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## Nothing is as Clear as Unclear

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# Nothing is as Clear as Unclear

## Iivari's Response

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### 1 Introduction

I am honored by the international coverage of the commentators on my essay and by the quality and variety of their comments. In the following I will attempt to respond to their major comments and to clarify some of my points. I found it easiest to respond to my colleagues one by one in alphabetical order.

### 2 Tone Bratteteig

Tone writes that "I disagree with Iivari's view of what IS design is about, which leads me to disagree with most of what he chooses to see as ontological, epistemological, methodological and ethical questions". That is interesting since I agree with most of what she says.

The problem with Tone's comment is that she has misunderstood my essay. I do not directly discuss what IS design is about, but what Information Systems as a design science is or could be, referring by 'Information Systems' to an academic discipline. In a way, this misunderstanding is understandable since 'design science' as used in the IS context by March and Smith (1995) and Hevner et al. (2004) easily gets confused with 'design science' as used in the design research community (e.g. Cross 1993; 2001). Cross (1993; 2001) distinguishes 'scientific design', 'design science' and the 'science of design'. According to my reading 'scientific design' means that design products should be based on scientific knowledge, 'design science' means that the design process is based on "an explicitly, organized, rational, and wholly systematic approach to design", as if the design process was "a scientific activity itself", and the 'science of design' means the scientific study of design activity itself (Cross 2001, p. 53).

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My essay addresses ‘scientific design’ to a minimal extent. Following Walls et al. (1992), I recognize that design products could be based on descriptive kernel theories, but my Thesis 7 is contrary to the idea of ‘scientific design’ in its spirit.

I have never been happy with the phrase ‘design science’ as introduced in the IS literature, since it is confusing and misleading, but I am afraid that it is too late to remove the phrase from use. ‘Design science’ in Information Systems (March and Smith, 1995; Hevner et al., 2004) is mainly introduced as a contrast to natural-behavioral science research. While natural-behavioral science aims at finding empirical regularities and building explanatory theories, ‘design science’ aims at building artifacts. Participatory Design, as a systems development approach, and its techniques are examples of such artifacts. Accordingly, ‘design science’ research as used in the IS community does not aim at making the IS design process into something like a scientific activity. Some systems development methods produced by ‘design science’ research in IS may attempt to do this, but I do not discuss them in my essay.

I do not think that I discuss the ‘science of design’ at all in my essay, but it is obvious that descriptive accounts of design practice are significant when developing IT meta-artifacts to support the IS design process.

Having said this, Tone’s comments echo Cross (2001), but they do not have much to do with my essay. I wish to thank Tone, however, for inducing me to clarify the relationship between ‘design science’ in Information Systems and ‘design science’ within the design research community.

### 3 Sven Carlsson

I found Sven’s comment particularly interesting because of his knowledge perspective. I have similar interests (Iivari et al. 2004). I also agree with much of what he says. His major objection to my essay is that I too narrowly have a ‘pure’ IT artifact view. I agree with him in the sense that I do not like the term ‘artifact’, partly because it has too heavy a ‘design’ connotation. To me many modern information systems are much more emergent. Because of the page limits I did not follow this line of argumentation (see Iivari 2005 for initial thoughts). My essay attempts to introduce one new word into the English language, ‘to artisticize’, which I hope will be included at the latest in the 2207 edition of the Oxford English Dictionary. I have also a non-English term for ‘artifact’, but two new words in one paper is too many.

But seriously, the idea of the typology of IT artifacts in my essay was to draw a line between Information Systems and its sister disciplines within com-

puting (Computer Science and Software Engineering). At the same time it reminds us that Information Systems as a discipline has a broader focus than information systems (proper). In that sense 'Informatics' would be a better name for the discipline, but unfortunately it does not go far enough, since the content of many new IT applications is not informational by nature.

I do not think that my conception of 'information systems' excludes viewing them as socio-technical systems. In fact, the definition of Gustafsson et al. quoted in my essay attempts to hint to that direction. I have earlier elaborated my view of an information system proper in detail (Iivari 1989; 1990a; 1990b). Actually, it is stronger in its human/social/organizational orientation than the socio-technical view that implies merely joint optimization of the technical and social system as equal partners. I recognize that information systems in particular are more intertwined with the business environment than they were 20 years ago, but in my view this just increases the need to recognize the levels of abstraction or modeling I suggested in Iivari (1989; 1990a) and to develop information systems primarily as IT-enabled business and work processes and relationships.

As a comment on Sven's suggestions for the aim of IS design science "to develop practical knowledge for the design and realization of 'IS initiatives'", I think that it is a nice formulation of Information Systems as an applied science, but it does not clearly identify the design science aspect of Information Systems. At least in principle, practical knowledge can equally well lie in the findings of descriptive (natural-behavioral science) research as in IT meta-artifacts as outcomes of design science research.

Sven's ideas seem to be heavily influenced by van Aken. The idea of IS design knowledge as design propositions looks appealing, even though I am not quite sure whether Sven is just substituting the word 'proposition' for 'technological rule' in van Aken (2004). This makes me wonder whether Sven sees 'technological rules' as synonyms of 'technical norms'. Van Aken (2004) formulates 'technological rules' essentially as 'technical norms', but compared with Niiniluoto (1993), he expands them to include general solution concepts. In my vocabulary IT meta-artifacts are general solution concepts. In a way, contrary to van Aken (2004) I ended up in my essay with the interpretation that Bunge's 'technological rules' differ from Niiniluoto's 'technical norms' in the sense that that the former include an implicit idea of the design process, i.e. how the artifact, the specific solution in terms of van Aken (2004), can be built.

## 4 Alan Hevner

I am very pleased that Alan, as a very prominent figure in the design science movement within Information Systems, seems to agree with me to the extent that I do not have much to comment on. He introduces three cycles in design science, which nicely incorporate rigor and relevance into research in that field. As a brief clarifying comment, Alan seems to use the term ‘evaluation’ in a more constrained meaning than in Hevner et al. (2004), where it also covers the field testing of the relevance cycle.

It may be that we have a minor disagreement about pragmatics as a philosophy of truth. I will comment on this in more detail in the context of Sein et al. below.

## 5 Björn Niehaves

Björn focuses on epistemology, arguing for alternative epistemologies in design science. I agree with him that design science is not primarily an epistemological position. To me it is more a methodological category. I introduced the idea of ‘constructive research’ (design science) as a methodological approach complementary to nomothetic and idiographic methods (Iivari, 1991). I also wish to point out that evaluation in design science is a descriptive research activity, testing statements such as “X causes A in situation B”, where X refers to the artifact and A to the outcomes, both intended and unintended, of using X in situation B. Therefore I do not see anything fundamentally different in design science evaluation. It is open to all research paradigms. The distinctiveness of design science lies in building artifacts. But I agree with Björn that it is through evaluation that prescriptive knowledge is embedded in a system of theoretical, descriptive and empirical knowledge.

I did attempt, however, to point out that the artifact X is essentially knowledge. It is most distinctively ‘design science knowledge’, or prescriptive design product knowledge in my terminology. According to my argumentation this knowledge of artifacts does not have any truth value. It is simply useful to a greater or lesser extent. My thesis was also that this knowledge cannot be reduced to descriptive knowledge (Thesis 7).

## 6 Sein, Rossi and Purao

I am pleased to discover that my remarks on Cole et al. (2005) succeeded in cajoling a comment from them on my essay. I also observe that we reciprocally misread each other's papers. My essay did not claim that design science research is inherently realistic in its ontology and positivistic in its epistemology, but that it has a history of these positions in engineering and medicine.

I do not have anything against combining and integrating Action Research and Design Science research in the way Sein et al. suggest. I would coin a term to describe this new research approach. What about 'Action Design Research'? The point is that it is different from both Action Research and the dominant Design Science Research. Only the future will show what would be the appropriate problems and situation for this approach and how useful it might be. My essay simply attempted to remind the reader that 'Action Design Research' may not be the right methodological choice when attempting to build a complex IT meta-artifact as a research contribution. This does not mean that building could not take place in close contact with practice when recognizing the practical problems to be 'solved', defining the requirements for the meta-artifact, field testing the meta-artifact, etc.

Sein et al. also refer to my CAIS paper from 2003, in which I had IT artifacts rather than IT meta-artifacts in mind when speaking about emergent features of IT artifacts. At least in principle, the same phenomenon may occur in the case of IT meta-artifacts, but I do not see that 'Action Design Research' is necessarily a solution. In fact, my view is that IS designers cannot and should not attempt to design all aspects of IT artifacts and their use, and analogously perhaps, 'design science researchers' should not attempt to design all aspects of IT meta-artifacts and their use.

In the case of pragmatism, I definitely accept that artifacts (in the narrow sense, see Table 1 in my essay) should be evaluated in terms of their usefulness and utility, but I object to the view that we should at the same time buy pragmatism as a philosophy of truth. My point is that it is not meaningful to speak about the truth or truthfulness of artifacts as such (in the narrow sense), but we should speak rather about their usefulness. Contrary to the interpretation of Sein et al., even theory does not confer any truth value on an artifact. Truth and truthfulness as concepts are meaningful only in the case of descriptive facts, empirical regularities and theories (see Table 3 in my essay). Note that empirical propositions/hypotheses regarding the usefulness/utility of artifacts are descriptive statements.

Finally, I am pleased that Sein, Rossi and Puroo, as younger researchers, are more cautious than Järvinen and Figueiredo in combining Action Research and Design Science. I do not know if it is a good sign, but I appreciate it.

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