

Closing the practice loop: Practice design research

Göran Goldkuhl^a and Jonas Sjöström^b

^a Department of Management & Engineering, Linköping University, Sweden

^b Department of Informatics & Media, Uppsala University – Campus Gotland, Sweden

Abstract

There exist different types or genres of design science research (DSR) in information systems, like laboratory-oriented and practice-oriented DSR. This paper investigates different arguments for practice-oriented approach to DSR. It uses the research approach of practice research as a starting point and elaborates then a possible approach to practice-oriented DSR, labelled Practice Design Research (PDR). This approach addresses some unresolved issues in IS DSR like the roles of theorizing and evaluation. PDR consists of two inter-related sub-activities: theorizing and situational design inquiry. The conduct of situational design inquiry is described as iterative cycles of 1) pre-evaluate, 2) plan & design, 3) test & intervene and 4) post-evaluate. These four sub-activities are described through iterative sub-cycles. The foundations of these iterative sub-activities/cycles in pragmatist philosophy and theory are explained.

Keywords: Design science, practice research, epistemology, practice theory, evaluation, theorizing, pragmatism

1 Introduction

Design science research (DSR) has emerged as viable research approach in information systems (IS). The interest for this type of research among IS scholars seems to be still growing. We see many applications of DSR and there are many meta-scientific contributions concerning DSR methodology and epistemology. Despite a decade of progress in DSR, there are unresolved issues, controversies and even confusion among IS scholars concerning how to conduct DSR. Gregor & Hevner (2013, p 338) state: “We contend that ongoing confusion and misunderstandings of DSR’s central ideas and goals are hindering DSR from having a more striking influence on the IS field. A key problem that underlies this confusion is less than full understanding of how DSR relates to human knowledge”. Iivari (2015, p 107) takes a similar position, stating that “the scientific discourse on DSR is still in a state of conceptual confusion”, suggesting that one cause of confusion exists due to different types or DSR genres, namely: 1) A *laboratory approach*, in which the DSR scholar addresses a general problem (conceived as a “class of problems”) through the design of “conceptual artefacts” and possibly materialized instantiations. The *laboratory approach* does not require specific and real problems in real-life practice contexts. 2) A *practice approach*, in which the DSR scholar addresses real-life problems through building

specific artefacts intended to resolve such problems. Collaboration with practitioners, in this genre of DSR, is essential.

Iivari (2015) claims that the laboratory genre seems to be the prevailing approach in the IS DSR community following such bias in the seminal work of Hevner et al (2004). This can explain the criticism and argumentation of Sein et al (2011) when introducing their intervention-oriented approach to DSR labelled Action Design Research (ADR). They claim that “traditional design science does not fully recognize the role of organizational context in shaping the design as well as shaping the deployed artefact.” (ibid p 38). How to take into account specific practice contexts in DSR efforts is thus one important concern for DSR.

Interestingly – despite the emerging recognition within the IS community that DSR may benefit from elaborating on the relationships between research and practice – there has not been any substantial efforts to exapt ideas from the field of practice research into the DSR field. Practice research (PR) has emerged as a viable research approach in different social sciences. There exists an active branch within the discipline of social work (Pain 2010; Salisbury Forum Group, 2011; Uggerhøj, 2011). Similar approaches, with the same or similar labels appear in e.g. nursing (Stevenson, 2005), organisational strategy (Whittington, 2006), urban planning (Watson, 2002), education (Nilsen et al, 2012) and human-computer interaction (Kuutti & Bannon, 2014). Research with a practice orientation and label has also been introduced in information systems (Mathiassen, 2002; Goldkuhl, 2011). Practice research in IS (Goldkuhl, 2011; 2012a) can be seen to be a research approach that may encompass action research, design research or evaluation research as special variants. Practice research resonates well with “mode 2 knowledge production” (Gibbons et al, 1994) and “engaged scholarship” (Van de Ven, 2007).

With this backdrop, we turn to two controversies and unresolved issues in DSR: *Theorizing* and *evaluation*. First, the role of *theorizing* in DSR. Early dominant publications (e.g. March & Smith, 1995; Hevner et al, 2004) downplayed the role of theory as an outcome from DSR. There have been many objections to this a-theoretical stance; e.g. Venable (2006), Gregor & Jones, (2007), Goldkuhl & Lind (2010), Lee et al (2011) and Kuechler & Vaishnavi (2012). It is not only a matter of the nature of a theory outcome (as design theory or design principles), but also how theorizing takes place as an integral part of the DSR process. In some established DSR process models (e.g. Peffers et al, 2008) theorizing has no distinct place. Second, the role of *evaluation* in DSR. In Hevner et al (2004) DSR is understood, in its essence, as an iterative cycle of build and evaluate activities. However, these authors were not detailed concerning how evaluation should inform the design process in different stages. As a response to this, several evaluation frameworks have been presented, proposing roles and process points for evaluation (e.g. Venable et al, 2012; Sonnenberg & vom Brocke, 2012). In addition, there are alternative approaches, like ADR (Sein et al, 2011), where evaluation is fully integrated into other activities of building and intervention and thus not seen as separate and distinct activities.

We could add to these two important DSR issues a third one, which is the intersection of the two. How is evaluation related to theorizing? Should it be seen as a part of theorizing or should be closely related to the design process of a new artifact?

In this paper, we embrace a practice view of DSR. The main purpose is to elaborate a practice-based DSR approach. When doing this we seek to clarify the meaning of different aspects of DSR, especially theorizing and evaluation by exploring DSR as

a special mode of practice research. We exapt ideas from practice research as a general topic as a means to conceptualize DSR and its constituents of evaluation and theorizing. This is a way of framing our paper purpose as one of DSR reconceptualization based on a practice perspective. It is possible to re-frame the purpose from a practice research perspective. Taking such a perspective as a vantage point the purpose of the paper is to elaborate the research approach of practice research with an explicit design orientation; i.e. to clarify the subclass of design-oriented practice research. This means that the paper can be read differently depending on the reader's interest: 1) A DSR interest to understand how practice-based DSR can be conducted or 2) a practice research interest to understand design-oriented practice research.

2 Research approach

We use the unresolved DSR issues – evaluation and theorizing – together with the knowledge need for an elaborated practice-based DSR as impetuses for this paper. They form together a problematic situation to be addressed in this inquiry. The main issue is the unclear relation to practice. We mean that how we frame DSR, either as a laboratory exercise or a practice improvement effort, has fundamental consequences for DSR conceptualization and performance. Our purpose is to give a contribution to DSR as research into practices. Our basic conception is to see DSR as a practice loop, i.e. from problematic situations in a practice through design and back to practice as an artefact-renewed and improved practice (figure 1).

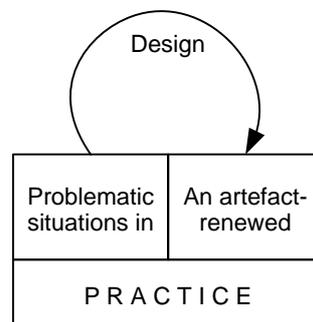


Figure 1. Design research as a practice loop

It is fundamental to start the process with the practice and its problematic situation and to end the process with a renewed and improved practice. This means that we propose to use design (research) as a way to conduct an inquiry process in its original pragmatic sense (Dewey, 1938), i.e. as movement from a problematic situation to a resolved and settled situation.

The way we have conducted this is in itself through an inquiry. The different problems, concerns and issues described above constitute the problematic situation that needs to be resolved through our inquiry of this paper. The resolved situation, as our knowledge contribution, is a practice-oriented conceptualization of design research. We sketch an approach to design research that we have labelled practice design research (PDR). We will (in the next section) go through some important literature sources that have argued for practice DSR concerns. We do not start our work of

developing PDR from scratch. As mentioned, we obtain our main inspiration from the research approach of practice research. We will go through this research approach in section 4. In section 5 we will articulate practice design research as a possible DSR approach with the main idea to direct design research as a practice improvement endeavor. In this section we will not only present conceptualizations and models of PRD. We will give theoretical grounding through literature references. The theoretical sources are mainly obtained from pragmatist philosophy and theory since our approach is positioned within this paradigmatic stance. The paper is ended with conclusions in section 6.

3 Practice orientation in current design science?

Practical problems are considered as a starting point in several DSR approaches (e.g. Hevner et al, 2004; Peffers et al, 2008). However, criticisms are formulated that these approaches pay too little attention to the organizational context of IT artifact design (Rohde et al, 2009; Sein et al, 2011; McKay et al, 2012). Hevner (2007) has based DSR in three cycles; relevance, design and rigor cycles. The separation of relevance cycle from design cycle might however be inappropriate for making design sufficiently practice-based. Sein et al (2011 p 37) criticize established DSR approaches to “value technological rigor at the cost of organizational relevance, and fail to recognize that the artifact emerges from interaction with the organizational context even when its initial design is guided by the researchers’ intent”. Sein et al (2001) apply an ensemble view of IT artifacts (from Orlikowski & Iacono, 2001). This means that IT artifacts are seen as carriers of “social structures” and embedded in social practices. This demands a close interaction with the practice during its development. Sein et al (2011) object to a separation between building, intervention and evaluation. Instead they speak of interweaving these types of activities. Evaluation should be seen as an ongoing and concurrent activity to building and not as they interpret current DSR to “relegate evaluation to a subsequent and separate phase” (ibid p 37). The importance of organizational intervention as an integral activity of DSR is emphasized; “current DR methods ... consider organizational intervention to be secondary” (ibid p 39). Hevner (2007) considers intervention as matter of technology transfer that can be managed through action research. The key idea of ADR is the opposite; to integrate and fuse DSR and action research into one coherent research approach.

McKay et al (2012 p 135) demand DSR to be “geared more toward intervening in contexts to make improvements and ensuring that change works well”. They argue against a narrow “construction-oriented view” of DSR and claim the importance of a broader human-centered perspective including topics like “how IT ... artifacts appear to users, what they mean to users, how they communicate to users, the nature of the user experience with the artifact, the value ascribed to designed artifacts within contexts of use by users.” (ibid p 137).

Rohde et al (2009) investigate epistemological foundations of DSR from a social practice perspective. Their stance is to conceive “design as an intervention into social practices”. Such a design practice is seen “as a reflective practice confronted with wicked situations.” They claim the importance that evaluation should be conducted in real world settings. The introduction of new IT artifacts in social practices is always made through an appropriation process. Rohde et al (2009) claim social practices to “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.” The consequence of this is that “emergence in the appropriation process cannot be observed before the intervention has occurred” (ibid). There needs thus to be an intervention before a proper evaluation can be conducted. The appropriation view is far from seeing IT artifact implementation as a matter of technology transfer as claimed by Hevner (2007).

Simplistic sequences of DSR activities (like build → evaluate → intervene) should thus be avoided. Epistemologically, a sound action logic is much more complex and nuanced.

Arguments for a more practice-based foundation of DSR can be found in the three referenced contributions above. Rohde et al (2007) and McKay et al (2012) present general arguments for adopting a practice approach to DSR. They do not operationalize this into any clear research approach. This is however done by Sein et al (2011). An alternative DSR approach is presented in their Action Design Research method. Their arguments against sequencing evaluation after building and before intervention are convincing. However, a DSR scholar is not much helped through their descriptions of interweaving building, evaluation and intervention. Even if these activities are closely related it is not helpful to claim them as integrated and fused in the way Sein et al (2011) do. It should be possible to analytically differentiate such activities and specify how they can be possibly sequenced in different ways. We will present such attempts in the following section when introducing Practice Design Research.

Even if there are several similarities between ADR and our approach (PDR), there seem to be differences between our starting points. It seems that Sein et al (2011) have started with DSR and then adapted it and fused it together with action research. Our starting point is practice research. We have then proceeded with this research approach and specified how design research could be one variant (sub-class) of it.

4 Practice research

Practice research means research into some practice(s) with the purpose to improve such and similar practices. Fundamentally, we base our practice view on Dewey's (1938) idea of inquiry as a theory of knowledge. Through ‘moral inquiry’, i.e. inquiry into social practice, experiences are gained through activities aiming at improving practice. These experiences – including the adoption and refinement of existing ideas – are the basis for learning. Following Dewey's view, engagement with practice is an essential component in research. Consequentially, there are several characteristics that are shared among different PR approaches, like:

- Conceiving the empirical field as a set of practices
- Close investigation of current practices
- A research aim of improvement of practices
- Collaboration between researchers and practitioners

The presented research here takes the practice research approach as presented by Goldkuhl (2011; 2012a) as a starting point. .

Goldkuhl (2011) has described practice research as an interplay between situational inquiry and theorizing. The anatomy of practice research consisting of these two sub-practices is described as in figure 2. Three target practices (research community, general practice, local operational practice) are included in the figure. Different actors have been placed in the anatomy model. The following abbreviations have been used: R = researchers (active in the research process); P = practitioners (belonging to the local practice); OR = other researchers (not participating in the focused research; belonging to research communities with relevance for the focused research); OP = other practitioners (in practices outside the studied local practice; i.e. belonging to “general practice”).

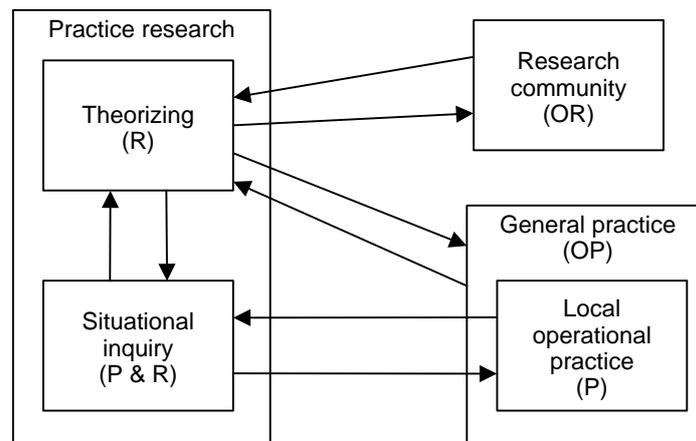


Figure 2: The anatomy of practice research (from Goldkuhl, 2011).

Situational inquiry (SI) means an investigation into one local practice or sometimes into several practices. The situational inquiry is driven by conceiving problematic situations in the local (operational) practice. The aim is to understand the practice in order to improve it. A situational inquiry 1) can be just a diagnosis or 2) it can include design proposals or 3) even implementation of change measures and new artefacts (Goldkuhl, 2011). The result from SI in relation to local practice(s) is labelled a local practice contribution. This means that a local practice contribution can be an evaluation or a design/change proposal or implemented change measures. SI will often be conducted collaboratively between researchers and practitioners.

SI will interplay with theorizing during a practice research. Theorizing comprises both furnishing of “theoretical tools” to SI and taking care of empirical data from SI. Theorizing means knowledge production. It produces useful knowledge aimed for “general practice”, that is practice communities that are not limited to the local practice studied. This is called general practice contribution. Theorizing as a sub-practice of PR exists with the purpose of adding to the scientific body of knowledge within the research community.

5 Practice design research

5.1 The interplay of situational design inquiry and theorizing

We apply the perspective and the anatomy from practice research as described above in our endeavor to elaborate a practice oriented DSR approach. We label our approach practice design research (PDR), which is a similar labelling as Action design research (ADR) of Sein et al (2011). The ADR originators refer to action research as the fundamental inspiration and reference model when adapting DSR. In a corresponding way, we base our DSR adaptation within practice research. What we accomplish in this development is thus the formulation of a special variant of practice research that is oriented towards design as the primary kind of practice improvement.

The general anatomy of PR (from Goldkuhl, 2011) with a division into theorizing and situational inquiry is kept here. We label “situational inquiry” of general PR as “situational design inquiry” here in order to emphasize the design orientation of PDR. The structuring of theorizing and situational (design) inquiry has been done in new ways within PDR (figure 3) compared with general PR.

Following PR, it is important to conceive of theorizing as a distinct and separate sub-activity within a DSR study. This addresses the confusion concerning DSR outcomes as local artefacts vs. general knowledge. In Hevner et al (2004) the outcome of DSR is emphasized to be an artefact – a construct, method, model or instantiation. Hevner et al (2004) mention that artefacts may be technology-based (e.g. software), people-based (e.g. incentives that affect people’s actions) and/or organization-based (e.g. process design). Several scholars are demanding DSR outcome to also be of abstract and theoretical character (e.g. Venable, 2006; Sjöström & Ågerfalk, 2009; Lee et al, 2011; Winter, 2013). Gregor & Hevner (2013) differentiate between contributions on different abstraction levels, from instantiations (level 1), nascent design theory (level 2; constructs, methods, models, design principles, and technological rules), to design theory (level 3; ‘mid-range and grand theories’). Our interpretation of the discourse is that IS scholars recognize that theorizing is an important but insufficiently conceptualized part of DSR. The division in PDR into theorizing and design inquiry emphasizes that theorizing is an explicit part of such an approach aiming for general and abstract knowledge, in addition to contributions made to the local practice. Theorizing in PDR should result in 1) general practice contributions and 2) additions to the scientific body of knowledge following the principles of PR (figure 2). Such results can be abstracted descriptions of artefact features and their contributions to practical use values (as a kind of design principles).

While we separate situational design inquiry from theorizing for the sake of conceptual clarity, we acknowledge a practical entanglement of the two. Figure 3 illustrates the anticipated value creation in PDR: Through the inquiry process needs for knowledge and cognitive tools are identified. These triggers the theorizing activity search for or create suitable knowledge to be supplied to the situational design inquiry. Through theorizing different knowledge needs are generated like hypotheses and questions sometimes operationalized in data collection instruments. Situational inquiry feeds empirical data into theorizing as a source for analysis, abstraction and formulation of theoretical propositions. The remainder of figure 3 is discussed in depth in sections 5.2 – 5.5.

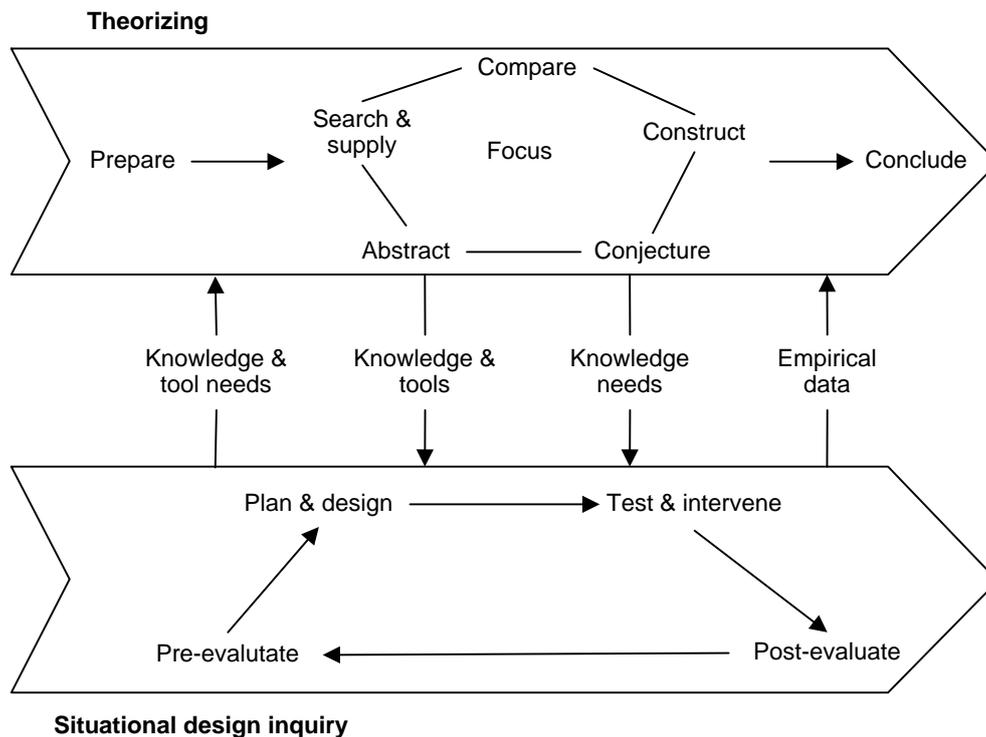


Figure 3: Theorizing and situational design inquiry in Practice design research.

5.2 Theorizing activities in PDR

PDR theorizing is divided into three stages (figure 3), slightly revised from Goldkuhl (2011): Prepare, continual theorizing, and conclude.

The **prepare** stage includes an initial formulation of *research interest and research questions*, as well as an initial *establishment of the knowledge base* for the study (i.e. literature search and study). Further, there is a need to make initial arrangements for the empirical work in situational design inquiry, including furnishing of *cognitive tools* – selection and situated adaptation of ideas from the knowledge base – for SI. It is important to emphasize these initial formulations of research interest and establishment of knowledge bases are provisional and open to later refinement. The prepare stage is to give the design study an initial focus and direction.

The **continual theorizing** stage in PDR means a continual interest in conceptualizing and explaining the emerging theoretical focus at hand. The focus emerges through on-going reflection and learning, which may lead to a revised understanding of the problem and its solution, and sometimes to a shift in research interests and theoretical focus. Continual theorizing consists of several generic activities: (i) Abstraction (data analysis and conceptual development), (ii) search and supply of relevant extant knowledge that may be relevant in the PDR process, (iii) compare, i.e. a continual analysis and comparison of 1) different empirical elements, 2) different theoretical elements and 3) consistency between data and theory, (iv) construct/design of cognitive tools for descriptive, explanatory, normative and prescriptive purposes, and (v) conjecture, i.e. articulation of hypotheses and issues to study in the empirical SI. These activities are considered ‘generic’ in the sense that they exist in some form

in all theorizing situations, whether explicitly reflected upon or not. We conceive of theorizing as a continual shift between the activities, aligned with activities in the SI. It is hard to state a clear epistemic order between the activities; therefore there are no arrows in figure 3 to indicate any particular order.

The **conclude** stage corresponds to formalization of learning in ADR, and refers to the post-inquiry work to make final reflections and formalize the results of the theorizing process intended for targeted audiences (research community and/or general practice).

5.3 Situational design inquiry

Four stages are identified as fundamental in the design inquiry process: 1) Pre-evaluate, 2) plan and design, 3) test and intervene, and 4) post-evaluate. The four stages are illustrated on a high level in figure 3. The stage-division is inspired by the inquiry process as described by Dewey (1910; 1938) and the principal stage division of the act by Mead (1938). We synthesize Mead's division of four phases (impulse, perception, manipulation and consummation) with the three-stage model presented by Goldkuhl (2012b), consisting of pre-assessment, intervention (including simultaneous monitoring), and post-assessment. In comparison with Mead (1938) and Goldkuhl (2012b) a second phase of planning has been added and inserted between pre-assessment and intervention. PDR thus follows Dewey's concept of inquiry by acknowledging the necessary moments of suggestions and reasoning before embarking on action. Each stage in the PDR view on situational design inquiry in turn consists of activities as elaborated in figure 4.

The PDR inquiry process corresponds fairly well with the phases in canonical action research as described by Susman & Evered (1978). Pre-evaluate corresponds directly to "diagnosing" in the model by Susman & Evered (1978). Plan & design corresponds to "action planning" and test & intervene corresponds to "action taking". Post-evaluate includes "evaluation" and parts of "specifying learning". This latter activity is however also included in theorizing; cf Goldkuhl (2012a).

The **pre-evaluate** phase (of this new SI model) starts with the experience of problematic situations; something "difficult" or "disturbing" following Dewey (1910). The next stage is the generation of data about the problematic situation ("observe"). Data should be recorded and analyzed ("describe & abstract"). The situation (according to generated data and conducted descriptions) needs to be explicitly evaluated ("assess"). This initial phase of establishing a problematic situation and its evaluation is done in concordance with an emerging focus and demarcation. The evaluation of the current situation should not only be done with a critical knowledge intent, i.e. a search for "what does not work". This should be complemented with an interest for "what works (well)", i.e. different strengths in the situation. Such an analysis is often called an appreciative inquiry (Ludema et al, 2001).

The activities of pre-evaluate should be seen as iterative and continual. A principal epistemic order has been described above and in figure 4, but this should not be seen as a model of "frozen stages". This comment pertains also to the overall inquiry structure and the other three inquiry stages.

Plan & design means the generation of proposals and a direct assessment of these. However, there cannot be a plain reaction from identified problems to suggestions. It is necessary to reflect on and articulate values ("desire") as a basis for proposing. Otherwise, there is a risk that trivial problems are amended and severe prob-

lems are neglected. A value analysis can thus also slightly shift the focus from the pre-evaluate stage in this design stage.

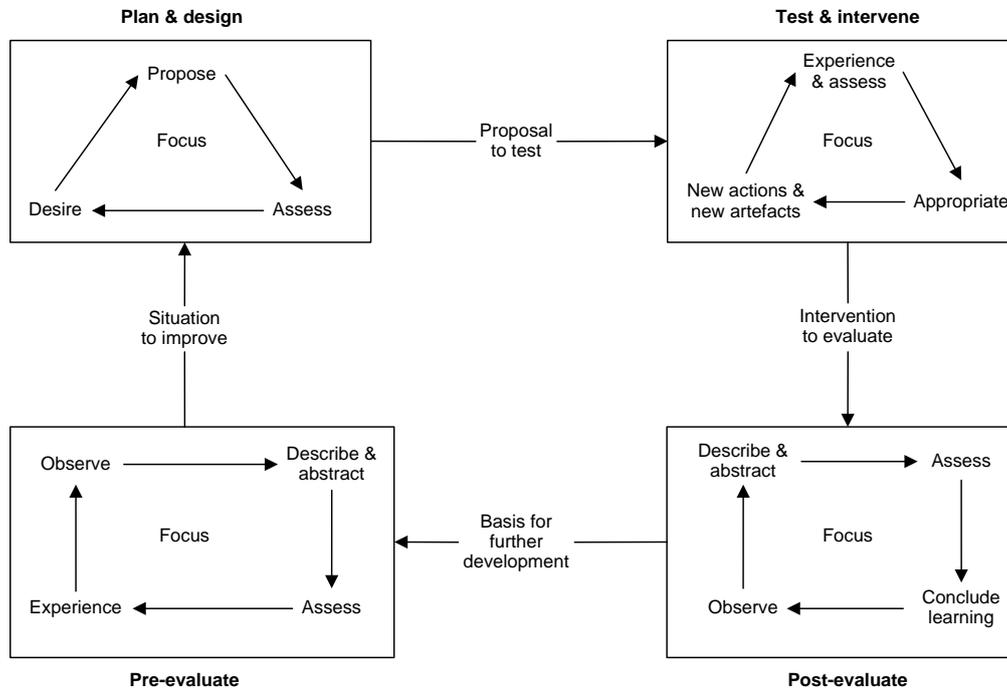


Figure 4: The situational design inquiry process unfolded.

The propose phase can consist of different sub-steps, such as incubate, generate/capture, formulate, visualize and materialize. Incubate is the second step in the classical creativity model by Wallas (1926). The first step in this creativity model is “preparation” and this corresponds well to pre-evaluate in this presented inquiry model. The third step is “illumination”, which corresponds to generation (of ideas/proposals). The fourth and last phase in the creativity model by Wallas (1926) is “verification” and this corresponds to the assess phase in plan & design and also to the two subsequent stages (test & intervene and post-evaluate). Propose covers the generation of new designs of different degrees of realization; everything from hunches and ideas, to visualizations in models and further to instantiated prototypes and full-blown products.

Assessment in plan & design is a desk-top evaluation of proposals before any practical test. Implied consequences of the projected suggestions are sought for. This assessment should include a clear comparison between status quo (problem statements from pre-evaluate) and the proposed solution and its (through reasoning) identified consequences.

Test & intervene means that new actions are taken in relation to the inquired practice. This should also, following the tenets of design science, include the use of new artefacts. A current practice might be resilient to changes and new actions. In order to get new procedures to work, there is often necessary to appropriate these new procedures to fit the situation (Rohde et al, 2007). Modifications and adaptations need sometimes to be done. This appropriation is conducted based on experiences and an

“assessment-in-action”. This follows the theories of Schön (1983) stated as “reflection-in-action”. Typically, this stage of test & intervene can be iteratively conducted until a new (modified) way of working is functioning satisfactorily. What is implemented can thus deviate from the planned intervention.

This new action is, in an inquiry context, seen as a test. And as such, it should be evaluated properly, not only through an assessment-in-action. There should be an explicit **post-evaluation**. Such an evaluation includes data collection (“observe”), description, abstraction and explicit assessment. This finalizing post-evaluation should also comprise an overall statement of the learning from the inquiry process; i.e. how the problematic situation has been transformed into a satisfactory one. Dewey (1938) describes the closure of an inquiry as a resolution of the problematic situation into a settled one.

5.4 Situational design inquiry as a learning process

PDR is also informed by Kolb’s (1984) model of experiential learning, consisting of a cycle of 1) concrete experiences, 2) reflective observation, 3) abstract conceptualization and 4) active experimentation. In a simple sense the inquiry process can be said to follow this cycle. The inquiry process, stated above, starts with experiences of something troubled. It goes through stages of observation, reflection and abstraction to a test (i.e. active experimentation) followed by experiences of this and further learning through observation, reflection and abstraction. However, there are some aspects that are not sufficiently explicit in Kolb’s model in relation to inquiry. There is no explicit development of proposals based on comprehensions of problems. Evaluation is not put forth as an important stage but somewhat implied in reflection. Anyhow, the different stages mentioned by Kolb (1984) are important, and they appear as different phases within the four stages. The pre-evaluate stage starts, as said, with some experiences and proceeds with observation and abstraction. Reflection and abstraction play important roles in working with proposals in the plan & design stage. Test & intervene corresponds to active experimentation, but it involves also observation and reflection based on experiences from new action. The post-evaluate stage works with observation, reflection and abstraction.

It is important to recognize that abstraction plays important roles in the situational inquiry as described here. It could be interpreted in Goldkuhl’s (2011) description of practice research that abstraction only occurs in the theorizing sub-practices. Abstraction is of course a central part of theorizing, but is not limited to occur in those theory-oriented activities. As can be seen in figure 4 and the appurtenant text description (section 5.3), abstraction is important at several places in the inquiry process. Abstractions are made (within SI) when they support the direct knowledge development of the situational design inquiry. SI is considered to be a knowledge integrated development of workpractices. The development of knowledge (through observation, description, abstraction, evaluation and ideation) is a pivotal and integral part of what we call a situational design inquiry. Informed change should be informed by 1) generated and refined knowledge from the current practice together with 2) trans-situational knowledge infusion from theoretical sources.

Another aspect of learning in PDR is an emergent view on study focus and knowledge interests in both theorizing and situational inquiry. It is important to analytically differentiate between 1) research focus and purpose generated within theorizing and 2) the practice and design inquiry focus and purpose of SI. This is the case

even if these two knowledge interests might coincide to a large degree. The SI focus/purpose will be dependent on the definition of the problematic situation. The SI focus/purpose will of course influence the research purpose, since what may be achieved through a specific SI cannot fulfil all research purposes. There might need to be an adaptation of research purposes in relation to what is possible to attain through the empirical SI, and the empirical SI itself may be characterized by a new understanding of the problem and its possible solutions as the inquiry process unfolds.

5.5 Evaluation in PDR

At the heart of pragmatism lies an interest to engage with the development of *ideas* that support human understanding and govern human action. We differentiate between theoretical ideas and situated ideas that are proposed in the situational design inquiry. We conceive of an ‘idea’ in a broad sense. It encompasses any type of representation of knowledge (instantiations, methods, models, concepts, design principles, design theory *et cetera*).

Evaluation plays crucial roles in both sub-practices of practice design research. In the design inquiry process, evaluation is vital for understanding the current practice, emergent design ideas and the usefulness of new artifacts put into test and use in the practice. Evaluation appears in all four stages of the inquiry process, which can be found in figure 4 (through the word ‘assess’). However these evaluation activities in the inquiry stages differ in character. The differences are summarized in table 1.

Table 1: Different types of evaluation in the stages of situational inquiry.

Stage	Temporality	Evaluation object	Character of evaluation
Pre-evaluate	Evaluation-before-design	Current practice	Observation-based explicit evaluation
Plan & design	Evaluation-in-design	Proposals	Evaluation of anticipated consequences
Test & intervene	Evaluation-in-action	Experiences of new action and artifact	Reflection-in-action
Post-evaluate	Evaluation-after-action	Changed practice through new artifact	Observation-based explicit evaluation

Venable et al (2012) and Sonnenberg & vom Brocke (2012) have made important contributions to the understanding of DSR evaluation. Venable et al (2012) have distinguished between naturalistic and artificial evaluation and between ex ante and ex post evaluation. In a situational design inquiry it is obvious that naturalistic evaluations are preferred. However, artificial evaluations can guide knowledge development in certain situations. The evaluation-in-design (i.e. the assessment conducted in plan & design) is performed in an arranged design arena separated from a (naturalistic) operational practice, although it may comprise real problems, real users and a real artefact underway (Sun & Kantor, 2006; Sonnenberg & vom Brocke, 2012). This means that this kind of evaluation can be characterized by both artificial and naturalistic traits.

The post-evaluation of artefact use in changed practices is typically a naturalistic ex post evaluation following the typologies of Venable et al (2012) and Sonnenberg & vom Brocke (2012). The two types of evaluation-before-design (in pre-assess) and evaluation-in-action (in test & intervene) seem not to be covered in the typologies mentioned above. Sonnenberg & vom Brocke (2012) have distinguished a type of evaluation before design, which could correspond to our evaluation in pre-assess. However, their evaluation before design seems to be 1) an assessment of the problems being relevant for DSR (“ensuring that a meaningful DSR problem is selected”) and more closely related to artifact design (“demonstrate how the artefact is expected to work”). Our evaluation before design is an assessment of problematic situations within a current practice and ideally performed without any IT solution bias. Their evaluation before design is covered by our initial assessment in theorizing (prepare); see below.

Activities in situational design inquiry provide empirical data to the theorizing process potentially signaling the usefulness and applicability of the ideas used in inquiry. Ideas in inquiry may be either (i) theoretically informed proposals from researchers, (ii) creatively crafted ideas by practitioners and/or researchers, or a combination of (i) and (ii). For example, a design proposal from the researchers, based on theory X, is rejected by the local practice due to incoherence with the existing technological base. The implication for the situational inquiry is that the proposal is rejected in its current form. The implication for theorizing is that the researcher has new data regarding the applicability of the theory in the particular context of inquiry. When the researcher presents a revised version of theory X to their academic peers, a set of values (e.g. rigor and relevance) different from the values in the local practice (e.g. technological fitness) will be used to determine the goodness of the generic idea.

Evaluation of ideas in theorizing thus seeks to (i) draw from the experiences in practice of a situated idea to (ii) phrase a generic idea, and (iii) evaluate the generic idea based on values in the academic community.

Evaluation in PDR theorizing can thus mean *learning from experiences of implementing ideas in situational inquiry*. Following James’ (1907) view that ideas also need to be anchored in older truths, *ideas may also be assessed through theoretical studies*. Evaluation is not stated as a separate and explicit activity in theorizing (figure 3) due to its continual presence in the abstraction process. Evaluation occurs both in studying the empirics and in studying theoretical sources. It occurs continually when developing new/changed abstractions. The fact that evaluation is an integrated part of theorizing calls for an attention to how data is collected and documented for research purposes. PDR calls for data collection that allows for a reconstruction of design rationale as well as a transparent empirical justification of generic idea propositions.

In order to account for evaluation in theorizing, we need to further elaborate on PDR knowledge outcomes. In the PDR context, our primary interest is ideas that support inquiry, either by (i) promoting an enhanced understanding of existing practice (e.g. a business modeling technique) or by (ii) providing prescriptive advice for design (e.g. design principles). That is; PDR does not only focus prescriptive knowledge: Ideas that support description and explanation of practice are considered equally important.

Everything that can be conceived of as a *proposal* in theorizing can be assessed in different ways. Every proposal can be *pre-assessed* before any use; if it seems suitable for what it is intended for. Such pre-assessment will usually be conducted

through theoretical scrutiny, but it can also be conducted by the support of naturalistic evaluation through collaboration with practitioners, or through artificial evaluation techniques from the laboratory genre of DSR. It can be *post-assessed* after use (either in theorizing or situational design inquiry) concerning its usefulness in relation to intended purposes or emergent reasons. This conceptualization of evaluation in theorizing follows the inherent nature of evaluation (both pre-assess and post-assess) in actions (Mead, 1938; Goldkuhl, 2012b). It follows also from the importance of reasoning and judgements of ideas as necessary parts of the inquiry process as described by Dewey (1910; 1938).

What can be seen as proposals to be assessed in theorizing? The answer is: Everything that is put forth in these processes conceived of having an epistemological value. *Research focus* directs what is done in PDR and this needs to be assessed. *Extant theoretical knowledge* is brought into the PDR process to be used for different purposes. What kind of knowledge that is selected needs to be assessed. In theorizing *cognitive tools* are generated and adapted to be used in further theorizing or situational design inquiry. These tools need to be evaluated. One important task in theorizing is the generation of *hypotheses* or other *conjectures*. Such hypotheses need to be assessed to inquire if they are interesting, valuable and applicable in the research process. *Empirical data* are supplied from situational inquiry to be used for analysis and abstraction in the theorizing process. Such data cannot be taken for granted. They should be assessed to scrutinize their validity, sufficiency, coverage and usefulness. Theorizing should produce *theoretical constructs* (such as design principles and design theory) as outcomes directed to research community and/or general practice (figure 2). The evaluation of such theoretical constructs needs to be conducted following academic standards as well as values from other target groups.

6 Conclusions

We acknowledge that existing DSR approaches recognize the role of *practice* in design-oriented research in various ways. There is, however, a significant difference between existing approaches and our proposed approach to practice design research. First, other approaches do not use practice as a vantage point for conceptualization, resulting in a set of scattered – albeit meaningful and useful – ideas on how to relate to practice in design-oriented research. Practice design research, on the other hand, is an exploration of how to understand design-oriented research grounded in the ontological and epistemological roots of pragmatism and practice research. Practice design research should be seen as a consequent elaboration of practice-oriented DSR as described as one genre of DSR as a contrast to laboratory-oriented DSR; these genres described by Iivari (2015). ADR is the only other approach we have found that draws from a fairly explicit underlying philosophy. ADR clearly relates to interpretivism and interventionism as a measure to position itself against DSR as accounted for by Hevner et al (2004). ADR, however, puts the idea of an ensemble artifact at the fore, and builds their method around it. Second, in contrast to other design-oriented approaches, our approach offers an analytically viable view on theorizing and its relation to design inquiry. Inquiry as a starting point leads to a contrast to other DSR approaches regarding the idea of knowledge contributions. PDR, coherent with Dewey's inquiry as a theory of knowledge, serves to develop and evaluate ideas in a broad sense, whether they aim at describing, explaining or even predicting phenomena. The

idea of contributions beyond prescriptive knowledge and instantiations is a clear distinction from the prevalent DSR discourse in the field. The roots of PDR in pragmatism and Dewey's notion of inquiry give a solid foundation for the creative and possibility-exploring aspect of DSR. Inquiry and knowledge is the basis for change and improvement of the world; Dewey (1931) writes "reason has a creative function ... which helps to make the world other than it would have been without it".

There is a risk that the approach presented is conceived of as 'yet another model', thus causes even more confusion about evaluation and theorizing in DSR. Our response to such argumentation is that the approach – while still in its infancy – offers an enhanced conceptual understanding of the role and nature of evaluation in DSR, as well as increased clarity regarding theorizing and its interrelations with situational design inquiry. This is a clear difference to ADR where either theorizing or evaluation has been given conceptually clear and distinct positions in that model. We acknowledge that evaluation should be conducted in close alternation with build and intervene activities in entangled ways, but we find it important to analytically clarify the different roles and positions of evaluation in both situational design inquiry and theorizing.

We emphasize that PDR addresses the practice genre of DSR, and in doing so we explore the consequences of addressing design-oriented research drawing from practice theory and pragmatism. Clearly, there is a contemporary stream of practice theory (e.g. Feldman & Orlikowski, 2011; Nicolini, 2012; Kuutti & Bannon, 2012) and a related discourse on socio-materiality (e.g. Leonardi, 2011; Scott & Orlikowski, 2014) that elaborate more in detail about various aspects of practice – such as the entanglement of technology and the social world, power and politics in organizations, and the emergent characteristics of socio-material practice. The very idea of Dewey's moral inquiry is to be able to identify and improve the social world taking into account such complex aspects. The cohesive ontological and epistemological foundations of PDR support commensurability with contemporary streams of practice theory and socio-materiality.

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