

TOWARDS A PARADIGMATIC SHIFT IN IS: DESIGNING FOR SOCIAL PRACTICE

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ABSTRACT

The paper elaborates on the theoretical foundation of Information System understood as a field of design science. Revisiting Hevner's et al. seminal paper [44], we elaborate on theoretical and conceptual shortcomings. Theoretically, we state a somehow limited perception of pragmatist thinking. Conceptually, we criticize a limited definition of the IS research field and argue in favour of an (obligatory) evaluation of IT artifacts in real world settings. To develop the design science paradigm beyond these shortcomings, we present a theoretical framework which takes the interrelation of IT artifacts and social practices as a central focus of research. Such an epistemological and ontological opening of the design science perspective leads to methodological implications. We exemplify methodological shifts by taking the Canonical Action Research (CAR) method as a problematic example. Design probes are discussed as a method which holds considerable promises under a reframed paradigm. The consequences of the theoretical and methodological reflections for a socially relevant IS design science are discussed finally.

Categories and Subject Descriptors

H [Information Systems]: H.0 General –Reflection on the Design Science Paradigm in Information Systems Research

General Terms

Design, Theory, Human Factors, Management

Keywords

Information Systems, Design Science, Theories of Practice, Epistemology, Ontology, Methodology, Action Research, Design Probes, Social Relevance

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1. INTRODUCTION

The problem of creating effective and efficient information systems (IS) has recently been approached from a design science perspective [44]. The authors present a research framework which aims at bridging the gap between a behavioural science understanding of IS and a theoretically informed design of IT artifacts. This most prominent attempt to (re-)orientate IS research as a design science has initiated an ongoing discourse on the theoretical foundation and the methodological consequences of such a stance. Hevner's et al. [44] design science approach has influenced various studies, mostly elaborating their research guidelines or evaluating corresponding software development processes and artifacts (e.g., [2], [3], [5], [6], [19], [35], [41], [52], [58], [70], [79], [80]). Hevner's et al. design science approach has also been discussed with regard to its epistemological and ontological preconditions (cf. [62], [10]).

This paper adds to the current discourse on a design-centred (re-)orientation of IS research by embracing the social practices IT artifacts are designed for and appropriated for use. Our theoretical and methodological considerations aim at strengthening the organizational relevance of the design science perspective in IS research. Since information systems are embedded in and shaped by their organizational context, IS research needs to take social practices into account. Therefore, a comprehensive research perspective should not be limited to the design of IT artifacts but also incorporate their interactions with the organizational context they are used in. IS research has to (re-)define its research objects and objectives with respect to the social context and the historical situatedness of IT artifacts' design and use. To assess the value of a design science perspective, IS researchers have to deal with the following issues:

- (1) what are the objects (and objectives) of their design,
- (2) how to gain appropriate design requirements for IT artifacts,
- (4) how to achieve appropriate IS, and
- (4) how to evaluate the achievements of their efforts.

We argue that a more adequate understanding of shaping IS as a subject of design science must overcome certain limitations inherent in Hevner's et al. [44] work regarding its research focus, and therefore, has to broaden its analytical perspective and methodological repertoire. To develop this argument, we first

clarify our objections with respect to Hevner's et al. work. Then, we elaborate our stance: As IT artifacts emerge from formalizing and modelling social activities which in turn are changed by their use, we refer to a pragmatic understanding of everyday's social practices and to a structural conceptualization of organizations as sense-making social systems. We describe the design and use of IT artifacts as being shaped by a specific social and historical context. With respect to ethical issues when intervening in social practices, we argue to thoroughly respect and adequately cope with the complexity and dynamics of social reality, esp. human needs, conflicting interests, and micro-politics. We finally discuss important methodological consequences referring to the examples of Canonical Action Research (CAR) approach [26] and the Integrated Organization and Technology Development (OTD) approach [85] in combination with the conception of Business Ethnography [59].

2. SHORTCOMINGS OF THE DESIGN SCIENCE PARADIGM IN IS

Hevner's et al. [44] highly quoted paper claims design science to be a suitable approach for information system research. This work presents a revised and enlarged edition of Simon book "The Sciences of the Artificial" [76]. Simon has demonstrated that natural science and the science of the artificial are different as the former is about analysis where the later is about synthesis. Based on this distinction Hevner et al. [44] introduce two distinct paradigms: behavioural science research and design science research. The former is understood as a "problem understanding paradigm", the latter as a "problem solving paradigm" (cf. [62]).

Discussing the consequences of this insight, [44] have considerably widened the perspectives of IS research and have initiated a vivid international discussion widening our understanding of appropriate research methods. By linking the IS design perspective that attempts to ultimately determine the necessary functions of IT artifacts according to given requirements with the behavioral science perspective that explains and predicts the ways the artifacts are used, the authors provide a holistic framework for IS research. The value of this approach becomes evident as it overcomes the constraints of so far prevailing IS research activities that either focus on design of IT artifacts or their use practices in organizations separately. Despite the undisputed merits of this integrated design science approach to IS research, it exhibits some severe deficits with respect to the ontological and epistemological assumptions underlying the approach.

In contrast to the behavioural science research paradigm, Hevner's et al. [44] position the characteristics of the technical artifacts in the centre of IS research and focus on the design processes which lead to their emergence. The design of technical artifacts is understood as a wicked problem (p. 81). Referring to earlier work by [76], they understand design research in the field of information systems to be conducted iteratively, consisting of activities such as elaborating relevant problems in the application domain, building the artifact and evaluating its performance. As a result of design research, the artifact needs to satisfy the articulated requirements within a field of application as well as to enlarge the knowledge base of the scientific community. [44] distinguish between routine design and design research. While both activities satisfy requirements from the field of application,

design research additionally leads to results that augment the scientific knowledge base for design.

While [44] have impacted the international IS research discourse profoundly by postulating a new research perspective, their work suffers from certain limitations in scope and epistemological inconsistencies.

2.1 Understanding Design as a Wicked Problem

Hevner's et al. [44] design concept stays epistemologically in the tradition of [76] work on the "science of the artificial". Design is in this perspective conceived as a pure optimization process of an artifact based on a utility function and the definition of constraints for its application. Several authors have criticized this design concept and developed an alternative understanding that conceives design as an intervention into social practices, as a reflective practice confronted with wicked situations. In this context, Tripp [78] uses the term "design as optimisation" to characterize Simon's design paradigm and coins the term "design as dialog" to characterize the alternative approach. Allen [4] speaks of situated design "which recognizes that the unexpected things in the part are not only obstacles to be overcome, but also opportunities for new view on the problem" ([4]. p. 12, cited by [74]).

Donald Schön as a prominent proponent of this alternative design concept pointed out that design is not a linear process in practice, but one that is confronted with uncertainty, uniqueness and conflict. Designers, for him, are reflective practitioners, design is a reflexive conversation with a given situation (cf. [75]). Other prominent opponents are Horst Rittel and Melvin Webber. In their seminal essay "Dilemmas in a General Theory of Planning" [71], they argue against the mainstream idealistic and reductionist concept of design understood as optimization process. Instead they perceive design and planning as a practice to tackle wicked situations. Following [71], wicked problems imply that every solution is a "one-shot operation" which consequentially leaves "traces" that cannot be undone. Every wicked problem is essentially unique. So there is not any general theory which determines the right practice. As a consequence, designers are confronted with the dilemma that "there is no right to be wrong", even if in such situations there is neither an ethically well-defined situation nor a sound theoretical base for to differentiate right from wrong. Theoretically spoken, wicked situations are constituted by the contradictory unity of the compulsion to make right decisions on the one hand and the obligation to justify them on the other. This means that a wicked situation implies a necessity for action (which creates a decision). It can neither be completely rational nor completely solved by tradition. Therefore, the decisions always consist of charisma in Max Weber's sense. We found this element in Schumpeter's "dynamic entrepreneur" as a charismatic leader. [71] present a democratic model to manage the structural dilemma without solving the contradiction.

2.2 Epistemological Shortcomings

Following the German sociologist Ulrich Oevermann the characteristics of wicked situations do not hold only for design problems but for everyday's practice (Lebenspraxis). In particular, [63] perceives the contradictory unity as an inherent condition of everyday's practice and a structural constituent of

autonomy. We refer to [63] when discussing [44] since both authors ground their work in pragmatism. In particular, [63] refers to Peirce's pragmatist epistemology and Mead's philosophy of the present. However, compared to [44], Oevermann [63] presents a clearly different interpretation of some of the pragmatists' main lines of thought. Following [63], the pragmatic maxim does not imply truth to be inseparable from utility, rather it is referentially bounded in and on practice. [63] integrates Mead's concept of 'social time' (in opposite to linear natural time) systematically in his theoretical work on the formation processes of everyday's practice. Formation processes are highly important in the context of innovation. However, this concept is completely neglected by [44] while still referring to Mead and the Pragmatists. [63] demonstrates that we cannot understand social practice without understanding social time. Mead's philosophy of social time puts emphasis upon "emergence" in which the presence is the locus of experiences in a fundamental way: presence is constituted by the integration of different perspectives in that way that it holds the past and the future as possibilities (cf. [57]). The past is as essentially subject to revision as is the future. Beyond its application in humanities, the concept of social time is interesting with respect to the solution of wicked problems. Taking Mead serious, design can not be understood as a creation of abstract ideas but has to be seen as a social practice which can have emergent effects on the material world. These emergent effects do not leave merely "ontic", but (among others) also "epistemic traces" which cannot be undone after completion since the "present is always in some sense new and abrupt, but once it has occurred, we start on the arduous task of reconstructing the past in terms of it" [48].

This short excursion on Oevermann's philosophy demonstrates that [44] do not develop the full potentials of pragmatism. Reducing it to a utilitarian philosophy, they ignore the essence of social practice. The aspects of Mead's work cited by [44] have more overlaps with Critical Theory and Historical Materialism than with Utilitarianism. Taking Mead's conception of social time serious, Hevner et al.'s [44] utilitarian position towards design practices becomes imprecise: Does it use utility as an ontological mechanism or merely as a theoretic model to interpret behaviour? If Hevner et al.'s [44] design science concept represents nothing but a rational-choice theory of design, Rittel's and Webber's critique holds that such a reductionist model can not provide an appropriate understanding of action in wicked situations. While the concept of "bounded rationality", prominent among proponents of (neo-)rational choice theory, helps to reconcile theoretical findings with empirical data, it fails in capturing the dialectical relationship between situated actions and the historical development of practices.

IS research is, by its nature, a multidisciplinary endeavor to which a number of scientific traditions, disciplines, and knowledge domains can and do contribute. For this reason, the ontological and epistemological assumptions underlying IS research approaches and paradigms vary widely ([45], [66], [46], [82], [21], [83]). This inescapable fact requires, as [10] rightly claim, the "extensive publication of the epistemological assumptions made". In this context, they understand epistemology as "the science of analyzing the way human beings comprehend knowledge about what is perceived to exist" and of inquiring the "question of how a person can arrive at 'true' cognition" (p. 201). Consequently, the authors provide a useful framework for

orientation and for positioning specific IS research contributions in this perspective (cf. table 3; p. 202).

Applying this framework to the IS design science perspective as articulated by [44], it has to be noted that the epistemological assumptions underlying their work are rather contained implicitly in the text than being explicitly stated. They, therefore, need to be extracted by means of text analysis. The authors basically rely on behavioral science and design science as complementary but inseparable disciplines to analyze, design, and evaluate information systems. While they regard behavioral science as research efforts for the development and justification of theories that explain and predict human or organizational behavior, they understand design science as research efforts for extending boundaries of human or organizational capabilities by building and evaluating new artifacts that meet specified business needs: "The goal of behavioral research is truth. The goal of design science is utility. As argued above, our position is that truth and utility are inseparable. Truth informs design and utility informs theory. An artifact may have utility because of some as yet undiscovered truth. A theory may yet to be developed to the point where its truth can be incorporated into design" (p. 80).

Making use of a utilitarian school of thought, [44] provide an elegant, nevertheless problematic argument to combine both paradigms. Reflecting on their own epistemological considerations, they place it into the tradition of the pragmatist philosophy: "Philosophically these arguments draw from the pragmatists [1] who argue that truth (justified theory) and utility (artifacts that are effective) are two sides of the same coin and that scientific research should be evaluated in light of its practical implications."

Analyzing this view of IS research and recognizing the epistemological backgrounds of behavioral science and design science the authors' basic epistemological position must be characterized, according to the Becker & Niehaves [10] framework, as assuming a (social) world that exists independently of human cognition or thought and speech processes and that this independent (social) reality can be recognized (ontological and epistemological realism). So, cognition is based on empirical findings (empiricism) and true statements corresponding with real world phenomena (correspondence theory of truth). This appears to be problematic considering the fact that social practices cannot be thought of being independent of their observation, since any observation, i.e. any distinction and denomination of social facts, inevitably takes place in the same social world being observed and changed by the observation; hence, the observation itself changes the subject of observation ("double hermeneutics" see e.g. [38]).

Missing to address these issues, [44] develop an unhistorical, naturalistic position in which "utility" is understood to be independent of historical design practices. Such a theoretical position may hold to describe established routine-design practices. However, it appears to be an insufficient base to ground design science research which operates in "domain areas in which existing theory [and existing ethical norms] is often insufficient" ([44], p. 76).

Therefore, we suggest a shift in the understanding of IS research as an academic discipline. Hevner et al [44] conceive IS research as gaining knowledge supporting "the productive

application of IT to human organizations and their management” and define the core activities of IS to be designing, evaluating, and managing IT artifacts and their use for organizational purposes. We rather suggest to understand IS as the scientific field that deals with the design of innovative IT artifacts and their interrelation with social practices in organizations. So, social practices in organizations, i.e. goal-directed collective activities and the routines and resources through which collective acting is enabled or constrained are at the heart of IS research.

3. SHIFT IN PERSPECTIVE: ARTIFACTS STRUCTURING SOCIAL PRACTICE

Our perspective on social practices, inherently embracing the interaction with IT artifacts, is rooted in a different set of epistemological assumptions: It is based on the constructionist view that our experienced reality is being socially constructed [11] rather than “discovered” in an independently existing world (such an ontic world “out there” being assumed, although seen as mentally inaccessible, in accordance with [51]). As the relationship between cognition and the object of cognition is determined by subjective conceptualization and the way humans interact with each other, statements are seen as ‘true’ or valid by a social community, if they are accepted within this community (consensus theory of truth). Moreover, gaining knowledge is subject to a hermeneutic circle, where the understanding of a certain phenomenon depends on previous understanding of its context ([39], [53]). Cognition thus evolves through neither deduction nor induction but rather through the creative operations of abduction in concept formation and artifact appropriation [68].

We prefer this perspective to positivistic approaches for a number of reasons. First, it reflects the fact that cognition and knowledge always are mediated by language while inseparably embedded in social practices. As a consequence of this, concepts, as they are communicated through language, gain validity in processes of inter-personal understanding only [53]. Objective cognition or ‘truth’, therefore, is not available. Second, the observation – and even more so the shaping – of social practices is subject to “double hermeneutics”: The process of gaining knowledge through concept formation is self-referential in the sense that it changes the social practice it refers to in the very moment it is performed; observing a social practice inevitably means to intervene. Third, it transcends the infertile dispute over subjective acting versus objective structures in comprehending human action and it simultaneously explains both the inertia as well as the dynamics of change in social practices. Fourth, it comprehends the functional properties of IT artifacts as a product of conceptualizing social practices, while the collective appropriation of the functions for effective practical use makes them a part of these practices. It thus informs design activities as interventions of organizational development rather than functional shaping of useful artifacts.

According to this perspective, we assume that organizations emerge and reproduce themselves as social systems through continued sense-making as well as mutually related and coordinated acting of their members. These processes of continuous action and interaction are based on grown routines and assumed expectations. In the course of their continuous action flow, actors may generate explicit knowledge through reflection and concept formation. This conceptual knowledge can be

expressed and objectified in the form of linguistic signs, of organizational schemes, or of technical artifacts that represent, although incompletely, a social practice. This way of analyzing social practices in organizations transcends the persisting dichotomy of subjective action and objective structure – a dichotomy that makes it difficult to explain either the stability or the dynamics of social practices respectively ([38], [14]).

In particular, technical systems like computer artifacts can be constructed as a product of reflecting and conceptualizing practical human activities through modeling and objectifying explicit knowledge about these activities in terms of formal operations and procedures (“auto-operational form”, [30]). In this way, computer artifacts emerge as objectified propositional knowledge about purposeful collective acting. They are, as such, used again as means for further acting. As “congealed knowledge” being inscribed in their functions and properties, they embody formal aspects or features of human practice. Being built to support work in organizations, they set specific action requirements for effective use for which they must, however, be appropriated again. Appropriation for skilful and effective use thus constitutes a new practice which results in new ways of doing things. Since they are derived from abstract, decontextualised knowledge, technical artifacts (in particular IT systems) always contain empty “slots” that have to be filled in use through “recontextualization”, i.e. by interpreting and applying their functions appropriately to given situations. As the artifacts’ forms and functions leave room for interpretation, their use value is constituted during application. Consequently they are, due to the scope of interpretation within the limits of their action requirements, open for diverse use practices [17].

Humans act with the objects at hand by virtue of the meaning they attribute to them [12]. By making sense of and effectively enacting the artifacts’ forms and functions in use, specific regularities and use patterns can emerge. They regularly structure human action, and in this way they become involved as rules and resources in the constitution of a particular recurrent social practice. Through recurrent interaction with the artifacts at hand, certain of the artifact’s functions or properties become implicated in an ongoing process of structuration in which rules and routines of using then emerge. The resulting recurrent social practice produces and reproduces a particular social structure of technology use [65]. Consequently, the design and use of IT artifacts have to be regarded as an integral part of an organization’s social practices and dynamics and, hence, as part of organizational development (cf. [85]).

According to this dialectics of expressive form (objectified knowledge) and process (appropriation for use), the interaction with computer artifacts to accomplish given tasks, can be understood as a process of “social construction of reality” [31]. Since the meaning of an artifacts’ functions is created through interpretation in the process of acting with them, they can also be interpreted by others acting in the same action context. Successful and mutually confirmed acting thus leads to a shared understanding among the co-workers. Like practicing a language or organizational acting, computer artifacts, thus, are embedded in sign processes of social interaction. In all these activities conceptual knowledge is externalized or objectified as expressive forms – be they language terms, organizational schemes or IT

artifacts – together with emerging rules how to make sense of and how to effectively act with them.

The externalized forms, in turn, can be used as resources for further acting; they even enable or allow for new ways of acting, if interpreted differently. As far as the rules of acting with them are being appropriated and internalized, together with the objectified forms they enact to become effective, they establish a new practice. In this way, the organizational forms and artifacts used as resources together with the rules to interact with them, i.e. the established patterns of thinking, acting, and sense making, constitute social structures that enable and, at the same time, constrain collective acting (“duality of social structure”, [38]). It is these mutually shared (but mostly unconscious) rules and routines that enable the actors to appropriately interpret situations or facts as well as data, instructions, instruments or computer artifacts, in short: to fluently act in the organizational environment.

A paramount consequence is the indispensable fact of “double hermeneutics” [38]. In contrast to natural sciences, where (with the exception of quantum mechanics) cognition and the object of cognition are independent of each other, in social sciences observations do change their own object of observation. Hence, the object of observation, the social practice, is reflexive in the sense that the explicit knowledge gained about the practice – as well as the technical artifacts derived from that knowledge – becomes part of the practice’s resources and rules being changed by this. Social scientists, like system designers, have to interpret features of a social system as object of observation, in which they themselves take part as observers. Requirements analysis, conceptual modeling, and formalization as central system design activities exactly are such observation processes that change the object of observation: The social practice as object of modeling undergoes change by the process of modeling itself – a fact that has been widely neglected in the design science as well as in the software engineering discourse with fatal consequences: It is the basic reason for inevitably frequent requirement changes during systems implementation (for empirical evidence see e.g. [73]).

The dynamics of social practices in organizations can thus be comprehended as interplay between embodied capabilities and dispositions producing human action and emerging artifacts as objectified operational forms of action, as interplay between incorporated “habitus” (modus operandi) and objectified “habitat” (opus operatus) [14]. Through appropriating the artifacts for effective acting new incorporated capabilities and dispositions emerge that enable new ways of acting some features of which can, in turn, be conceptualized and objectified again as organizational forms or IT artifacts.

4. METHODOLOGICAL IMPLICATIONS

As a consequence of this alternative theoretical perspective, IS design projects must cope with the open structuration process of appropriating IT artifacts in and for an organization’s social practices that – in contrast to the claims of design science – can by no means be anticipated. Designing and appropriating IT artifacts need to be conceived as interventions in social practices initiating collective learning processes. This is an inescapable fact of social practice design research has to cope with and provide methods to organize design and implementation processes in a reflexive and evolutionary way that allows for iteratively revising

and improving versions of the system or its modules. It requires sound procedures of iterative design processes and an evolutionary project management which combine methods for modular design, formative evaluation and collective learning in recurring development loops with limited range in order to confine the risks.

In particular, evolutionary project organization allows for combining the IT design (respectively configuration) efforts with the collective learning efforts for putting the system to effective use. While trying to make sense of a given version for accomplishing their working tasks, users simultaneously learn how to use the system and to generate further work-oriented requirements for an improved version – following the principle of learning by designing. Based on the emergent character of appropriation processes, a sound analysis and comprehension of the existing is a necessary but not sufficient condition for an appropriate methodology. Instead, the methodology should – as demonstrated below – also systematically embrace the practical experience with the new technology that constitute an “emergent present” [57], where the appropriation of the new technology often leads to unanticipated phenomena (cf. [65]; [13]). As owners of the competences and capabilities for effective acting, the actors performing the social practices in question need to understand existing practices, how they have developed as they are., the problems they cause, and how they should further develop. They further need to be motivated for collective change, and the course of events needs to be legitimated.

Such an evolutionary procedure has to cope with the ‘symmetry of ignorance’ [29], where communication breakdowns between users and designers are often experienced because stakeholders belong to different cultures. Design science research is specifically confronted with these issues (a fact that is basically neglected by [44]) based on the highly innovativeness and the interdisciplinary character of such projects (in opposite to design routine). In these wicked situations, it is difficult to articulate precisely what the real benefits of a design solution for a certain practice are.

Moreover, these efforts are, due to the system’s embeddedness in the organization’s social relationships, always subject to micro politics. Project management, therefore, has to take care that the actors involved transparently negotiate on synthesizing their different views and on balancing their different interests. Rather than suppressing these conflicts, they need to be dealt with openly.

These considerations have methodological consequences for design science research with two respects: First, we address the fundamental question of adequate project organization in design science research for developing the reflexivity needed in the co-evolution of social practices and IT artifacts. Secondly, we address the methodological implications based on the fact that artifacts are always embedded in continued sense-making processes, where humans act with the artifacts at hand by virtue of the meaning they attribute to them, while the artifacts as material objects incorporate formalized aspects of the practice.

4.1 The Evolutionary Character of Knowledge Development

There is a multitude of ways doing design science research projects. However, if we understand design as an intervention in

social practices, the affinity between design-science research and action research becomes obvious. In action research, researchers collaborate with practitioners to intervene in social practices in order to solve concrete problems while expanding scientific knowledge (cf. [7], [20], [33]). In the literature, action research rather represents “a class of research approaches, rather than a single monolithic research method” [9]. A specific variant which has become popular in the IS research community is the concept of the Canonical Action Research (CAR) [26]. CAR argues that action research projects should follow a strict and highly formalized five-stage model of change. Cole et al. [22] have figured out the underlying similarities between CAR and the Design Science Research concept of [44]. In particular, both approaches try to solve the rigor-versus-relevance problem by standardizing the research process. [22] demonstrate this by mapping the research guidelines presented by [44] onto the canonical process model of CAR.

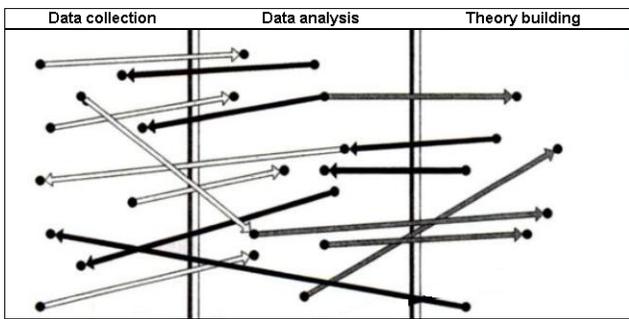


Figure 1: Phases of research conceptualized by the Grounded Theory as a continuous and parallel process of data collection, data analysis and theory building (according to [77])

In particular, the way CAR conceptualizes the “Principle of Theory” seems to be an unnecessary methodological constraint in the context of innovation-oriented design-projects. The “Principle of Theory” states that action research may begin with theory-unrelated action learning, but not later than in the intervention stage, the logic of hypotheses testing based on an explicit theory should be followed. This explicit theory can be deduced from other theories or, following Baskerville and Pries-Heje [8], generated with the help of the methodology of Grounded Theory [77]. Nett and Stevens [59] have discussed problems related to the ‘Principle of Theory’ and the very specific understanding of Grounded Theory in CAR. On the one hand, CAR just takes the analysis method of data coding into account; furthermore, the time structure given in Grounded Theory is neglected, which is based on a parallel process of data collection, data analysis and theory building over a whole research project (cf. Figure 1). CAR instead splits this process into a prior theory building phase and a second theory testing phase.

The main argument of [59] is based on the interpretation of social practices as historically contingent. They evolve together with the appropriation of the IT artifact. In this process unanticipated opportunities for the design of the artifact may emerge organically within work practices. However, emergence in the appropriation process cannot be observed before the intervention has occurred. Following the argument of [59], it would be an act of blindfolding if design science research did not care about such emergences and reflect them systematically.

Therefore, it is necessary to make use of the logic of discovery, reconstructing the creative operations of abduction in concept formation and artifact appropriation, instead of following only the logic of justification that restricts itself to testing of predefined hypotheses. While a standardized model following the logic of predefined hypothesis testing can (under certain circumstances) indicate that emergent events happened, it cannot help to analyze the nature of the related phenomena. When limiting the pattern of inquiry to context-unspecific phases in the research process in order to improve research rigor, CAR misinterprets the differences between the logic of discovery and the logic of justification to be a chronological one. We rather suggest to perceive these distinct logics to be dialectical elements during the whole research process.

To cope with the social time dilemma in wicked design situations, and with respect to the interdependency between technical design and social practice in organizations, we would prefer a cyclic-iterative process, which takes the historical contingency into account. Instead of starting from specific theoretical assumptions, we follow the principle of abduction. At the beginning of a design process our knowledge might be based on highly-contextualized experiences of former design case studies. Each design project would represent a new design case study in the context of social practice. Based on the new experiences of such case studies, we would analyze processes of use, appropriation and adaptation of technical artifacts in the organizational practice and reiterate a new design-introduction-evaluation cycle. Theory-building and the generation of hypotheses in this framework are part of the ongoing process in the design case study. Although it is based on the concept of action research as well, our process framework differs from CAR by not following a standardized and formalized model of change and by starting with a problem definition instead of theoretical assumptions.

Within their concept, coined Business Ethnography, Nett and Stevens present a participative action-research model for reflective technology development (cf. [60], [59]). Business Ethnography (BE) was originally developed as the empirical part of the action-research-oriented design conception of Integrated Organization and Technology Development (OTD) [85]. OTD is a process model to support a technology expert in his efforts to identify and tailor technology dedicated to help a client’s self-organization instead of replacing it technologically. It is defined as “the process of change of an organization in which an organization and technology are designed and developed task- and needs-oriented by the members affected with integrated means: the organization members affected consider the existing problems, search and evaluate the problems’ causes, and negotiate a process of problem solving. OTD only takes place if the members affected are willing and able to define contents and course of the OTD-process, and are immediately taking part. (...)” ([72], p. 22). OTD focuses on the development and introduction of technical systems (usually groupware systems) in order to support social practice in organizations. It distinguishes the difference between the primary task of an organization (establishment of an appropriate work system in the organizational practice to fulfil the organization’s aims) and the secondary task (to develop, adapt, and – if necessary – reorganize the “work system”, consisting of organizational structures, cultures, practices, technical systems and tools, and human resources and competencies; cf. figure 2). The central concept of

an integrated work system was influenced by the approach of Socio-Technical Systems (STS) According to STS, work in organizations is defined by the interconnectedness of organizational tasks, supporting technologies, and the people working in the organization (vgl. [28]). Referring to this interconnectedness of task, technologies, and working people, OTD takes a threefold perspective on the design of work systems, consisting of organization development, technology development, and qualification of working organization members. Related projects were based on a set of workshops, in which researchers and organization members took part to analyze and define requirements or to discuss design alternatives (cf. [72]).

As part of this OTD framework Nett and Stevens developed the concept of *Business Ethnography*, representing a participative action-research model for reflective technology development ([59], [60]). BE, in this OTD context, informed the technical expert about the status quo in the given setting. It is framed by the action research-oriented context of OTD. This implies that BE is conceptualized as a visible intervention into the field established by the cooperation of project partners.

The qualitative research, therefore, originally was based more on interviews than on field observations. This did not only help the ethnographers to understand the given situation and possible boundary objects [16], but additionally helped them to establish Social Capital [47] between the actors in the project and supporting experts [61].

The goal of BE is to understand everyday work practices in a particular context, constituted by a specific design-oriented action research project. [59] have further elaborated the methodological implication for reflective technology development. They argue that in innovation-oriented design projects, it does not make sense to fully standardize the learning process. To avoid a reduction of the cause of a design project to the sum of the expected functions of an artifact, research process models should better follow an 'agile' approach based on continuous reflections on practical experiences in participatory research processes.

The conceptions of Business Ethnography and Grounded Theory do not only share an abductive attitude when researching into social practices but also organize the research process as an endeavour of continuous and interwoven reflections and actions (indicated in Figure 1). In that sense, OTD and the Business Ethnography methodology take the historic contingencies of social practice seriously into account.

4.2 The Experimental Character of Design and Appropriation

The Design Research Society has celebrated its 40th anniversary [25]. From the beginning there was a debate on the issue of how to understand design as a discipline characterized by an autonomous practice and research as well as by independent theory building [24]. Frayling [34] has suggested design research should distinguish between 'research about design', 'research for design' and 'research through design'. It would be quite interesting to use this categorization as an analytical lens to study the design science discourse within IS. However, in this paper we want to focus on the concept of 'research through design' with respect to a methodological perspective which theoretically reflects on design and social practices.

[50] perceives designers and researchers as directly involved in the 'research through design' process and [54] characterize the 'through'-ness of the research perspective as a denotation of "the fact that the researcher is interested in a particular subject matter when entering a certain design project. This subject matter is then observed and engaged through design, both in design thinking and in design process." Based on our theoretical considerations, we argue that this perspective has to be broadened. Beyond designers and researchers, also the people that will be affected by the design should be perceived as an integrated part of the research process. In addition 'design through research' should not be restricted to work on an artifact but also to include working with the artifact.

From a methodological perspective, some actual trends in the situated (perspectives) paradigm of HCI [43] can be read as an concretization of a 'research through design' concept. Especially the concept of Critical Design ([27], [15]) and the concept of Design Probes ([56], cf. the probe concept introduced by [36], [37]) provide instruments for an 'design through research' approach which takes the appropriation processes of the IT artifacts into account. Both concepts share our understanding of social practices as being historical contingent. In this perspective artifacts play an important role in initiating change processes as they enable new ways of acting in the world and reflecting about it.

In contrast, the approaches of [44] ('utilitarian design' concept) and [27] ('critical design' concept) are based on the aesthetic quality of design. They provide a 'mean producing presence' [42] in the sense of Mead's [57] philosophy of the present that is irritating traditional ways of interpreting the world and initiating reflection processes. The reflection can lead to a new perception of the world, which refers to, but is not determined by the artifact. Thus, critical design posits a 'negative quality' of design projects (as design efforts are disturbing social systems). However, the negative quality does not mean that this is a negative value which should be eliminated. Instead it provides a moment of emancipation and progressive development as it "reject[s] the current situation as the only possibility, and provide[s] a critique in the form of design outputs embodying alternative[s]" [15].

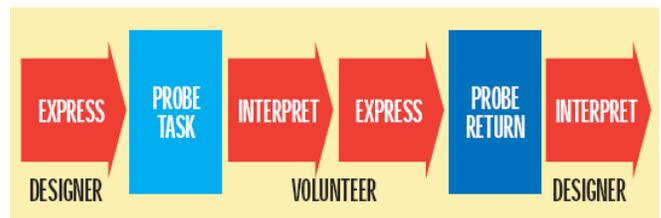


Figure 2: Probe results are the result of a multi-layered process of expression and interpretation (taken from [37])

Also Gaver's (design) probe concept is based on aesthetic quality where in as much as an artifact expresses more than the entirety of its interpretations. In this context Gaver stresses the positive value of uncertainty. With this in mind, a design probe is an artifact that was designed with the intention to be inherently vague. These artifacts will be given to volunteers, who come represent form the interesting target group (cf. Figure 2). By this introduction of vague objects into existing social practice, the

chance will be increased that creative and interesting appropriation phenomena occur. The volunteers are asked to express their interpretation(s) by a second probe, which should be sent back to the designer. The designer can use this second probe to interpret the sense-making of the original design by participants of the target group. In that way, the design probe concept creates a “double hermeneutic” in which the appropriation process will be an integrated part, transforming the hermeneutic circle into a dynamically evolved hermeneutical spiral.

The underlying connection between our own theoretical framework and the aesthetic approaches of Gaver and Dunne is given by Mead’s philosophy of the present [57] and the work of Peirce, in particular his considerations regarding reflection and abduction processes [68]. In this work Peirce noted that there are two kinds of situations that have an increased abductive quality: breakdown or doubtful situation (in which someone is forced to reflect) and ‘musement’ situation (in which someone is forced not to act routinely) (cf. [64], [84]). The concept of critical design focused on creating breakdown situations, while the concept of design probes is more interested in ‘musement’ situations. But both concepts have in common that they want to trigger situations which can be characterized by a free play with thoughts and things. In such situations, the aesthetic aspects play an important role. Following Peirce, we can understand the appropriation of an external artifact as a semiotic process, where signs establish a connection between the life-world of the participants and the new artifact. These signs can constitute novel ideas that convey a quality of usage that goes beyond the simple addition of previously existing ideas embedded in the artifacts and in the participants.

In sum, design science research projects can rely methodologically on concepts like design probes or critical design as a instrument for ‘qualitative field experiments’ [59]. In particular, these concepts can be used to spark off a process of reflection and appropriation around practices which are usually taken for granted. In early stages of a design process, design probes can create the opportunity to make use of very simple or incomplete ideas. Building vague solutions can be used as an early seeds for practice evolution which can be explore by analyzing the initial appropriation phenomena.

5. CONCLUSION

Based on a critical reflection of Hevner’s et al. [44] seminal paper, we have suggested to open their design science framework theoretically, conceptually and methodologically. From a theoretical perspective, we elaborate on the interrelations between social practices and designing IT artifacts. Due to the “double hermeneutics” [38] of designing these artifacts, IS design is a wicked problem. Appropriating IT artifacts for practical use happens to be inherently creative, the effects of which cannot be fully anticipated [67]. Therefore, design intentions for IT artifacts and their practical use are inseparably interwoven. From a pragmatist perspective, both design and use of IT artefacts always own an element of creative action [49] which can theoretically be understood as abductive process. Such an understanding has conceptual implications: IS research has to investigate into appropriation processes and their relationship with historically grown social practices. Since they rely on a prevailing functionalist theoretical perspective, Hevner et al [44] neglect this

coherent relation. As [19] point out: “Two recent papers from IS researchers highlight the application of functionalist perspectives in promoting design science (Hevner et al., 2004) and design theory (Markus et al., 2002). Both studies draw on insights from an earlier paper by [81] that focused on design theory for executive information systems (EIS). It is interesting that [44] identify just two paradigms as being influential in shaping design theory in the IS field: the design-science paradigm and the behaviour-science paradigm – both of which are strongly functionalist in orientation.” ([19], p. 151).

Shifting IS research from the design of IT artifacts to the shaping of socio-technical systems, i.e. developing the relation between IT artifacts and social practice, helps to overcome the antagonism between artifact design and human behaviour – however in a different sense than [44] suggested. Our research addresses not only human behaviour with respect to the design and use of tools but also meaningful and intentional human activities in their socio-cultural and historical context instead. Design is conceived itself as a social practice which is directed towards developing other social practices by designing artifacts and stimulating their appropriation in organizational settings. Such a focus requires a simultaneous analysis of social activities, artifacts’ functionalities, design processes, and organizational change. The unavoidable interrelatedness of technical and social systems has also been stated before in the approaches of socio-technical systems [28] or - in the same tradition – the framework for Integrated Organization and Technology Development [85].

While socio-technical systems approaches provide highly relevant theoretical frameworks for IT design and introduction projects, they do not offer a specified methodology to investigate into the interrelation of IT artifacts and social practices. They do not offer a sufficient analytical toolkit for unintended and unanticipated use and appropriation. An appropriate perspective on micro-political issues is missing. Therefore, we have presented Business Ethnography – a critical adaptation of Canonical Action Research - and the Design Probes as promising methodological building blocks. Certain methods developed in the Skandinavian tradition of Participatory Design might add to this collection [40]. Since the design and implementation of IT systems is a reflexive endeavor in the sense that the systems’ appropriation and use change the social practices they are designed for, frequent changes of functional requirements during system design and implementation are inevitable. A toolkit of design research methods will have to cater for this fact. IS research will increase its social relevance if its findings do not only contribute to utilitarian standards or short-term economical value but also to theoretical insights in social practices. Its theoretical concepts and methodological approaches need to cope with the complexity and dynamics of social reality.

Beyond the ontological and epistemological foundations considered above, a goal-oriented development of social practices, embracing the implementation and use of IT artifacts, also requires ethical foundation. Since interventions not only affect the effectiveness and efficiency of social practices but also greatly impact the well-being of those actors involved, the legitimation issue is at stake. The question arises who is legitimated to intervene, what could be the base for this legitimation, and to which set of values should the change process conform. From our point of view, such a legitimation can only be

derived out of the social practice itself. To take users and their needs serious requires involving them in the design process. Discussion on values, the definition of goals, an analysis of requirements, the development of design solutions, participative (re-) design cycles, the appropriation of artifacts in the social practice of organizations, and the collaborative evaluation of design projects seem to be methodological prerequisites for the legitimation of design interventions into social practices.

It is the main merit of Hevner et al. [44] to start the scientific discourse on a (re-)conceptualization of IS as a design science. However, in our opinion their epistemological and ontological perspective limited their analytical focus and the scope of their research framework. Especially the utilitarian conception of their approach bears the risk of limiting the social relevance of IS design research. Suggesting an epistemological opening, we try to sharpen the understanding of IS as a design science, dealing with the design and use of IT artifacts embedded in and shaped through the social practices of organizations.

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