Designer Driven Innovation

How community based methodology can facilitate the designer and foster innovation

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Design and innovation are inherently uncertain. Designers deal with uncertainty associated with multiple causes. Design methodology aims to support the designer in dealing with uncertainty. However, it often does not provide methodological support that is adaptable to the individual's needs in new and uncertain situations. In this doctoral research project, the aim is to create a better understanding of designer behavior in situations of uncertainty and their need for design methodology. The knowledge will be used to develop a web-based tool that assists designers to deal – or play - with uncertainty. The overall goal is a step towards designer-centered methodology.

Keywords: Designer-centered methodology, innovation, uncertainty

1. Introduction

Design and innovation are at the core of successful business. While working on innovation projects, designers have to deal with uncertainty associated with complexity, multi-disciplinarity and outcomes that in the early phases are not - and are not supposed to be - foreseeable. Assuming that uncertainty is unavoidable in design projects, designers are challenged to deal or even play with uncertainty in order to create successful innovations. They rely on knowledge of previous processes that have led to successful innovation and on their own problem solving abilities. In situations of unusual or high uncertainty the designer might not know how to proceed. These situations are referred to herein as non-routine situations. They are characterized by an increased awareness of uncertainty (Figure 1).

Design methodology, as a field of inquiry, studies design processes and develops methods and tools to assist designers. Based on this knowledge design methodology supports the designer by providing structure and thus assists in dealing with uncertainty. In the context of this project, we use a broad understanding of design methodology as the set of any more or less formalized procedures that describe or prescribe (parts of) the activity of designing with the aim to support designers. Examples of such formalized procedures are for example the VDI process model for product development [1] or techniques for generating creative ideas like brainstorming [13] or even sketching techniques.

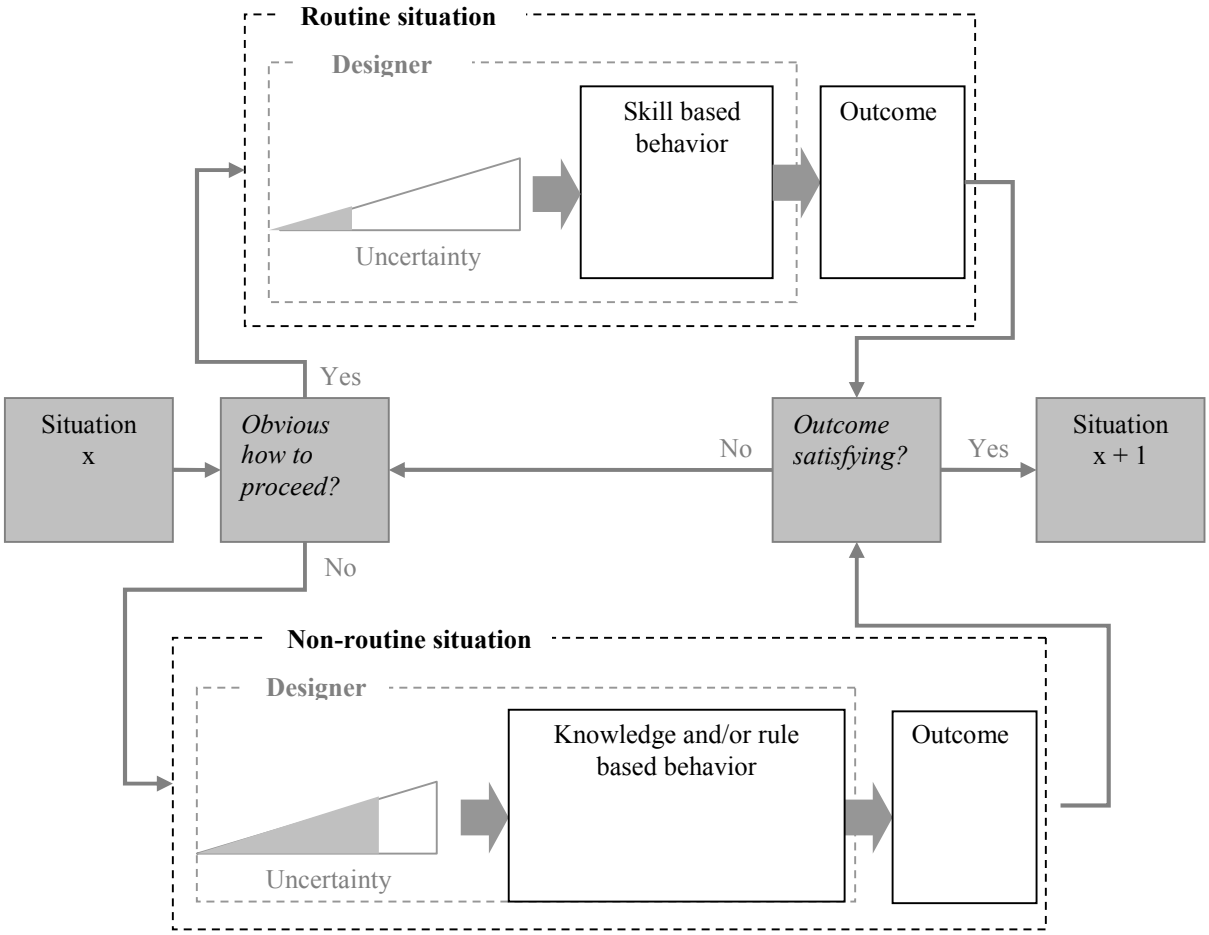

Figure 1. Distinguishing between routine & non-routine situations and the relationship with skill-, rule- and knowledge based performance.

2. Problem domain

Research in the field of design methodology is usually focused on the design process and it often includes an implicit model of the designer as rational problem solver. This has been a successful approach [5]. However, the descriptions of design processes in the design methodology literature often exclude non-technical factors like team dynamics, company culture or level of expertise. These descriptions also often lack an indication of when methods and tools should be used, in what way and what may be expected as a result in specific situations. Currently, this type of – still mostly experiential - information is mostly shared through informal discussions in communities of practice, i.e. with colleagues [2]. To summarize, design methodology does not support designers to deal with non-routine situations because it does not integrate and relate to the non-technical factors that cause these situations. It also does not fit well with the workflow of practicing designers. Studying these two related issues is currently problematic; therefore we propose to develop a software system that allows us to study the designers' behavior in non-routine situations, the role of design methodology and sharing of related experiences in communities of practice in an integrated way.

3. Related work

Human behavior in routine and non-routine situations has been analyzed by Rasmussen and others who

identified different levels of abstraction in human information processing from studies of nuclear power plan operators [12]. Their model describes three levels of performance, skill-based, rule-based and knowledge-based [6] cognitive processing activities on an increasingly abstract and mental-effort intensive levels. Although the model primarily provides insight in the behavior of plant operators, we believe that this ladder model provides useful insights in the behavior of designers as well. As a consequence of the frequent occurrence of non-routine situations in design processes, it is expected that the designer often performs on a knowledge-based level (figure 1). We also expect that for some non-routine situations the designer may anticipate the need to adopt or develop new procedures.

In empirical studies it was found that designers - as an answer to a high level of perceived uncertainty - co-develop problem definition and problem understanding with the development of solutions [4] [8] [10] [11]. For example, a new insight into the problem might require a designer to frame the problem differently, and force him to develop or adopt another, more appropriate procedure. To date, very little design research has focused on the phenomenon. An exception is research into design expertise (see for example [3], [9]) that gives insight into how experts deal with complexity and ambiguity in design projects. Another exception is the approach of analyzing and modeling design practice done in a collaboration of German engineers and psychologists [1].

4. Research goal and methodological approach

In order to improve methodological support for designers in practice, research is required to define and analyze the situations in which methodology is desired – according to the designer's wishes and needs. Particularly, further research should focus on those situations where the combination of these characteristics leads to a high level of uncertainty. In order to improve methodological support further, existing design methodologies need to be complemented with situational, experiential knowledge that provides insight into their application, value and results. We propose that to effectively communicate experiential knowledge, design methodology needs to be integrated into the communities of practice, into the social system of colleagues, peers, and design researchers that constitute a design community.

The phenomenon as described is strongly embedded in practice. This justifies a research approach that involves inquiries in real situations in practice in addition to experimental studies. Thus a mixed methods approach is used. First, in order to describe the use of methods and tools in non-routine situations a number of experimental studies will be performed. Second, to contextualize the findings and create a broader understanding of the phenomenon a number of field studies will be performed through the use of an online software system. The system integrates issues of designer-centered methodology as described earlier. For this, a 'Design Inclusive Research' [7] approach will be used. Conclusions from the data will be used to improve the system and theoretical framework underneath.

5. Conclusions

There is a gap between what current design methodology offers to designers and the needs of designers in practice. The research project aims to bridge this gap. We propose that in order to do so, design methodology should support the designer to:

1.) Access, choose and apply methods and tools in an easy and intuitive way in the midst of action, and based on

the characteristics of the situation at hand, i.e. help them to deal with *situations of uncertainty*

2.) Communicate methods, tools and related experiences through communities of practice, i.e. to help them to use the *right* methods and tools *efficiently*.

This would, according to our view, make design methodology more *designer-friendly*. As stated earlier, a promising approach seems to be the combination of experimental studies on the use of methods and tools in non-routine situations with field studies that are focused on the phenomenon in practice. The objectives of such a system are: (1) to stimulate the designer reflecting on non-routine situations, (2) to motivate the designer searching, finding and using appropriate methodology in an appropriate amount of time (3) and to stimulate discussion about design methodology within a web-based community of designers and researchers.

6. References

[1] Badke-Schaub, P. and Frankenberger, E. Analysis of Design Practice. *Design Studies*, 1999, 20(5), 465-480.

[2] Badke-schaub, P. Stempfle, J. and Wallmeier, S. (2001). Transfer of experience in critical design situations. International conference on engineering design, ICED '01, August 21-23, Glasgow.

[3] Cross, N. Expertise in Design: an Overview. *Design Studies*, 2004, 25(4), 427-441.

[4] Darke, J. The Primary Generator and the Design Process. *Design Studies*, 1979, 1(1), 36-44.

[5] Hansen, C.T., Dorst, K. and Andreasen, M.M. (2009). Problem formulation as a discursive design activity. To be published in the proceedings of ICED '09.

[6] Hollnagel, E., Pederson, O.M. and Rasmussen, J. *Notes on Human Performance Analysis, Report No. Risø-M-2285*, 1981 (Danish Atomic Energy Commission, Roskilde, Denmark).

[7] Horváth, I. (2007). Comparison of three methodological approaches of design research. In proceedings of ICED '07.

[8] Lawson, B. *How Designers Think*, 1980 (Butterworths, London).

[9] Lawson, B. Schemata, Gambits and Precedent: some Factors in Design Expertise. *Design Studies*, 2004, 25(5), 443-457

[10] Schön, D.A. *The Reflective Practitioner*, 1983 (Basic books: New York).

[11] Schön, D.A. *Educating the Reflective Practitioner*, 1987 (Jossey-Bass, San Fransisco).

[12] Rasmussen, J. *The Human Data Processor as a System Component: Bits and Pieces of a Model, Report No. Risø-M-1722*, 1974 (Danish Atomic Energy Commission, Roskilde, Denmark).

[13] Osborn, A.F. (1963). *Applied imagination: Principles and Procedures of Creative Problem Solving*. Charles Scribner's Sons, New York.

[14] VDI 2221 (1986). *Systematic Approach to the Design of Technical Systems and Products*, Verein Deutscher Ingenieure, Düssuldorf.