Designing the Mind's Eye: A Holistic View of Design Research

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Abstract

As design research has become an accepted research approach, a focus on rationalistic problem solving and the production of artefacts has become the dominant focus. Looking to design research in other disciplines reveals design considerations which inform the practice of design. We consider how practice theory can reveal the interpretations translations and stabilisation of an ecosystem necessary to negotiate a social imaginary – a design. In addition, design occurs within an ecosystem which becomes stabilized through negotiation and action as goals and evaluations evolve. Re-examining a seminal design science research paper through a practice theory lens, reveals underlying actions of design and develop a more holistic expression of design research.

1.0 Introduction

Contributing to knowledge through the formalized design and evaluation of artefacts is an accepted research approach in Information Systems. Such enquiry has placed significant attention on the construction of artefacts (Hevner et al., 2004; March and Smith, 1995; Walls et al., 1992; Orlikowski et al., 2001), explication of artefact-centric design theory (Gregor and Jones, 2007; Venable, 2006; Walls et al., 1992), evaluation of design artefacts (Baskerville et al. 2007; Hevner et al. 2004; Pries-Heje et al. 2008), and to a much lesser extent, the activities and processes which constitute design itself (Germonprez et al. 2011; McKay et al. 2007; McKay et al. 2012). In IS, the legitimacy of design as a research approach is often credited to Nunamaker et al. (Nunamaker et al. 1991), Walls et al. (1992), or Hevner et al. (2004) or a combination thereof. Regardless of which of the aforementioned works is considered a point of origin, they each find common roots in Herbert Simon's *The Sciences*

of the Artificial (Simon 1969) and reviews of DSR look to the origins of design research from within the IS field (Indulska et al. 2010; Kuechler et al. 2008a). While the focus on artefacts has been productive for design science research (DSR), it has principally been through an engineering lens centred on the manipulation of materials according to theorized processes of nature (Buchanan 1985). Such contributions are through design methods, such as that found in Walls et al. (1992), March and Smith (1995), and Hevner et al. (2004), functionally evaluated through experimental behavioural science methodologies and explicated through prescriptive scripts (Gregor et al. 2013).

Such a received view is potentially restrictive as such enquiry is predicated on contributions to design research as specific kinds of knowledge oriented toward prescriptions for artefacts (Gregor et al. 2013). As an example, Walls et al. (1992) provides a prescriptive method to develop theoretical knowledge about a class of information systems (expert systems) and provide specific functionality (vigilance) to enable organizations to react appropriately when faced with a class of problems (turbulent environments). In another exemplar, Markus et al. (Markus et al. 2002) later employs the framework developed in Walls et al. (1992) to develop a design theory to support a class of user requirements around emergent knowledge processes. Further, the knowledge base for design has been divided into two types of knowledge: description (of natural laws and theorized regularities and principles) and prescriptive (models, constructs, methods, instantiations and design theory) (Gregor et al. 2013). While this normative perspective has become reified and has served to legitimize design in the IS community, we argue that a dominant, artefact-centric focus has narrowed consideration of design to a technologist concentration on prescriptive design theories (models) for IT mechanisms rather than expanding design research to have the depth it has achieved in other design fields (Kuechler et al. 2008b). Articles that adhere to a normative perspective of design illustrate the concept *Design Of* – a dimension of design inherently focused on artefacts, be they material, social, or information based (Lee et al. 2013). In this research essay, we argue that the *Design Of* does not exhaust the possibilities for knowledge contributions and thinking on design, and suggest a complementary perspective that offers new depth to what *Design Is*.

As a point of departure, McKay et al. (2012) highlight a greater depth of design research as both an artifactual product and a complex, multi-faceted process. Their research emphasizes human-centric design composed of multiple activities that include problem solving, process, planning, intention, and communication, in addition to a traditional artefact-centric view. Kuechler and Vaishnavi (2008b) explicitly discuss broadening the scope of IS DSR to include aspects beyond the IT artefact and more towards the multitude of perspectives part-and-parcel to IS. Thus, design research can be conceived as focused on an ecosystem of actions, competing perspectives and value identification and creation in addition to the product output of the designing in the world. We add to this discourse by positing a more holistic view of design as engaged by real-world designers as the locus of inquiry. In shifting focus to investigating the confluence of social and material worlds in the practices of design, we argue that design is “charged with making the material culture conducive to engagement” (Borgmann 1995 p. 18). In this sense, design incorporates technology into the broader argument about the lives and actions of individuals and groups. The holistic view developed in this research essay highlights the contingent aspects of design (what may occur) rather than what must necessarily occur (due to scientific laws) and is oriented toward “shaping society, changing the course of individuals and communities and setting patterns for new action” (Buchanan 1985 p. 6).

We proceed by briefly tracing concepts that inform the wider discipline of design but are largely taken-for-granted and unexamined in DSR. We then explicate a more holistic stance for design founded in practice theory and suggest three behaviors which designers engage in as part of all design practices. These behaviors are then used as a lens to reformulate the design activities in a classic DSR paper (Kuechler et al. 2008a) as behaviors in a practice. The reformulation is not a replacement of the DSR theory but rather and expanded view of

the practice of design. The strengthening of their DSR theory may be considered an instance of how practice theory can complement and reinforce design research. We conclude with implications for expanding contributions of design in practice.

2.0 *Design*

Design has a history that predates the computer age and in that history we find alternate perspectives on design. The rich literature on design does not begin nor stop at artefact construction but includes communication, construction, planning, and the persuasion of users. Designs must persuade through technological reasoning (the scientific premise for its functions) and human premises by which forms/functions make sense within material, social and linguistic practices of users (Buchanan 1995). In the case of novel designs, designers are not charged with fitting new artefacts within existing practices but rather with creating a *social imaginary* such that particular features of the world show up in new practices. Designs persuade not though offering theoretical underpinning but as a means for to people imagine their future lives in images, narratives, and metaphors (Taylor, 2004).

Design then involves a plurality of activities to guide the integration of different styles of thinking, processes and materials into these human environments, an understanding of the actors involved, and the people who experience the outcomes of design. Underlying these perspectives are unexamined assumptions about the nature of the world, the problems worth attending to, and the ideals and values worth pursuing. Design occurs within and is shaped by the range of ecosystems in which it occurs (e.g. configurations of organizations, foundations, designers, governance) each of which brings its own with, historical adaptation to design resistance, and teleology (purpose and goal states). Understanding the broader context of design provide a depth of design suited for understanding the ubiquitous design environments of contemporary society. For example, Buchanan (1995) suggests the rhetorical commonplaces fundamental to the study and to the practice of design (Figure 1) which highlight the tensions that have grown over time between the material conditions that guide designers and the social conditions to explore and create the human world of the artificial.

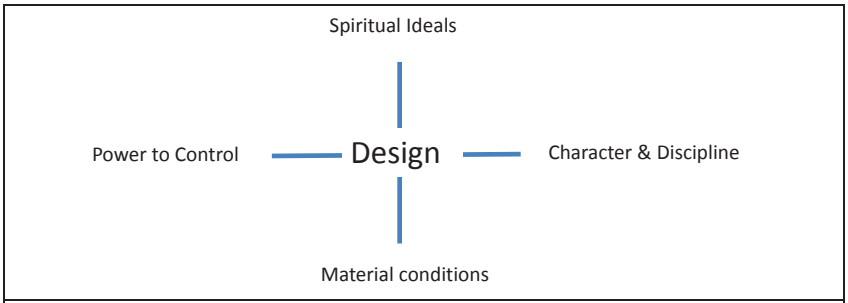

Figure 1.
Rhetorical Commonplaces of Design (Buchanan, 1995)

Design Is is a world-shaping endeavour, grounded in competing ideas regarding design: control and manipulation, spiritual ideas for human well-being, and the improvement of material and social conditions. Within these tensions, design is shaped by a by both material and societal/organizational history. This view highlights that, in addition to the ability to manipulate material structures in accordance with known theory, design does not occur *in an environment*, design occurs *because of an environment* (Orel 1995).

An illustrative account of the broader context of *Design Is* can be found in Pickering's (Pickering 1993) description of the design of the bubble chamber.[1] By Pickering's account,

[1] A **bubble chamber** is a vessel filled with a superheated transparent liquid (most often liquid hydrogen) used to detect electrically charged particles moving through it. (http://en.wikipedia.org/wiki/Bubble_chamber; accessed July 4 2014)

the different practices adopted in creating the bubble chamber (e.g. “big science” vs. “small-scale science”) were shaped by several factors, both internal and external. These factors include competition for funding, recognition by the social ecosystem of participants in different design environments, the history of material resistances and accommodations in earlier attempts, and the researchers own interpretation of design and what designing means. One researcher is quoted as saying, "There was a psychological side to this [design project]… I didn't want to join an army of people working at the big machines”, thus “I decided that if I were clever enough” it could “work in a nice peaceful environment rather than in the factory environment of big machines. I wanted to save cosmic-ray physics" (Galison 1985 p. 323).

In this example, the design of the bubble chamber is envisaged as enveloped by the context of a particular scientific domain – high-energy physics in the 1950s. The domain split into big vs. small-scale practices with different interpretations of the meaning and goals of physics research, differential requirements for the pursuit of funding, the need for coordination of design teams, and the pursuit of prestige. However, Galison was also engaged with persuading the scientific community that his small-scale approach could “save cosmic-ray physics” – that design was more than merely solving the technological problems. To holistically understand design through a practice lens requires our attention to focus on design as the confluence of cognitive, social, material meanings and the emergence of ideas and behaviors. Design accommodates performative activities, not as distinct components or constructs, but as the creation of shared backgrounds of understanding that enable coordinative and generative processes (Buchannan and Margolin, 1995).

Design Is requires understanding the engagement of heterogeneous groups of actors in creating a continually evolving background context even as “the range of products or areas where design thinking may be applied continues to expand” (Borgmann 1995 p. 25). Design does not begin with an identified problem but rather with an engagement to the world, in which an actor comes to envision a *social imaginary* (Taylor, 2004). *Design Is* practices are fundamentally indeterminate and require evolving engagement to the world in which design occurs. By focusing IS design research on a requirement extraction process, manipulation of material conditions as solutions to a defined business problem, and a specific evaluation regime, we assume narrow bounds of design as business value, system efficiency, and managerial structure and control. Absent from these accounts is the meaning of the problem, the ecosystem of actors who interpret their world as problematic, the and the background of values and ideals against which the artefact is considered a solution.

To deepen what *Design Is*, we turn to a practice view to shift attention from the artefact to the actions, ecosystems, and teleology of design, arguing for a depth of design around design practices and the ongoing evolution of designed artefacts. *Design Is* will help to unravel the complex design literature that often conflates design theory, design method, and design artefacts, providing an examination of design that “empowers individuals to explore the diverse qualities of personal experience and to shape the common qualities of communal experience” (Buchanan 1995 p. 29).

3.0 A Practice View of *Design Is*

A practice view of design begins by recognizing the inter-related social, cognitive, and material actions in design. The reflective actions of planning, problem solving, and the construction and evaluation of artefacts are only comprehensible against the shared background of values and meanings against which design occurs. Design is not simply the solution to a problem -- it must persuade people that it is an appropriate solution to an appropriate problem. This view is complementary to the artefact-centric perspective on design, and works toward a phenomenological examination of what *Design Is.* Design must accommodate the integration of styles of thinking (humanist, industrial, product-oriented), the social/political ecosystem in which design occurs, and the doing of design against the shared

background in which the problem and its solution make sense. Understanding design practices lies in understanding how the processes and actions of design emanate from an active engagement with "the moral and cultural excellence of the humanly shaped and built environment" (Borgmann, 1995 p. 18). Design envelops the social and informational qualities in common experiences (Lee et al. 2013) that ostensibly culminate in the design of engineered artefacts. In essence, *Design Is* highlights the inseparability and co-constitution of design within social, cultural, political, and material environments.

To understand *Design Is* from a practice view, we understand design as entailing the routinized ways of discovering, understanding, and acting (Reckwitz 2002). A practice view reveals the manner in which participants initiate and maintain design and make a place for new designs as part of routinized work, creating a sensitizing framework and vocabulary in the investigation of design as deeper than any single artefact. Through a practice view, we are afforded the ability to de-center the dominant focus on artefacts in design and instead locate design in practices of people participating in design in relation to the world within which they live.

Design involves multiple actors: from employees of the organization from whom requirements are elicited, to people who bring the developed systems forward into existing contexts. Each person has a different view on what is needed; what would be most beneficial, engaging, or aesthetic; what the problems are or what values the design should be aligned with. People come from differing backgrounds, attach different meaning to the values of a system, and have different experiences of encountering technologies that they bring to any design. From this perspective we understand that problems to which design is often focused, cannot be treated as given – problem creation occurs against the different backgrounds of the people involved. Design is collectively constructed toward an agreed upon problem (Getzels 1982). Design is about imagination composed of "specific forms, functions, and reinventions that might, or ought to appear" (Ramiller 2007 p. 2) and articulate a *social imaginary* (Taylor, 2004) and is not necessarily based on theoretical knowledge that already exists. Inventions, for example, as "a clear departure from the accepted ways of thinking and doing (Gregor et al. 2013 p. 345), may be based on substantive reasoning (Gregor et al. 2011) not on pre-existing theoretical knowledge. But inventions as artefacts and as functions must still be comprehensible to both the designers and future users. This is not to say that knowledge of the world cannot be gained through design but rather that design itself occurs through actions by which people "struggle discursively to construct their future reality" (Ramiller 2007 Abstract) since the objects towards which design points, do not yet exist. Understanding the practices from which a future reality is constructed requires that the rhetoric underlying design be surfaced.

Design is always contested (Buchanan 1995) requiring design to accommodate negotiation in interpretation of meanings, and the translation of multiple worldviews into a shared understanding. Negotiation is necessary as design is "a struggle for language which would be adequate to the task" (Bucciarelli 1994). These interpretations and translations result in the integration of different thinking styles (e.g. humanist, industrial, engineering, scientific, fictional), requires that the tensions of material, control, ideals and character that shape the design. A more holistic view of design is obtained by viewing these efforts as practices to accommodate the histories, interpretations, translations, and stabilizations amongst people involved in design.

4.1 Historicity

Design is requires an account of historicity: the shaping of design by organizational, societal or human situations. Superficially this shaping may be to maintain interoperability with existing technology, compatibility with social norms, and constraints based on knowledge of materials. But at a deeper level, interpretations and translations are mangled together with material considerations (Pickering 1995), and innovations are based on historical

precedence and the resistance of design to instantiation. Historical conventions, human expectations, and project anticipations are salient as the translations upon which design is based are revealed to be ineffective, incomplete or inaccurate. Designing in different areas of knowledge maturity (e.g., routine, improvement, exaptation, invention (Gregor et al. 2013)) will entail different dialectics of resistances and accommodations as designers situated interpretations are translated into a new reality. The interpretations and translations are interrogated to evolving understandings after each artefact instantiation, providing a historical process of knowledge creation that occurs in the ecosystem of any design effort.

4.2 Interpretation

Design is focuses attention and practice on a boundary object (Star et al. 2002) through which ideas are exchanged and negotiated. Such focus involves "an unsettled region, a zone of potential, that nonetheless contains the real material or content, and above all the idea of what will become the technology-enabled innovation…" (Ramiller 2007 p. 4). The indeterminate aspect of design is not necessarily a problem, but opens a space for an imagination of how the world could be other than what it is. In its earliest form design may be nebulous, difficult to communicate and shifting even for the actor who envisions it. It is likely that the design will not will not appear to other actors in the same way – given different worldviews, activities and language may not appear important, relevant, of value, or even possible. *Design is* involves interpretation as people gain an understanding of the situation such that an alternative world of a different situation appears plausible.

4.3 Translation

Design is entails a collective effort to which shared understandings – the background - can emerge. Without shared understanding, a collective understanding of any design is not likely to emerge from within the group. *Design is* translates personal interpretations into shared understandings. Translation can shift as the design context is presented in new and interesting ways (Paton et al. 2011) and elements from different interpretations are brought together. As these shifts occur, individual interpretations undergo deformation as translation continues (Star and Griesemer 2002). For example, a kernel theory (Kuechler et al. 2008a) will not directly determine how a technology is instantiated. It is first translated from its linguistic form into a principle that is then further deformed as it is reified into material components of a system. These translations (from interpretations of the situation) enable the problem to be articulated, actors in the design to be enrolled, and ideas to move from the virtual to the material.

4.4 Stabilization

Design is occurs as situated actions among participants in a world. People come from different social, political, and material worlds with unique viewpoints, power structures, and embedded meanings. Design may be undertaken by disparate and heterogeneous groups of consultants, technical experts, business management, and employees who act with varying degree of involvement. These intersecting social worlds comprise an ecosystem that shapes the exchange of design. Design activities, thinking, and methods are negotiated, becoming stabilized for clear and cogent interpretation and translation from all (Kelty, 2013). As design includes heterogeneous participants and worldviews, design methods must become recognizable and approachable by all but "unfortunately, *methodology* [is often] interpreted in its narrow form as specialized techniques or methods rather than in its architectonic from as systematic disciplines of integrative thinking, within which diverse techniques and methods are given direction and purpose" (Buchanan, 1995 pg. 37). Creating stabilized design ecosystems allows design to be an engagement between people, objects, and practices, supporting a deeper picture of what design is (Orel, 1995).

5.0 Case Example

Given these considerations, we now summarize a seminal DSR paper: Kuechler and Vaishnavi (2008a). This case is then re-examined through a more holistic perspective based on practice theory to expose the taken-for-granted activities that underlie the guidelines for DSR artefact and theory production that were followed.

5.1 DSR: Design Of

The detailed account of an ongoing DSR project provided by Kuechler and Vaishnavi (2008a) enables us to view the activities undertaken by the actors throughout the project. First, the authors state that a DSR project seeks solutions to real-world problems and that a goal of the project was to refine a starting kernel theory into a mid-range design theory. The researchers' project "originated in the continued interest of the industry advisory board … in business processes – specifically in courses and research to support business process design…" (ibid p 492) and reviewed several case studies supplied by the advisory board. The researchers concluded the problem "was the suboptimal design of business processes due to the lack of incorporation of soft context information into the final [business process] designs. (ibid p. 492). The hypothesized that suboptimal design was due to lack of soft context information (e.g. webs of interrelated qualitative influences in an environment.) and pursued an enhancement of business process notations that would make "soft context information more salient and more likely to be incorporated in final BP designs" (ibid. p. 493).

During their investigation of problem solving cognition in academic literature in education and cognitive psychology, the researchers "came upon our 'kernel theory'" that fit the hypothesized cause of suboptimal design. The design goal then became "to induce 'narrative thinking' by incorporating textual representation of soft information into a graphic design notation via a software artefact" (ibid p. 495). The artefact evaluated iterated through multiple prototypes as in evaluation of early versions subjects avoided using the presentation manipulation (the narrative components) despite being told that they were important. Use of mouse rollovers to replace links was equally unsuccessful. Finally the researchers used new subjects and "ultimately designed the display software to force a sequential viewing of process text description" (ibid p. 495).

The researchers followed Walls et al. (1992) for the development of IS design theory. The researchers interpreted the kernel theory literature but "took no liberties with maters of fact, but repackaged conclusions to concisely state what was of interest to us" (ibid 397). Subsequently a "conceptual leap from kernel theory propositions to the primary propositions of the [IS design theory]" was made to create a set of testable propositions for future research. After much reflection the researchers conclude that they contributed to the development of a mid-range IS design theory but that the design process for the artefact was not novel in any meaningful way.

5.2 Exposing *Design Is*

We now examine this case through from a more holistic perspective informed from practice theory. We specifically highlight unexamined actions and assumptions which contributed to the design process. At the outset, the problem that became the focus of the research was a specific interpretation of several case examples provided by industry. That is to say, the problem was not clearly *given by the world* or discovered in the world, rather was created from an understanding of the world of business process design in organizations that came from interpretation from the case texts. This is the first indication that the researchers

performed numerous interpretations to develop their own understanding of the problem space and that different interpretations might also have been plausible. The interpretations are only intelligible against the shared background of the case authors, the university setting and the researchers own experiences. Significantly the researchers state that "based on 20 + years of IS industry development experience we wondered if the real problem was not the capture and representation of soft context information – in most cases the information was available in the original requirements notes – but rather in making that information more immediately available and especially more salient to the designer" (Kuechler and Vaishnavi, 2008a, p. 493). Thus designing a solution required that they translate the problem into a solution by hypothesizing that "the suboptimal design of business processes **[was] due to** the lack of incorporation of soft context information…" (ibid p. 492, emphasis added). Their review of selected problem solving literature revealed a set of theories that were interpreted as consistent with the hypothesis that narrative thinking would provide a solution and they used this literature to "to build the position that the highly qualitative, sometimes political, frequently ambiguous nature of soft information was best captured by textual narrative rather than graphics" (ibid p 494). This is a clear indication that the problem formulation was based on a long personal industry history that allowed the interpretation and translation from the "kernel theory" to the conceptual leap of new hypothesis not found in the literature.

These interpretations become a common background (for the researchers) against which certain technology features and human attributes are viewed as salient and brought into the foreground. The selected cognitive science and education literature from which the kernel theory was chosen contain another and a potentially competing ontology which would bear examination as it acts as another background (Hovorka 2010). The researchers note the identification of narrative thinking "gave no specific prescriptions as to how the information could be used in the context of IS/BP modelling" (Kuechler et al. 2008a p. 494), and that the kernel literature contained conflicting mechanisms for comprehension. In repackaged [kernel theory] conclusions to concisely state what was of interest to us" the researchers translate the theoretical conflict into propositions they assume will inform and extend those theories in a different context.

These acts of interpretation and translation are critical because the researchers are creating the problem they will solve against a taken-for-granted background – the problem is not discoverable in world in the same way relationships are discovered in the physical sciences. The comprehensibility of the problem, the reliance on theoretical constructs and future statistical testing and its societal value are all predicated on the existing practices of DSR, or the business world, the reference literature and the researchers own design experience.. Changes in any one of these ecosystems would result in different design configurations and design processes.

Nor was the translation of the virtual design into a material artefact a simple process. The act of prototyping resulted in multiple resistances of the problem to the solution as "pilot study subjects attempted to answer questions about the operation of the process without viewing any of the narrative components" (ibid p. 495) and a second instantiation of mouse-rollover technology also failed to provide the desired hypothesis confirmation. This observation is consistent with Lee and Dennis (2012) who concluded that subjects are not blank slates reacting to features of the technology but rather have their own technology backgrounds and agendas through which the subjects interpreted the meanings and capabilities of the technology prototype. In response to resistances, the design researchers in this case devised "some other tentative approach toward [the] goal … circumvent the obstacles that [have] already been encountered" (Kuechler and Vaishnavi 2008a p. 569). In this design example, accommodation to resistance was achieved by iterating through various imaginations, material prototypes, with new subjects and "ultimately designed the display software **to force a sequential viewing** of process text description" (emphasis added ibid p. 495). This forced behaviour came about so the research could realize the primary goal for the project: "to improve understanding of and reasoning about process models" (ibid p. 496)

through controlled experimental testing. This manipulation of the subjects can be seen as an academic practice prescribed by DSR in which the researchers "truly wished to test our primary hypotheses that narrative mode thinking could be induced by a presentation artefact." Although the long term goal of the research was to produce an artefact which would benefit the production of business process models, the value system underpinning the interpretations and translations and the immediate and long-term assumptions of the world were taken-for-granted.

The ecosystem of this project was narrow and limited in the number of actors involved. The set of case studies from which the problem was created as well as the relevant cognitive, communication, educational, and psychology literature from which kernel theory was translated was pointed, not comprehensive. This is not a criticism as much as recognition that the world of this problem was reflective of a particular set of academic practices with which the researchers were familiar as represented in that literature. Nor is there any indication that industry (in the persons of the advisory board) or professional modellers were used to elicit artefact requirements, suggest prior design alternatives or exposed theories. The only noted input from anyone other than the researchers was the perceived misbehaviour by experimental subjects who were eventually forced to view the narrative artefact thus allowing confirmation of the design. This very closed ecosystem enables control by the researchers of the design direction but also limits imagination to the researchers own interpretations of the world in which the problem exists.

6.0 Discussion

Exploring what *Design Is* holds the potential to add considerable depth to an understanding of design and the emergent perspectives that may not be readily obvious when employing the dominant, artefact-centric perspective found in DSR. To understand the cognitive, social and material strands that contribute to depth of design, our aperture of understanding needs to be expanded, and quite possibly, our interpretation of 'artefact' needs to change. To move from *design of* to *Design Is* entails displacing our own understanding of DSR to allow for new types of contributions to the predominant genre. When design is considered through a practice lens our ways of speaking of and doing design expands to include the histories, interpretations, translations, and stabilizations of people. This mode of thought expands to the full breadth of what seminal theorists envisage as scientific enquiry into design.

A Practice View: Mediating Informative and Constructive Knowledge

We know that design involves the processes of people in construction, organization, and representation of knowledge (Germonprez et al., 2011). We also know that design involves the development actions in the implementation and evaluation of IT artifacts (Hevner et al., 2004). Yet, these positions often remain distinct from each other. The relationship between these two positions is not simply formed through written acknowledgements in published literature. Limitation statements of "we did not account for the social process" or "we did not evaluate the artifact in practice" fail to recognize the necessary conditions shared between *Design Is* and *Design Of*. We have argued that a bridge can be constructed through the exploration of a third involvement, one that mediates between informative and constructive knowledge (Gregor and Hevner, 2013) necessary in any design.

A practice view reveals a mediating perspective between design processes and artifacts, illustrating the relationship of technologies-in-practice (Orlikowski, 2000). Design has a depth beyond the IT artifact, and using a practice view can aid a more holistic investigation of design provides, providing avenues for publishing design research that does not adhere to a functional DSR publishing perspective (Gregor and Hevner, 2013). Design research should not be limited to the solution-based view where design knowledge only resides at the end of a series of design events. Design theory lies across an entire chain of events, including the

informing knowledge that contributes to a final artifact. Like the fisherman who catches fish, knowledge is not only about *the fish,* knowledge is also about *background from which the fish comes.*

A practice view allows researchers to theorize design across the entire landscape that it resides, one that includes the actions of people involved in the ongoing and evolving negotiations that constitute design as equally as any artifact. In addition it opens research in phenomena in which the shared backgrounds where design configurations appear are important including secondary design (Germonprez et al. 2011), open source software development (von Krogh and Spaeth 2007), and open innovation (West and Gallagher 2006). In this article, we explored four aspects of *Design Is* as the historicity, interpretation, translation, and stabilizing ecosystems available in design research. As we ground these concepts to fully understand the potential gains and limitations of *Design Is*, we reinterpret design science in IS to capture a depth of design thinking exhibited in other disciplines. We explore this with the hope of expanding the aperture of DSR towards more than the construction and evaluation of new designs, and towards an increased attention to the co-constitution of social and material practices that *Design Is*.

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