

Reflections on a Reflective Cycle: A Tale of Knowledge Development in Design Praxis

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Abstract

This paper explores the way design rules are developed and enacted. Literature on design stresses that scientific knowledge should be used as input for constructing a coherent repertoire of design rules. In line with the reflective cycle, these rules have to be tested and refined during their application in organizational praxis. However, in this paper we argue that do not particularly consider this process as linear and unproblematic. More specifically, our research reveals major impediments to the establishment of allegedly tested and grounded design rules. The paper illustrates this by drawing on a longitudinal case study on the evolution of a piece of design knowledge. As a result, the study provides an understanding of the specific conditions and elements that may inhibit or encourage the development and enactment of technological rules at the interface of science and design. It adds support to the importance of considering the (1) cognitive and (2) socio-political process in which design rules gain 'good currency' in design praxis and sets an agenda for further studying the development and enactment process of design knowledge.

Introduction

Organizational design is presented as an important mode of conduct to address the persistent problems in the knowledge exchange between organizational science and organizational praxis (Rome, 2003; Hevner et al., 2004). It is argued that by means of design, organization theory is able to gain relevance to practitioners and increase the likelihood of utilization what is produced by academia (Beyer & Trice, 1982). Central to design knowledge production is reflective cycle. This entails that by means of continuous pragmatic experimentation/search for alternatives building of knowledge repertoire. This can be used in diagnostic and therapeutic parts of subsequent designs (van Eijnatten & Hoevenaars, 1989; Hevner et al., 2004). The successful experiences used to refine knowledge.

Current literature concentrates mainly concentrates on object knowledge while there is still a lack of attention to knowledge development in design. In addition, current conceptualizations of reflective cycle present process of building knowledge base as linear and unproblematic. However, as various other accounts have indicated, the development of design knowledge is not without important difficulties. For instance scientific management is regarded as important generation of design methodologies (Romme, 2003: 564). At the same time various historical accounts have shown that development not uncontested enterprise, most notably among engineers (Nelson, 1975; Shenhav, 1999). This indicates that development of design knowledge not self-evident but should be regarded as a specific product of a constellation of different context specific factors (Guillén, 1994). It is this configuration of cognitive and socio-political factors determining whether design knowledge is able to gain 'good currency'

(van de Ven, 1986: 591) often neglected in literature on organizational design. Though as we will argue in this paper, elements are essential in generations and accumulation of design knowledge (Lammers, 1988).

Reflects need for further understand elements shaping evolution of knowledge. In this paper we seek to further explore impediments to knowledge development in design praxis by tracing routes of design knowledge and going back how knowledge is constructed and becomes established (Latour, 1987; Shenhav, 1995). We start this paper by discussing current view on knowledge development in organizational design by regulative and reflective cycle. As we will indicate below, it presents a reified view by focussing on 'success stories' thereby unavoidably conceptualizing knowledge development and accumulation as linear and unproblematic. It is easily assumed that new design knowledge is automatically accepted and routinized. The discussion then draws on literature related to knowledge development because this provides important insights into the impediments inherent to the creation and establishment of design rules. It is shown that process may encounter cognitive and socio-political barriers. The paper empirically illustrates the our main argument by drawing on case. This may constitute a basis for generating grounded rules for enhancing knowledge development in design praxis.

Constructing design knowledge

Knowledge representations

Design knowledge requires a different form than knowledge representations in natural sciences or humanities (Simon, 1969). Rather than being concerned with how things are by providing explanation of organizational reality, the focus of a theory of design is on what ought to be (Simon, 1969: 133). In other words design is aimed at constructing a desired situation by intervening in organizational practice. So instead of providing descriptions or representing causal relationships among variables (Romme, 2003), design knowledge has a function of/should deliver norms to shape organizations as artificial objects. In line with this, van Aken (2004) stressed that the knowledge should be used in designing solutions to problems in the field. Because of this problem focused approach of reality, theory likely more integral rather than disciplinary oriented. For instance historical accounts considered the increased application of technological innovations as an important factor in the substantial growth and changing design of industrial enterprises in the late 19th century. However this was attended by organizational structural and social problems. On the shopfloor these transformations often led to the increasing power the foremen and worsened labor conditions. The coordination problems and labor unrest that resulted from this had negative consequences for performance of organizations. In response to problems, various experts developed a constellation of technical and administrative solutions often presented under the label of systematic management or scientific management (Litterer, 1961). The design concentrated on standardization of repetitive management tasks an creation of administrative units in production control and cost accounting to support the management.

The knowledge items within the field of organizational design cannot be treated alike. Rather, related to types of design theorists distinguished between different categories of design knowledge (van Aken, 2004; van Eijnatten & Hoevenaars, 1989; van Strien, 1986). A first, and most obvious type of knowledge is related to the object to be designed. The analytical models and design principles are particularly considered relevant in a diagnostic part of a design process (van Eijnatten & Hoevenaars, 1989). For instance, De Sitter developed design parameters to . This design knowledge has been often grafted on systems theory and cybernetics (in 't Veld, 1992; Ashby, 1956). This offers ideal solutions which provide a measure to assess the functioning of organizations. A second type of design knowledge is about the reali-

zation of the artefact. Moving from the current situation to an idealtypical design generally entails making intervention in organizations which requires specific methods and skills (de Leeuw, 1994). For example van Amelsvoort (1996) identified a number of different change programs aimed at re-designing organizations and explained the specific conditions under which they can be applied. Finally, van Aken (2004) distinguishes knowledge on constructing the actual design process. This type of design knowledge provides guidelines as to how the content-oriented knowledge can be deployed. It is argued that the latter resides mainly in implicit form, mainly because generally concentrate on content knowledge and little attention for methodology of knowledge application and development (van Aken, 1994; van Strien, 1997).

In the form of prescriptions as knowledge manifestations. Simon (1969), showed that prescriptions can consist of algorithms that may provide a system of rules for optimization. More often, search for and assessment of alternatives guided by design heuristics. Habitually such heuristics are presented in the form of what Benders & van Veen (2001) dub organization concepts. These are more or less coherent sets of prescriptive visions or design propositions on organizing that are known by specific label. These concepts are considered important carriers of design knowledge. In line with Ortmann (1995), Benders & van Veen (2001) stress that a key element of these design rules is their interpretative viability, that is, lend itself for different interpretation and usage. This allows to become perceived as applicable in large variety of different situations. As been stressed general rules translated (Czarniawska & Sévon, 1996) and thereby contextualized to fit the specific problem situation. For instance Werr, et al. (1997) structured methods offered important guidelines in organizational design projects, but at the same time stressed the need for adaptation to specific problem by the professional. As Brunsson and Olsen (1997: 37) nicely put it, deployment of these rules in organizational praxis both increase and reduce the variety of possible outcomes. That is why effects of heuristics cannot easily be predicted.

Not any prescription can become established in a theory of design. Theorists of organizational design stress that the knowledge should meet several criteria thereby increasing the likelihood of utilization and improvement of organizational praxis. De Leeuw (1996) states that when design oriented science provide tools to intervene in organizational reality important that knowledge within a design-oriented science should be useful in the sense of both sound and relevant (1996: 20). Soundness entails that knowledge products should be at the same time correct and consistent. For example Baligh et al. (1996) proposed that in developing a knowledge base that consists of a coherent set of design rules should be guided by several consistency criteria. Specifically internal consistent, consistent with general theories, and usable for design purposes in the real world. Soundness also requires that the design knowledge can be relied upon in its usage. To achieve this, van Strien (1986) noted that essential for building scientific practice of design that knowledge products open to control. In line with this notion, van Aken (1994) stressed that a crucial criterion for design knowledge is that it can be tested and be verified. Specifically, claims and evidence should be assessed to the extent in which application leads to promised result and under which conditions. However, at the same time it is indicated that particularly design heuristics cannot be proved in a strict sense. Rather, by its application building of trust (van Aken, 2004). It is therefore that design knowledge no stable entity, but continuously adapted on the basis of new experiences. Another key criterion for the quality of design-oriented knowledge is that it should be relevant in the sense of linked with control issues (de Leeuw, 1996). Organizations are continuously confronted with persistent organizational problems in search of way by which can be addressed. Lack of relevant and accurate knowledge leads to making basic mistakes (Benders & Vermeulen, 2002; Hevner et al., 2004). This would imply that the knowledge should be generalized to other situations while at the same time the knowledge should fit the specific knowledge needs

and thought world of the organizational context in which it is applied. In the next section we discuss the way in which this process is conceptualized in design literature.

Regulative cycle

Common in organizational design approaches following a 'regulative cycle' (van Strien, 1986). In line with Simon's (1969) description of the design process this involves structured organizational problem solving process guided by grounded design rules. Rather than distancing from the object of research, this approach characterized by clinical attitude. Researcher aimed at designing new reality on the basis of problem diagnosis (van Eijnatten & Hoevenaars, 1989) thereby 'regulating' his research object/situation by its actions. As a result organizations may react and try to close this performance gap by applying specific knowledge on organizational design. The application of this knowledge should improve organizational performance and eventually contribute to attaining the organizational objectives. This requires viewing organization as a whole/integral approach different aspects in their interrelation. Assume that each situation is unique and therefore requires developing a theory of practice (van Strien, 1986).

As been shown in Figure 1, theorists typically identify different phases of which the actual design process is only one element (van Strien, 1986; 1997; Simon, 1969; van Aken, 1994; Suh, 1990; de Leeuw, 1996). Firstly, a specific constellation of interrelated problems in a particular organization or also denoted as messy problems may give cause for a general scientific problem formulation. Suh (1990: 6) considers this as a key process in design. Strictly seen, the accuracy of this problem definition can only be verified when the output of the design process is judge against the perceived needs. Suh also point to the fact that the way problem is defined is highly dependent upon designer: 'different designers may end up with defining a different set of design requirements for the same perceived needs' (1990: 7). This may eventually result in a large number of possible design solutions.

Next, using the available theoretic insights the researcher should make a diagnosis by further analyzing the problem situation and thereby identify symptoms and causes. De Leeuw (1996) stressed the need for creating a pluriform view, that is, developing an understanding of the problem situation by using a variety of different conceptual and empirically grounded perspectives. Parallel to this the clinical researcher develops a judgement of the characteristics and behavior of the research object in functional terms. The criteria against which to judge should be independent from possible measures.

A third phase involves the design of specific model of an entity that may address the diagnosed problem and improve organizational performance. Discovering generally conceptualized as a creative search process in which design alternatives are generated and tested against the functional requirements and environmental constraints (Suh, 1990; Simon, 1969; Hevner et al., 2004). Because of complexities, often decomposed into smaller manageable parts after which partial solutions can be recombined into a larger design (Suh, 1990; in 't Veld, 1992). The iterative search process continues until satisfactory solution 'that works well for the specified class of problems' (Hevner et al, 2004: 89). In addition Suh states that key to a good design is also that the perceived needs are satisfied with a minimum set of functional requirements. In other words, designers should beware that they not seek to satisfy more requirements than necessary.

Fourthly, an intervention in the problem situation will take place by implementing the designed solution. Suh (1990: 26) distinguishes between the functional and the physical domain. These are regarded as two independent domains that can only be linked by design. It is therefore that to realize design a good designer should be able to operate both in the functional and physical domain. According to de Leeuw (1996) this phase should entail three elements: a specific change diagnosis, a design of change approach and design of change organi-

zation. Finally, the effects of the intervention are analyzed and evaluated from the design and initial problem formulation. This may result in a new situation that, on its turn, may give cause for a next problem formulation and associated regulative cycle.

Scientific organizational knowledge may be exploited within the design process. Common is that existing knowledge important means to explaining and shaping new artefacts. Also should be adapted to the specific context of application. However, regulative cycle can be characterized by a diagnostic and a therapeutic part each with own specific consequences for the kind of knowledge and its usage (van Eijnatten & Hoevenaars, 1989). In the diagnostic part of the cycle supported by existing literature. These theories can guide problem analysis and provide alternative perspectives for pluriform view. In a therapeutic part knowledge support bringing change in desired direction. This requires choice of change methods and personal skills of designers.

The regulative cycle not only plays an important role in addressing these problem situations in organizations but also central element in generation of a cumulative organizational design knowledge base. We will elaborate this in the next section.

Reflective cycle

The regulative cycle can be found/recognized in current conceptualizations of knowledge development cycle for design focused research. As design uses and may serve theory development research (Florusse & Wouters, 1991; van Aken, 2004; van Eijnatten & Hoevenaars, 1989) it is considered as a vital link between research and praxis (Romme, 2003; Hevner et al., 2004; van Strien, 1997). Within design oriented research these experts or business professionals are considered to have an important role. Scientific knowledge is often been developed in close collaboration between professionals and business academics applying both regulative and reflective cycle. Florusse & Wouters (1991) even argue that designers should have skills to use results of knowledge development research but should also be able to do theory-development research. However, solely leaving this to practitioners easily leads to fragmentation and dispersed body of knowledge (Romme, 2003).

As been elaborated earlier in this paper, the aim of a design oriented science entails the development of useful organizational knowledge in a scientifically appropriate way (van Aken, 1994). This research should cumulatively yield clinical knowledge on problems and solutions which have been studied within their specific organizational context. This scientific knowledge may be stored and used when necessary. Here the input of organizational knowledge may be considered important as to successfully proceed through both the diagnostic as well as the therapeutic section of the regulative cycle. Current literature on organizational design stress that a crucial element to organizational design research is the process of developing a coherent set of design propositions by following a 'reflective cycle' (van Aken, 2004). In line with van Strien, van Aken (2004) emphasized, clinical research on the basis of a series of successful cases constitutes an important basis for the derivation of technological rules. The reflective cycle is considered as a key element in the accumulation of design knowledge and seen as crucial to the interface of science and design (Romme, 2003: 567). These sets of design propositions contain technological rules that are both grounded in organization science and tested in the context of their application. This process is to result in valid and reliable knowledge in the form of prescriptions that can be used as guide in new design processes.

According to van Aken the cycle commences by firstly concentrating on a specific domain of problem situations. realizing a design and intervention in selected cases on the basis of the 'regulative cycle' (van Strien, 1986). Concentrating analysis on effectiveness in original context by initiator (alpha testing) or examination of rule by others beyond the point of origin (beta testing). Output of regulative cycle entails a theory of practice or 'mini-theory'

(van Strien, 1997: 685) that is only applicable in the individual case (N=1). These organizational designs and interventions may be studied by evaluating and classifying a number of selected and successful N=1 theories. (Hevner, 2004: 80) research assessment via evaluation activities can result in identification of weaknesses in theory or artefact and need to redefine. In scientific process these N=1 theories may be generalized to N=K theories. van Aken (2004: 229) testing technological rule during reflective cycle gain insight into indications and contra indications for application and also in application domain, a specific class of problems. This is followed by reflections on the cases' performance resulting in refining the specific design theory which can be readily used in new cases. On basis of reflection experiences can be abstracted and codified after which can be transferred to different contexts. Hevner (2004: 81) design science results are codified in knowledge base they become best practice. Many design activities have been extensively studied, formalized and become routine. Following reflective cycle develop knowledge that can be transferred to similar contexts on basis of reflection and cross-case analysis. Inclusion in knowledge base and serve as new input for. Van Aken (2004: 234) Translating of rule to other contexts, having others use it gain further insight into application domain and counteract 'unrecognized defenses' of the originator.

Romme (2003) illustrates this knowledge development process by drawing on the success case of circular organizations. Here it is shown that, in answer to a perceived organizational problem, people started experimentation designing structures that allowed for active employee participation. Early experiences in one organization were reflected on after which these were abstracted and codified. This resulted in coherent approach and rules for designing decision making. Subsequently the method was continuously taken as a basis for application in other contexts which allowed to show that it worked and generate more knowledge. Another successful and widely publicized example of design approach entails the development of socio-technical systems design. Having its origin in Durham mines it is presented as accumulated body of design knowledge by continuously drawing on the experiences of designs in organizational praxis (van Eijnatten & van der Zwaan, 1998).

Design knowledge development as a contested process

As outlined in the above, current literature on organizational design shares a view in which the development of design knowledge is considered as linear and unproblematic. It is shown that current design literature still shows a lack of attention to difficulties in knowledge development. The 'reflective cycle' is presented as a series of logical and straightforward phases that automatically results in the construction and establishment of grounded design propositions which are readily accepted and used in new cases. In this successful interventions resulting from the application of the regulative cycle may be generated and evaluated. However, as we will argue in this paper, this notion is at odds with viable knowledge development in design practice.

For instance historical accounts point out that although the concept of Scientific Management is often regarded as a basis for a large organizational design movement (Romme, 2003) the reception within engineering circles was not uncontested. Remarkably, the concept raised strong disagreements among its most important advocates (Nelson, 1975: 182) what caused that the institutionalization of these ideas was far from straightforward at the time these were constructed. Specifically, different streams of adherents challenging other's interpretations in professional engineering journals. For example, commentators were anxious that the concept would put the present body of knowledge in the shade. As a result, 'old' systematizers sought to regain credibility by stating that Scientific Management is nothing new

(Shenhav, 1999: 114). At the same time Shenhav (1999) noted that by debunking the practices of ‘efficiency experts’, Taylor and his disciples sought to dissociate themselves from this group that tried to hitch-hike on the popularity of the Scientific Management concept and thereby were reluctant to share the knowledge in the fear of losing ownership. Hence, in contrast to what is suggested by the reflective cycle, tested and grounded design rules may still experience substantial opposition, not the least among designers themselves. Rather the historical accounts indicate that the outcomes of knowledge development activities are the result of various struggles of which the outcome cannot be determined on the beforehand.

INSERT FIGURE 1 ABOUT HERE

In line with this, theorists have shown that the development and establishment of design knowledge is not without important complications (Heusinkveld & Benders, 2005). Rather, as will be elaborated below, new prescriptions are not developed linearly or automatically incorporated in the habitualized pattern of thought and action (Berger & Luckmann, 1967; van de Ven, 1986). Various accounts indicate that the process may encounter substantial (1) cognitive and (2) socio-political barriers to become established and used in praxis (see Figure 1). As a result, developing a successful knowledge repertoire is not restricted to simply translating design experiences into codified design rules, but particularly involves managing the institutionalization of that repertoire within a design community. Obviously, present conceptualization of design knowledge development based on the reflective cycle lacks attention to such key elements that are inherent to this process in design praxis. We seek to address these issues in the remainder of this paper.

Cognitive barriers

Theorists indicate that barriers to design knowledge development may become apparent in the inability of actors to absorb new design rules (Cohen & Levinthal, 1990; Szulanski, 1996). It is argued that particularly the existing stock of accumulated knowledge determines ability to value, assimilate and apply new knowledge. This would imply that the ability to acquire and exploit new design knowledge is a function of the prior level of related knowledge. As Rogers (1995) but also Hargadon & Douglas (2001) explain, for a novel idea to become accepted it is essential to combine novelty and familiarity. On the one hand ideas must appear novel to draw attention and suggest a relative advantage in relation to existing ideas and practices. On the other hand new knowledge must include characteristics that are already known in a given population to increase understanding and gain acceptance. As Ortmann (1995) pointed out, ideas can only be considered old by the emergence of new but the old is constitutive for what can be regarded as new.

Obviously, also a lack of interest at the receiving side hampers the knowledge institutionalization process (Szulanski, 1996). As van de Ven (1986) indicated human beings tend to stick to existing ideas and practices share a reluctance to pay attention to non-routine issues. It is therefore that knowledge development involves overcoming inertial forces. Shaping the rate of acceptance entails that the complexity of the design knowledge and its perceived compatibility to existing ideas and practices is essential. Provide ideas that offer mental tools to assess new ideas. Degree to which innovation perceived as consistent with existing values and pre-

vious ideas. Deal with innovation on basis of familiar against which can be interpreted. Try to see the new in the light of the old (Hargadon & Douglas, 2001).

Organizational design knowledge is not automatically continued to be used. As theorists of organizational knowing have stressed, continuity of accumulated experiences is not predetermined but an ongoing achievement (Tsoukas, 1996; Orlikowski, 2002). Such a view implies that design can only survive when it becomes inherent part of design practice and herein constantly shape and reshaped in daily activities of designers (Nelson & Winter, 1982; Starbuck, 1992). If practice in relation to specific problem discontinued before collectively learned little transfer to next series of problems. Therefore persistence of effort is critical, insufficient to expose people briefly to relevant knowledge. Rather retention by continuous application, only then organizational design knowledge remain part of cognitive representations (Starbuck, 1992; Tsoukas, 1996).

Starbuck observed that simply collecting knowledge only provides short-term continuity. In the long run, however, entrenchment requires design knowledge to be continuously associated with contemporary problems and actually be applied in daily praxis. Means that meeting the felt needs of the professionals and client system. Nelson and Winter even argue that while knowledge can be stored, organizations only remember by application (1982: 99). To be maintained, knowledge has to become an enduring part of designers cognitive base and incorporated in organizational routines. A deficiency in continuous usage easily leads to forgetfulness and an inability of successful application.

Socio-political barriers

In line with van de Ven (1986), reflecting on and learning from design experiences may be largely individual activity, but constructing a knowledge base should be regarded a collective achievement. Therefore, developing successful design knowledge is not restricted to simply constructing a new idea and store it into a knowledge base, but particularly involves managing the establishment of it within the design community. That is, the sociopolitical process in which new ideas gain good currency (van de Ven, 1986). A new idea can only be used when it is institutionalized and thereby has been 'incorporated in the taken for granted assumptions and thought structure of organizational practice' (van de Ven, 1986: 604). This involves moving through a process of developing a shared meaning (Berger & Luckmann, 1966: 55) of the value of novel knowledge beyond its initial innovator. This indicates that it is essential to regard design knowledge development as a collective activity in which novelty has to become interwoven into established thoughts and actions (van de Ven, 1986; Tolbert & Zucker, 1996; Hargadon & Douglas, 2001). generating and channeling the interest of other designers However, as argued before, this process is often problematic because of some important inertial forces causing major barriers in the accumulation of collective design knowledge (Lammers, 1988). In the next sections we discuss (1) human agency and (2) contextual factors that are hypothesized to define the shape of design knowledge evolution.

Agency

To overcome problems of linking design knowledge with current ideas, Dougherty & Heller (1994) stressed the key role of legitimation activities, and show various ways in which innovators seek to explain and justify (Berger & Luckmann, 1966: 86) novelty as valid organizational practice. Gaining legitimacy involves 'winning acceptance' (Suchman, 1995: 586) for the innovative idea and for the people that are propagating it. This means that pioneers have to trigger people to pay attention to new ideas and persuade organizational members of their advantage over current practices (van de Ven, 1986). Gaining organizational support and resources for new ideas involves drawing on persuasive communication activities to make a

favorable impression thereby conveying the perception that a new idea can be converted into a successful design rules (Tolbert & Zucker, 1996). Convincing others to support allocate resources by conveying the belief that novelty has some positive value involves legitimation efforts. (Shenhav, 1999; Heusinkveld & Benders, 2005).

Szulanski (1996) emphasized that required legitimation efforts to become established is not a given as sources may easily lack motivation to share experiences and facilitate access to it. This indicates that legitimization heavily draws on human agency. As novelty seeks to change measures by which practices are perceived (Ortmann, 1995) it is essential that people are willing and able both understand and enact it. New design ideas may be selectively interpreted and not necessarily lead to action (Benders & van Veen, 2001). In other words, it is not enough to be presented in attractive form, it also requires changing existing power structures and established patterns of social activity (Dougherty & Heller, 1994). A key element in gaining legitimacy is a champion (Chakrabarti, 1974) or 'soul of fire' (Stjernberg & Philips, 1993) who has an interest and involvement in a new product's realization and is able to sell it to the decision makers in the organization. In addition, Chakrabarti argues that it is essential for a champion to have political skills (1974: 61) to overcome resistance and limit controversies during a new idea's realization. Guillén (1994) stressed the importance of considering the role of professional groups in the institutionalization of design knowledge. For instance in spite of the substantial internal and external opposition, the efforts of engineering professionals were crucial in legitimating and institutionalizing the ideas associated with systematic and scientific management. These had their origin in mechanical engineering were translated to organizations and propagated as solution for contemporary organizational and societal problems (Nelson, 1975; Shenhav, 1999).

Contextual

In the previous sections we stressed that the absence of absorptive capacity and a lack of human agency reduces the likelihood that design knowledge will become institutionalized and thereby continued to be applied. In this section we focus on the context-related barriers in the long-term viability of design knowledge. The specific interactive situation plays an essential role in the activation of design knowledge as it may trigger their ongoing application in daily practice (Tsoukas, 1996). In other words, although some newly developed design knowledge may be validated and considered useful, the seed constantly requires a fertile breeding ground to grow (Kimberly, 1981). In line with Kingdon (1984), a fertile context for the establishment of design knowledge is particularly shaped by the occurrence of a receptive political context (Flyvbjerg, 2001). This involves the presence of opportunities to introduce a solution in an organization and getting it accepted. Key element in the emergence of these opportunities is the coupling of solutions to perceived problems. This means that a receptive environment for ongoing activation of new design knowledge is hypothesized to be shaped by the interplay of (1) perceived organizational problems and (2) the opportunities to attach specific solutions to it (Kingdon, 1984; Brunsson & Olsen, 1997).

Theorist emphasized that specific constellations of context related factors such as structural-economic changes in interaction with other elements that shape organizational problems determine the possibilities for development and establishment of design knowledge (Guillén, 1994; Whiston, 1997). It is therefore that design knowledge is not in every context widely received. For instance when we go back to the evolution of design knowledge around the turn of the previous century, we see that mechanical engineers took advantage of a situation that was particularly favorable of their ideas (Nelson, 1975; Shenhav, 1999). The establishment of their ideas on organizational design is considered to be enhanced by a number of context specific forces such as the emergence of a progressive culture with its emphasis on professionalism and the occurrence of labor unrest which was seen as a threat to the perfor-

mance of organizations (Shenhav, 1995; 1999). Initially, engineers even showed a general denial of the political and social class driven background of the frequent strikes and labor unrest. In addition, the industrial unrest of that time was heavily criticized by regarding this situation in technical terms. In engineering circles, of which most had their background in the relatively trouble-free mechanical engineering, showed little understanding of the proclamation of violence and anarchism associated with this unrest. This was of course significantly at odds with rational order and efficiency. But in the course of time Shenhav indicated that these severe labor problems were used as a leverage to apply engineering ideas in organizations and legitimizing an engineering profession. Rather than a conflict between different social classes, the labor unrest was conceived as a technical managerial problem which ought to be solved by engineering rationality. The application of allegedly neutral, objective and scientifically grounded design ideas in the engineering discourse were regarded as solution to the deeply political and ideological charged conflicts between capital and labor.

The changes in the perceived problems easily become a barrier in the opportunities for continuity of design knowledge. Organizations are confronted with an inexhaustible supply of insoluble problems (Brunsson & Olsen, 1997). An important element shaping the viability of design knowledge is that the perception of organizational problems tends to fade (Kingdon, 1984). The application of design rules does not necessarily solve the initial problem that created the opportunity for their introduction (DeCock & Hipkin, 1997). A lack of satisfying results may entail that members stop investing time in addressing specific problems. This constitutes an important base for being abandoned as prominent issue on the managerial agenda. As a result, the opportunities for the development and establishment of design knowledge that typically addresses these 'outdated' problems tend to fade.

Illustration of themes

This paper offers an in-depth description of a case of design knowledge development. It particularly reveals the struggles inherent to this process of development and the large varieties of new and unexpected ways in which it proliferates subsequent to this development process. The description is based on participant observations, ex-post interviews, and analysis of e-mails, presentations and various documents such as client offers, reports of assignments, and internal project proposals. It starts with an introduction of the scientific background of the design knowledge, mode after which we consider evolution in design. In the latter part we elaborate what we think are two central themes that emerged from the case data (1) the process of development and the struggles inherent to this process and (2) the process of proliferation and translation of design rules.

Development process

Origins

The scientific roots of process design method P can be traced back to R University of Technology. Ever since its foundation, R university tends to produce research that is of particular interest to the manufacturing and chemical industry, rather than for more service-oriented organizations such as banks or governmental agencies. This is a natural result from R university's strong roots in typical engineering areas such as mechanical engineering, chemistry and applied physics. This tendency is slightly less apparent within its business school, where instead of the study and design of technical artifacts much emphasis is placed on the less tangible and, perhaps more universal, management, design and control concepts for production and operations.

At the end of the nineties, various researchers from R university were considering the potential of transferring typical manufacturing concepts to the design of service processes, resulting in a Ph.D. thesis on the subject and some papers. A general insight that seems to emerge from a comparison between production organizations vs. service organizations, is that despite the many similarities the former typically exhibit a more rational control of its operational production processes. This is for a great part due to greater certainty on how the production of a specific product, for example a car, should evolve, than the materialization of a service, for example a mortgage offering, which may be more affected by particular customer preferences. The more rational control of manufacturing processes is driven by such well-established concepts such as Material Resource Planning (MRP) and Optimised Production Technology (OPT) (Buffa and Sarin, 1987; Bertrand, Wortmann and Wijngaard, 1990) .

In particular, a part-time professor of R university, who also served as director of a consultancy firm, started to wonder about the transfer of production concepts to the realm of process design and control in the service industry. He was intrigued by the phenomenon that by observing the user-interface of an information system, it is possible to see which main building blocks (i.e. required pieces of information) are used to produce a certain outcome, such as a decision supported by that system. By this observation, the idea grew to use some notion of a product structure, composed of informational building blocks, to determine a feasible and efficient process structure for information-intensive processes (e.g. banking

processes). This idea is very similar to use a so-called Bill-Of-Materials (BOM), as used in manufacturing to capture the structure of the products to be produced (Orlicky, 1972; Buffa and Sarin, 1987). It can be considered as the embryonal basis of the P approach.

Proposal

The first version of a written note about the approach was written during commercial talks with company ABC, a social security agency and the first client that showed interest in the application of the P method. In this note, the initial contours can be recognized of what later was developed into the P approach. One of the key reasons mentioned for developing the method was a discontent with what is called traditional methods. These methods take the current situation as a starting point and assume that these activities are necessary. However, both the client and the consultancy noted that:

‘Often business processes grow in the course of years and there is no underlying integral design. That is why there is a need for a method with which processes can be designed in a systematic way. [...] A deduction method starts from the end product and seeks to deduce what processes are necessary and sufficient.’ [from initial note]

The formerly mentioned director of the consultancy was particularly involved in this selling process and was able to convince this client to take part in the project. He argued that:

‘An important point in the genesis of method P was direct client demand, with this you could develop the method together with the assignment.’ [director]

This resulted in an offer to ABC to analyze and redesign of one specific key process within the organization. This was done only with a single image about how to do it without a concrete method.

The approach differed significantly from what was common to the consultancy to address these issues in organizations. The current approaches started from the business process as it was, while this idea took the bill of materials as a starting point. A large part of the ideas underlying the proposed approach had its origin at the university in which research had been done into the relation between bill of materials and business processes. The people involved were particularly inspired by concepts common in logistics but had not been translated and elaborated to administrative environments. Research in the university focused on all kinds of measurement techniques within business processes.

The central aim of the method P was to develop a repertoire that allowed analyzing and designing business processes from the structure of the administrative product. It seeks to provide a number of steps that drawing on the product specification lead to a simultaneous design of the process and supporting IT components. The method concentrates on administrative processes and particularly in information intensive environments. The initial client offer states the goal:

‘Design a prototype of a business process on the basis of the research ‘smooth cases: an application of product based process design’ in such a way that this can be used for an internal test by internal experts of ABC.

Generation of design repertoire

The development of a design repertoire occurred during performing assignments in two organizations, ABC, a large social security agency and DEF, a large Dutch bank. While the method was considered theoretically mature, but because little experiences in practical application not complete. This manifested itself in that things cost a lot of time. When more experience data more realistic estimations. Because of pioneering adjustments of initial planning. Maturization of the method occurs particularly by application, but also involves the systemat-

ic accumulation of experiences and managing the method. This also allows focusing on key aspects such as quickly defining product structures and paying attention to the translation of the design to the IT. Another aspect that was enhanced was it appeared that feeding back process design to the organization to increase acceptance.

‘So you have to build in more points in which you confront the organization with partial designs that you have constructed [...] This constitutes an important element that will be incorporate into the method.’ [consultant Ha]

During the first project at ABC a study was made and validated by construction of a prototype of new process. With this people were asked to process real cases and this worked very well. Also the organizational members liked it very much. The consultants involved learned a lot from this assignment and wrote it down into the P method.

Then via the director of the consultancy the method was sold at DEF. Here it was applied to three different key processes and as a whole turned out to be the largest project that was done with method P. At the start small group of people wrote plan of action in which it was indicated how the project would take shape. After the project’s approval, more consultants from the firm were recruited and trained in the method. The process started with a design of one key business process after which applications were built and configuration of workflow systems. This was followed by a dissemination of the new process and support systems.

Struggles in legitimation

From the moment it showed that the ABC project went well the idea increasingly generated attention of consultants. Quickly after the DEF project, a working group was formed that aimed to further develop the method P. As been stated in the internal weekly bulletin:

‘This week the working group method P has started. The working group recognizes and initiates activities in relation to method P on commercial, educational and content matters.’ [internal weekbulletin]

A project plan was written and sent to the consultancy’s management. This plan contained several activities the working group wanted to perform around method P. it included the development of a brochure but also plans to further inform the firm about method P, the development of a tool to better support the product and ideas about how the tool could be more generally applied. In relation to this the method was also explained in conference papers and articles in scientific journals. Also commercial activities were started to bring the method under the attention of potential clients. This was for a large part induced by the management who wanted next to the costs also wanted to have a picture the prospected revenues.

→ e-mail Re

‘Seriously, clients for method P have to be organizations with a lot of orders/cases and a large processing stream of forms. In that case you obviously think about banks (bank A, bank R or maybe bank F), insurance companies (such as company Z, company D, company A) or social security agencies of the government (agency Ga, agency Gu). To be honest, I am not quite familiar in the last sector, so maybe you can think of better examples.’ [consultant Re]

Internal selling efforts to gain space for further development. At the same time the method was seen as difficult and hard to sell.

‘The method P wasn’t quite that popular within consultancy.’ [director]

The frustrations also materialized in e-mails to other members of the working group about the tardiness of the management to decide upon supporting the development activities:

'It does not yet gets on with method P as we want to. [consultant Ro] and I are still working on that brochure and at the same time we did not yet got the approval of the management for the other things we have developed (prototype, checklist, etc.). [consultant Ha]

The people of the working group repeatedly urge the management to take action to support the development process. One example comes from an e-mail from consultant Ha to the management:

'You'll understand that I am anxiously waiting for your invitation to talk about our method P plan. It seems that after this the development of a brochure will be easily done.'

However, the efforts did not resulted in opportunities for further application and therefore hampered the process of knowledge development and accumulation.

→ Provisional conclusion: The previous shows that, in spite of their validation in praxis, design rules are not necessarily readily adopted by other designers and in organizational praxis. Rather it requires extensive internal and external legitimation efforts and a fertile context that is receptive to the ideas.

Proliferation and translation process

As been stressed in the above, the working group has more or less disappeared. While at the same time consultants from the firm indicate that the underlying ideas of method P are part of current consultancy practice, only named differently. It is revealed that the initial name of method P is hardly used within the consultancy but the ideas are still used. The knowledge of method P is incorporated in several key persons in he consultancy because they had done projects or were educated in that way. Consultants experienced that other more fashionable terms were appealing to decision makers in client organizations. These new terms do not (yet) have a fixed meaning which allows consultants to construct them in their own way. Method P still persisted but has been translated in three distinct ways.

First, these insights are incorporated into a concept that is dubbed Straight Through Processing (STP). Within STP, method P was used to guide organizations in collecting their client information and moving directly to the design phase without human interventions. Time and budget for development activities. This allowed consultants to develop a presentation that can be used for clients. In addition constructed an approach that was structured into several phases for designing business processes. Also tools that were initially developed under method P for client DEF is included in the approach because it is seen as useful to show clients the possibilities of the approach. This tool has been anonymized so that it could come back within the STP concept. This means that consultants do not consider the method as obsolete but is drawn upon in a highly selective and interpretative fashion:

'At one moment we called it STP and positioned it as a concept that is mainly focused at financial institutions. The underlying theory was just method P'. [consultant Re]

Secondly, method P was used in developing a new concept that was dubbed Operational Excellence (OE). This concept is aimed at improving companies' operational processes, and particularly their back-offices. Presentation was developed and a course that is given by consultancy. That course has met with a highly favorable response among the client, a major airline company, for which it was further developed. Decision makers in client organizations were more receptive to this term than method P which resulted in more space from the consultancy's management to further develop the methods.

'The people at [consultancy] who were a bit negative about method P see Operational Excellence as a concept that is well constructed and will be explicitly positive about it, while method P is a substantial part of it.' [consultant Re]

A third manifestation that included the ideas from method P was an internal course on process modeling. Within the consultancy there is a general course that is called process design and method P constitutes a key chapter in this. The course also includes examples from recent cases. Such a course is generally seen as something more tangible than a method in itself. Initially only internal but now also external.

So the ideas of the method P maintain to manifest themselves in various ways. The repertoire that has been developed under the banner of method P have been translated and focused to the specific client situation. Consultants within the firm still see prospects for the ideas in the market, only name differently. The reconfiguration of the initial ideas also stimulated support from the consultancy's management.

→ Provisional conclusion: The case data reveals that design knowledge proliferates in a large variety of new and unexpected ways. (see also Starbuck, 1992; Tsoukas, 1996)

→ preliminary conclusion: In contrast to what is suggested by the reflective cycle, our longitudinal case research reveals that designers experience important struggles in gaining acceptance to design rules in spite of the fact that these are grounded in scientific rules and tested in organizational praxis. In other words, design rules are not necessarily considered useful and widely drawn upon in organizational praxis.

In the light of design theory, knowledge development requires rules that guides researchers.

Conclusions

It is therefore argued that unlike current conceptualizations, experienced designers do not consider knowledge development as unproblematic. Rather, cognitive and socio-political factors are considered to inhibit and encourage the development and application of design rules and are crucial to the question whether the cycle's output 'will work'. We believe these are central elements in understanding the knowledge development and enactment processes that needs to be addressed in theoretical treatments of the reflective cycle and the interface of science and design.

→ conditions for knowledge development in design praxis

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Trash

As we regard Business science to concentrate for a large extent on so called design oriented research. This research tradition focus on organizational problems in praxis as point of application for scientific research. Using existing scientific knowledge, new practices are designed within organizations in order to improve their problem situations. Here

According to management scholars organizational knowledge has to be useful in the sense of both valid and relevant. As knowledge products does not meet these criteria it has to be rejected. Moreover the application of organizational knowledge should be guided by a proper diagnosis of the problem situation and an appropriate therapy. Merely applying popular ideas to 'keep up with the Joneses' will not result in technical efficiency and may eventually harm organizational performance.

Each of these phases may require further research which can be addressed by following an empirical cycle (Florusse & Wouters, 1991).

barriers to become appreciated and used in praxis and In addition, these design rules have to be translated (Czarniawska & Sévon, 1996) and thereby presented in such a form that increases the likelihood of acceptance in organizational praxis (Ortmann, 1995; Benders & van Veen, 2001; Benders & Verlaar, 2003).

