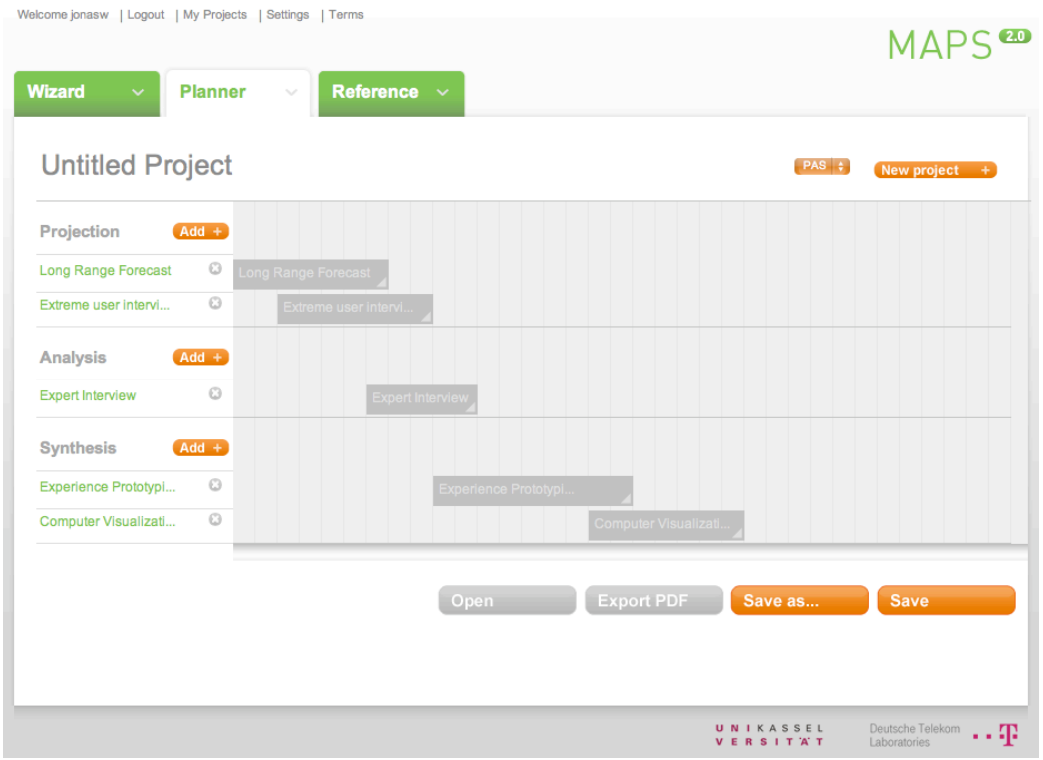


Fig. 6: Configurating a design research project in the PLANNER mode.

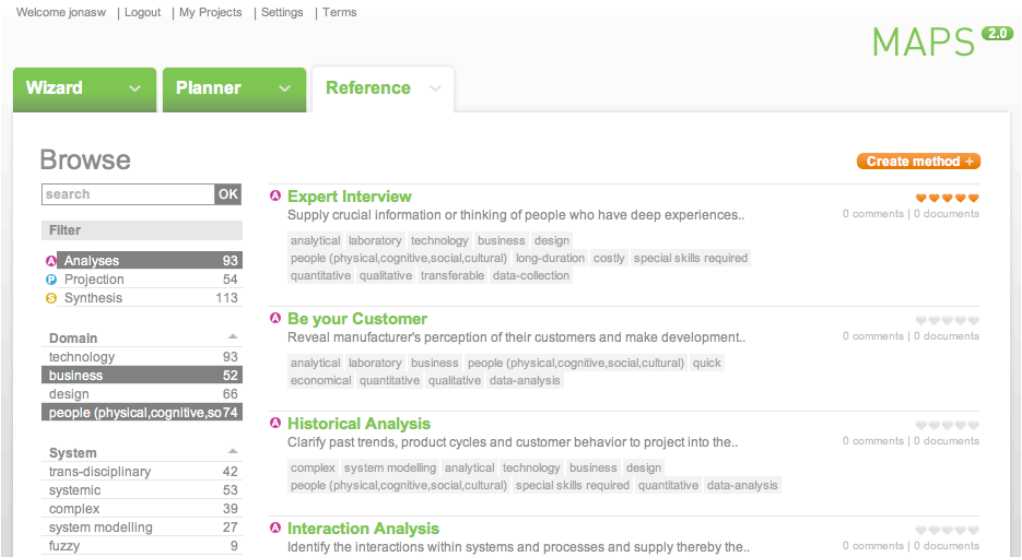


Fig. 7: Method description in the REFERENCE mode.

CONCLUSIONS

It is not difficult to find descriptions and representations of processes for designing, problem solving, and innovative product development. Evbuomwan et. al. (1996) and Dubberly (2004) provide a comprehensive collection of philosophies and process models. However, most of these representations, although informed by practical experiences, can hardly be considered systematic or rigorous. And even the more thoughtful representations come short in a few critical aspects, since they overlook the problematic situation, i.e. the relevant contextual factors of the project, or they conflate process models with methods and tools, or they fail to distinguish the epistemological domains of knowing (the true, the ideal, the real), or they are focussed on specific application areas such as software, HCI, architecture, etc. Table 6 provides an overview.

Our ambitious claim may be supported by the observation that there is self-similarity in the project. The entire ongoing development process of MAPS can be described so far as A – P – S – A – P – A – S … with open end: A: Analysing existing process models and tools – P: Projecting a tool for design research (theoretical concept) – S: Synthesising the first version of MAPS (toolbox and MAPS1.0) – A: Analysing user experience with MAPS1.0 – P: Projecting the improved version of MAPS – A: Analysing user needs for the new version – S: Synthesising the improved version MAPS2.0 – …

The rather rigid toolbox structure of MAPS1.0 has been made much more open and flexible in MAPS2.0. Three different modes are available by means of a user-friendly interface. Further improvements are required for each of the three modes:

• WIZARD: Filtering algorithm for matching problem situations and methods needs refinement. MAPS-users have to contribute.

• PLANNER: Connecting interfaces to project planning software might be helpful.?

• REFERENCE: User collaboration is required for the evaluation of the existing methods, for the thorough examination of the tagging logic, and the introduction of new methods

We are looking forward to MAPS3.0…

	MAPS2.0	ID Chicago approach	MePSS	Z-Punkt CF toolbox	IDEO method cards
Reference	http://www.designprocess.de	http://www.id.iit.edu/130/	http://www.mepss.nl/index.php?p=intro	http://www.zukunft-im-mittelstand.de/z_punkt.php?kat=1	http://www.ideo.com/work/item/method-cards/
Application focus	Support Design + Research Through Design (RTD)	Support human-centered design and design research	Support Product Service Systems (PSS) development	Support Corporate Foresight (CF) processes	Inspire human-centered design and research processes
Problem situation / purpose	Situation may be specified in detail (questionnaire)	Human-center-ed design and design research situations	PSS development in general	One out of four different CF purposes has to be chosen	Design situations in general
Theory	3-step macro- and 4-step micro process (Kolb-type), 12-step hypercyclic	4-step process (Kolb-type)	5-step process and 6 decision nodes	4-step process (Kolb-type)	4 suits according to activity modes: Ask, Watch, Learn, Try
Methods	200 methods	100+ methods	23 tools, detailed des-cription of the working steps	21 methods, detailed description of tools	51 methods, brief illustrated descriptions
Method selection / process configu-ration	According to the situation as specified in the questionnaire, or underlying 12-step struc-ture , or free	Selection of methods for each of the 4 steps	Configuration according to a fixed scheme	Predefined proposal, user can choose among 1-3 methods for each of the 4 steps	Completely free, supported by the 4 suits
Normativity regarding whole process	Normative, descriptive, or anything in between	Mainly normative	Mainly normative	Mainly normative	Non-normative
Comment	Theoretically the most robust and practically the most general. Usability still to be improved	The classic	Excellent for PSS development	Excellent for CF purposes	Nice and playful tool for inspiration

Table 6: Comparison of exemplary methodical tools.

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