DESIGN RESEARCH PRACTICE:
A PRODUCT SEMANTICS INTERPRETATION

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Abstract

In this paper, we adopt a somewhat novel perspective on design research. The concept of product semantics and its focus on meaning is used to interpret design research as design. It is argued that we may conceive of design research as design in two realms: The practical and the academic. In doing design research, there is a reciprocal shaping of artifacts: Better artifacts (contributions to practice) through appropriation of knowledge and methods from the academic realm, and better knowledge artifacts (contributions to academia) by drawing relevance and experiences of appropriation from the practical realm. We adopt a product semantics view to discuss research as design. Product semantics highlights the meaning of artifacts with respect to their (i) stakeholders, (ii) artifacts-in-use, (iii), artifacts-in-language, (iv) artifact lifecycle, and (v) ecology. Based on this interpretation, we propose important activities that should characterize the practice of doing design research.

Keywords: Design, research, practice, meaning, artifact.

1   Introduction

The IS field has paid an increased interest in design research (DR) over the last two decades. Design research is becoming recognized as equally important to behavioural information systems (IS) research (Hevner, 2007; Iivari, 2007). Design is depicted as 'fundamental' to the IS discipline (March & Storey, 2008). DR is manifested through special issues in leading journals, conference tracks, and dedicated conferences for design science research in IS. Purao et al (2008) and Baskerville et al (2011a) provide a rich account of the development of DR in the IS field.

There is an on-going discussion about the norms that should govern DR, including both (i) what type of knowledge we can expect as a result of research, and (ii) how to accomplish rigor in the design process in order to substantiate claims. This corresponds to the *process* of research and the *product* (outcomes) of research. In design science research (March & Smith, 1995; Hevner et al, 2004) knowledge outcome is defined as design science artifacts, i.e. constructs, models, methods and instantiations. Hevner et al (2004) also propose that design science research may lead to new evaluation techniques. The idea of building design theory has been proposed (Gregor & Jones, 2007; Kuechler & Vaishnavi, 2008), while the recent notion of action design research (ADR) suggests that the minimum requirement of the ADR approach is to formulate design principles that are applicable to design solutions for a class of problem (Sein et al, 2011). The ambition in ADR initiatives should be to contribute to theory (Sein et al, 2011). 'Scholarly contributions' are endorsed by major journals (Baskerville et al, 2011a). Orlikowski & Iacono (2001) identify five views of the IT artifact; (i) Tool view – functions and capabilities to perform tasks, substitute for labour, or improve productivity, (ii) Proxy view – perceptions as something to use and of value, (iii) Ensemble view – embedded relationship within social, organisational, and economic context, (iv) Computational view – computational capabilities including processing and representational model and (v) Nominal view –

abstract, non-specific, collective view. A very inclusive definition of IT artifacts is provided by Gill & Hevner (2011, p. 238): "IT artifacts are broadly defined as constructs (vocabulary and symbols), models (abstractions and representations), methods (algorithms and practices), and instantiations (implemented and prototype systems). More generally, artifacts can be viewed as the symbolic representation or physical instantiation of design concepts. Even within a discipline such as MIS, they are not necessarily limited to information systems. Rather, MIS artifacts include organizational designs, process designs, and other intentionally constructed entities relating to information systems."

Our interpretation of the discourse summarized above is that there are co-existing ideas about what the outcome of DR should be (models, methods, instantiations, constructs, new evaluation techniques, design principles, or design theory). Here, for the sake of our argument, we speak of design research as *design of knowledge artifacts*.

While this meta-theoretical development on DR in the IS field emerges, there has still been little effort to factor in other design traditions into the IS field. Although some IS research has promoted design thinking (e.g. Winograd & Flores, 1986; Ehn, 1989; Baskerville et al., 2011b), it has not yet had considerable impact on the design research discourse in IS. Design thinking (e.g. Cross, 2001; Krippendorff, 1995, 2006) and its notion of *product semantics* highlight stakeholders in design and their sense-making of artifacts. Krippendorff stresses contextual approaches which focus on the meaning of artifacts in use and typically consider the design of affordances, constraints, feedback, coherence, learnability, multi-sensory redundancy, variability, robustness, and so forth. Some recent IS publications have incorporated concepts from design thinking (e.g. Baskerville et al, 2011b; Gill & Hevner, 2011; Sjöström, 2010). Interestingly, there has been little or no discussion about how DR can be conceived from a design perspective. Baskerville et al (2011b) show that lessons learned in design studies prove useful to further the meta-theoretical models in the IS field. Baskerville et al (2011b) employ the works of Cross (2001) – among other things – to distinguish conceptually between design and research in DR. In this paper, we make a similar contribution. We challenge the supposed distinction between design and research, claiming that design researchers in essence are designers of knowledge artifacts. A practice perspective is adopted to characterize the context in which design research takes place.

We employ ideas from product semantics (Krippendorff, 2006) to further factor in fundamentals of design thinking into IS design research. We elaborate of design research as practice; and the multiple realms in which design research operates (section 2). The notion of product semantics, and the axiomaticity of meaning in design is elaborated (section 3), and used to interpret research as design (section 4). Tentative conclusions are presented (section 5).

2   Investigating the Realms of Design Research

We acknowledge the emergent properties of the social world, and the view that artifacts (e.g. information technology) are entangled in – and emerge with – social the social world. While acknowledging this socio-material view of the world (Orlikowski & Scott 2008; Leonardi and Barley, 2008), we adopt a practice view on practices. Such a view guides us to inquire into the structures in which DR operates. In addition, DR as such may be conceived of as practice.

Sociologists have elaborated the concept of practice for a long time, and there is no 'unified' view of what it means (Gherardi, 2009). Schatski (2001, p. 2) explains practice as "embodied materially mediated arrays of human activity centrally organized around shared practical understanding". The use of artifacts ("materially mediated") in action is recognized, while at the same time human action is acknowledged as part of a social context. Schatski's account of practice theory (2001) resonates well with the idea of a reciprocal shaping of action and structure, as proposed by Giddens (1984). Orlikowski (1992) elaborates on Giddens' ideas through her notion of a duality of technology (as begin shaped by, and shaping, human action). In this paper, we do not intend to solve the problems of adopting structuration theory in IS (e.g. DeSanctis and Poole, 1994). However, we adopt the view that design and appropriation of technology is strongly 'fused' with human action (El Sawy, 2004).

A key proposition in design research is that research results should be relevant and useful for practice (e.g. Hevner et al, 2004). At the same time, IS researchers are expected to contribute to the academic knowledge base (e.g. Gregor & Jones, 2007). Goldkuhl (2004) articulates a distinction between contributions to *local* practice (e.g. through a DR effort within a specific company) and contributions to *general* practice through re-usable knowledge (e.g. workshops and practitioner-oriented text books). Apart from contributing to both practice and academia, design researchers should draw rigor from the knowledge base and draw relevance from practice (e.g. Hevner et al, 2004). Design researchers thus operate in at least two different (but interdependent) social structures. We refer to these here as the *practical realm* and the *academic realm* (Figure 1). Each realm may be broken down into more specific practices, such as a single company in the practical realm or a specific sub-community (e.g. a journal or a conference) in the academic realm.
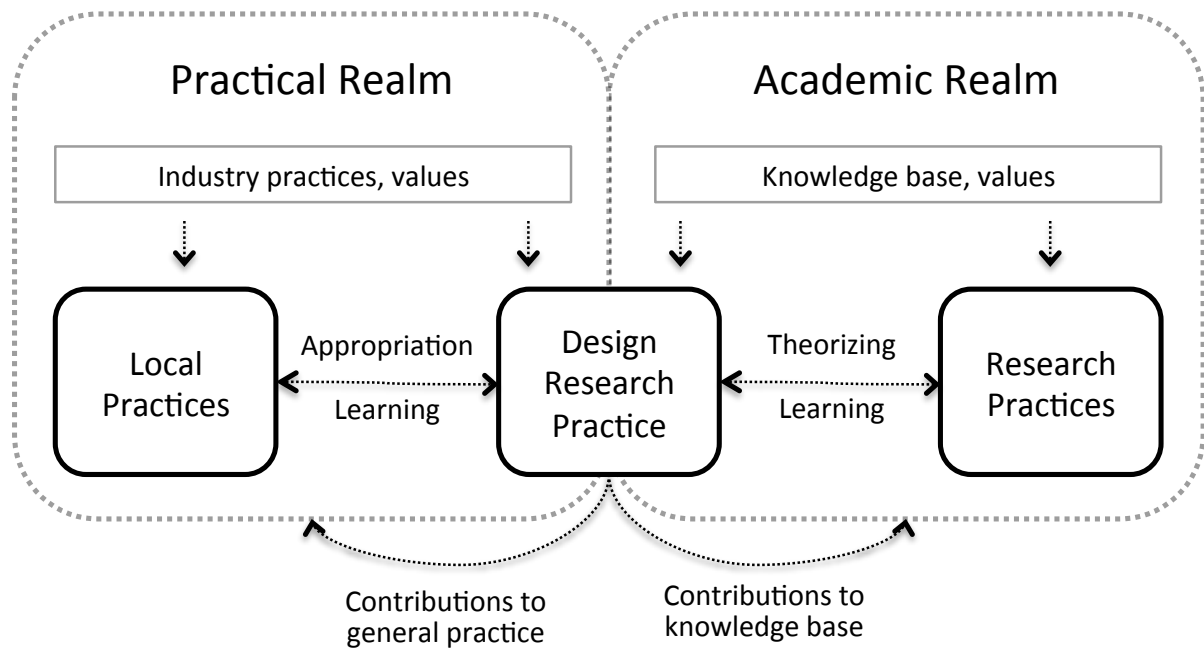

Figure 1.   The Multiple Realms of Design Research

Figure 1 illustrates our view of design research as practice. The framework is clearly influenced by the IS design science research framework (Hevner et al, 2004; Hevner, 2007). The realms of practice and academia can be recognized from Baskerville et al (2011b). Our adaptation of the IS DSR framework is based on the notion that the DR practice interacts with other practices, either in the practical realm or in the academic realm. This corresponds with the ideals of relevant and useful research outputs from a practice point of view, while at the same time adhering to academic ideals. We acknowledge that ideals in practice and academia may partially overlap. In contrast to Hevner et al. (2004), we seek to explicitly view the relation between the DR practice and the academic realm as action, governed by the ideals emerging in interplay with relevant stakeholder communities in the two realms. This way, the idea of ideals is not fixed (e.g. *rigor* and *relevance*), instead we highlight that any DR practice needs to be based on a process both to monitor and influence the discourse in the two realms. In our view, ideals are situated. Indeed, research in IS and other disciplines is characterized by ideals that emerge through social interaction within the research community. An example of this is well expressed by DeSanctis (2003, p. 370): "Scholarly publication is a jointly constructed process, reflective of dialogue among researchers, reviewers, editors, and readers." Within a community, ideals emerge and evolve.

Within the practical realm, we find local practices (e.g. public and commercial organizations). Possibly, the notion of the practical realm can be further delineated into 'government practices', 'learning practices', 'commercial practices' et cetera, if there are good arguments to make a further

differentiation within the realm. Practices in the academic realm may include research communities (such as AIS and ACM), governed by emergent value systems that are applied in the assessment of proposed contributions to the knowledge base. A practice in the academic realm may also be more narrowly defined, e.g. a specific journal or conference.

A core idea in DR is that learning occurs through moral inquiry (Dewey, 1938); i.e. an attempt to improve a situation. Evaluation is a core activity in DR, and there are several (alternative) ideas about how evaluation (what to evaluate, when to evaluate and how to evaluate). Arguably, the design science research approach (March & Smith, 1995; Hevner et al, 2011) is biased towards a positivistic tradition of evaluation, while the action design research approach (Sein et al, 2011) emphasizes an interpretive approach to assessing artifacts when appropriated in practice. This is somewhat (but not completely) comparable to Venable (2006), who suggests that we should distinguish between artificial versus naturalistic evaluation of artifacts. Artificial evaluation is conducted through experimental or analytical techniques (evaluating the artifact-as-such), while naturalistic evaluation concerns use qualities and emergent phenomena that cannot be assessed without an actual appropriation of the artifact in a 'real' empirical setting. Through appropriate evaluation efforts, design researchers are expected to demonstrate the qualities of their artifacts. Gregor and Hevner (in press) elaborate further on the relation between artificial and naturalistic evaluation and its relation to design science v. behavioural science.

For design researchers, the ideal is to design artifacts that are highly valued, having an impact in both the practical realm and in the academic realm. An underlying DR assumption is that a DR practice will be able to design better artifacts by drawing from both realms. The practical realm ingrains design with relevance and allows us to perform naturalistic evaluations of artifacts, while the academic realm provides a knowledge base design and evaluation, both with respect to the process and the product of research (Sjöström & Ågerfalk, 2009). Further, we are expected to contribute to both realms, and to communicate our results to multiple audiences (Hevner et al, 2004).

3 Adopting Product Semantics to Characterize Realms

A common perspective in the IS field is that information systems *represent* reality (e.g. Wand & Wang, 1996). When adopting such a perspective, designers aim at creating accurate representations of reality in their models. While the representation perspective still stands strong in the IS field, it is the subject of an emerging criticism (Ågerfalk, 2010). We realize that the term product *semantics* may invoke strong reactions in a practice context. The criticism is mainly based on the view that language does not merely represent the world. In contrast, the way we express ourselves using language should rather be seen as a fundamental way to bring about change to the world (Austin, 1962; Searle, 1969; Habermas, 1984). As an example, the action *to order* establishes expectations that the customer will pay for a product; and that that product is delivered to the customer by the supplier. Following this perspective, information systems are instruments used to perform action (Goldkuhl & Lyytinen, 1982; Ågerfalk, 2004; Sjöström, 2010) and mediate actors' intentions. Designing information systems is primarily to be seen as enabling and empowering social interaction, typically in a multiple-stakeholder context (Sjöström 2010).

Krippendorff defines product semantics as "a vocabulary and methodology for designing artifacts in view of the meanings they could acquire for their users and the communities of their stakeholders". Although Krippendorff uses the term product *semantics*, we agree with Ehn (2007) that it is in fact more appropriate to refer to Krippendorff's ideas as a *pragmatic* view of design. That being said, the notion of *meaning* and its impact on design is still at the core of product semantics. Krippendorff (2006, p. 47) explains that the meaning has a central role in design thinking: "Humans do not see and act on the physical qualities of things, but on what they mean to them." He refers to this as the 'axiomaticity of meaning' and argues: "There is no escape from the axiom. It states an undeniable truth that is so strong that one might as well embrace it fully for the strengths it provides for the design

discourse. Without realizing its strength, designers are doomed to chase the ghosts of other discourses." (p. 50)

The notion of meaning is recognized in the social sciences. Krippendorff's notion of meaning resonates well with Peirce's *semiosis*, Bühler's *symbolic interactionism*, Polanyi's *sense-reading* and *sense-giving*, as well as Weick's *sense-making*, to mention a few. Polanyi (1966, p. 181) states: "Both the way we endow our own utterances with meaning and our attribution of meaning to the utterances of others are acts of tacit knowing. They represent sense-giving and sense-reading within the structure of tacit knowing". As humans, we continually make sense of the world around us on the basis of our cumulated experiences. This interpretive view of the world is well recognized in IS research (e.g. Walsham, 1995; Klein & Myers, 1999). Krippendorff (2006) emphasizes that designers need to seek a 2nd order understanding – i.e. employ design methods that allow them to gain some degree of understanding of the meaning different stakeholders ascribe to artifacts. Krippendorff suggests that designers increase their chances to design successful artifacts by taking into account four different perspectives on how individuals attribute meaning to artifacts: (i) The meaning of *artifacts in use*, (ii) the meaning of *artifacts in language*, (iii) the meaning of a *lifecycle of artifacts*, and (iv) the meaning of an *ecology of artifacts*.

Category	Description
Stakeholders	Individuals and/or organizations that are affected by the artifact(s); or that have influence over the dissemination of artifact(s).
Artifacts in use	The way that stakeholders appropriate artifacts; and the way they make sense of some them through their appropriation experiences. Understood as the interplay between appropriation of artifacts (materiality) and the social structure.
Artifacts in language	How stakeholders speak of artifacts. Especially adjectives that signal how stakeholders assess the quality of artifact(s).
Lifecycle of artifacts	The way that stakeholders conceive of the 'status' of some artifact(s) within the realm – the way it has been appropriated and its projected future role within the realm.
Ecology of artifacts	Other artifacts in this realm (competing, supporting) that affect the way that stakeholders attach meaning to the artifact(s) in focus.

Table 1.   A Model to Characterize Design Research Realms

The success of an artifact depends on the meaning ascribed to them by stakeholders in each realm. We do not claim that every practice within each realm is identical, but that practices that belong to the same realm share similarities, and that there are notable differences between practices in the academic and the practical realm.

4   Interpreting Research as Design

We have asserted that DR practices operate in two realms (Figure 1) and introduced a basic model based on product semantics to characterize each realm (Table 1). This section lends structure from that model to interpret design research as design. Our view is that researchers design 'knowledge artifacts' that are aimed at improving something (e.g. designers' capabilities to explain a phenomena; inquire into a workpractice; or devise a situational solution to a problem that belongs to some class of problems). DR practices need to factor in research norms, and sometimes even aim at contributing to a change of these norms. A recent example of this is seen is the German DR memorandum (Österle et al, 2011) and the response from journal editors (Baskerville et al., 2011a).

The discussion in the following subsections aims at exploring the meaning of DR outcomes as artifacts. By adopting a product semantics view, we emphasize sense-making and politics in design research. In the remainder of this section, we appropriate Krippendorff's (2006) notion of meaning to investigate the character of design research, with respect to stakeholders, their use of artifacts, the way artifacts are spoken of, the lifecycle of artifacts, and the ecology of artifacts (see also Table 1).

Stakeholders

As stated by Krippendorff (2006), "No artifact can be realized within a culture without being meaningful to those who can move it through its various definitions." Product semantics advocates a design process that recognizes and adapts to its stakeholders. Thus it is important to understand how artifacts relate to users/stakeholders appreciation and appropriation and how the artifacts are part of their *life-worlds* and their evolving ecologies of artifacts. This implies that DR practices must actively scrutinize stakeholders in both the practical and the academic realm, and make sense of various stakeholders' interpretations of emerging artifacts.

In the practical realm, stakeholders may be understood as *local* practices, such as companies or government agencies. In addition, *general* practice may benefit from practical theory/design science artifacts/design principles to improve their organizations. Further, R&D organizations benefit from commercialization of DR outcome/innovation/patents. Depending on the research goals, stakeholders may also include end-consumers, media, citizens, government *et cetera*.

In the academic realm, stakeholders include (but are not limited to) individual researchers, the DR practice as such, and the institution(s) to which the DR belongs, funding agencies/organizations *et cetera*. However, stakeholders also include other researchers (reviewers, editors, other scholars). In essence, these actors pursue different but also overlapping goals. We believe that a more elaborate dialogue based on academic stakeholders is important, since it highlights the political dimension of research. Design is value-laden (e.g. Järvinen, 2008) – we also need to properly conceptualize the value-ladenness of design research.

The meaning of artifacts-in-use

In terms of DR outcomes in the practical realm, the aim of design is (arguably) to develop knowledge oriented towards change in a sociomaterial assemblage. However, the idea of *designing* the social world is problematic. IS researchers tend to emphasize the view of design as a way to induce change into a soft system (e.g. Checkland, 1981). The issues associated with changes to the social world in relation to IS development is well recognized in the IS field (e.g. Mumford & Weir, 1979; Checkland, 1981). IS development has, for example, been conceptualized as organizational change in which design activities and approach to stakeholders are at the core (Lyytinen & Hirschheim, 1988; Kotter, 1996; Hayes, 2002; Sjöström, 2010). Design thinking supports this sociomaterial view of design. Krippendorff (2006) emphasizes the meaning of artifacts in use. People's perception of an artifact differs from the actual use of the artifacts; and the way people make sense of its actual use. In the IS field, several scholars investigated the 'drift' that occurs when IT systems are implemented into practice. Users' appropriation of technology may lead to ways of use that were neither intended nor anticipated by designers. The phenomena of 'design in use' has been discussed by IS researchers in terms of, for example, drift (Ciborra, 1996), tailoring (Trigg and Bödker, 1994), adaptation (Majchrak et al., 2000), reinvention (Rogers, 1995) and appropriation (e.g. De Sanctis and Poole, 1994; Orlikowski, 2000). Apparently, there has been a lot of interest put into how artifacts, e.g. IT systems, are appropriated in the practical realm. In addition, appropriation is a pre-requisite to 'naturalistic' evaluation (Venable, 2006) of our artifacts.

We may discuss how DR knowledge artifacts are actually evaluated based on their 'appropriation' in the academic realm. Local and international workshops, special interest communities, and conferences provide opportunities to prototype artifacts in the academic realm. This is often spoken of, and in this context we conceptualize it as 'prototyping' of knowledge artifacts in the academic realm. However, true 'appropriation' of knowledge artifacts will only occur when the artifacts are adopted in new

design situations, by their own DR practice or by other researchers who learned about the artifacts through their own exploration of the academic realm. By appropriation in new situations, we will be able to perform 'naturalistic' evaluations of these knowledge artifacts in a new design setting. A DR practice should exploit this opportunity, as a means to evaluate and further improve their work.

A flipside of the 'academic prototyping'-coin is discussed by Parnas (2007). Parnas points out problems with the 'numbers game' in computing disciplines – the problem that a high citation count may lead to superficial research, overly large groups of authors, repetitive publications (self-plagiarism), small and insignificant studies, and publication of half-baked ideas. As stated by Parnas (2007, p. 20) regarding conferences: "People come to talk, not to listen. Presentations are often made to nearly empty halls. Some never attend at all." Our view is that there is a purpose of presenting half-baked ideas, if there is a good chance that the presentation will lead to feedback that helps improving the ideas.

The meaning of artifacts-in-language

Regarding the meaning of artifacts in language (ii), Krippendorff claims that an important role of a designer is to interpret the discourse among stakeholders, stating that "The fate of all artifacts is decided in language". In ISD, communication between designers and other stakeholders is a core issue. Several approaches to improving sense-making have been proposed over the years, such as various types of user-centered approaches, e.g. prototyping in interaction design, and arenas and concepts for customer-developer interaction in agile development. They all share the idea that designers need to promote communication and learning between stakeholders. In design thinking, the importance of language is manifested in several ways, e.g. through user-centered design processes and through questionnaires that are used to assess how stakeholders perceive the artifact and its potential usefulness during the design process.

In the academic realm, the difference between 'use of artifacts' and 'artifacts in language' becomes somewhat fuzzy. Use of knowledge artifacts may very well consist of how we interpret those artifacts, represent them in our own discourses and appropriate them into our own research. However, we argue that from a product semantics point of view, design researchers should attempt to sensitize themselves to how their knowledge artifacts are interpreted and assessed by other researchers in the scholarly discourse. This is a type of feedback, both with respect to the way knowledge artifacts are appropriated and how they are framed in language by others. Ideals in the academic realm typically promote communication to different audiences (e.g. Hevner et al, 2004). We agree that this is important, but we also want to highlight that the way others speak of our artifacts (both in the practical and the academic realm) is valuable for improvement of knowledge artifacts.

The meaning of a lifecycle of artifacts

Krippendorff stresses that designers need to reflect about the lifecycle of their artifacts. His emphasis on the lifecycle perspective suggests that designers should focus on the "before" the project, the "procurement" process of aligning actants in a design project and how the object of a design becomes this specific design object. This view has been discussed in the DR discourse. The sociomaterial notion of emergence resonates well with the idea of *mutability* of artifacts (Gregor & Jones, 2007; Gregor & Iivari, 2007; Gill & Hevner, 2011). Although artifact mutability has been elaborated (Orlikowski & Iaccono, 2001; Gregor & Jones, 2007; Gregor & Iivari, 2007; Sjöström et al, 2011), it is still peripheral in the DR discourse. The idea of mutability, however, is clearly a basis for Gill & Hevner's (2011) utility-fitness model, which proposes that we focus on (i) the ability of an artifact to prove useful in a specific situation, and (ii) that the artifact proves useful over time in various situations in its sociomaterial context, (iii) in competition with other artifacts that address the same class of problems. Gill & Hevner's model thus introduces a perspective on the value of artifacts that is similar to Krippendorff's (2006) emphasis on understanding the meaning of artifacts from a lifecycle perspective as well as an ecological perspective (next section).

The lifecycle perspective may also prove useful for the design of 'knowledge artifacts'. If the ultimate goal of DR is to make a difference, it is imperative to consider artifacts from a lifecycle perspective. This can be done both with respect to the practical realm and the academic realm.
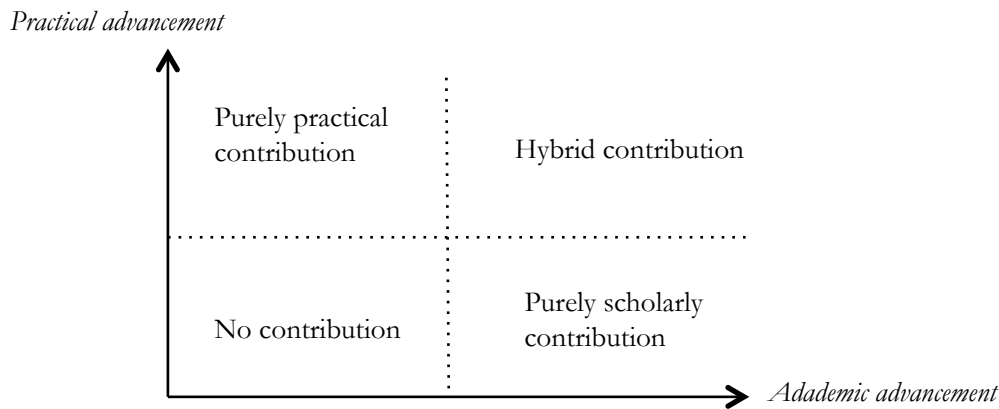
Practical advancement

Purely practical contribution	Hybrid contribution
No contribution	Purely scholarly contribution

Adademic advancement

Figure 2.   Artifact advancement in the two realms of DR

Figure 2 illustrates our view on the emergent contributions that DR practices can make into the two realms. In the practical realm, artifacts 'advance' in steps, such as formative design workshops with prototypes, appropriation into local practices and subsequent evaluation of the results, dissemination to general practice, and sometimes 'success' in general practice. In those cases, artifacts become an integrated part of the ecology of artifacts (e.g. the relational database model and its implementations in database management technologies). In the academic realm, knowledge artifacts also advance through small steps. Typically, ideas are initially discussed within the design practice or in smaller workshops in institutions or networks. After that, results are exposed through international workshops and conferences, followed by attempts to publish in journals. As discussed above, such a 'lifecycle' strategy is necessary both to show continuous research activity, and in order to learn from other scholars as a means to improve our artifacts. Some journal papers become an important part of the 'ecology' or 'web of beliefs' that shape the actions of other researchers. In the academic realm, researchers attempt to make an impact. Although citation counts are questionable measures of quality (Parnas, 2007), journal publication is important to individual researchers.

In practice, we attempt to build IT artifacts that are mutable to fit into the emerging social world. In academia, we attempt to generalize artifacts beyond limited contexts and specific technologies. The lifecycle perspective is also highly political: A designer (design researcher) needs to plan ahead and manage the needs of multiple stakeholders to promote continued resources for design and future success of an artifact.

At some point, advancements in both realms may become obsolete or fade away due to a changed world or new artifacts that outcompete the old ones.

The meaning of an ecology of artifacts

Krippendorff's (2006) perspective on ecology, influenced by Bateson (1972) and Boulding (1992), proposes that designers need to recognize the meaning of an ecology of artifacts, stating that "Designers who can handle the ecological meaning of their proposals have a better chance of keeping their designs alive." People attach meaning to artifacts in relation to other artifacts. This relationship can span a number of dimensions e.g. cooperation, competition, interdependence, reproduction and retirement (death) of artifacts in specific contexts. At the individual level, this means (for instance) that a computer is meaningful only when there is relevant software for it. Another example is that a person will ascribe meaning to a new IT system in relation to their experience with other IT systems in the same genre. The most obvious example from a technical perspective is that artifacts depend on infrastructure. However, there are other relations in an ecology of artifacts, such as competing artifacts, or artifacts that 'thrive' through the existence of other artifacts. This is also pointed out by

Gill & Hevner (2011). From the perspective of technical stakeholders, the ecology looks different. IT strategists / architects would try to see how a specific IT artifact 'fits in' and contributes to an existing IT infrastructure. When it comes to models and methods, those would be assessed against the current methods and models in use in a particular organization. This is a simplified line of reasoning, but it illustrates the point that the meaning of a single artifact is based on its place within a larger ecology.

In the academic realm, our artifacts are similarly connected to an ecology of knowledge artifacts. We are expected to draw from the knowledge base (e.g. Hevner et al, 2004) and strive for a cumulative tradition (Gregor & Jones, 2007). When designing a new artifact (i.e. producing knowledge) designers/researchers need to build upon existing artifacts and clearly relate their new artifacts to the knowledge base. Further, for design researchers, there is a need to build artifacts targeting the practical realm in order to meet the ideals of relevance and practical utility.

The qualities of an artifact alone cannot explain its survival in a competitive world. Organizational development and decision-making is a political process. Thus, any artifact that is not supported actively by stakeholders become a "prey" to other artifacts – "predators" that are more extensively promoted, e.g. for commercial reasons. When it comes to academic promotion of ideas, it is clear that publications in high impact journals increase the readership as well as the likelihood of citations. On top of that, researchers may engage in various activities to expose their ideas to others in academia. Commercial organizations have strong incentives to promote their products. An implication for the DR practice is that they do not only need to design artifacts in accordance with practical and academic ideals, they also need to reflect about the promotion of their artifacts, either through commercial strategies or through other mechanisms. Following this view, any DR practice aiming for innovation needs to actively monitor the appropriate 'ecology' of artifacts and promote their own artifacts within this ecology.

5 Concluding Discussion

This paper may be somewhat provocative as it is intended to stimulate discussion in the context of the workshop where it is being presented.. Although we may interpret research as design, there are (arguably) numerous reasons to make a clear distinction between these two phenomena. However, we believe that the adoption of a design perspective on research adopted here leads to valuable insights about the practice of doing design research. Our main proposition in this paper is that both practical contributions and theoretical contributions are actually artifacts (products of design). However, stakeholders in the two realms will interpret the entire idea of 'use', 'language', 'lifecycle' and 'ecology' differently. Consequentially, a challenge of design research is to obtain a second order understanding of stakeholder views within the two realms, in order to promote the success of their artifacts in both realms. Further, the actions of design researchers may be strategic in the sense that they may affect the structure(s) of academic communities. Two prominent examples are the publications by Hevner et al (2004) and Sein et al (2011) that, respectively, impact the norms of design researchers. By engaging in the meta-theoretical discourse at the highest levels, these researchers have created a fertile ground to promote the acceptance of new 'artifacts' that correspond to their ideals.

We have addressed a number of issues that design researchers face, which have not previously been in focus in the meta-theoretical DR discourse. The outcome of DR practice should be valuable for other practices that are governed by their own set of values and history (knowledge base). In contrast to previous research we do not presume that *any specific values* – such as rigor and relevance – are in focus. We rather state that an important activity in a DR practice is to continually investigate the ideals that need be met in the two realms, and also to try to affect those ideals. We recognize the emergence of the realms, and the reciprocal shaping of values between any practice and its environment. Even though some values may be rather stable over time (such as relevance and rigor in IS research), they are indeed dynamic and context-specific. A conclusion from this is that a continuous and systematic interpretation, and active participation in the discourse on ideals, are important activities in a DR

practice. The way that we conduct research and succeed in publishing is also a way to reinforce and/or weaken ideals in the research community.

The idea of emergent and reciprocally shaped ideals is also connected to evaluation. We believe that the proposed perspective may prove powerful in further conceptualizing DR evaluation. Evaluation takes place formatively to improve design, but also as a means to demonstrate artifact qualitites to stakeholders. As stated by Krippendorff (2006): "No artifact can be realized within a culture without being meaningful to those who can move it through its various definitions". Evaluation needs to be understood from the political perspective as well as the formative perspective. Exposure of an artifact, whether in the practical realm or in the academic realm, is multi-functional. As a design researcher, academic publication as well as appropriation of artifacts in practice, needs to be conceived of as interwoven yet analytically distinguishable activities. The very reason to operate as design researchers is based on the assumption that the quality of the emerging compound of artifacts is increased through the interplay between evaluation in the academic realm and evaluation in the practical realm. We conceive of the exposure of an artifact into either realm as a form of 'naturalistic evaluation'. In addition to this, DR practices may conduct artificial evaluation 'in-house', e.g. through qualified discourse within the DR team and simulations. This leads us to a more elaborate concept of evaluation in design research, which occurs in many forms: (1) artificial evaluation; through evaluation measures taking place within the DR practice, (2) naturalistic evaluation; through appropriation of ideas in other practices, and through feedback from those practices to the DR practice, and (3) scholarly evaluation; through the discourse that takes place within the academic realm through peer-review and other forms of interaction between researchers.

In essence, we have identified that a DR practice needs to engage in certain activities – or develop certain capabilities – in order to operate successfully within the two proposed realms, these capabilities include:

- Identify and scrutinize stakeholders, and explore ideals in the two realms, to promote outcome that brings value to all stakeholders. This includes establishing working relations between DR practice, local practice(s), the academic community and other stakeholders.

- Identification of important activities in a DR practice to support the evolution of ideas (design artifacts) over time (lifecycle perspective) to make them part of the 'ecology' of artifacts.

- Strategically appropriate the publication process as a type of 'scholarly evaluation' of artifacts, in addition to its other purposes

- Establishing relations between the DR practice and its client practices (in the practical and academic realm) to enable appropriation of ideas, thus establish the foundation for different types of naturalistic and scholarly evaluation of design artifacts.

- Establishing a strategy for contributions to both the academic and the practical realm.

The proposed product semantics perspective on DR practice harmonizes with 'the practice turn' in organizational research. By addressing DR as design, we adopt a critical perspective in design research, recognizing the politics and value-ladenness of design research. As stated by Gherardi (2011, p. 124): "In summary, practice as epistemology articulates knowledge in and about organizing as practical accomplishment, rather than as a transcendental account of a decontextualized reality done by a genderless and disembodied researcher."

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