

## **Separation or unity? Behavioral science vs. design science**

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### **Abstract**

Design science is considered as a separate research paradigm in information systems and is distinguished from what is called behavioral science. Design science is associated with the creation of new artifacts, while behavioral science studies behavior in relation to IT usage. This paper investigates and challenges this separation view into two distinct research paradigms. The procedure taken is a dialectical one. The two research paradigms are seen as thesis and anti-thesis. These opposites are described through a couple of ideal-typical polarities. The next step is to flip these polarities, which means to try to find elements of the opposite in each polarity. Using these flipped polarities as a basis, a synthesis is aimed for concerning ontological and epistemological assumptions. An ontological analysis is conducted by clarifying the essence of the common empirical domain of IS, which is characterized as designed digitized practices. An epistemological analysis is also performed leading to a common view of knowledge aiming for improvement of designed digitized practices. Based on these syntheses the dichotomous claims of behavioral science and design science as distinct and separate research paradigms are replaced by a view articulating two main genres of IS research (post-hoc studies and design studies) as parts of a research unity.

**Keywords:** Design science, behavioral science, information systems, ontology, epistemology, dialectics

## **1 Introduction**

Since the explicit introduction of an explicit design science (DS) approach in the information systems (IS) discipline (March & Smith, 1995; Hevner et al, 2004), there has been a strong argumentation to see this as a distinct research paradigm differentiated from other kinds of IS research labelled as “behavioral science” by Hevner et al (2004). Originally, there was a differentiation made between “design science” and “natural science” (March & Smith, 1995). This labelling (“natural science”) was abandoned by Hevner et al (2004) in favor of “behavioral science”. This seems more adequate since IS is rather considered as a social and business science than a natural science.

Since this explicit introduction of DS in IS, there has been a huge growth in interest among IS scholars for this research approach. Besides, many DS applications, there are many contributions of how to conduct research following this paradigm (e.g. Sein et al, 2011; Lee et al, 2011; Gregor & Hevner, 2013; Winter, 2014; Iivari, 2015;

Venable et al, 2016). The bulk of arguments is to conceive of DS as a distinct research approach that is separated from traditional behavioral science (BS) of IS. This separation view seems to have evolved into a taken-for-granted view that guides much research in IS, especially design oriented research. During the inception of design science research within IS it seems adequate and well motivated to pinpoint differences and thereby articulating its distinct properties in relation to other types of IS research. However, it might now be time to challenge this sharp differentiation into two separate research strands. Besides this well established focus on differences it might now be plausible to search for characteristics that unite rather than differentiate.

The purpose of this position paper is to make an inquiry into characteristics of behavioral science oriented research and design science research in order to search for possibly uniting features. This is done from an idea that these two research approaches can learn from each other. It is also conducted from a suspicion that a too sharp separation might be unhealthy for the IS discipline as such. It needs to be said that the early DS contributions in IS (March & Smith, 1995; Hevner et al, 2004) tried to articulate a common ground for IS research, where the two research paradigms had their roles and places in order to co-exist. Nevertheless, most arguments have been in the direction of separation and distinct features.

This is a conceptual inquiry. It proceeds through the adoption of a dialectical approach (Popper, 1940), where the two alternatives (behavioral science vs. design science) are clearly differentiated as thesis and anti-thesis and later harmonized through a synthesis procedure. The differentiation is made through the articulation of polarities (section 2). These polarities are in the next step flipped in order to search for possibly similarities (section 3.1). Based on this analysis, an articulation is made of a common ontological ground for IS research (section 3.2) and a common epistemological ground (section 3.3). This leads to a reformulation of the two research paradigms (BS, DS) into two research genres within a united view (section 3.4). The paper is ended through conclusions (section 4).

## 2 Disclosing polarities

Hevner et al (2004) distinguish between the research paradigms by the following characterizations: “Behavioral science addresses research through the development and justification of theories that explain or predict phenomena related to the identified business need. Design science addresses research through the building and evaluation of artifacts designed to meet the identified business need.” (ibid p 79-80). There is a clear difference in temporality between these two research approaches. Behavioral science is seen as reactive and retrospective; looking backwards and trying to explain what already exists. Design science is given its legitimacy through being proactive; creating technological solutions for the future. It works with creating new artifacts as responses to identified business problems and needs. In the quote above, BS is epistemologically associated with explanation. There is no corresponding epistemological characterization of DS in this quote. In March & Simon (1995) an epistemological differentiation is made. BS (or as they term it “natural science”) is characterized as “descriptive” and DS as “prescriptive”. In Hevner et al (2004) theory plays a superseded role in DS, but in later contributions (e.g. Hevner & Chatterjee, 2010; Gregor & Hevner, 2013) it has been given greater importance. The concept of design theory as articulated by many scholars (e.g. Walls et al, 1992; Goldkuhl, 2004; Venable, 2006;

Gregor & Jones, 2007; Baskerville & Pries-Heje, 2010; Kuechler & Vaishnavi, 2012) has an important role in DS. Such a theory is mainly considered as a prescriptive theory, although there exists different epistemological interpretations.

Hevner et al (2004 p 80) make another important differentiation between BS and DS: “The goal of behavioral science research is truth. The goal of design science research is utility”. This follows the different research orientations:

- The truth of explained use behavior
- The utility of designed new artifacts

The interest for explanatory knowledge in BS is often, but not always, met through a hypothesis testing approach. A hypothesis about a causal relation is formulated, data are collected and the hypothesis is corroborated or rejected. One can argue that the Hevner et al characterization of BS has a positivist bias with an emphasis of causality and explanatory epistemology. Even if they have abandoned to use the term “natural science” (as is done by March & Simon, 1995), they still acknowledge such an influence: “The behavioral-science paradigm has its roots in natural science research methods.” (Hevner et al, 20004 p 76). This seems to be a limited view since there are many research studies within IS that adopt different epistemological assumptions as e.g. in interpretive or critical studies (Orlikowski & Baroudi, 1991). However, for the analysis in this paper this is not a crucial issue. An explanatory knowledge interest will be grouped together with other descriptive knowledge interests, which can comprise interpretation, understanding and criticism.

In DS, design ideas usually replace a causal hypothesis. A formulated design idea is realized through design work and an artifact is created as a result. These different characters of behavioral science and design science are summarized as ideal-typical polarities in table 1.

Table 1: Identified polarities of behavioral science vs. design science in information systems research .

	<b>Behavioral science</b>	<b>Design science</b>
<i>Ontological temporality</i>	Existing reality	New reality
<i>Basic aim</i>	Truth	Utility
<i>Study focus</i>	Use behavior	Designed artifacts
<i>Basic procedure</i>	Data collection	Creation through design
<i>Basic epistemic types</i>	Explanation & description	Prescription through design principles and design theory
<i>Type of conjecture</i>	Causality hypothesis	Design idea & design hypothesis

### 3 A unifying view: Improvement knowledge for designed digitized practices

#### 3.1 Flipping polarities

Behavioral science and design science can be seen, in a dialectical fashion, as thesis and anti-thesis; i.e. two opposites. In a dialectical analysis (cf. e.g. Popper, 1940), one strives for a synthesis based on the two opposites. In this case the synthesis procedure has been conducted through flipping the identified polarities of the two opposites (as described in table 1). A guiding thought figure has been the well-known Taoist figure of yin and yang (Taijitu). This dialectical figure shows that in the white yang part there is a black dot of yin and in the black yin part there is white dot of yang. The seemingly opposites involve elements that make them complementary. The procedure has thus been to search for DS elements in BS and for BS elements in DS. For example, look for truth in DS and utility in BS or look for existing reality in DS and changing reality in BS.

Table 1 has been used as a starting point for this synthesis procedure. A new table (2) has been created. The demand for this table was to find terms from the opposite polarities in each column. Concerning ontological temporality, DS was essentially characterized as “new reality” as opposite to “existing reality” in BS (table 1). The challenge was to put “existing reality” into a complementary characterization of DS. This was not difficult. It is obvious that *existing reality* is a vantage point for design. How about “new reality” in BS? BS is definitely dealing with existing reality, but many such studies end up with discussions about how the formulated knowledge contribution has implications for change of the reality (the circumstances revealed through such a BS study): “Implications of new knowledge for *changing reality*”.

Table 2: Flipping polarities of behavioral science and design science; i.e. complementary characterizations of these research paradigms using elements from their opposites.

	<b>Behavioral science</b>	<b>Design science</b>
<i>Ontological temporality</i>	Implications of new knowledge for <i>changing reality</i>	<i>Existing reality</i> as a vantage point for design
<i>Aim</i>	Interest in <i>utility</i> of existing artifacts	Statements of existing and changed reality need to be <i>true</i>
<i>Study focus</i>	Use behavior in relation to <i>designed artifacts &amp; practices</i>	Need to study design <i>behavior</i> and <i>use</i> of new artifacts
<i>Procedure</i>	Possibility to create <i>prescriptions</i> about <i>design</i> from collected data	<i>Collection of data</i> about design process & product
<i>Epistemic types</i>	<i>Prescriptions</i> can be derived from explanations	<i>Descriptions &amp; explanations</i> are needed for formulating prescriptions
<i>Type of conjecture</i>	Hypotheses can concern different <i>designs</i>	Hypotheses about <i>causality</i> concerning artifact properties and use behavior & effects

How about truth vs. utility? BS is associated with truth and DS with utility (Hevner et al, 2004). Isn't there any orientation for utility in BS? And for truth in DS? I would say yes to this. I think it is a simplified view of DS to be concerned with utility and not truth. DS are dealing with statements of both existing reality (as vantage point) and of a changed reality. These statements need to be true in order to be used for knowledge building. I would also say that it is a simplification to say that BS has no interest for utility. Many BS studies have a clear interest in the utility of studied artifacts. When the knowledge purpose of BS is to evaluate the use of existing IT artifacts, then this implies that some utility of artefacts are studied.

The study focus of BS is defined to be "use behavior" and in DS "designed artifacts" (table 1). How about use behavior in DS? There is a clear need to study *use behavior* in relation new artifacts in order to investigate the usefulness of these newly designed artifacts. To put "behavior" only in the box of behavioral research seems also inadequate, since designing is a kind of behavior. In BS, there is of course an interest for a study of (already) designed artifacts; i.e. the use behavior in relation to those artifacts.

One basic procedure of BS is considered to be empirical data collection, which is contrasted to the design of new artifacts in DS. However, DS would not be scientific if it was not based on proper data collection concerning design process and design product. In BS, there is a possibility to create prescriptive knowledge about design from collected empirical data. This will be further clarified in section 3.3 below.

The primary epistemic types in BS are considered to be descriptions and explanations, while DS is working with prescriptions. As indicated above, even in BS there can be an interest for prescriptions. Such prescriptions can be derived from explanations, which will be clarified in section 3.3 below. Correspondingly, DS needs to include work with descriptions and explanations.

Following an explanatory orientation, BS is considered to work with classical hypothesis formulation and testing based on assumptions about causality. This is opposed in DS where the design endeavors are based on design ideas and design hypotheses. However, to evaluate and justify the implemented designs, there is a need for studying causal relations between artifact properties and use behavior. As stated by Romme (2003 p 558): "design research draws on 'design causality' to produce knowledge that is both actionable and open to validation." In BS, hypotheses may not only concern behavior as such, but behavior in relation to different designs.

### 3.2 A common ontology: Designed digitized practices

The synthesis, as outlined in table 2, indicates a common ontology for BS and DS. The opposite, diverse ontologies for the two research orientations would actually be remarkable. BS and DS will ontologically cover the empirical domain of the IS discipline. Should any research paradigm actually disregard some part of IS practice? It is easy to reject the idea of diverse ontologies. However, it is not only the question what kind of phenomena that is included in a disciplinary demarcation. There might be differences between the research paradigms concerning what is emphasized and what is down-played. This was actually indicated in table 1; BS having an emphasis on use behavior and DS on design process and designed artifacts.

The opposites of BS and DS prompts, in this dialectical synthesis, towards an articulated common ontological ground. There are parts in "BS ontology" respectively in "DS ontology" that should be taken into account for in such a synthesizing. Benba-

sat & Zmud (2001) has made an ontological determination of the IS discipline centered on the IT artifact; called “IT Artifact and its immediate nomological net” (ibid p 187). This was made a couple of years before the design science bandwagon started 2004 through the seminal paper of Hevner et al (2004). This means that we can use this ontological demarcation and definition as an appropriate representative for behavioral science oriented IS research. Five generic categories are mentioned by Benbasat & Zmud (2001) in their demarcation. It is, as said, centered on the *IT artifact* and followed by *usage* and *impact*. Two types of preconditions are identified: 1) IT managerial, methodological, and technological *capabilities* and 2) IT managerial, methodological, and operational *practices*. It is clear that the empirical domain covers the IT artifact and its usage context in a broad sense.

What can be added through a design science perspective? Above all, it is the *design* notion. An IT artifact represents a design; i.e. design is inherent when looking at IT artifacts. However, design is not restricted to just the IT artifact. Essential parts of the practice context are also a result from design processes. This is obvious when looking at the business process management (BPM) movement (e.g. Davenport, 1993). A BPM design endeavor is usually seen as a co-design of business processes and supporting IT artifacts. A design attitude to managerial decision-making and development is argued for by Boland & Collopy (2004) in “Managing as designing”; confer also Romme (2003). Business operations should not be seen as only a result from deciding among already existing alternatives. The development of alternatives for how to run the business is made through design processes. Such design processes can be conscious and explicit, but they can also be made in an unconscious and implicit way. Even if there is bad design in IT artifacts and practice contexts, we need as scholars, to discover this design and reveal and assess it and possibly also criticize it.

To bring in design as an essential feature of the business practice context, is not to exclude other “mechanisms of emergence”. What is done in a business practice will be results of design processes, but also of evolutionary processes of habitualization (Berger & Luckmann, 1966; Goldkuhl, 2003) and appropriation (Rohde et al, 2016). Even something that has emerged from other processes than explicit and conscious design (as habitualization and appropriation) can be studied meaningfully as design (i.e. some result that has been given some form and function).

This means that 1) IT artifacts and 2) its surrounding practice contexts can be considered and studied as designs. However, one important lasting question to pose in this ontological analysis is: Should they be seen and studied as separated objects in a kind of dualist fashion? Is what is called practice here, something that is separate from an IT artifact? Something that exist outside of the artifact? It is sure the case that humans and organizational arrangements of diverse kinds exist outside the IT artifact and that they should not be mixed with each other in obscure and confusing ways. However, it should also been said that the IT artifact is part of a practice and as such it carries certain element from such practice. The ensemble view of IT artifacts (as described by Orlikowski & Iacono, 2001; Sein et al, 2011; Goldkuhl, 2013) emphasizes IT artifacts as 1) embedded in social practices and 2) carriers of elements of such practices. This makes it appropriate to talk about a whole of practice and IT. What has emerged through this ontological analysis is a common ground for BS and DS studies. This common ontological ground can be described in a summarized way as: *Designed digitized practices*.

The design character has thus been emphasized. It has also been emphasized the integrated character of practices and IT. This is made through the wording “digitized practices”. This means that IS is conceived of as a science of practice; not whichever practices, but practices that are digitized and designed as such.

### 3.3 A common epistemology: Improvement knowledge

The main epistemic character of knowledge from BS studies is defined as descriptive and explanatory (table 1). The main epistemic character of knowledge from DS studies is defined as prescriptive (table 1). The flipped polarities (in table 2) add more flesh to this. Prescriptions can be reached in BS, and DS scholars can work with descriptions and explanations.

There are epistemic relations between explanations and prescriptions. This is shown by Goldkuhl (2004). A classical explanatory clause expressing a cause-to-effect relation can be transformed into a prescriptive clause expressing means-to-ends. This is the case when an identified effect (within an explanatory clause) is considered as desirable, i.e. a goal of some kind. This means that prescriptions are based on explanations. Explanatory knowledge can be seen as a preparatory step to prescriptive knowledge. Confer also Romme (2003) about similar reasoning in organization science.

DS is, as said, usually associated with prescriptions. Such knowledge can be systematized into design theories (e.g. Walls et al, 1992; Goldkuhl, 2004; Gregor & Jones, 2007). However, such prescriptive design theories are not only developed within DS studies. They can appear as results from BS studies.

When introducing their conceptualization of design theory, Walls et al (1992), use an illustrative case (an executive information system). This design theory seems to be developed through inspiration from other theories, so called kernel theories of explanatory and normative character, and not through any design science approach. Germonprez et al (2011) have studied secondary design where users have conducted appropriation of IT tools directly related to their use. Based on these empirical studies of integrated design and use the authors have contributed to prescriptive design theory for tailorable IT design. Another example of design theory development is Markus et al (2002). This is a study comprising the design of a new IT artifact and should thus be seen as a typical DS study. Based on their design study they have formulated a prescriptive design theory for systems supporting emergent knowledge processes.

The development of prescriptive design theories can thus be made based on either DS studies or BS studies. Design theory generation is not restricted to design science (i.e. studies through designing). On the other hand, it is not the case that DS studies always result in clear prescriptive knowledge. In Hevner et al (2004) there was a reluctance to bring in theorizing as a part of design science. Development and justification of theories were seen as parts of BS and not of DS. In later works (e.g. Gregor & Hevner et al, 2013), theory has been accepted as an optional result from DS studies. Other possible results are constructs and descriptions of methods and processes and also technological artifacts as such (“instantiations”). This means that conceptual and descriptive knowledge are considered as possible outcomes from DS.

There has been several waves in IS of the relevance vs. rigor debate. Benbasat & Zmud (1999) is a well-cited contribution in this debate. They divide practical relevance into interesting and current (timely) topic, applicable results and accessible and readable publications. Applicable results can of course be methods and models of

prescriptive character. However, conceptual and descriptive outcomes are also considered as important applicable results by Benbasat & Zmud (1999). New ways to conceptualize phenomena can be valuable to a practice audience. “Based on their research findings, academicians supply new concepts, which then alter the perceptions and mental models that practitioners apply in their daily life” (ibid p 10). Rich descriptive knowledge can also be valuable, especially if there are efforts to support transferability. “Descriptive case-studies together with the author’s interpretations of events taking place in a specific organization, often prove to be effective means communicating such contributions to practice” (ibid p 10).

Prescriptions can be seen as directly useful knowledge for practitioners. It is knowledge in the form of explicit recommendations. However, other kinds of knowledge, that don’t have such a prescriptive form, can also be useful for practice. Even papers that have an orientation to explanatory theory may have a discussion part within them on “implications for practice”, that demonstrates some type of applicability of this kind of more theoretical knowledge.

There may thus be different outcomes from IS research (both BS and DS) in relation to practice:

- Conceptualizations as new ways of looking at phenomena in practice
- Transferrable descriptive knowledge
- Explanatory theories with practical implications
- Explicit recommendations of prescriptive kinds (as design theories, methods, models)

All of these are examples of *knowledge aiming for improvement of designed digitized practices*, which can be seen as a common epistemological ground for IS research, either conducted as BS or DS.

### 3.4 Four genres of IS research

What has been demonstrated above is that there exist common ontological and epistemological grounds for IS research; either conducted in a BS manner or a DS manner. The common ontological ground is a succinct demarcation of the empirical field: *Designed digitized practices*. The common epistemological ground departs from this ontological characterization and has given the following wording: *Knowledge aiming for improvement of designed digitized practices*.

Does this mean that the boundaries between behavioral science and design science in IS are obliterated? This is not the key conclusion from this dialectical analysis; but boundaries need to be “renegotiated”. Design orientation and prescriptive knowledge are not criteria for demarcation of different approaches in IS. The border line should be drawn by using partially other conceptual tools. Both BS and DS is *research about design*, but DS is also *research through design*. What has been called BS is conducted through studies of “what is” and not of “what could be”. Possible futures are not created, but sometimes only indicated or implied through BS studies. There is *accomplished* improvement through DS. There should be an interest in BS studies for improvement (if such a research should be considered relevant for practice). Such improvements are not accomplished but only *suggested* or *indicated*. Instead of the used terminology of “behavioral science” and “design science”, I will here use the following wordings:



- Indicated/suggested improvement through post-hoc studies
- Accomplished improvement through design studies

I prefer to use “post-hoc studies” instead of “behavioral science”. First, I find this term misleading since “behavioral sciences” is an established wording for sciences like psychology, criminology, sociology and other related disciplines. Second, behavior is not a proper demarcation criterion since there are studies of behavior in design science (as e.g. design behavior, use behavior). The obvious difference lies instead in the temporality of the study objects. The replaced concept “post-hoc studies” emphasizes that the study object already exists in contrast to design studies where the study object is something that is designed during the study. Post-hoc is Latin meaning “after this”. The opposite would be ante-hoc (“before this”), but it is more relevant to keep to the established concept of design study (design science).

The notion of already existing as in post-hoc studies needs to be problematized. This notion of an *already existing reality* needs to be interpreted in a broad sense here. It covers also situations where researchers follow emergent processes (e.g. ongoing development processes), however, with no intent at all to influence them as in design studies. Post-hoc studies are about “what is”. Design studies are about “what might be”.

I would like to call post-hoc studies and design studies as two main genres of IS research. I do not claim that this is an exhaustive categorization for IS research. It should, in this discourse, be seen as a reformulation of the two previously defined research orientations of behavioral science and design science. It should not either be interpreted as I suggest that the term “design science” should be abandoned.

The idea to use the notion of research genre is to emphasize that they should not be interpreted as dichotomous as has been done in previous DS publications. There are clear ontological and epistemological resemblances between these two genres as has been shown above (sections 3.1-3.3). These affinities should be accounted for.

As described above (section 3.3) there is no descriptive-prescriptive boundary between BS (post-hoc studies) and DS. Descriptive knowledge outcome respectively prescriptive knowledge outcome apply to both these IS research genres. This implies that it possible to sub-divide the two main genres into sub-genres. First, there are the two main genres:

- A. Post-hoc studies
- B. Design studies

These genres can be subdivided into the following four IS research genres:

- A1. Descriptive post-hoc studies
- A2. Prescriptive post-hoc studies
- B1. Descriptive design studies
- B2. Prescriptive design studies

Descriptive is here used as a covering label for conceptual, characterizing, explanatory and other descriptive knowledge types. The four research genres have been further characterized in table 3.

Genre A1 (Post-hoc description and explanation) encompasses studies, which are performed with purposes to interpret, understand and explain already existing reality

of digitized practices. There is no prescriptive intent accompanying the empirical studies and the theorizing in this genre.

Table 3: Four genres of IS research

	<b>A. Post-hoc studies</b>	<b>B. Design studies</b>
<b>1.Descriptive knowledge interest</b>	Explanatory, interpretive or critical studies of existing reality without any prescriptive intent	Design of new artifacts with purpose to describe these artifacts and give no prescriptive recommendations
<b>2.Prescriptive knowledge interest</b>	Conduct and use of empirical studies of existing reality with intent to formulate prescriptive knowledge	Design of new artifacts accompanied with a purpose to formulate prescriptive knowledge

Genre A2 (post-hoc based prescriptions) involves any type of empirical study as stated in genre A1, but in this case there is also an explicit intent to use such empirical knowledge in order to generate prescriptive knowledge; post-hoc based design theorizing.

Genre B1 (design studies aiming for artifact description) is limited to creating new artifacts and plainly describing them as new possibilities. This corresponds to level 1 of Gregor & Hevner's (2013) typology of DS types: "situated implementation of artifact".

Genre B2 (design studies aiming for prescriptions) comprises the design of new artifacts accompanied with an explicit ambition to generate prescriptive knowledge. This can be a fully developed design theory (level 3 in the typology of Gregor & Hevner, 2013) or design principles in a "nascent design theory" (level 2 in the typology of Gregor & Hevner, 2013).

This formulation of IS research genres gives also assistance to further characterize IS research. It helps us to see the core tasks of IS research. Empirically, IS research could be said to essentially consist of *design evaluation*; i.e. inquiring design processes and design products and their implications and consequences. It is evaluation since evaluation means data collection, analysis and judgement about a study object often with the purpose of improvement (House, 1994). Sometimes, IS research can expand this further, as in design studies, through proposing and realizing new designs.

Epistemologically, core tasks of IS could be seen as *theorizing about design*. Design includes here design processes and design products and of course also their preconditions and consequences. Sometimes this is not only descriptive theory about design, but also prescriptive theory that explicitly guides action in practice.

## 4 Conclusions

This paper started with questioning the sharp differentiation between behavioral science and design science as stated by several DS advocates. The paper proceeded, using a dialectical approach, with sharpening these two research orientations as ideal-typical opposites through the formulation of polarities. The next step was flipping these polarities, i.e. trying to find elements of the opposite in each polarity. These flipped polarities were basis for formulating common ontological and epistemological

grounds for IS research and its different research orientations. A general conclusion is that the initially stated differences (e.g. design orientation and prescriptiveness only in DS) do not hold. Instead of two research paradigms of behavioral science and design science a new view of IS research has emerged in this paper; a conception of two research genres: post-hoc studies and design studies. These two genres have also been subdivided into four research genres.

Where does this lead us? This can open up for better cross-fertilization between researchers of “behavioral science” (post-hoc studies) and design science. It can be easier to move between these genres. These ontological and epistemological clarifications will also make it easier to classify research endeavors. Just because a scholar is addressing design, this does not mean that this is a design science approach. Just because a scholar is creating a design theory, this does not mean that this is a design science approach. The paper should also be interpreted as *a call to IS scholars to take design seriously and put this in the fore of our research*. This does not need to be in the shape of design studies (design science). It can be made through post-hoc studies of existing design in digitized practices. The paper can also be interpreted as *a call for stronger epistemological focus on “improvement knowledge”*. This complements what already has been said by many scholars about directing IS research towards clear practical relevance.

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