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Editorial

The design of practice and the practice of design

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1 Introduction

Design has grown into the center of the information systems (IS) discourse. There has of course, since the advent of the scientific discipline of IS, existed a great interest for the design of information systems. However, through the articulation of design science (DS) as a specific research approach within IS, there has been a tremendous growth of research and publications concerned with design issues and explicitly adhering to such a research orientation. There are many papers that apply a design science approach and there are also many papers that are trying to elaborate principles and procedures of such research approach. The former can be seen as design of artifacts within IS practices. The latter can be seen as design of the design science practice.

In this editorial I will reflect on such practices and how the notion of design should be interpreted as its essences. In a DS approach it is presumed that its essence lies within the function of designing artifacts; being IT artifacts or other types of related artifacts such as methods and models. I think that this conception needs to be nuanced. Instead of a limited focus on artifact design, I will argue in section 2 below for a broader view: the design of practices. In section 3 I will discuss the practice of design science. There seems to be a confusion concerning how to conceive this kind of practice; mainly as a design practice or mainly as a research practice. I will make some elaborations with the purpose of clarification.

In section 4, this special issue will be introduced. The papers included in this special issue on "Design & Practice" will be briefly described.

2 The design of practice

A key assumption in IS design science is that such an approach should result in some kind of artifact. Hevner et al (2004 p 82) are very clear about this: "The result of design-science research in IS is, by definition, a purposeful IT artifact created to address an important organizational problem". Besides IT artifacts, there may be other types of artifacts as outcomes from DS research. Constructs, methods and models are mentioned (besides "instantiations") by Hevner et al (2004) and previously by March & Simon (1995).

2.1 Artifacts in practices

The idea of design science originates to a large degree from Herbert Simon (1996). Simon writes about "artificial things", which later has been abbreviated (by Simon himself and others) in the research discourse to "artifacts". Simon (ibid, p 5) expresses that "artificial things can be characterized in terms of functions, goals and adaptation". Simon stresses that an artifact operates in an environment; that it has functions that serve the environment and its fulfilment of goals. This means also that the introduction of a new artifact (or a change of an existing one) may lead to changes in the artifact environment. The environment and the artifact taken together can be called a *practice*. There is at least some generative act by the artifact (a functional service) and some corresponding consummatory act by the user[1] when utilizing the artifact (and its functionality) as an instrument for attaining a goal. It is actually meaningless to talk about an artifact's function without anticipating a possible utilization by a user. An artifact is an instrument; i.e. something to be used by someone for a purpose. What is done by the artifact and what is done by the user need to be taken as a whole.

There are different vocabularies for what an artifact does. Simon (1996) speaks of "functions" and also about of an "interface" to the environment. A functional view of artifacts seems to be essential for their use, design and theorizing (Chandrasekaran & Josephson, 2000; Crilly, 2010; Vermaas, 2006). However, a functional view of artifacts has been challenged and proposals to conceptually replace "function" by "affordance" has been made (Galvao & Sato; 2005; Maier & Fadel, 2009). This is based on affordance theory; an ecological perception theory formulated by Gibson (1979). An affordance, in this context, is what an artifact affords or provides to actors in its environment; i.e. what action possibilities an object offers to potential users.

There has been some confusion concerning the use of the affordance notion within IS due to transformed and unclear meanings expressed by Norman (1988; 1999) who introduced this concept within human-computer interaction. Efforts have been made to clarify this notion and bring it back to original meanings from Gibson (McGrenere & Ho, 2000; Hartson, 2003). The conceptual elaboration of affordances made by Hartson (2003) establishes actually a bridge between the notions of affordance and function, since one type of affordance is described as "functional affordance". What is essential, in this conceptual development of affordances related to IS, is to understand the existence and inter-relatedness of both informative and executable affordances (Hartson, 2003; Goldkuhl, 2008). A user 1) needs to perceive and understand what an IT artifact can do and 2) should be able to conduct a desired IT-mediated action based on such understanding (1).

2.2 Design of artifacts vs. design of practices

Following this line of thought implies that the design of an IT artifact should comprise the design of informative and executable affordances (ibid). This is of course not the total picture. There is besides such external properties (affordances for the users) also a need for an "interior design" of structural foundations for the intended affordances. Simon (1996) makes such a differentiation concerning artifacts when distinguishing between 1) the substance of the artifact itself and 2) the artifact's functional interface to its external environment. Rosenman & Gero (1998) distinguish

[1] The user is here mainly presumed to be human user. In principle there can of course be another artifact that uses the functions of an artifact.

between 1) an artifact's structure and internal behavior and 2) its external functions that relates to human use and purposes.

The design of affordances implies an intentional influence on human users and their potential actions. An affordance corresponds to some proper user action. Affordances are chosen in design since they are seen to be instrumental in relation to certain practice purposes. The design of artifacts is not a creation of mere objects without senseful use. Artifact design is a process of creating instruments with intended and meaningful uses. Houkes (2006) describes the design process with reference to the notion of a "use plan". A human user follows a use plan when conducting an activity and which is based on a purpose and implies the use of some potential instrument. Houkes (2006 p 108) describes proper artefact design as "a stage … embedded in [use] plan designing". The idea of some artifact affordance (in design) needs to be grounded in a clear idea of how user behavior is afforded by this instrumental feature.

Goldkuhl (2013a) distinguishes between a 1) techno-centric design of artefacts and 2) co-design of artefact and its practice context. In (2) there is an explicit attention to the practice with a new/changed artifact as an embedded part within it. This means that a use plan (following the terminology of Houkes, 2006) is designed and as part of such a design an artifact with appropriate affordances is designed. The case of techno-centric design (1) is when the designer focus lies nearly entirely on the artifact as a technical object and thus on its internal structure and behavior.

The practice (as artifact-use) is a consequence from the design process. The artifact is a direct result from the design process and the use-practices emerge as consequences from the design. This follows the important distinction between results of actions (i.e. what lies within the control of the actor) and effects from actions (i.e. what may arise as consequences from actions); cf. Ryle (1949) and Goldkuhl (2005) about this distinction.

The terminology of IS design science might encourage a restricted techno-centric design of artifacts. As described above, design science is intended to result in artifacts. Argumentation for a DS approach is normally shaped around the design of IT artifacts or other related artifacts; cf. for example Hevner et al (2004). There are counterexamples where a practice design orientation is advocated (e.g. Rohde et al, 2009; Sein et al, 2011; Goldkuhl & Sjöström, 2015). These two DS orientations (techno-centric design vs. practice design) seem to follow the two ideal types of design science strategies identified by Iivari (2015): laboratory-oriented design (strategy 1) vs. practice-based design[1] (strategy 2). In laboratory-oriented design, scholars address a general design problem and do not need any interaction with real-life contexts or real-life problems. In practice-based design such an interaction is inevitable. Iivari (2015) concludes in his analysis that prevailing IS design science has a clear emphasis on strategy 1 (laboratory approach). This seems to be due to such bias in the DSR literature. Iivari states that "Hevner et al (2004) are biased towards DSR Strategy 1 [=laboratory-oriented design]" (ibid, p 114).

My arguments here favor a practice-based approach. A design science endeavor should not be restricted to mere artifact design, but instead to a *design of practices with embedded artifacts*. The reader might wonder if a techno-centric artifact design approach should be totally avoided. That is not my claim. I do think that such an ap-

[1] These labels do not come from Iivari (2015). They originate from characterizations made by Goldkuhl & Sjöström (2015). Iivari uses the neutral labels of strategy 1 and 2.

proach may have a role in certain situations. In their seminal paper, Orlikowski & Iacono (2001) differentiates between different views of the IT artifact in research. Three such views are the ensemble view, the tool view and the computational view. The ensemble view and the tool view are congruent with practice-based design. In the ensemble view, the IT artifact is considered 1) as a carrier of elements from its practice context and 2) as an integral and embedded part of its social practice (ibid; Sein et al, 2011; Goldkuhl, 2013b). The tool view emphasizes that the artifact is used as an instrument by users in a practice situation (Orlikowski & Iacono, 2001; Markus, 2007; Goldkuhl, 2013b). Taking these two views together provides a proper basis for a practice-based approach to design science in IS.

A more restricted computational view corresponds to a techno-centric DS approach. I do not dismiss such an approach. A techno-centric DS approach is legitimate if it takes artifact affordances and its practice context as given and concentrates on interior design of structure and behavior of the IT artifact as a technical object. The design focus will be on efficiency of algorithms, storage principles and other computational aspects. If a scholar makes claims for practice effectiveness and quality, such a restricted DS approach should be avoided. In such a situation a DS scholar should fully embrace a practice-based approach; i.e. the design of a practice with a supportive artifact embedded within it.

3 The practice of design

Design science within IS has been shaped by the important contributions of Nunamaker et al (1991), March & Smith (1995) and Hevner et al (2004). Numerous papers have followed these seminal publications attempting to further shape IS design science. These contributions should be seen as attempts to *design the practice* of design science. As identified by e.g. Gregor & Hevner (2013) and Iivari (2015) there seem to exist a considerable confusion concerning the DS practice including its outcomes. 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".

There are many dimensions in such DS confusions and far from all will be treated in this brief editorial. I will concentrate on views of design science: The practice of design science[1]. Is it seen mainly as a practice of design or mainly as a practice of research? My personal view is very clear on this matter. First of all, it must be conceived of as a research practice, otherwise it cannot part of science. However, as I hasten to add: It should be a research practice that comprises a considerable element of design.

The basic conceptualization of the DS process in Hevner et al (2004) is to divide it into the two iterative activities of build and evaluate. I claim this conceptualization to have a design bias over a research orientation. A more elaborated process description of DS was presented by Peffers et al (2007). In this more detailed process de-

[1] The label of this section ("the practice of design") should thus not be interpreted as design in general. It should be seen as an investigation into the *practice of design science*.

scription there is still an emphasis on design rather than proper research activities. A last activity of communication is added in their description. This comprises communication to both research and practice audiences.

In both these dominant DS works, there is actually a reluctance to theory development as a constituent in a design science approach. This means that formulation and empirical testing of theory is dismissed from DS according to these well cited publications. I consider this to be serious problem for design science in IS, since it diminishes its scientific credibility. Taking this non-theoretical stance as a prescription for how to conduct and present design science in IS seems to have contributed to a confusion concerning its scientific character. There have been numerous objections to this non-theoretical stance including formulations how to integrate theoretical development as a necessary ingredient in DS; cf. for example Venable (2006), Gregor & Jones (2007), Lee et al (2011) and Kuechler & Vaishnavi (2012). Design science endeavors in IS should thus comprise both design activities and theorizing. There should be a continuous alternating between 1) concrete design with illustrations in artifacts and 2) abstraction and conceptualization with theoretical purposes (Goldkuhl, 2013c).

Theorizing is not the only activity that makes designing IT artifacts a scientific endeavor. There needs also to be a thorough generation of empirical data. The created artifacts form the core of the empirical data in DS research (ibid). But there needs to be other types of data concerning the design process and designed product. Data are necessary for both the design activities and as a basis for theorizing. Evaluation uses empirical data in order to create judgements and conclusions. In the classical DS model of Hevner et al (2004) design is considered to consist of iterations of build and evaluate. However, evaluation should not be restricted to a supporting activity to building artifacts. Evaluation plays several roles in designing (Goldkuhl & Sjöström, 2015): as a pre-assessment of current practice before design; as an in-design evaluation of artifact proposals; as an assessment-in-action during test and use; and as a post-assessment of use and use-effects. However, it is equally important to acknowledge that evaluation can play several roles in theorizing (ibid). Evaluation can be conducted on different types of epistemic objects in theorizing; e.g. on research questions, extant knowledge, hypotheses, empirical data and generated theoretical constructs.

The practice of design science is a practice of design, but there is more into it. DS as a practice should comprise

- Theorizing including evaluation
- Design of practices/artifacts including evaluation
- Generation of supplementary empirical data

4 Papers in this special issue

There are four papers in this special issue. All papers originate from presentations made at the AIS SIGPRAG workshops of “IT Artefact Design & Workpractice Improvement” (ADWI-2013; ADWI-2014). This means that the presented papers in this special issue have been through several rounds of revision; both for the workshop and for inclusion in this journal. Originally seven papers were submitted to this special issue. Four papers have been accepted for publication.

The first paper is *When is a problem a design science problem?* authored by Rob Gleasure. This paper investigates the types of research problem for which Design Science Research is suitable. This requires that DSR approaches are compared and contrasted with intervention-free empirical approaches, in order to determine the strengths and weakness of each approach. From this distinction, three guidelines are presented to allow Information Systems researchers to identify appropriate research problems for DSR. These three guidelines are discussed in the context of the IS design literature, and illustrated using examples of existing DSR studies.

The second paper is *Conducting focus group research in a design science project: Application in developing a process model for the front end of innovation* authored by Patrick Brandtner, Markus Helfert, Andreas Auinger and Kurt Gaubinger. This paper applies and tests the focus group procedure by Tremblay et al. in the setting of a design science study on the Front End of Innovation. The main results of the paper are an empirical testing of the Tremblay et al. method and proposed modifications of this method based on said testing. These results confirm that focus groups, conducted in compliance with said method, can be of great use in design science projects to support refining and evaluating artifacts.

The third paper is *Decision support for succession management – Results from a multi-grounded design science research project* authored by Christian Tornack, Björn Pilarski and Matthias Schumann. This paper employs multi-grounded design science research to develop design principles for succession management systems. Design principles are deduced based on meta-requirements from principal agent theory and an interview study. Subsequently, these principles are tested by developing and empirically evaluating a mockup and a prototypical instantiation. In result, design principles are provided for succession management systems, which are verified through two empirical evaluations.

The fourth paper is *Evaluating an IT Governance model-in-use* authored by Jenny Lagsten and Malin Nordström. This paper suggests an evaluation method for comparing an ideal IT Governance model (the model-in-concept) with the corresponding use of the model in daily operations (the model-in-use). The concept of model rationale has been applied in order to express the logic of the model-in-concept as intended by the model developers. In an action research study it is shown how the ITG evaluation method was developed and tested as part of an evaluation of the deployment and use of an ITG model in a large healthcare organisation.

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