JYU DISSERTATIONS 414

Pertti Järvinen

Improving Guidelines and Developing a Taxonomy of Methodologies for Research in Information Systems

UNIVERSITY OF JYVÄSKYLÄ
FACULTY OF INFORMATION TECHNOLOGY

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ABSTRACT

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Over the years, information systems (IS) researchers have developed guidelines for research methods. IS researchers have used the guidelines to direct the writing of manuscripts in their research work. Reviewers and editors also use the guidelines when evaluating submitted manuscripts. Researchers can see what a good quality manuscript is like, and reviewers and editors can relate manuscripts to guidelines. However, guidelines do not accurately measure goodness. Rather, the guidelines should be understood pedagogically, for example as checklists. Despite the fact that guidelines are often used to measure the quality of research, the guidelines themselves have rarely been critically reviewed.

As a step in this direction, several methodological guidelines for IS research are reviewed in this thesis. Some guidelines require minor modifications based on our analysis. Some other guidelines need major updates, and one requires a total change. This thesis also presents and defends a classification that aims to provide a taxonomy of IS research methods. It can be utilized in selecting an appropriate method for research.

Keywords: guideline, methodology, IS research

TIIVISTELMÄ (ABSTRACT IN FINNISH)

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Parempia metodien ohjeita ja uusi metodien taksonomia informaatiosysteemien tutkimukseen
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Tutkimus on tavallisesti jaoteltu tieteenfilosofisten olettamusten mukaan positivistiseen, tulkinnalliseen ja kriittiseen tietämättä aina varmasti, mitä filosofiset olettamukset oikein ovat. Nuorena tieteenä informaatiosysteemien tutkimus on lainannut vanhemmilta tieteiltä menettelyjä, joita ei useinkaan ole tarkemmin pohdittu. Ei ole mietitty, millainen todellisuus on ja millaiset suhteet todellisuuden osien välillä vallitsevat. Todellisuutta tai sen osaa on haluttu tutkia mahdollisimman hyvin ja silloin on painotettu tutkimusmetodin tai yleisemmin metodologian osaamista.

Eri metodologioille on annettu omat ohjeensa. Ohjeilla pyritään auttamaan tutkijaa tekemään työnsä hyvin. Ennen tutkimuksen julkaisua tieteellisen aikakauslehden arvioijat ja toimittajat, jotka itsekin ovat alan tutkijoita, tarkistavat tarjotun käsikirjoituksen. Laaditut ohjeet auttavat myös arvioijia ja toimittajia. Ohjeet eivät sisällä riittäviä eivätkä välttämättömiä ehtoja hyvälle tutkimukselle, joten tutkija ei voi niihin vedoten vaatia käsikirjoitustaan hyväksyttäväksi. Sama koskee myös arvioijia ja toimittajia. He eivät voi ohjeisiin perustuen esittää käsikirjoituksen hylkäämistä. Haluamme, että ohjeet ymmärretään pedagogisesti vaikkapa tarkistuslistoina.

Olemme laatineet tutkimusmetodien taksonomian, joka perustuu kirjan alkupuolella tarkasteltujen eri tutkimusmetodologioiden ohjeisiin. Taksonomian perusteella voi päätellä ainakin kaksi asiaa: tutkijan ongelmaan sopivan tutkimusmetodologian ja ne tutkimuksen tyypit, joissa ei vielä ole ohjeistoa. Eri metodologioiden ohjeita ja niiden varaan luotua taksonomiaa on kuvattu yksityiskohtaisemmin suomenkielisessä yhteenvedossa.

Asiasanat: ohje, metodologia, IS-tutkimus

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Pertti Järvinen

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1 INTRODUCTION

This thesis concerns conducting IS research work and its publication from a research methodological perspective. In scientific research, researchers try to solve a certain problem (Laudan 1977) and communicate their findings to the research community by writing a manuscript. Once submitted, reviewers / editors then evaluate a manuscript in a peer-review process. Against of this background, Figure 1 describes two processes: research and evaluation.

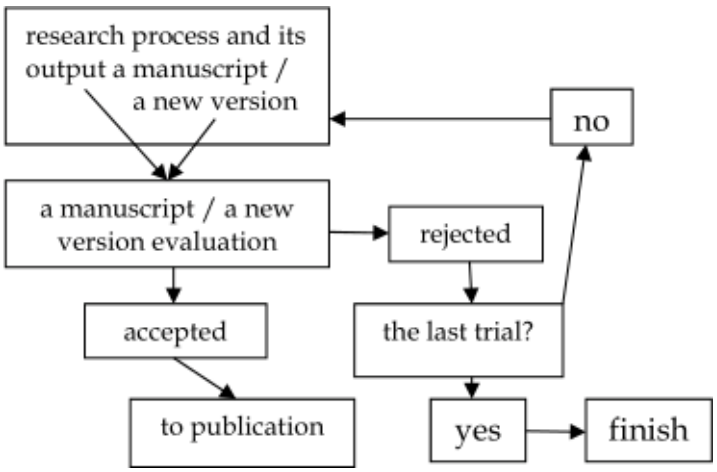

FIGURE 1. Research and evaluation processes

Arguably, the scientific community should be interested in improving both processes, research and evaluation. It is tried to help information systems (IS) researchers when they are conducting their studies, and the reviewers and editors when they are evaluating the manuscripts. Our aim is to help pedagogically researchers and reviewers by giving guidelines how to conduct research work and how to evaluate manuscripts.

A researcher can submit and sometimes only once correct a draft of a study. Often, there are two to three reviewers and an editor, a superior of reviewers.

1.1 Motivation

A situation is similar in connection with scientific reports, i.e., a submission of a research report needs a pre-control procedure, and reviewers evaluate submissions. It is desired that published manuscripts are good in quality. To our mind, such publications best react to challenges in practice and science.

Iivari much appreciated an importance of a scientific research and publication, i.e., its conducting and evaluating processes. He was especially worried about the reviewers' approval. He saw that:

> Scholarly or scientific peer review is the evaluation of research findings for competence, significance and originality by qualified experts who do research in the same field (Brown, 2004; Benos et al., 2007). Peer review is critical in the process of legitimizing new scientific knowledge and assuring its quality. A piece of research that has not passed scholarly review and has not been published cannot be regarded as scientific since its findings have not been accepted by the scientific community in question and are not trustworthy in that sense. (Iivari 2016a, p. 264)

Iivari prepared three technology-independent system-level means for improving the quality of the review:

> 1) provide systematic feedback to reviewers, 2) reward good reviews, and 3) make reviewers more accountable by revealing their identity to authors in certain conditions. (Iivari 2016a, p. 264)

Iivari's manuscript (2016a) was solicited by six distinguished IS researchers (Jennex, Mora, Ralph, Recker, Saunders and Stafford) asked to comment on Iivari's suggestions. Ralph clearly opposed; the others slightly supported. Iivari (2016b) replied nicely to the six experts. In this work, however, we consider these kinds of system-level problems beyond the scope of our topic. The aim of this thesis is to improve conducting research work and evaluating its results by giving better guidelines.

In IS research, its rigor is highly appreciated. Rigor has been referred to as "the correct use of methods and analyses appropriate to the tasks at hand" (Benbasat & Zmud, 1999, p. 5). Also, Hevner et al. (2004) support research rigor, when they put in Guideline 5: "Design-science research relies upon the application of rigorous methods."

Straub et al. contend that

> manuscript quality can be improved by making explicit, to authors and reviewers alike, the standards [guidelines] that are being used when manuscripts are rejected or accepted. ... [They found] key criteria and normative standards [guidelines] for publishing research are differentiated by research methodology. (Straub et al. 1994, p. 22)

Straub et al. (1994) use the term "standard" and other writers the term "guideline". The two terms mean the similar thing. - Holtkamp et al. (2019) evaluated guidelines for interpretive, design science and mixed methods research, and concluded that guidelines are not evidence of cause and effect or good out-

comes. To our mind, however, to follow guidelines can improve research methodology, when at the same time an object domain is useful.

According to Järvinen (2012, p. 14), we use term *research approach* or *methodology* as a general expression of the similar research methods presented. The *research method* itself refers to a set and sequence of steps a researcher carries in her singular study. We do not regard, for example, interviews and participant observation as research methods but as *techniques* to gather data. Note too that the same data gathering technique can be used in different methods.

1.2 Research questions

By referring to an importance of methodology (cf. Straub et al. 1994) in studies, we can now state the research questions:

A. What are guidelines for most methodologies presented in the IS literature, and can we improve guidelines?;

B. Can we build a taxonomy of research methods?

For Question A, we first try to find methodologies with some guidelines (criteria, principles, ...) then to analyze guidelines whether there are shortcomings and thereafter to improve guidelines in order to help researchers and reviewers. For Question B, we develop a structure of questions based on methodologies analyzed in connection with Question A. We try to formulate question sentences in such a way that there always were two pairwise disjoint alternatives (no overlapping). A structure of questions might see as a tree and its leaves are selected methodologies or some unknowns. The latter means that more research is needed.

Nickerson et al. (2013, p. 337) describes that "*taxonomy* is a form of classification, and ... the terms, along with typology and framework, are sometimes used interchangeably." Nickerson et al. (2013, p. 338) define that "the term classification is used to refer to both the system or process of organizing objects of interest and the organization of the objects according to a system." The term typology is usually restricted to a system of conceptually derived groupings and taxonomy to a system of empirically derived groupings. Bailey (1994) also notes that taxonomies and typologies are usually multidimensional and distinguishes them from simple unidimensional classification systems, implying that taxonomies and typologies are usually more complex than classification systems.

1.3 Research approaches

Sometimes, it is recommended that a researcher informs her approach that she has developed just for a work under consideration, for example a new method,

a new description system, a new language, etc. Here, we do not develop new requirements for a good classification but we take Bunge's (1967, p. 75) proposal with following principles or rules:

> One of the principles of correct classification is that the characters or properties chosen for performing the grouping should stuck to throughout the work. Another rule of correct classification is that the subsets of the same hierarchical rank should be exhaustive and pairwise disjoint, i.e. should jointly cover the whole field and should have no members in common. The third rule is not a logical but a methodological one, namely, the various classifications of one and the same universe of discourse should be coincident (as regards the extensions) if they are to be natural rather than artificial groupings. (Bunge 1967, p. 75)

In summary, in a good classification,

a. a differentiating factor is remaining permanent,
b. it is exhaustive,
c. pairwise disjoint and
d. natural.

We evaluate guidelines of a methodology by using properties a, b, ..., d. Hence, we can say that our approach is conceptual in both problems.

Concerning Question B, we can say that we rather freely apply Bunge's proposal to develop a taxonomy. In a history of taxonomies, Galliers (1991) uses a division to positivist and interpretive perspectives. March and Smith (1995) divide sciences to natural and design ones and then use a differentiation between build and evaluate activities in design sciences, and theorize and justify activities in natural sciences. To construct a taxonomy of research methods, methods are divided into independent subgroups, i.e., they do not overlap and are pairwise disjoint (Bunge's Property c).

1.4 Structure of the work

The rest of this presentation is structured as follows: In Chapter 2, we evaluate traditional guidelines for different methodologies. We present new guidelines for critical research (Section 2.8) and improve guidelines for other types of research (Sections 2.1–2.7). In Chapter 3, our research methods are grouped to a taxonomy. In Chapter 4, we collect implications to science and practice. We also evaluate limitations of our study and suggest how to alleviate them in future studies. Finally, we present our results in Finnish, in more detail.

2 TRADITIONAL GUIDELINES FOR METHODOLOGIES

In this chapter, we analyze traditional guidelines for different research methodologies and try to improve their guidelines. Our improvements are sometimes gradual, but at least in Section 2.8, we develop a new set of guidelines that much better take care of what is known as *critical research philosophy* than this far.

Most of the researchers that we cite are (or have been) editors of a certain journal, and (we assume) they may be worried about the quality of the submissions the journal received. These researchers wrote guidelines for a particular methodology to improve submissions. Holtkamp et al. (2019, p. 6280) advised readers that "as these guidelines are outlined for conducting and evaluating good research, studies may be denied publication simply because they do not follow a prescribed methodology."

We inform that we do not use a differentiation between quantitative and qualitative but instead that confirmatory (theory-testing) and exploratory (theory-creating), because we like to emphasize an expression's characteristics to differentiate (pairwise disjoint, Bunge's (1967) Property c in classification). At the same time, we underline a key role of theory and new knowledge in IS research (Avison and Malaurent 2014). Hence, we exclude articles of Venkatesh et al. (2013, 2016) concerning mixed methods, i.e., quantitative and qualitative methods.

We have chronologically selected articles where guidelines / principles / criteria for research methodologies are presented. If we have found more than one, we have selected the most informative one.

2.1 Positivist case studies

Guidelines or actually case study is often referred to as "positivistic" in IS literature. We, therefore, call them as such, albeit they may not be positivistic from

the perspective of positivism in the philosophy of science (Siponen and Tsohou 2018).

In the IS domain, it is, and has been typical, that technology continually advances. Then, theory and practice prefer that it is soon sought new knowledge concerning a novel technology. A study can then refer to several first implementations of a new technology. It is more suitable and faster to use a case study approach than a survey, for the latter may need more IT implementations. This might be a reason why guidelines for case studies were first stated. Benbasat, Goldstein and Mead (1987) wanted to help researchers by presenting guidelines for how to conduct case study research and publish it. Later, Eisenhardt (1989) proposed eight steps for case studies. We present Benbasat et al. (1987) first and then Eisenhardt (1989).

Benbasat et al. (1987)

Benbasat et al. tell in the abstract:

> This article defines and discusses one of these qualitative methods - the case study strategy. Suggestions are provided for researchers who wish to undertake research employing this approach. Criteria for the evaluation of case research are established and several characteristics useful for categorizing the studies are identified. A sample of papers drawn from information systems journals is reviewed. The paper concludes with examples of research areas that are particularly well suited. (Benbasat et al. 1987, p. 369)

We shall supplement suggestions by analyzing assumptions, explicit and implicit, presented by Benbasat et al. (1987). We find that Benbasat et al. (1987) implicitly assume that in case study firms consensus prevails. In Benbasat et al. (1987), we try to find criteria (guidelines or principles) how to conduct case studies. A reason is that Klein and Myers informed IS readers that

> One of the key contributions of the research methods stream in IS research has been the formulation of a set of methodological principles for case studies that were consistent with the conventions of positivism (Benbasat et al. 1987; Lee 1989; Yin 1994). (Klein and Myers 1999, p. 68)

We, however, contest this claim by Klein and Myers (1999). Despite that the abstract of Benbasat et al. (1987) refer to criteria, there is no such a term "principle" nor "guideline" in the text nor in the abstract. In the text of Benbasat et al. (1987), there are two times the term "guideline" in connection with end-user computing (Rockart and Flannery 1983), but only one with the case study method.

According to Benbasat et al. (1987, Table 1, p. 370), Table 1 contains a list of eleven characteristics of case studies summarized from the papers written by five experts in methods.

TABLE 1. Key characteristics of case studies (Benbasat et al. 1987, p. 371)

1.	Phenomenon is examined in a natural setting.
2.	Data are collected by multiple means.
3.	One or few entities (person, group, or organization) are examined.
4.	The complexity of the unit is studied intensively.
5.	Case studies are more suitable for the exploration, classification and hypothesis development stages of the knowledge building process; the investigator should have a receptive attitude towards exploration.
6.	No experimental controls or manipulation are involved.
7.	The investigator may not specify the set of independent and dependent variables in advance.
8.	The results derived depend heavily on the integrative powers of the investigator.
9.	Changes in site selection and data collection methods could take place as the investigator develops new hypotheses.
10.	Case research is useful in the study of "why" and "how" questions because these deal with operational links to be traced over time rather than with frequency or incidence.
11.	The focus is on contemporary events.

Later in this section, Eisenhardt (1989) present case study theory building steps, where she requires that "neither theory nor hypotheses", i.e., theory-building research is begun as close as possible to the ideal of no theory under consideration and no hypotheses to be tested. Researchers should avoid thinking about specific relationships between variables and theories as much as possible, especially at the outset of the process.

In the literature survey, Benbasat et al. (1987) found three categories of case studies but did not accept 1) application descriptions and 2) action research as case studies. First, the former was rejected, because practitioners did not perform a study but described how to implement an application. Second, Benbasat et al. (1987) consider that the action researcher is not an independent observer, but becomes a participant, and the process of change becomes the subject of the research. Third, Benbasat et al. (1987, p. 371) seem to assume that in case studies, research questions are specified prior to the study by researchers "who are observers/investigators rather than participants". Another difference between case study and action research is that, in the former, truth (in status quo) is investigated, but utility in the latter.

Benbasat et al. (1987) characterize that the case study approach is suitable for different purposes: description, exploration and explanation (theory testing). In their sample of 10 old case studies, two of them are explanations, two other exploration /explanations, and many explorations

Benbasat et al. (1987) assumed the "positivist" perspective, and hence, if the interpretive perspective has assumed, then studying a certain case must be performed under guidelines presented in Section 2.3.

Benbasat et al. (1987) have been interested in positivist case studies, and they survey the following journals and conferences between 1981 and 1985: *Communications for the ACM*, the *Proceedings of the International Conference on Information Systems (ICIS)*, *Information and Management*, *MIS Quarterly*, and *Sys-*

tems, Objectives, Solutions. The last journal contained about 25 % case studies, the others 10 % only.

Benbasat et al. (1987) divided their critique of the articles picked into their sample in two parts. First, they evaluated four case studies in detail, their strengths and weaknesses. Then, Benbasat et al. (1987) evaluated the sample of 10 case studies. Benbasat et al. (1987) analyzed articles by Markus (1981), Dutton (1981), Pyburn (1983) and Olson (1981) more deeply and conclude:

> The characteristics of the four case studies discussed well present the all other case studies, too. (Benbasat et al. 1987, p. 378)

Then, Benbasat et al. (1987) describe the nature and general quality of case studies in IS. The evaluation is based on their view for conducting case research. Benbasat et al. (1987) were concerned with the following aspects: Research theme, research objectives, unit of analysis and site selection, and data collection. We shall still pick some other findings. Benbasat et al. (1987) characterize most of the case studies as exploratory in nature. They find that none of the multiple case studies clearly stated the site selection objectives. They also noticed that (p. 381) "in about half of the case studies, the data were collected by multiple means; the other half relied solely on interviews."

Researchers in some studies interviewed individuals who had different perspectives, e.g., managers, users, and designers. According to our mind, this finding only differs from an assumption that all the people are equal, i.e., no classes exist in case studies.

Benbasat et al. (1987, p. 387) conclude that:

> The case research strategy has mostly been used for exploration and hypothesis generation. This is a legitimate way of adding to the body of knowledge in the IS field. (Benbasat et al. 1987, p. 387)

Review of Benbasat et al. (1987)

In Benbasat et al. (1987), we cannot explicitly identify guidelines (principles nor criteria) for case study.

Eisenhardt (1989)

Eisenhardt (1989) is selected to give a concrete advice for case research. This article has much referred to as a guide to perform case study, and it describes a process of inducting theory using case studies - from specifying the research questions to reaching closure, see Table 2 [Table 1]. However, we propose some improvements for Eisenhardt's (1989) method.

TABLE 2 Process of "building theory from Case Study Research" (Eisenhardt 1989, Table 1, p. 533)

Step	Activity	Reason
1. Getting started	Definition of research question Possibly a priori constructs Neither theory nor hypotheses	Focuses efforts Provides better grounding of construct measures Retains theoretical flexibility
2. Selecting cases	Specified population Theoretical, not random, sampling	Constrains extraneous variation and sharpens external validity Focuses efforts on theoretically useful cases – i.e., those that replicate or extend theory by filling conceptual categories
3. Crafting instruments and protocols	Multiple data collection methods Qualitative and quantitative data combined Multiple investigators	Strengthens grounding of theory by triangulation of evidence Synergistic view of evidence Fosters divergent perspectives and strengthens grounding
4. Entering the field	Overlap data collection and analysis, including field notes Flexible and opportunistic data collection methods	Speeds analyses and reveals helpful adjustments to data collection Allows investigators to take advantage of emergent themes and unique case features
5. Analyzing data	Within-case analysis Cross-case pattern search using divergent techniques	Gains familiarity with data and preliminary theory generation Forces investigators to look beyond initial impressions and see evidence thru multiple lenses
6. Shaping hypotheses	Iterative tabulation of evidence for each construct Replication, not sampling, logic across cases Search evidence for "why" behind relationships	Sharpens construct definition, validity, and measurability Confirms, extends, and sharpens theory Builds internal validity
7. Enfolding literature	Comparison with conflicting literature Comparison with similar literature	Builds internal validity, raises theoretical level, and sharpens construct definitions Sharpens generalizability, improves construct definition, and raises theoretical level
8. Reaching closure	Theoretical saturation when possible	Ends process when marginal improvement becomes small

Review of Eisenhardt (1989)

To our mind, Eisenhardt's process and its 'sequential' steps in Table 2 better guides a case study research work than descriptions of individual research tasks in Benbasat et al. (1987). Steps in Table 2 are also more deeply described than tasks by Benbasat et al. (1987). Eisenhardt considers that:

> the process includes a priori specification of constructs, population specification, flexible instrumentation, multiple investigators, cross-case analysis tactics, and several uses of literature. ... The process of building theory from case study research is a strikingly iterative one. While an investigator may focus on one part of the process at a time, the process itself involves constant iteration backward and forward between steps. (Eisenhardt 1989, p. 546)

In order to point out specific weaknesses in Eisenhardt (1989), we analyze Table 2 more deeply. We first use a differentiation between continuous and interrupting work, and a case study research process is interrupting. For the latter, there is a possibility that a total research process has one or many case studies. We first consider one case study.

Table 2 seems to contain two steps like 'begin' and 'end' surrounding a real study (process). In Table 2, 'begin' seems to be Step 1 (Getting Started) and 'end' Step 8 (Reaching Closure). In operation research, there are some starting activities before a certain process and some tearing down activities after a process. Starting and tearing down activities happen once and surround an interrupting process.

A process itself can be composed of a sequence of activities applied to and realized once or many times. When there is an entity where the same or similar sequence of tasks is realized many times (many cases), then there is a *change-over* from the former sequence to the latter sequence. In a multiple case study, a change-over is needed when results from the previous case are moved to the next case.

We can conclude that Eisenhardt (1989) describes 8 phases of case study process, but not exhaustively as Property b requires for classification (Bunge 1967). Hence, we can supplement Table 2 (Eisenhardt 1989):

Guideline 1: To identify starting, tearing down and, in connection with more than one case study, change-over activities are needed.

When we analyze Step 1 more carefully, we realize the following: Eisenhardt (1989) proposes three tasks: a) 'definition of research question', b) 'possibly a priori constructs' and c) 'neither theory nor hypotheses'. The contention of the thesis that tasks a and b are performed only once. In turn, as for the third one (c), one cannot even try to follow more than once, because then there is a second, third, … case study, and a researcher can try to nullify her mind, i.e., to prevent any theory and hypotheses coming to her mind in connection with the first case study only. But when a second, third, ... case is started, she is then recommended to move results of the former case study to the latter case study.

Guideline 2: Apply to the recommendation "neither theory nor hypotheses" in connection with the first case study only.

Step 8 (Reaching Closure) contains the activity "theoretical saturation when possible" and the reason "ends process when marginal improvement becomes small". They seem to be valid both for one study and multiple case studies.

We still have two minor remarks:

1. Two last steps in Eisenhardt's Table 2 (Enfolding literature, Reaching closure) are not for case study only, but also for other methods in developing a new

tentative theory, e.g., in a study where a grounded theory (GT) method is used.

2. We want to pay attention to that researchers sometimes perform a specification of constructs beforehand. It has two potential consequences. First, it is then possible that local people do not fully understand these constructs, although the constructs may help developing a tentative theory. Second, a prior specification of constructs can also help to shape the initial design of theory-building research. Although this type of specification is not common in theory-building studies (e.g., in case studies) to date, it is valuable because it permits researchers to measure constructs more accurately.

Benbasat et al. (1987) presented (cf. Table 1) that a) phenomenon is examined in a natural setting and b) the investigator may not specify the set of independent and dependent variables in advance. Benbasat et al. (1987) are clearly against Eisenhardt (1989) when she proposed that constructs could specify beforehand. Both Benbasat et al. (1987) and Eisenhardt (1989) emphasize that case studies are suitable for exploration.

Eisenhardt emphasizes her positivist view when she compares her own approach with two interpretivists:

> in comparison with Strauss (1987) and Van Maanen (1988), the process described here adopts a positivist view of research. That is, the process is directed toward the development of testable hypotheses and theory which are generalizable across settings. In contrast, authors like Strauss and Van Maanen are more concerned that a rich, complex description of the specific cases under study evolve and they appear less concerned with development of generalizable theory. (Eisenhardt 1989, p. 546)

2.2 Positivist studies

We first characterize positivism by referring to Chua (1986). He considers many assumptions at a background of different perspectives of philosophies of science. Here, we only take two assumptions of ontology of what Chua (1986, p. 611) refers to as the mainstream (positivist) perspective: "Empirical reality is objective and external to the subject. Human beings are also characterized as passive objects; not seen as makers of social reality." Compared with Eisenhardt's view "testable hypotheses and generalizations", it seems that researchers' view of positivism then (and even now) much differ from Siponen and Tsohou (2018). - In Section 2.2, we are interested in how guidelines (actually standards) are defined for all positivist studies.

Straub et al. (1994)

Straub, Ang and Evaristo (1994) found that manuscript acceptance rate for the top academic journals in IS averages then only 10 %. Even acceptance rate for IS conference proceedings is low, e.g., International Conference of Information Systems (ICIS) accepts only about 15 % submitted manuscripts. Hence, Straub et al. ask:

What can be done about high rejection rates? One seeming solution is to create new outlets and to allocate more space in existing journals. But this achieves nothing unless the evaluative standards of reviewers and editors also change in the process. (Straub et al. 1994, p. 21)

Straub et al. state:

This paper contends that manuscript quality can be improved by making explicit, to authors and reviewers alike, the standards that are being used when manuscripts are rejected or accepted. The straightforward and simple argument is that scientific journals should adopt a total quality management perspective and that this is their proper role. ... Does IS have a set of mutually agreed-upon, unambiguous objectives and professional standards for acceptable, high quality manuscripts? A careful look at the top journals and their practices suggests that we do not. Nowhere, perhaps, is this lack of common standards more evident than in the evaluation forms that the reviewers are required to send in with each manuscript reviewed, as shown in Table 3 [Table 1]. (Straub et al. 1994, p. 22)

TABLE 3 Evaluation standards for the top IS journals (Straub et al. 1994, p. 22)

MISQ/data base	**ISR**	**CACM**	**MS**
Relevance Objectives Readability Organization Literature review Methodology Quality of evidence Contribution Potential contribution	Significance of contribution Technical adequacy Appropriateness to journal Clarity of presentation & significance	Technical content Originality Style and organization Overall quality	Importance of research Impact on discipline Impact on practice Presentation

(MISQ = *MIS Quarterly*, ISR = *Information Systems Research*, CACM = *Communications of the ACM*, MS = *Management Science*)

Straub et al. write:

Although the underlying dimensions for high quality IS research have not been enunciated for the IS scientific community, there have been numerous studies of publication standards in sociology, psychology, organization behavior, and the physical sciences, as shown in Table 4 [Table 2]. (Straub et al. 1994, p. 22)

TABLE 4. Criteria for high-quality research (Straub et al. 1994, p. 23)

Criteria	Chase (1970)	Wolff (1970)	Price (1985)	Daft (1985)	Mitchell (1985)
1. Statistical /mathematical analysis	x	x			x
2. Theory	x	x	x	x	
3. Coverage of significant literature	x	x	x		
4. Professional style & tone		x		x	x
5. Logical rigor	x		x	x	x
6. Contribution to knowledge	x	x	x		x
7. Contribution to practice	x	x	x		
8. Presentation level		x			
9. Research design		x		x	x
10. Adherence to scientific ethics	x				
11. Manuscript length		x			
12. Reputation		x			
13. Replicability of research	x	x			
14. Suggestions for future research		x	x		
15. Topic selection	x	x		x	x

Straub et al. chose criteria for acceptance of scientific articles from the sources Chase (1970), Wolff (1970), Price (1985), Daft (1985), and Mitchell (1985) and conclude:

> Results showed consistent agreement on the relative importance of manuscript criteria. Editors rated contribution to knowledge as the most important criterion, followed closely by sound research design and objectivity in reporting results. Findings indicated that an author's reputation and institutional affiliation were least important in manuscript assessment. (Straub et al. 1994, p. 23)

Straub et al. (1994) considered the 15 criteria listed in Table 4 are too many to guide positivist studies. They also looked at possibility to select most important criteria to be critical factors. Straub et al. (1994), however, decided to solve the following research question: Is it possible to derive a parsimonious set of meaningful standards for IS research? Straub et al. evaluated:

> To answer the research question, it was determined that a survey of the perceptions of published IS authors and editors would be the most appropriate methodological choice. ... To obtain a representative sample of the IS scientific community, names and affiliations of authors and editorial board members were drawn from complete volumes of the *Communications of the ACM*, *Management Science*, *MIS Quarterly*, and *Information & Management* for the period from 1985 to 1989. The final sample included 523 IS professionals. (Straub et al. 1994, p. 25)

Straub et al. (1994) organized pilot testing of the questionnaire with 40 faculty and doctoral students. The questionnaire was deemed sufficiently content-valid for purposes of judging quality of IS research submissions. Thereafter, the questionnaire was sent to IS community. Straub et al. describe that

> Respondents were asked to select two research methodologies they felt most comfortable reviewing . For each methodology, respondents rated 15 criteria on a 9-point scale ranging from "not important" to "critically important." A sample copy of a sur-

> vey sent to one of the participants. ... The research instrument was mailed to every published author and editorial board member whose name appeared in the selected journals over a five year period. Of 523 questionnaires sent out, 144 (27.5%) were returned. (Straub et al. 1994, p. 25)

Straub et al. (1994) described respondents' characteristics, tested non-response bias, and found four factors in the following order:

I. Conduct of research (replication, statistical/mathematical analysis, research design and scientific ethics),
II. Presentation (professional style, presentation style, length, logical rigor),
III. Conceptual significance (coverage of significant literature, theory, suggest future research, contribution knowledge),
IV. Practical significance (contribution to practice, topic).

In brackets at the end of the factors, there are items of a certain factor.

Review of Straub et al. (1994)

In factor analysis, a certain factor can be considered a (formative) construct. A researcher normally gives a name to a particular factor or construct. A fictitious example could be (Petter et al. 2007, 624): "a formative construct could be organizational performance operationalized using three measures: productivity, profitability, and market share." Thus, we are unsure:

Whether a reader will understand a name of a certain factor in the same way as the researcher?

In Table 4, Straub et al. (1994) collected 15 criteria for high-quality research. The number of criteria seems to be too high for guidelines, although criteria themselves otherwise could be used (cf. Miller 1956). Straub et al. (1994) used factor analysis to diminish the number of criteria to 4 standards, and factor analysis then collected standards from components of criteria. Then, standards were difficult to understand. Instead of standards, we like propose four 'best' criteria that Straub et al. (1994, p. 26) themselves judged to be used as guidelines:

Contribution to knowledge, logical rigor, theory and coverage of significant literature.

Then, we have five minor remarks. Straub et al. (1994) used standards from sociology, psychology, organization behavior and physical sciences (Table 4) as the basis for the evaluation of standards for IS.

1. Although senior IS researchers, reviewers and editors were respondents in this survey study, they could not suggest a new criterion. They had to use previously defined ones by Straub et al. (1994) (cf. open vs. closed questions on a questionnaire).
2. We are not sure whether the sample of respondents was representative.
3. The authors used a 9-point scale ranging from "not important" to "critically important". Variables based on this kind of scale are ordinal, not interval. Instead, Straub et al. (1994) used correlation coefficients and factor analysis. Such calculations are not allowed.
4. First, the response rate in Straub et al.'s (1994) study was low 27,5 %. Second, although no t-tests were statistically significant at the 0.5 level, we cannot

trust it, because it is possible to compute a t-test that is based on variables with an interval scale. In this study, the variables had an ordinal scale only.
5. All the journals were from the United States.

Finally, Straub et al. (1994) did not differentiate studies to confirmatory and exploratory ones. Karahanna et al. (2018, p. iii) liked to "constrain their focus to lab, field, and natural experiments and their online variants." They stated (p. ix) that their "research objective then [in experiments] was hypothesis testing", thus confirmatory ones.

2.3 Interpretive in-depth case study and interpretive field study

Klein and Myers (1999) discuss "conducting and evaluating of interpretive research" in information systems. They base their seven principles on Gadamer's and Ricour's philosophical works.

We focus on Klein and Myers (1999) and slightly supplement it with Boland et al. (2010). We exclude Sarker et al. (2013), because they consider qualitative studies in general, and they mix positivist and interpretive studies.

Klein and Myers (1999)

Klein and Myers motivate readers as follows:

> In recent years, interpretive research has emerged as an important strand in information systems research (Walsham 1995). Interpretive research can help IS researchers to understand human thought and action in social and organizational contexts; it has the potential to produce deep insights into information systems phenomena. (Klein and Myers 1999, p. 67)

Klein and Myers (1999) propose seven principles and they believe that (p. 68) "proposed principles are consistent with a considerable part of the philosophical base of literature on interpretivism and hence an improvement over the status quo." Klein and Myers (1999) help readers to understand the interpretive research by explaining its nature and differentiating it from two other approaches. They use Chua's (1986) three epistemologies (positivist, interpretive and critical). Klein and Myers write:

> Generally speaking, IS research can be classified as positivist if there is evidence of formal propositions, quantifiable measures of variables, hypothesis testing, and the drawing of inferences about a phenomenon from a representative sample to a stated population (Orlikowski and Baroudi 1991). (Klein and Myers 1999, p. 69)

We pay especially attention to the term "testing" and cite Klein and Myers' (1999, p. 69) description of an interpretive study:

> IS research can be classified as interpretive if it is assumed that our knowledge of reality is gained only through social constructions such a language, consciousness, shared meanings, documents, tools, and other artifacts. ... Interpretive methods of re-

> search in IS are "aimed at producing an understanding of the context of the information system, and the process whereby the information system influences and is influenced by the context" (Walsham 1993, pp. 4-5).

Klein and Myers consider that interpretive studies exploratorily develop new knowledge and they like to clarify that:

> Keeping the above definition of interpretive research in mind, the scope of this paper is limited to addressing the quality standards of only one type of interpretive research, namely, the interpretive field study. Field studies include in depth case studies (Walsham 1993) and ethnographies (Suchman 1987; Wynn 1979, 1991; Zuboff 1988). (Klein and Myers 1999, p. 69)

Klein and Myers (1999) explain that they mainly base their guidelines on the hermeneutic philosophers, especially Gadamer and Ricoeur, and their works. Klein and Myers present seven principles for interpretive field studies in Table 5 [Table 1].

TABLE 5. Summary of principles for interpretive field research (Klein and Myers 1999, Table 1, p. 72)

1. The Fundamental Principle of the Hermeneutic Circle This principle suggests that all human understanding is achieved by iterating between considering the interdependent meaning of parts and the whole that they form. This principle of human understanding is fundamental to all the other principles.
2. The Principle of Contextualization Requires critical reflection of the social and historical background of the research setting, so that the intended audience can see how the current situation under investigation emerged.
3. The Principle of Interaction between the Researchers and the Subjects Requires critical reflection on how the research materials (or "data") were socially constructed through the interaction between the researchers and participants.
4. The Principle of Abstraction and Generalization Requires relating the ideographic details revealed by the data interpretation through the application of principles one and two to theoretical, general concepts that describe the nature of human understanding and social action.
5. The Principle of Dialogical Reasoning Requires sensitivity to possible contradictions between the theoretical preconceptions guiding the research design and actual findings ("the story which the data tell") with subsequent cycles of revision.
6. The Principle of Multiple Interpretations Requires sensitivity to possible differences in interpretations among the participants as are typically expressed in multiple narratives or stories of the same sequence of events under study. Similar to multiple witness accounts even if all tell it as they saw it.
7. The Principle of Suspicion Requires sensitivity to possible "biases" and systematic "distortions" in the narratives collected from the participants.

Klein and Myers, as we understand them, highly regard the fundamental principle of the Hermeneutic Circle. Niederman states:

> Hermeneutics is largely the study of texts and comes largely from trying to interpret the ″real″ meaning of the Bible given its many versions and translations. Using hermeneutics in IS tends to emphasize the nature of IS being in statements about it. (Niederman 2020)

Siponen sees that

> hermeneutics is the key philosophical perspective. Originally, hermeneutics was proposed as a method of interpreting the Holy Bible. The difficulty in such context is that all the key persons are not here with us. (Siponen 2021)

All the other principles are structured in the same way but one. Klein and Myers write about the principle of abstraction and generalization in different order than previously, e.g.,

> The two previous principles emphasize those features unique to the particular situation under study. (Klein and Myers 1999, p. 75)

The authors then show the interdependence of the seven principles. They also state that any principle is not necessary, but as many principles as possible may give a many-sided picture.

Klein and Myers discuss three studies (Orlikowski 1991, Walsham and Waema 1994, Myers 1994). They use the structure of principles as previously.

Review of Klein and Myers (1999)

Although the seven principles are slightly interdependent, they cover a wide domain of interpretivism. Almost all are clearly presented and well supported. Chen and Hirschheim (2004) examined 1893 articles published in eight major IS publication outlets between 1991 and 2001. Their findings suggested that the long-term endeavors of interpretivist researchers might need to continue because the paradigmatic progress appears inconsequential. Chen and Hirschheim (2004) further suggested that "positivist research still dominates 81 % of published empirical research". They also found that interpretive studies accounts for less than 20 %. Recently, Cecez-Kecmanovic et al. evaluated that

> Klein and Myers's (1999) principles made an important and lasting contribution to understanding, conducting, and evaluating interpretive field study research in IS. (Cecez-Kecmanovic et al. 2020, p. 250)

In addition to a positive evaluation above, we propose a new principle to be added to Klein and Myers (1999), and also some minor remarks.

0. The Principle of Communication

Chua (1986) considers a critical research and its assumptions. Concerning then beliefs about the social world, Chua (1986, p. 621) states that "critical researchers view individuals as acting within a matrix of intersubjective meanings. Thus, like the interpretive researcher, it is accepted that social scientists need to learn the language of their subject/object." Also Deetz (1996) emphasize that a researcher should understand a local language. It is hoped that a communica-

tion between a researcher and a practitioner should be successful. We suggest that the principle of communication is needed when data are gathered. The Hermeneutic Circle is used when a researcher has raw data. It seems to us that Klein and Myers (1999) concentrated on analysis of data not data gathering.

We have three known studies much supporting our proposal. Deetz (1996) proposes a change to a way how a domain in social sciences were divided by Burrell and Morgan (1979), i.e., by using two dimensions: a) radical change and regulation, and b) subjective and objective. Deetz (1996) emphasizes linguistic aspects, not a division between subjective and objective. Deetz wanted to replace the latter by elite/a priori (researcher) and local/emergent (practitioner). This principle of communication is mainly intended to the first part of a study (data gathering), to understand local people. Principle 1 (the hermeneutic cycle) is intended to deeper analysis of data after they have correctly gathered and fully understood.

With his co-workers, Barley (1996) studied technicians over a period of time. The objects / technicians said after one year's study that the researchers' description concerning technician's work is correct, maybe more exactly described than they themselves could do.

Another example is based a four-year longitudinal case study of a French multinational corporation (MNC) ... in its Chinese subsidiaries:

> The main source of data is 57 open-ended and semi-structured interviews. Interviews were conducted face to face and in English (the second language of most of the participants). (Malaurent and Karanasios 2020, p. 647)

We are afraid that the French interviewer cannot have the Chinese worldview in interviewing. Two examples demonstrate that it needs time to achieve a level when a communication is successful. Foreign languages can make communication even demanding.

In addition to the aforementioned, our minor remarks Klein and Myers (1999) can be briefly summarized as following:

1. Klein and Myers (1999) state that action research can be positivist (Clark 1972), interpretive (Elden and Chisholm 1993) or critical (Carr and Kemmis 1986). Action research (AR) is similar to design science (DS) research (Hevner et al. 2004, Järvinen 2007a), not to case study. AR and DS differ from other methodologies because of their emphasis is utility.
2. Klein and Myers appreciate:

> One of the key contributions of the research methods stream in IS research has been the formulation of a set of methodological principles for case studies that were consistent with the conventions of positivism (Benbasat et al. 1987; Lee 1989; Yin 1994). As a result, case study research is now accepted as a valid research strategy within the IS research community. The principles proposed in this stream of work have become the de facto standard against which most case study research in IS is evaluated. (Klein and Myers 1999, p. 68)

Unfortunately, Benbasat et al. (1987) do not include separate criteria, principles nor guidelines although Klein and Myers thus assert, for they refer to the ab-

stract by Benbasat et al. (1987) not to the whole article. Also, to our understanding, Cecez-Kecmanovic et al. (2020) make the same mistake.

Sarker et al. (2013)

The authors consider qualitative studies in general. They based their analysis of qualitative research in IS as represented in publications between 2001 and 2012 in four of the leading IS journals. They analyze positivist and interpretative case studies together. However, we have Benbasat et al. (1987) and Eisenhardt (1989) for positivist case studies, and Klein and Myers (1999) for interpretive case studies. Sarker et al. (2013) did not differentiate those two case study categories, thus, we cannot use their good article.

2.4 Design science

Hevner, March, Park and Ram (2004) developed a framework for IS research. It has had a tremendous effect on IS studies. This article was the fourth most-highly cited article ever published in *MISQ* (Goes 2014), and is a generally deemed "must read" article. Here, however, we present two articles (March and Smith, and Hevner et al.) chronologically. March and Smith (1995) introduced design research to information systems. They prepared a framework and four classes of research outputs that were later utilized in Hevner et al. (2004). According to Goes (2014), this article (March and Smith 1995) was based on discussions in the Workshop of Information Technology and Systems (WITS) established as a pre-ICIS workshop since 1990.

March and Smith (1995)

March and Smith highlights two roles of scientific interest:

> Scientific interest in IT reflects assumptions that these phenomena can be explained by scientific theories and that scientific research can improve IT practice. Note, however, that there are two kinds of scientific interest in IT, descriptive and prescriptive. Descriptive research aims at understanding the nature of IT. It is knowledge-producing activity corresponding to natural science. Prescriptive research aims at improving IT performance. It is a knowledge-using activity corresponding to design science. (March and Smith 1995, p. 252)

March and Smith further see that

> IT research studies artificial as opposed to natural phenomena. It deals with human creations such as organizations and information systems. (March and Smith 1995, p. 253)

This, according to March and Smith (1995), has significant implications for research on IT. March and Smith explain:

> Of immediate interest is that fact that artificial phenomena can be both created and studied, and that scientists can contribute to each of these activities. This underlies

> the dual nature of IT research. Rather than being in conflict, however, both activities can be encompassed under broad notion of science that includes two distinct species, termed natural and design science. Natural science is concerned with explaining how and why things are. Design science is concerned with 'devising artifacts to attain goals' (Simon 1981, p. 133). (March and Smith 1995, p. 253)

This can be criticized in the way that natural science can in fact involve 'devising artifacts to attain goals' (see Siponen and Klaavuniemi 2020a). Consider, for example, the development of medical treatments in molecular biology. Elsewhere, March and Smith (1995, p. 254) seem to recognize this: "natural science can address both natural and artificial phenomena."

Rather than being driven by research topic, the natural-design science distinction is based on different research objectives. Natural science aims at understanding and explaining phenomena - a goal is then truth; design sciences aims at developing ways to achieve human goals - a goal is then often called utility. (In fact, almost all scientific laws in physics are simpliphications or idealizations, e.g., according to a law of falling, a stone and a leaf are falling at the same velocity, but it will not happen in practice.)

This utility view can be also criticized. For example, natural science can also predict in some cases, yet virtually all research under cancer biology or biochemistry aims "at developing ways to achieve human goals." (cf., Siponen and Klaavuniemi 2020b) Generally, biological beings strive to find an equilibrium. It is then possible to find another explanation: cancer has thrown a human body from its equilibrium but a human being tries to re-establish equilibrium with treatments.

March and Smith (1995, p. 253) further suggest that natural science often is seen as "consisting of two activities, discovery and justification." Discovery is the process of proposing or generating scientific claims (e.g., theories or laws). Justification, in turn, deals with how theories or laws are tested. (March and Smith 1995, p. 253). Philosophers of science have also leveled a criticism towards this division, and added more phases/activities (Siponen and Klaavuniemi 2020b). Furthermore, March and Smith (1995, p. 253) see "natural sciences as technology-oriented, trying to understand reality, design science attempts to create things that serve human purposes." This means, according to March and Smith (1995, p. 253) that the products of design science "are assessed against criteria of value or utility – does it work? is it improvement?"

March and Smith describe their framework (Figure 2) [Figure 1]:

> The first dimension of the framework is based on design science research outputs or artifacts: constructs, models, methods and instantiations. The second dimension is based broad types of design and natural science research activities: build, evaluate, theorize and justify. (March and Smith 1995, p. 255–256)

Research Activities

		Build	Evaluate	Theorize	Justify
Research Outputs	Constructs				
	Model				
	Method				
	Instantiation				

FIGURE 2. Research framework (March and Smith 1995, p. 255)

Review of March and Smith (1995)

We evaluate March and Smith's (1995) IT research framework (Figure 2), their research outputs of design science (constructs, models, methods and instantiations) and evaluation criteria of those four research outputs, very positively. We are very happy that the authors differentiated design and other sciences from each other. We have two remarks.

1. Based on Figure 2, it seems that the framework covers everything. The authors of this article refer to mathematical theories, but where are mathematical theories studied?
2. Figure 2 seems to concern studies with empirical data, but where are non-data studies (Ives et al. 1980).

Hevner et al. (2004)

Hevner, March, Park and Ram (2004) prepared a framework for IS research (Figure 3) [Figure 2] and stated seven guidelines. Hevner et al. argue that

> acquiring such knowledge involves two complementary but distinct paradigms, behavioral science and design science (March and Smith 1995). The behavioral-science paradigm has its roots in natural science research methods. It seeks to develop and justify theories (i.e., principles and laws) that explain or predict organizational and human phenomena surrounding the analysis, design, implementation, management, and use of information systems. (Hevner et al. 2004, p. 76)

Hevner et al.'s idea is

> that each of these guidelines should be addressed in some manner for design-science research to be complete. How well the research satisfies the intent of each of the guidelines is then a matter for the reviewers, editors, and readers to determine. (Hevner et al. 2004, p. 82)

Table 6 [Table 1] summarizes the seven guidelines.

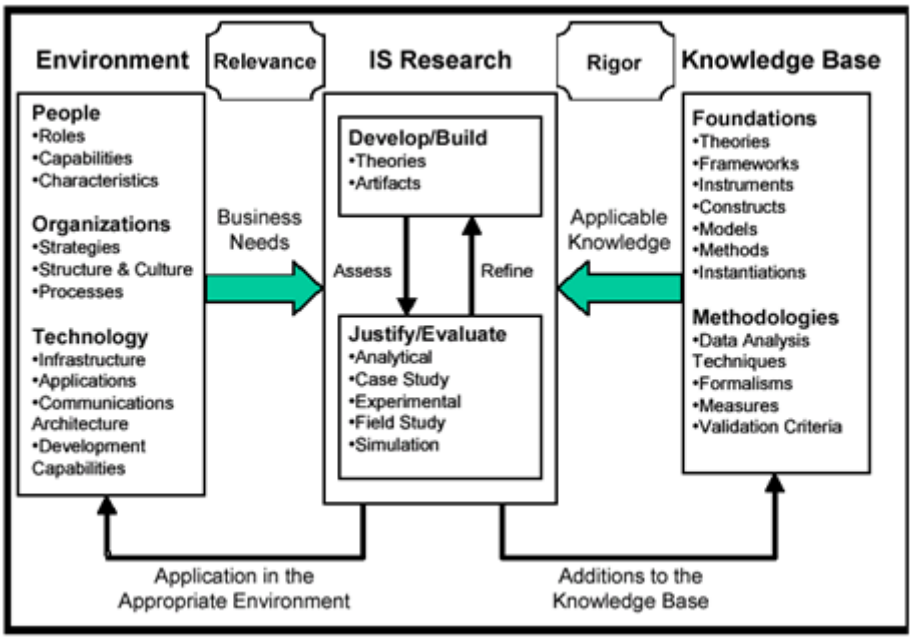

FIGURE 3. Information systems research framework (Hevner et al. 2004, p. 80)

TABLE 6. Design-science research guidelines (Hevner et al. 2004, Table 1, p. 83)

Guideline	**Description**
Guideline 1: Design as an artifact	Design-science research must produce a viable artifact in the form of a construct, a model, a method, or an instantiation.
Guideline 2: Problem relevance	The objective of design-science research is to develop technology-based solutions to important and relevant business problems.
Guideline 3: Design evaluation	The utility, quality, and efficacy of a design artifact must be rigorously demonstrated via well-executed evaluation methods.
Guideline 4: Research contributions	Effective design-science research must provide clear and verifiable contributions in the areas of the design artifact, design foundations, and/or design methodologies.
Guideline 5: Research rigor	Design-science research relies upon the application of rigorous methods in both the construction and evaluation of the design artifact.
Guideline 6: Design as a search process	The search for an effective artifact requires utilizing available means to reach desired ends while satisfying laws in the problem environment.
Guideline 7: Communication of research	Design-science research must be presented effectively both to technology-oriented as well as management-oriented audiences.

Review of Hevner et al. (2004)

Despite of all the merits of Hevner et al. (2004,) we herewith report an aspect that is often forgotten (in our opinion). Namely an importance of a research problem, it concerns *contributions* of both behavioral science and design science in IS research. Also, the research problem must be *useful* (cf. Clarke et al. 2020). Moreover, we have five minor remarks and three amendments.

We would like to remark that:

1. Hevner et al. write that their

> definition of IT artifacts is both broader and narrower than those articulated above. It is broader in the sense that we include not only instantiations in our definition of the IT artifact but also the constructs, models, and methods applied in the development and use of information systems. However, it is narrower in the sense that we do not include people or elements of organizations in our definition nor do we explicitly include the process by which such artifacts evolve over time. (Hevner et al. 2004, p. 82)

   Our concern is the following. This technology-orientation can create some difficulties where people and their behavior play an important role. A bookkeeper once asked, "Why do programmers try to solve all the problems?" She then asked, "Why don't programmers automate the easiest problems and leave the most difficult ones to people (experts)?"
2. Guideline 6 (Design as a search process) is explained as follows: "The search for an effective artifact requires utilizing available means to reach desired ends while satisfying laws in the problem environment" (see Table 6). We don't think the term "search" is the best possible. We would emphasize a development more than searching, because normally, we do not yet have a great number of components (sub-programs, etc.) among which to search, but we must create a component from scratch.
3. Hevner et al. state concerning Guideline 3 (Design evaluation) that

> evaluation of a designed IT artifact requires the definition of appropriate metrics and possibly the gathering and analysis of appropriate data. IT artifacts can be evaluated in terms of functionality, ..., fit with the organization, and other relevant quality attributes. (Hevner et al. 2004, p. 85)

   The evaluation of the fit between an IT artifact and the organization is similar to the evaluation between a representation of IS and IS itself, because the latter "represents some part of the world that a user and other stakeholders must understand" (cf. Burton-Jones and Grange 2013, p. 632).

   Østerlie and Monteiro (2020) draw on a four-year case study of offshore oil and gas production. They apply a representation theory to that production by using digital technologies. They examine "organizationally real" digital representations and compare them with reality. (Obs. Hevner et al. published their study years before Burton-Jones and Grange and much earlier than Østerlie and Monteiro.)
   Recently, Baskerville et al. state:

> As information systems (IS) academics, we have traditionally viewed the purpose of an information system as being to model and reflect reality. The information system is a

> reflection of reality and the information it contains is a purposeful representation of the real world. In this classical view of an information system, data models provide a formal means of representing information about the world. (Baskerville et al. 2020, p. 509)

Baskerville et al. believe

> that this classical view of an information system is increasingly obsolete ... explain how an ontological reversal is underway. In this reversal, the real world becomes a purposeful product of the digital world. Reality becomes a reflection of our models in the digital world. This reversal has profound implications for the IS field. (Baskerville et al. 2020)

4. March and Smith (1995) and Hevner et al. (2004) presented an innovation that based on an utilization of technology. Liedtka (2020) presented many social innovations based on a development of social resources. Liedtka's (2020) innovations could be combined with technical ones.
5. In Figure 3, Hevner et al. (2004) under heading 'IS Research' present main functions: Develop/Build (top) and Justify/Evaluate (down). But readers seem to have difficulties to differentiate behavioral science (Develop and Justify) and design science (Build and Evaluate), they are often confused.

We wish to advance our interpretation of Hevner et al.'s (2004, p. 78) view "two complementary but distinct paradigms, behavioral science and design science". We see a construction as a process. Its purpose is to achieve a movement from the initial state to the target or goal state (Figure 4).

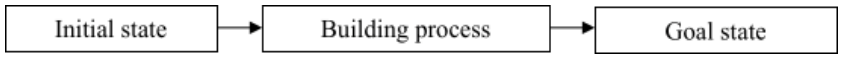

FIGURE 4. Building process

We propose the following amendments:

1. When we describe the initial and goal states, we use behavioral science.
   The descriptions of the initial and goal states can be kept as instances of a certain behavioral theory. The former is an instance of a certain theory about when we are at the beginning of a construction process. The goal state is not yet realized. i.e., it is a utopia which could be achieved. For example, when we previously had a certain manual system, say, paying for support in social care, we must describe the initial state of the system for understanding. When we ask software houses to build a computer-supported version, we must describe the system's goal state. In both description tasks (initial and goal), we could utilize a certain theory, and those descriptions are instances of a theory. The initial and goal states can be considered as activities (Figure 5).

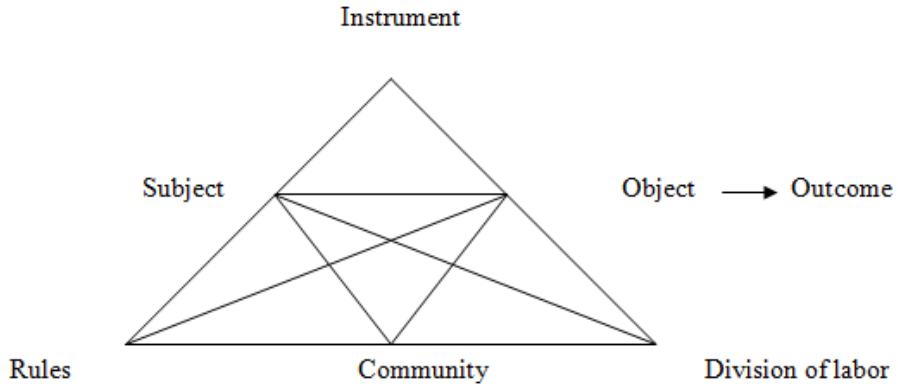

FIGURE 5. An activity (Engeström 1987)

Human activity consists of six components. Engeström (1987, pp. 76-78) describes it as a transition from animal to man where the subject-object-community triangle is enlarged with three differentiating abilities of man: 1) using instruments in elaboration of objects, 2) organizing work by division of labor and 3) using rules, e.g., language in communication and co-operation. We apply the idea of activity to the initial and goal states in Figure 6.

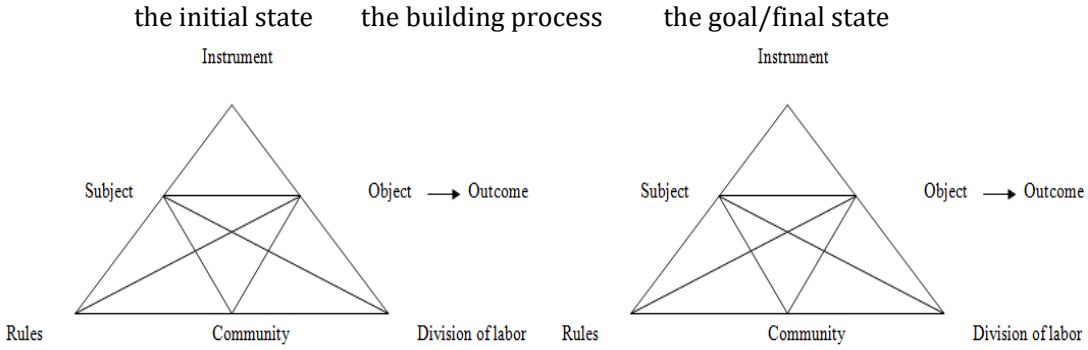

FIGURE 6. Transition from the initial state to the goal or final state

2. When we implement the building process, we use design science. According to March and Smith (1995) and Hevner et al. (2004), in a positive case, the goal state can be achieved by using an instrument in the elaboration of objects in the initial state, and in information systems, an instrument normally is an IT artifact. A researcher improves a current IT artifact or buys a new one or develops it himself, etc. to achieve the goal state. Sometimes, researchers and /or practitioners do not achieve the goal state but achieve the lower final state that is not the exactly a desired goal. However, in practice the final state can be mostly accepted. By the term "lower", we mean a value of the goal function (Järvinen 2007b) under which all kinds of different interests (from different stakeholders) can be collected. It is assumed that a goal function is higher in the final state and lower in the initial state.
3. The goal function can be a utility metric.

2.5 Canonical action research

Davison, Martinsons and Kock (2004) write that

> The application focus of action research (AR) involves solving organizational problems through intervention while at the same time contributing to knowledge. (Davison et al. 2004, p. 65)

Davison et al. (2004) and later Davison, Martinsons and Ou (2012) developed five principles and many criteria for canonical action research (CAR). They propose a theory for CAR and with it, they are at a forefront of research. In the latter article the authors demonstrated how their five principles and many criteria were applied to two firms' study.

Here, we first analyze the article Davison et al. (2004) by concentrating on the CAR process model (Figure 7) [Figure 1] and bypassing criteria that were slightly changed 2012. Davison et al. (2012) mainly demonstrate two types of theories in CAR and in two Chinese organizations. Finally, we shall present some our views in the future.

Davison et al. (2004)

Davison et al. state:

> In recent years, the publication of action research (AR) articles in the information systems (IS) domain has become more frequent, with a number of theoretical and applied contributions. ... AR has been criticized for its lack of methodological rigor (Cohen & Manion, 1980), its lack of distinction from consulting (cf. Avison, 1993) and its tendency to produce either 'research with little action or action with little research' (Dickens & Watkins, 1999, p. 131).
>
> This article addresses these criticisms by developing a set of interdependent principles and associated criteria that researchers and reviewers can use both to ensure and to assess the rigor and relevance of canonical action research (CAR) – one of the more widely practiced and reported forms of AR in the IS literature. The term 'canonical' is used to formalize the association with the iterative, rigorous and collaborative model developed by Susman and Evered (1978). (Davison et al. 2004, pp. 65–66)

Davison et al. (2004) consider how their views in this article are related to rigor and relevance and present their tentative view. We shall analyze this topic later.

Davison et al. (2004) explain an origin of action research (AR) and its relationship with CAR. They also state that their intention (p. 68) "is to improve the quality of CAR studies by providing practical guidance for both researchers and reviewers".

Davison et al. (2004) propose the following *five principles* for CAR:

1. Principle of the Researcher-Client Agreement (RCA),
2. Principle of the Cyclical Process Model (CPM),
3. Principle of Theory,
4. Principle of Change through Action,
5. Principle of Learning through Reflection.

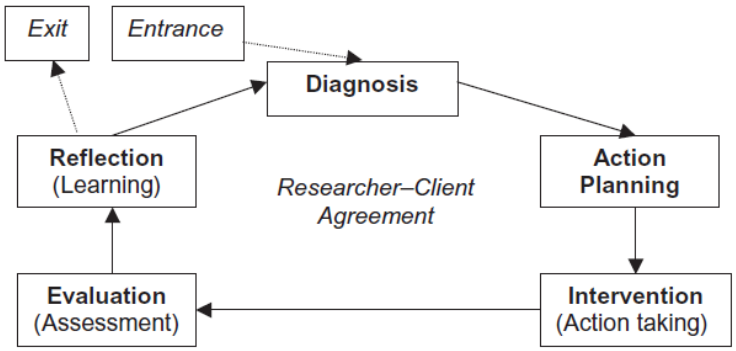

FIGURE 7. CAR process model (Davison et al. 2004, Figure 1, p. 72)

We relate those principles to Figure 7.

Susman and Everett (1978) called five main blocks in the cycle as follows:

1. Diagnosing: identifying or defining a problem,
2. Action planning: considering alternative courses of action for solving a problem,
3. Action taking: selecting a course of action,
4. Evaluating: studying the consequences of an action,
5. Specifying learning: identifying general findings.

Hence, we can see, that Davison et al. (2004) and Susman and Everett (1978) called blocks sometimes at the same way and sometimes differently.

Davison et al. (2004) mainly base their five principles in Figure 7 and explain them as follows.

(1) The Principle of the Researcher-Client Agreement (RCA)

According to Davison et al.,

> The RCA is the guiding foundation for an AR project (Foster, 1972). However, in order for the RCA to be effective, it is necessary that the client understands how CAR works and what its benefits and drawbacks are for the organization. Achieving this understanding may require a process of knowledge transfer (from researcher to client). The agreement should contain mutual guarantees for behaviour in the context of the project. A well-constructed RCA should provide a solid basis for building trust among the various stakeholders and contributes to the internal validity of the research. The agreement helps to promote a spirit of shared inquiry, by having clients contribute as the researcher determines goals, plans actions, implements changes and assesses the outcomes of those changes. (Davison et al. 2004, pp. 69–70)

(2) The Principle of the Cyclical Process Model (CPM)

Davison et al. describe:

> When an initial RCA has been established, it is appropriate for the action researcher to commence work on the project. His or her activities will typically be informed by and designed to follow a CPM. Susman & Evered (1978) originally proposed a model with the following five stages: diagnosis, planning, intervention, evaluation and reflection. (Davison et al. 2004, p. 72)

(3) The Principle of Theory

Davison et al. state that:

> ... a CAR project may begin with theory-free action learning. However, akin to the traditional scientific method, the diagnostic stage provides a starting point of comparison for the post-implementation evaluation. ... Changes to theory typically take place in the reflection stage of the CAR process and lead the project into an additional process cycle. The essential role of theory in CAR, which helps to distinguish it from action learning. (Davison et al. 2004, p. 74)

(4) The Principle of Change through Action

Davison et al. characterize the fourth principle as follows:

> The essence of CAR is to take actions in order to change the current situation and its unsatisfactory conditions (cf. Curle, 1949; Hult & Lennung, 1980; Eden & Huxham, 1996). The fourth principle reflects this essence and the indivisibility of action and change, with intervention seeking to produce change. A lack of change in the unsatisfactory conditions suggests that there was no meaningful problem, that the intervention failed to address the existing problem(s), or that the existing situation could not be altered because of political or practical obstacles that were neglected when the RCA was established. (Davison et al. 2004, p. 75)

(5) The Principle of Learning through Reflection

Davison et al. describe the fifth principle as follows:

> Lau (1997) asserts that the explicit specification of learning is the most critical activity in AR. The rationale for our Principle of Learning through Reflection stems from the multiple responsibilities of the action researcher: to clients and to the research community. This is consistent with the common call for research reports to specify the implications for both practice and (further) research. Clients will focus on practical outcomes while the research community will be interested in the discovery of new knowledge. Practical progress and the advancement of knowledge both result from considered reflection and learning. (Davison et al. 2004, p. 76)

Davison et al. (2004) demonstrate how principles and criteria could be used to assess and to conduct CAR. They apply their principles and criteria to the Olesen and Myers' (1999) CAR paper. The authors go through the paper by principles. They also published Myers' response to the critique.

Review of Davison et al. (2004)

Davison et al. (2004) provide many good principles to guide CAR. Their article also contains views that we consider *weaknesses* or, otherwise call for remarks:

1. (a) The CAR model by Davison et al. (2004), presented in Figure 7 slightly differs from the action research original cycle by Susman and Evered (1978). It contains Entrance and Exit. The term "entrance" exists only once and in Figure 7 in the article (Davison et al. 2004). To our mind, 'entrance' means an initialization of a certain process, here the cycle of Susman and Evered (1978), an 'entrance' can contain many preparing tasks. To our mind, the Researcher-Client agreement (RCA) could mainly belong to the Entrance, because a main part of a contract between researchers and practitioners will

prepared before an actual CAR cycle. A fine tuning of the contract will be performed during the cycles.
(b) The term "exit" can be many times found in the article (Davison et al. 2004). We see that this term can also mean termination and contain many 'tear down' tasks after an end of cycles.
(c) In Figure 7, a process is always surrounded by Entrance and Exit. The inner process can in this case contain many cycles, and then, according to our view, a process can be said continuous.

2. Comparing the original cycle of Susman and Evered (1978) with five blocks in Figure 7 and five principles (except for Principle 3 Theory), we can see that Principle 2 (CPM) refers to the whole cycle in Figure 7, and Principle 5 (Learning through Reflection) refers to one step of the cycle of Susman and Evered (1978), and Principle 4 to other steps of the cycle of Susman and Evered (1978), with Principle 1 (RCA) being realized mainly in Entrance. We can say that the consistency between the original cycle of Susman and Evered (1978) and Figure 7 is not very high and causes problems for readers.
3. Davison et al. (2004, p. 70) see that "the researcher determines goals", i.e., a CAR process is researcher-led. But a CAR process can also be practitioners-led, because practitioners own a firm, practitioners accept a researcher can help them and practitioners want to get utility because of CAR.

Davison et al. (2012)

The original set of five principles and 31 criteria were published as part of the Davison et al.'s article in *Information Systems Journal* in 2004. Under Principle 1, 4 and 5 are now (2012) the same criteria, under Principle 2 there are seven new (supplemented) criteria, and under Principle 3 there are three revised and seven new criteria (a total number of criteria being now 40).

Davison et al. (2012) updated their content in 2004 and presented four challenges in canonical action research (CAR) and how to overcome these challenges and improve CAR. Davison et al. describe two types of theories, focal and instrumental, as follows:

> A focal theory provides the intellectual basis for action-oriented change in a CAR (canonical action research (Susman and Evered 1978)) project. Examples of focal theories include the theory of planned behavior (Ajzen 1991), adaptive structuration theory (DeSanctis and Poole 1994), and punctuated equilibrium theory (Gersick 1991).
>
> In contrast, an instrumental theory is used to explain phenomena (Angeles 1992), including those processes and tools that are used to establish and verify focal theories. Action researchers and their clients use instrumental theories to facilitate specific activities, especially diagnosis, planning and evaluation. Although other terms such as micro-theory (Markus et al. 2002), theory for analyzing (Gregor 2006), and even analytical tool have been used previously to denote this kind of theory, our use of the term instrumental theory reflects a belief that the theory is instrumental in facilitating a rigorous CAR process. (Davison et al. 2012, pp. 765–766)

The set of principles, criteria, focal and instrumental theories are tested in two real-life cases. Davison et al. describe that:

> The planned changes in this particular project were underpinned by two specific instrumental theories—the value shop and the balanced scorecard—and three different focal theories—transaction cost economics (TCE) (Williamson 1975), transactive memory theory (TMT) (Wegner 1987), and an emerging theory of knowledge sharing. (Davison et al. 2012, p. 766)

Davison et al. (2012) illustrate an enhanced CAR in connection with two knowledge sharing cases from China. They demonstrate how they used focal and instrumental theories in those two cases (Eastwei, RuderFinn).

Review of Davison et al. (2012)

All the principles and criteria are well designed. In addition, the authors are the first ones to focus on theory in connection with AR. However, we have many minor and major remarks:

1. For three focal theories (TCE, TMT and an emerging theory of knowledge sharing), it is interesting to ask: Are three theories used in a confirmatory or exploratory way? Analysis of Davison et al. (2012) shows that in this article, researchers proposed focal theories (TCE for Eastwei, TMT for RuderFinn and a knowledge sharing theory for both), and in a confirmatory way. Then, researchers considered an object under study through focal theories, and this object seems to behave according to theories. It is also possible that a study situation is not so simple and stable, and then, researchers must perform a case study to find what is an explored part of reality. Both ways (exploratory and confirmatory) to use focal theories will help in CAR. The focal theories TCE and TMT assume like Hann and Weber (1996) an equilibrium (status quo) or "a stable state" has reached. Hence, we conclude that focal theories describe a certain state, either the initial or goal state, i.e., *focal theories are seeking truth*.
2. In two Chinese cases, the value shop and the balanced scorecard (BSC) were used as instrumental theories. The value shop contains five main generic activities (Problem finding and acquisition, Problem solving, Choice of problem solution, Execution of solution, and Control and evaluation) that are similar as phases of problem solving. – BSC emphasizes many different economic factors or utility criteria. Concerning BSC, Nørreklit (2003, p. 592) showed that ... "there is no cause-and-effect relationship between some of the suggested areas of measurements in the BSC." The cause-effect relationship is needed to guide a change process from an initial state to a goal state. Hence, BSC cannot be used as an instrumental theory.
3. According to Davison et al. (2004, 2012), AR solves and ameliorates organizational problematic situations. The term "ameliorate" means almost same as "improve". An improvement can be measured by a certain goal function. Practitioners often present, what is an improvement in a particular case. A problem in AR (and in CAR) is how to improve the initial state of an organization or a part of organization. If the better state called a goal state has a higher value of a goal function than the initial state, then AR has been

successful, and a change from the initial state to the goal state is realized. A goal function does not then measure truth but utility.

4. Pictorially, we present CAR (and AR) in Figures 8 and 9. A particular focal theory describes actions that produce things/services in the initial state and often in the goal/final state. The building process describes a change from the initial state to goal/final state. A change (a building process) in a certain CAR project happens only *once*. Action in the initial and goal/final state functions continuously.

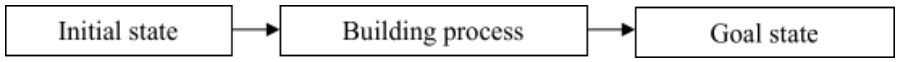

FIGURE 8. Building process (also in Hevner et al. 2004)

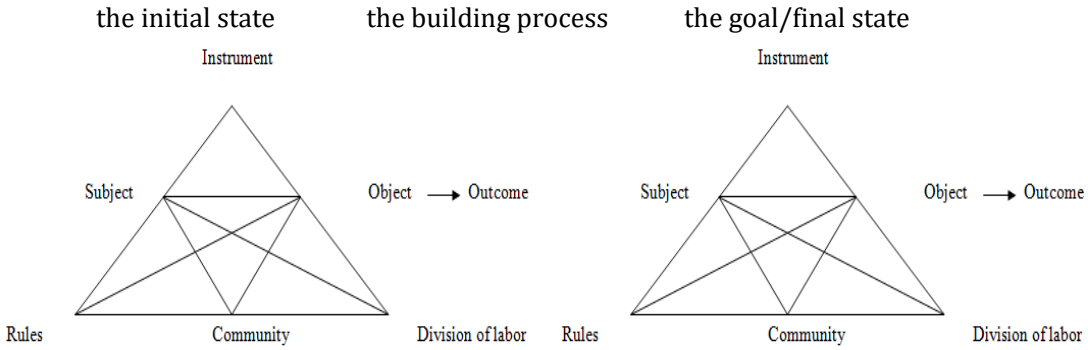

FIGURE 9. Transition from the initial state to the goal/final state

5. Davison et al. (2004, p. 66) consider how the five principles of CAR contribute to rigor and relevance. They define "rigor" as follows:

> While AR in general has been praised for the relevance of its results (e.g. Baskerville & Wood-Harper, 1996), it has also been criticized as lacking rigor (e.g. Cohen & Manion, 1980). Consequently, it is useful to clarify the meaning and importance of both rigor and relevance. Merriam-Webster's Collegiate Dictionary (http://www.m-w.com) defines rigor in various ways, the most relevant to our purpose being 'strict precision' and 'exactness'. Rigor has also been referred to as 'the correct use of methods and analyses appropriate to the tasks at hand' (Benbasat & Zmud, 1999, p. 5), which implies the existence of a context that will enable one to determine what is correct and appropriate. (Davison et al. 2004, p. 66)

A researcher and practitioners know the initial state, and its focal theory can be found or created. A researcher can test whether the focal theory is precise or exact or are methods and analyses correctly used (see the citation above). Based on our earlier comment, an intentional change or movement from the initial state to the goal state happens once. A path of this movement can rarely be direct but there often are a lot of snags involved. How to move a system from the initial state to the goal state, is a researcher's and practitioners' problem. It is known that in the literature, there is no particular theory for a problem-solving. Hence, *an instrumental theory is not*

needed to find, because we do not know a reuse of that instrumental theory. – Notwithstanding, a cause-and-effect relationship (a→b) existing because of a certain resource, e.g., a technical, social, informational resource or their combination for the change, is still needed. Davison et al. mainly proposed an instrumental theory for change, although they wrote:

> Focal theory also plays a critical role in the action plans, since any plan must be underpinned by theoretical cause-and-effect relationships. (Davison et al. 2012, p. 770)

To our mind, Davison et al. (2012) do not seem to remember that focal theory explores a status quo and a continual action (producing things and/or services) but instrumental theory is intended for a change happening only once. Davison et al. (2012, p. 766) say that their "use of the term instrumental theory reflects a belief that the theory is instrumental in facilitating a rigorous CAR process". We can say that Davison et al. (2012) did not succeed to define focal and instrumental theories in such a way that they were pairwise disjoint.

6. We assume that we can apply the resource-based view (RBV); i.e., there are physical, social and informational resources. (The fourth resource is financial, i.e., money with which we can buy the other three types.) Material, technology (IT etc.) are physical resources, people are social resources, and data, information and knowledge are informational resources.
   We re-analyze two examples presented by Davison et al. (2012) and show another potential solution. Davison et al. describe:

   > Our enhancement of CAR has emerged from a extended knowledge sharing project that we undertook with two public relations (PR) firms in China: Eastwei (www.eastwei.com) and RuderFinn (www.ruderfinnasia.com). ... Both firms also provide a similar range of media-related services to their clients, primarily large multinational corporations that need to develop and maintain PR initiatives in China. (Davison et al. 2012, p. 771)

   Davison et al. (2012) first performed action research in Eastwei and then in RuderFinn. We emphasize that the research objects are similar. Concerning Eastwei, Davison et al. state that their guiding research question was:

   > How do Chinese employees make use of technology to manage knowledge? The authors found that most knowledge sharing was because of Guanxi restricted to members of work teams. Team members used instant messengers (IM) in their communication and messages were automatically archived. (Davison et al. 2012, p. 774)

   Davison et al. (2012) made some minor improvements in knowledge sharing in Eastwei. Davison et al.'s (2012) second action research project was conducted at RuderFinn. Davison et al. (2012) took value shop (in fact, a problem solving) theory as instrumental theory and transactive memory theory as focal theory. In Eastwei and RuderFinn, we are sure that an IT system supports knowledge management. Davison et al. (2012) state that transactive memory refers to the knowledge of "who knows what". They then refer

to a fact: This meta-knowledge is a basic requirement of the distributed knowledge system.

Davison et al. (2012) emphasize that instrumental and focal theories play an important role in their two action research projects. We agree that the theories helped communication via perspective making and perspective taking between researchers and practitioners (Boland and Tenkasi 1995). Our view, however, slightly differs from their view. According to our view (Järvinen 2007a), action research and design research are similar. Thus, we believe that *IT and an improvement in its use* in Chinese cases helped knowledge sharing, although it happens mainly in teams, not among all the participants.

2.6 Conceptual research

Hirschheim was a senior editor of the *IS Research Perspectives* section of the *Journal of the Association for Information Systems* (*JAIS*). Hirschheim proposes seven guidelines structured by following 'consecutive' presentation areas of a scientific article.

Hirschheim (2008)

Hirschheim writes that *JAIS* needs more submissions and especially more individuals capable of reviewing submissions. He motivates researchers to submit not only papers focusing on the typical (traditional) research article genre. As for Hirschheim (2008, p. 434), this means "empirical and mostly positivist submissions." He calls for papers focusing on how to review conceptual or philosophically motivated, rather than empirical, pieces.

Hirschheim then asks:

> how does one distinguish between a good paper and a bad one? Although it is not necessarily easy to ascertain a good paper from a bad paper, there are some accepted guidelines to help. Unfortunately, many of these guidelines work for knowledge claims that are based on empirical data. But what if the claims are conceptual and focus more on offering new ways to think about a phenomenon? How does one judge such claims? ... Conceptual papers emphasize assumptions, premises, axioms, assertions, etc.; and these need to be made as explicit as possible so they can be evaluated. But how should they be evaluated? One useful framework is the one offered by the British philosopher Stephen Toulmin (1958) in The Uses of Argument. Using Toulmin's framework, one can assess the strengths and weaknesses of the arguments used by a paper's authors. (Hirschheim 2008, p. 435)

Hirschheim guides:

> Outside reviewers play a vital role here. They help the paper's authors better craft their arguments, their thinking, their way of presenting evidence, their conclusions, etc. Reviewers must, therefore, guard against narrow-mindedness. They must be open to new ideas: new ways of thinking, new ways of presenting evidence, new insights, and the like. ... Reviewers need to be diplomatic and constructive, yet clear and concise. ... the reviewer should be polite and constructive no matter how bad he/she feels the paper is. (Hirschheim 2008, pp. 435–436)

Hirschheim (2008) offers a rough set of guidelines to get started. They are structured in seven areas:

A. Introduction,
B. Content,
C. Presentation and structure,
D. Theoretical foundation,
E. Data analysis/interpretation/ argumentation,
F. Results,
G. Conclusions.

Many of these guidelines are general. Others – especially the sections D, E and F – are focused more on conceptual papers. Hirschheim (2008) describes each area as follows:

A) Introduction

The introduction sets out the motivation and the purpose of the paper. It tells the reader why he/she should be interested in investing the time to read the paper. It sets up the claims that the paper will be making.

B) Content

Content refers to the specific contribution of knowledge that the research makes (or is supposed to make). This is where the claims are actually articulated. The claims need to clearly stated and understandable.

C) Presentation and structure

Presentation refers to the logical sequence of the arguments presentation. It also involves the rhetorical style used by the authors, or how the claims are articulated to the reader. They must be presented in an intelligible way.

D) Theoretical foundation

Theoretical foundation refers to the theories, frameworks, or underlying concepts that are used to guide the research. Different disciplines have diverse bases for accepting or not accepting various theoretical arguments. Theoretical foundations relate to warrants – the assumptions and beliefs that lie behind the claims. They provide the raison d´etre for the claims.

E) Data analysis/interpretation/argumentation

In speaking about data here, it does not necessarily have to be empirical data. Data can come from many sources, and the reviewer has to be open to consider whatever type of data the authors may use. Moreover, data analysis / interpretation is broader than the application of some statistical technique; it refers to how whatever data used in the research is analyzed and/or interpreted in a rigorous fashion. In the Toulmin sense (Toulmin 1958), his refers to the grounds or support for the claims.

F) Results

Results refer to the output of the research inquiry. Having undertaken the research, this constitutes what was actually produced by the authors. In the sense

of Toulmin, this is where the claims, grounds and warrants all come together in one coherent unit. Metaphorically, this is 'where the rubber meets the road'.

G.) Conclusions

Conclusions should be the extrapolation of what was learned from the research. Many authors use the Conclusions section of their papers as summaries, simply repeating what they did. However, Conclusions should be the section where the authors take the opportunity to discuss what the results conceptually mean and what the implications are for research and practice.

Hirschheim concludes:

> While the review process is valuable for the institutional dissemination of all scholarly work, one is tempted to say it is especially valuable for knowledge claims not using empirical data, as these types of papers are largely based on conceptual thinking and argument. Traditional articles based on quantitative or qualitative data can typically be evaluated using a somewhat standard review template and by looking at weak points in sampling, statistical analysis, operationalization, or research design. The same cannot be said of a conceptual paper — it only stands on the strength of its argument and the originality of its thinking. And it is here where reviews can really add value. (Hirschheim 2008, p. 440)

Review of Hirschheim (2008)

In the guidelines for reviewers, Hirschheim gives helpful and detailed advice. His style using the form of questions helps reviewers of conceptual papers pay attention to many important aspects. He shows how all the key concepts must be first defined and then used consistently. The thought experiment to apply his recommendations (A–G) to his own paper seems to give a good result.

Schryen et al. (2020) demonstrate how they derive knowledge from literature reviews (LRs). The authors build their LR knowledge typology as six knowledge-building activities (synthesizing SYN, aggregating evidence AE, criticizing CRI, theory building TB, research gap RG, research agenda RA). Schryen et al. (2020) mention that three first knowledge development activities can be directly get from a literature review, and three latter after they are empirically tested. The authors say that synthesizing is always performed, and *synthesizing is an alternative* for Hirschheim's (2008) process (A, ..., G).

We found that Hirschheim (2008) is emphasizing a literature review (LR) (or literature base) as a starting point for his approach. LR is often consisted of primary studies (cf. Kitchenham et al. 2009) where empirical data are used. It seems to us that conceptual studies can achieve results following two approaches. The former seems to base on earlier studies using empirical data, but the latter bases on descriptions, say *axioms*, describing a part of reality. Hirschheim seems to follow the former but might forget the latter. Referring to descriptions of a part of reality, Wand and Weber (2002) like speak about the task of *conceptual modeling* that involves building a representation of selected phenomena in some domain. As an example of the latter (a *non-data approach*) Wand and Wang define:

> An information system is said to be a representation of a real-world system if observing the state of the information system at a given time enables the inference of a state of the real-world system (at the same or another time). (Wand and Wang 1996, p. 90)

A part of reality is described by conceptual modeling, and a definition of a certain object (e.g., an information system above) can be derived from scripts (axioms). Another example is Burton-Jones and Grange (2013). Recker et al. like to update research in conceptual modeling:

> Conceptual modeling research is more relevant to the IS field than ever, but it requires an update with new theory. We develop a new theoretical framework of conceptual modeling that delivers a fundamental shift in the assumptions that govern research in this area. (Recker et al. 2021, p. 269)

Hence, conceptual modeling is not yet expired, but it can still offer an alternative for Hirschheim's (2008) approach that is based on earlier primary studies with empirical data.

2.7 Grounded theory studies

Urquhart, Lehmann and Myers (2010) provide guidelines for grounded theory (GT) studies.

Urquhart et al. (2010)

Urquhart et al. (2010) pay attention to a common view that grounded theory (GT) studies in information systems have been criticized a low level of theory development. The GT method is considered only a coding method. Urquhart et al. (2010) inform their research question: "How can the GT method be leveraged to build a theory in information systems?"

In the literature, there are various definitions of GT. The creators of GT defined it: "the discovery of theory from data – systematically obtained and analyzed in social research" (Glaser and Strauss 1967, p. 1). Later, however, there is a clear disagreement between the two founders, Glaser and Strauss:

> Glaser disagreed on two fundamental issues. First, Strauss & Corbin (1990) suggested breaking down the coding process into four prescriptive steps (open, axial, selective and 'coding for process'), whereas Glaser uses just three: open, selective and theoretical coding, at incremental levels of abstraction. Second, Glaser objected to the use of a coding paradigm and the 'conditional matrix', which are designed to provide ready-made tools for the conceptualization process. Glaser pointed out that to 'force' coding through one paradigm and/or down one conditional path was not grounded theory, but conceptual description, which ignored the emergent nature of grounded theory (Glaser, 1992). Also, the coding paradigm used by Strauss and Corbin – which suggests that the researcher looks at context, conditions, action/ interactional strategies, intervening conditions and consequences for the purposes of establishing categories and relationships – can be further critiqued as a departure from traditional grounded theory. (Urquhart et al. 2010, pp. 361–362)

It is important that a researcher knows and informs readers that she will follow either Glaser's or Strauss' line. Strauss and Corbin's (1990) book

> was written in response to their students' request for a 'how to' manual of grounded theory, and contains clear guidelines and procedures. In Glaser's view, this formalization is far too restrictive, to the extent that it may strangle any emergent conceptualizations and instead force the concepts into preconceived mould. (Urquhart et al. 2010, p. 361)

Urquhart et al. developed Figure 10 [Figure 1] for GT and state:

> The process of generating a grounded theory is summarized in Figure 10 [Figure 1]. A researcher begins a grounded theory study with ideational constructs, such as 'hunches' (Miles & Huberman, 1984), for investigation. It is important to note that despite the injunction to try to avoid having any preconceived theoretical ideas before starting the research, these seed concepts or early hunches 'can come from sources other than data' (Glaser & Strauss, 1967, p. 6). These seed concepts help a researcher to select an area of enquiry and define the topic. The area of enquiry is called the 'substantive area' in grounded theory terminology. (Urquhart et al. 2010, p. 362)

Urquhart et al. emphasize a more formal theory than the normal substantive one:

> Figure 11 [Figure 2] depicts this hierarchy of theories. The general idea of using grounded theory is that as the researcher moves up the level of abstraction, the range and scope of the theory increases. (Urquhart et al. 2010, p. 364)

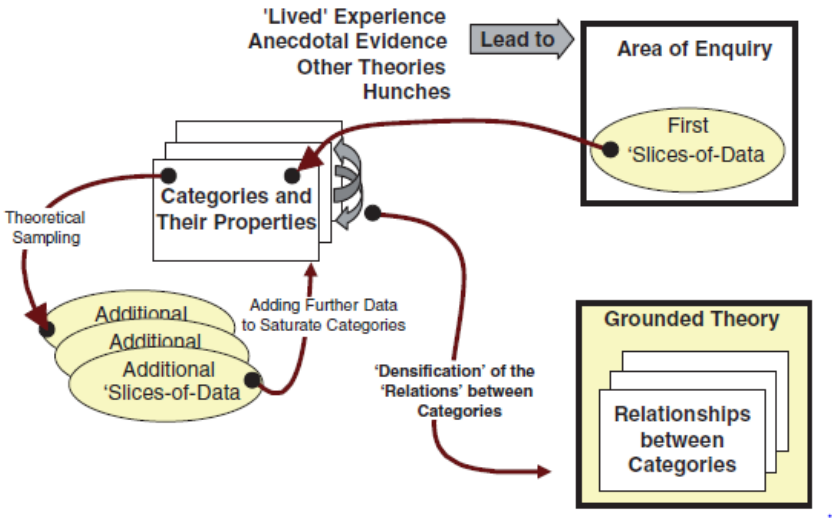

FIGURE 10. Cycle of data collection and analysis in the grounded theory method (after Lehmann (2001) and Fernandez *et al.* (2002)) (Urquhart et al. 2010, Figure 1, p. 363)

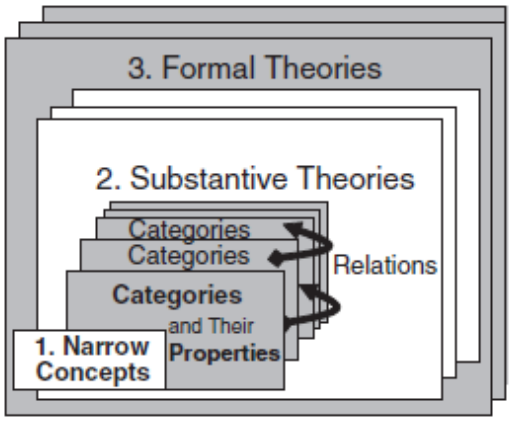

FIGURE 11. Progression of theory development in the grounded theory methodology (adapted from Lehmann, 2001) (Urquhart et al. 2010, p. 364)

Urquhart et al. (2010) state that theories that have been exploratorily generated from within a specific area of enquiry using GT method are termed 'substantive' theories. By referring to Strauss (1987), Urquhart et al. (2010) state that the highest level of abstraction theories produced by GT is called 'formal theory' focusing on conceptual entities. Glaser and Strauss (1967) suggest that in order to generate formal theory, a comparative analysis should be made among different substantive theories that fall within a particular substantive area. In this article, the authors emphasize a more formal theory than a normal substantive one.

Urquhart et al. base their framework for guidelines as follows:

> We have observed in our own grounded theory work and in that of others that two aspects are important for theorizing. These two aspects are the degree of conceptualization and theory scope. These two dimensions underline the grounded theory process of theory building – conceptualization that moves beyond mere description, and also considers relationships between categories, and pitching the theory scope at the appropriate level. The first axis – the degree of conceptualization, can be seen as relating to the process of building a grounded theory, and relates to the degree of analysis carried out. The second axis, theory scope, can be seen to relate to the outcome of building a grounded theory. A summary of the framework is shown in Figure 12 [Figure 3]. (Urquhart et al. 2010, p. 365)

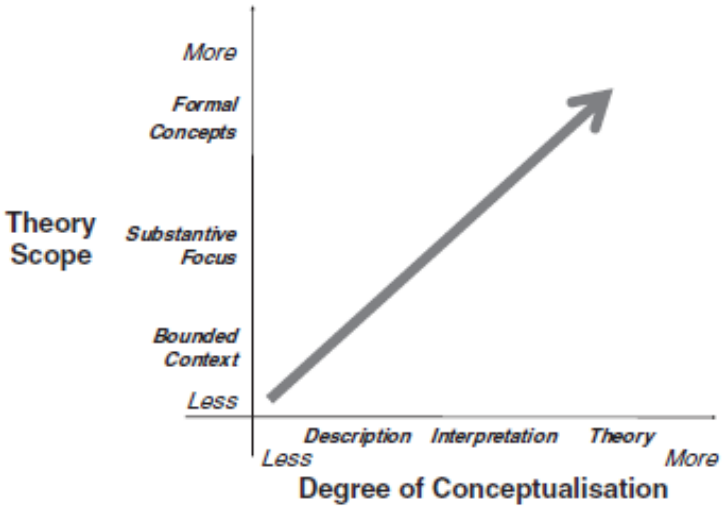

FIGURE 12. Framework for analyzing grounded theory studies (Urquhart et al. 2010, p. 366)

Urquhart et al. (2010) describe their dimensions: conceptualization (description, interpretation, theoretical coding) and theory scope (bounded context, substantive focus, formal concepts). Urquhart et al. (2010) aim to propose guidelines for a conduct and evaluation of grounded theory studies in information systems. These guidelines are oriented towards building theory in our field, and are summarized in Table 7 [Table 1].

TABLE 7. Guidelines for grounded theory studies in information systems (Urquhart et al. 2010, Table 1, p. 369)

1. Constant comparison	Constant comparison is the process of constantly comparing instances of data labelled as a particular category with other instances of data in the same category. Constant comparison contributes to the development of theory by exposing the analytic properties of the codes and categories to rigorous scrutiny. This guideline for data analysis encourages researchers to be both rigorous and theoretical (Charmaz, 2006).
2. Iterative conceptualization	This guideline suggests that researchers should increase the level of abstraction and relate categories to each other through a process of iterative conceptualization. In grounded theory, this is done using theoretical coding. The relationships between categories can be of many different types, not just causal. Theoretical coding contributes to an understanding of relationships between the concepts or factors of a theory. Theoretical memos are also very important to the development of theoretical coding and the whole process of iterative conceptualization.
3. Theoretical sampling	This guideline stresses the importance of deciding on analytic grounds where to sample from next in the study. Theoretical sampling helps to ensure the comprehensive nature of the theory, and ensures that the developing theory is truly grounded in the data.

4. Scaling up	This guideline suggests how a researcher might counter what is said to be a common problem in grounded theory viz. the production of a low level theory, which is then hard to relate to the broader literature. Scaling up is the process of grouping higher-level categories into broader themes. Scaling up contributes to the generalizability of the theory.
5. Theoretical integration	This guideline helps the researcher deal with what we think is an obligation of the grounded theorist – theoretical integration. Theoretical integration means relating the theory to other theories in the same or similar field. It is the process of comparing the substantive theory generated with other, previously developed, theories. This principle contributes to theoretical integration in the discipline and could help in the generation of formal theories.

Urquhart et al. explain an origin of their five guidelines:

> The guidelines build on the two axes of the framework, *conceptualization* and *theory scope*. The first three guidelines address how the researcher might achieve the degree of *conceptualization* necessary to build a good theory through analytic mechanisms, such as constant comparison. These guidelines can also be seen as relating to the *process* of theory building. The final two guidelines give assistance with the issue of *theory scope* by giving guidance on the level of theory and how it might be integrated with the extant literature, an important aspect of theory building. Thus, these last two guidelines deal with the theory that is the *outcome* of the first three stages. (Urquhart et al. 2010, p. 368)

Urquhart et al. (2010) illustrate the usefulness of the guidelines by applying them to three grounded theory studies in information systems:

1. Orlikowski's (1993) study of the use of CASE tools in two organizations;
2. Urquhart's (2001) study of the dialogue between a systems analyst and client in one of six case studies;
3. Lehmann & Gallupe's (2005) analysis of the use of information systems in three multinational companies across multiple locations.

Review of Urquhart et al. (2010)

Urquhart et al. (2010) give reasons for the degree of conceptualization (description, interpretation and theory) and for the first three guidelines (1 Constant comparison, 2 Iterative conceptualization, 3 Theoretical sampling). The last two guidelines (4 Scaling up, 5 Theoretical integration) are said to be based on theory scope (bounded contexts, substantive focus and formal concepts). These five guidelines may well help a junior scientist in GT and give more emphasis to theory.

Although we much appreciate this article, we like to present some changes. They are grouped according to subject matters:

1. Newly formulated guidelines,
2. Definition of terms,
3. Limitation of philosophical perspectives.

1) Newly formulated guidelines

Urquhart et al. (2010) express guidelines (1 Constant comparison, 2 Iterative conceptualization, 3 Theoretical sampling, 4 Scaling up, and 5 Theoretical integration) that are sequentially presented from a description to an abstract theory of a domain. However, Guidelines 1, 2, and 3 and tasks are always performed when new data are gathered; i.e., they are not totally sequential. Hence, Guidelines 1, 2, and 3 must re-called in such a way that they could be understood and applied to alternatively. Then, two highest guidelines (4 Scaling up and 5 Theoretical integration) are not directly connected with a substantive theory developed under Guidelines 1, 2, and 3.

Urquhart et al. mean abstractions from a substantive theory towards a formal theory and write

> Glaser and Strauss (1967) suggest that in order to generate formal theory, a comparative analysis should be made among different substantive theories that fall within a particular substantive area. (Urquhart et al. 2010, p. 364)

Abstracting is not an easy task, for Klein and Myers state:

> it is important that theoretical abstractions and generalizations should be carefully related to the field study details as they were experienced and/or collected by the researcher. This is so readers can follow how the researcher arrived at his or her theoretical insights. (Klein and Myers 1999, p. 75)

Therefore, a new guideline is needed for developing a formal theory (see Table 8).

TABLE 8. Revised guidelines for grounded theory studies in information systems

1. Constant comparison*	Constant comparison is the process of constantly comparing instances of data labelled as a particular category with other instances of data in the same category. Constant comparison contributes to the development of theory by exposing the analytic properties of the codes and categories to rigorous scrutiny. This guideline for data analysis encourages researchers to be both rigorous and theoretical (Charmaz, 2006).
2. Iterative conceptualization*	This guideline suggests that researchers should increase the level of abstraction and relate categories to each other through a process of iterative conceptualization. In grounded theory, this is done using theoretical coding. The relationships between categories can be of many different types, not just causal. Theoretical coding contributes to an understanding of relationships between the concepts or factors of a theory. Theoretical memos are also very important to the development of theoretical coding and the whole process of iterative conceptualization.
3. Theoretical sampling*	This guideline stresses the importance of deciding on analytic grounds where to sample from next in the study. Theoretical sampling helps to ensure the comprehensive nature of the theory, and ensures that the developing theory is truly grounded in the data.
4. Develop a formal theory**	A comparative analysis should be made among different substantive theories that fall within a particular substantive area (Glaser and Strauss 1967).

* applied alternatively; ** a new guideline, and old guidelines 4 and 5 deleted

2) A definition of terms

To our mind, the text of this article would better communicate, if some concepts and expressions were defined. First, the concept "category" is much used in the article but it is not defined, although it is one of the central concepts of the GT method. Second, Urquhart et al. write:

> The process of generating a grounded theory is summarized in Figure 10 [Figure 1]. (Urquhart et al. 2010, p. 362)

Here, "grounded theory" seems to mean a theory. But Urquhart et al. (2010) also write:

> According to Martin & Turner (1986), grounded theory is "an inductive, theory discovery methodology that allows the researcher to develop a theoretical account of the general features of a topic while simultaneously grounding the account in empirical observations or data". (Urquhart et al. 2010, p. 357)

In this citation, the expression "grounded theory" refers to a research method. Hence, we prefer that those two meanings of "grounded theory" should be differentiated by defining them at the beginning of an article.

3) A limitation of philosophical perspectives

Concerning philosophical perspectives, Urquhart et al. state:

> There is considerable disagreement and debate with regard to the underlying philosophical assumptions of grounded theory. Grounded theory belongs to the realm of qualitative empiricism and has been variously described as positivist, interpretive or critical. (Urquhart et al. 2010, p. 360)

Urquhart et al. (2010) seem to speak about philosophical assumptions (cf. Chua 1986). Following Myers (1997), Urquhart et al. take the view that

> as a research method, GT is independent of the underlying epistemology. This means that grounded theory is itself, as Glaser describes, 'paradigmatically neutral' (Glaser, 2001). It can be used in positivist studies (Lehmann, 2003), interpretive or critical studies (Annells, 1996; Urquhart, 2001; Cecez-Kecmanovic et al., 2008). (Urquhart et al. 2010, p. 361)

Orlikowski and Baroudi (1991, p. 19) consider that the critical research philosophy differs from the positivist and interpretive research philosophies, both of which "are content to predict or explain the status quo".

Principles for critical studies (written by Myers and Klein) were published in 2011. Myers and Klein (2011) accept three critical theories (Habermas, Bourdiou and Foucault), and some of them should have been mentioned. We cannot see a reference to any of the three theories in Urquhart et al. (2010) to any other GT article. In addition, Myers and Klein (2011) does not contain any GT study in IS. – Richardson and Robinson (2007) examined critical IS-studies but could not find any GT study.

We suspect that many researchers (Annells, 1996; Urquhart, 2001; Cecez-Kecmanovic et al., 2008) referred above did not recognize two different mean-

ings of term 'critical': based on either critical philosophy or general criticism. Hence, their study hardly was following critical philosophy but general criticism.

2.8 Critical research

Myers and Klein (2011) use critical theories from Habermas, Bourdieu and Foucault, and propose six principles for how to conduct critical research. These principles are derived from those three theories.

Myers and Klein (2011)

The authors of this article complain that critical research has not yet been recognized as a legitimate approach in IS. They state that their purpose is

> to propose a set of principles for the conduct of critical field research in information systems. In order to achieve this purpose, we examine the nature of the critical research perspective, clarify its significance, and review the major discourses in critical social research. The principal motivation is to clarify the most basic mission of critical research, recognizing that this mission cannot be captured by a fixed set of criteria once and for all. However, it should be possible to formulate a set of principles capturing some of the commonalities of those approaches that have so far become visible in the IS research literature. (Myers and Klein 2011, p. 18)

Myers and Klein (2011) motivate readers by writing "the absence of any criteria or principles makes it very difficult for critical work to be published in our top journals and hinders the acceptance of critical research amongst the wider IS research community."

Myers and Klein (2011) use Orlikowski and Baroudi's (1991) classification scheme, which itself is based on Chua's (1986) work. Myers and Klein state:

> Orlikowski and Baroudi classify research as critical where a critical stance is taken toward taken-for-granted assumptions about organizations and information systems, and where the aim is to critique to status quo "through the exposure of what are believed to be deep-seated, structural contradictions within social systems" (p. 6). Orlikowski and Baroudi say that some of the defining features of the critical research philosophy are a belief in the ability of people to change their material and social circumstances, yet the capacity to change is constrained by prevailing systems of economic, political, and cultural authority; a belief that contradictions inherent in existing social forms tend to lead to inequalities and conflicts, yet these conflicts lead to the emergence of new social forms; and a belief that knowledge is grounded in social and historical practices. Critical research aims to transform these alienating and restrictive social conditions (Orlikowski and Baroudi 1991, p. 19). (Myers and Klein 2011, p. 19)

Myers and Klein (2011) collect eight typical critical IS studies and find three researchers (Habermas, Bourdieu and Foucault) behind them. This means that in those eight studies, there are critical theories developed by Habermas, Bourdieu or Foucault. Myers and Klein (2011) analyze critical theorist's main writings for fundamental ideas that could ground a set of principles for the conduct and

evaluation of critical field studies in IS. The authors of this article analyze Alvesson and Deetz' (2000) three elements of critical research as follows:

> They name these three elements insight, critique, and transformative redefinition. The use of the term elements serves to emphasize that, in the practice of critical research, it might neither be practical nor desirable to completely separate these three elements from each other; they are all, to some extent, interconnected. All three elements are present in a critical study. The three elements are summarized in Table 9 [Table 3]. (Myers and Klein 2011, p. 23)

TABLE 9. Three elements of critical research (Myers and Klein 2011, p. 23)

	Brief Description
Insight	This element is concerned with interpretation and gaining insight. Insight can be gained in various ways, e.g., using critical hermeneutics and the archaeology of knowledge, or the concepts of social reproduction via the mechanisms associated with symbolic capital.
Critique	This element is concerned with critique, the genealogy of knowledge, and the social practices of control and reproduction. This element goes beyond interpretation to focus the researcher on the power structures that lie behind accepted interpretations.
Transformation	This element is concerned with suggesting improvements to the conditions of human existence, existing social arrangements, and social theories. Theories are not the primary driver for changes, but potentially fallible lenses through which we see the world. The ultimate arbiters of the desirability of changes are those affected by them.

Unfortunately, those three elements cannot "to completely separate from each other" (Myers and Klein 2012, p. 23). According to Alvesson and Deetz (2000), critique cannot be separated from insight, because critique builds upon insight. However, Myers and Klein (2011) conclude that it is important to concentrate on the two latter more carefully, because they represent real critical research.

Myers and Klein propose

> a set of principles for the conduct of critical field research in information systems. There are two sources for these principles: the past practice of critical field research in information systems and other management disciplines and our understanding of the underlying philosophical foundations of critical research. The principles are summarized in Table 10 [Table 4]. It should be noted that we are proposing principles for the three critical research streams only. We leave it to others to suggest principles for other critical theorists. Also, our principles are concerned solely with the two elements of critique and transformation. This is because the first element of insight is virtually identical to the kind of insight that is provided by interpretive research. (Myers and Klein 2011, p. 24)

TABLE 10. Proposed set of principles for critical research (Myers and Klein 2011, p. 25)

The element of critique
1. The principle of using core concepts from critical social theorists This principle suggests that critical researchers should organize their data collection and analysis around core concepts and ideas from one or more critical theorists. Example: Ngwenyama and Lee (1997) use core concepts from Habermas to critique information richness theory.
2. The principle of taking a value position Critical theorists advocate values such as open democracy, equal opportunity, or discursive ethics. These values drive or provide the basis for Principles 4 through 6. Example: Adam (2005) looks at how ethics may be more effectively integrated into critical IS research.
3. The principle of revealing and challenging prevailing beliefs and social practices This principle suggests that critical researchers should identify important beliefs and social practices and challenge them with potentially conflicting arguments and evidence. Example: Doolin (2004) considers how a medical information system was supposed to help administrators to ensure efficiency and financial viability, but he challenges the underlying beliefs and assumptions of the system using concepts from Foucault.
The Element of Transformation
4. The principle of individual emancipation All critical social theory is oriented toward facilitating the realization of human needs and potential, critical self reflection, and associated self-transformation. Example: Kanungo (2004) shows how a field laborer in an Indian village was able to receive credit and training using the data available in the local knowledge center to improve her standard of living.
5. The principle of improvements in society This principle suggests that improvements in society are possible. The goal is not just to reveal the current forms of domination, but to *suggest* how unwarranted uses of power might be overcome (although the critical theorist should not assume any special position of authority). Most critical theorists assume that social improvements are possible, although to very differing degrees. Example: Kvasny and Keil (2006) make recommendations with regard to how the provision of social services (using IT) for historically disadvantaged groups might be improved.
6. The principle of improvements in social theories All critical theorists believe that our theories are fallible and that improvements in social theories are possible. Critical researchers entertain the possibility of competing truth claims arising from alternative theoretical categories, which can guide critical researchers in their analyses and interventions. Example: Habermas modified his ideas in response to debates with Foucault and Gadamer. Conversely, Foucault and Gadamer modified their positions.

Myers and Klein then more describe each principle and give references to studies well following the principle under consideration. Their description also motivates, presents assumptions of a principle and gives more supporting reasons. Six principles consider the individual and society levels. This means that im-

provements tried and realized to concern both single participants and a group of people under study.

Cecez-Kecmanovic et al. view as follows:

> While critical researchers often apply interpretivist methods (such as ethnography) they do so in a distinctly critical way: by clearly and explicitly articulating values and ethical positions that motivate and drive their research projects (Principle 2). (Cecez-Kecmanovic et al. 2020, p. 251)

Their view is not quite correct, for interpretivist methods are normally used in interpretive perspective for studying the status quo, but we are here using a critical perspective for finding a potentiality for change.

Myers and Klein then take three examples of critical studies from three social theorists they use:

1. Doolin (2004) / Foucault,
2. Kanungo (2004) / Habermas,
3. Kvasny and Keil (2006) / Bourdieu.

At the end of this article, the authors first analyze the similarities and differences between interpretive and critical research. They then consider the added value of critical research and finally, evaluate the contribution of this article for strengthening critical research.

Review of Myers and Klein (2011)

Although Chen and Hirschheim (2004) claimed that "no empirical research work was done using a critical paradigm (0%)", Richardson and Robinson (2007) found 31 studies that used a critical approach. Such studies clearly require some principles for evaluating how well a certain study is conducted and whether the results are believable. We divide our review into four parts: The problematic element "insight", six principles, totality and our alternative.

The problematic element "insight"

To build a basis for their proposal of a critical approach, Myers and Klein (2011) analyze Alvesson and Deetz' (2000) three elements (insight, critique, and transformation) of critical research. Those three elements are interconnected and present in a critical study. We are suspicious, that Alvesson and Deetz (2000) might mislead Myers and Klein (2011), for the element "insight" is not present in a critical study, because it is concerned with interpretation.

In the section Discussion and Conclusions, Myers and Klein (2011) reconsider a relationship between interpretive and critical research. They propose three alternatives:

1. Interpretive research is very similar to critical research,
2. There are different degrees of interpretive and critical research and
3. Critical research is different from interpretive research.

We must reject Alternatives 1 and 2, and we can only accept Alternative 3. We give reasons as follows: Chua (1986) proposes and Orlikowski and Baroudi

(1991) more explain three perspectives: a positivist, interpretive and critical one. Three perspectives are independent (perpendicular). According to Orlikowski and Baroudi (1991, p. 19) the positivist and interpretive perspectives "are content to predict or explain the status quo, the critical perspective is concerned with critiquing existing social systems and revealing any contradictions and conflicts." The citation above is from Myers and Klein (2011, p. 19), nevertheless they often see the critical perspective similar to interpretive one. Hence, Myers and Klein (2011) might not have a real view on critical research.

On six principles

Myers and Klein (2011) present six principles, three for critique and three for transformation. Our aim is to present some weaknesses of Myers and Klein's (2011) set of principles.

Principle 1 must be rejected.

First, Myers and Klein (2011) are much interested in the IS literature and research community. They collected eight typical critical IS studies. But we are not convinced of whether all the critical IS studies are really based the critical perspective or are researchers applying a general criticism only.

Second, Myers and Klein (2011) base their principles on critical theories built by three famous critical social theorists: Bourdieau, Foucault and Habermas. In the IS literature, researchers are mostly using Habermas' critical theory. Important concepts in Bourdieu's theory of practice are *habitus*, *field*, and *social, cultural and symbolic capital*. Some important concepts in Foucault's work are *discourse*, *archaeology*, and *genealogy* of knowledge, and *panopticon*. Some important concepts in Habermas' work are *cognitive interests, communicative action, lifeworld*, and *system*. According to Principle 1, IS researchers must use core concepts (italics) from critical social theorists. First, IS researchers have difficulties to understand many key concepts by Bourdieau, Foucault and Habermas. Second, we are not sure that all the key concepts above are totally connected with critical perspective only. Hence, we propose that Myers and Klein's approach to use three social theories (Bourdieau, Foucault and Habermas) is no more recommended nor Principle 1.

Principle 2 should be changed.

Myers and Klein state:

> The second principle explicitly recognizes the importance of taking a value position for motivating and grounding a critical research project. Critical theorists advocate values such as open democracy, equal opportunity, or discursive ethics. ... Of course, this principle is not meant to imply that positivist or interpretive researchers do not have their own values. (Myers and Klein 2011, p. 26)

As much as we know, the positivist perspective is value-free or value-neutral, and the interpretive perspective "lacks an evaluative dimension" (Chua 1986, p. 619). Moreover, Chua sees that:

> Critical researchers reject the value position traditionally espoused by orthodox social scientist – a scientist cannot evaluate ends – arguing that it bolsters existing

> forms of injustice inherent in the current system of property rights and in the capitalist appropriation of economic surplus value. (Chua 1986, p. 621)

In addition, Aulin emphasizes a stronger view of human action and considers:

> human action as an interaction between a *subject* and an *object*, that is, between a conscious actor and some part of the real world, the latter being the object of the acts discussed. … Separating the subject from the object enables Aulin to regard *acts* as the tools of interaction between a subject and the world of objects. The interaction is a two-way traffic. Certain kinds of acts – the observations – cause some part of reality to be reflected in the subject's consciousness, as a consequence of which he gets *information* about the world. The information is somehow processed in the consciousness and set in contact with the *intentions* that are pushing the subject's acts to certain directions or goals. Making use of his directed acts the subject then is capable of impressing his intentions on the world and possibly changing it in some measure to some desired direction. In a closer analysis Aulin has to distinguish between three major categories of the contents of human consciousness:
> 1. *cognitive beliefs* expressing the information the subject has on the actual state of the world, mostly in form of some generalizations (the 'is');
> 2. *values* voicing the conception that the subject has constituted of what the world ought to be in order to be good (the 'ought'); and
> 3. *norms* telling the subject how to choose his acts so as to materialize his values in the actual state of the world (also a part of the 'ought'). (Aulin 1982, p. 14)

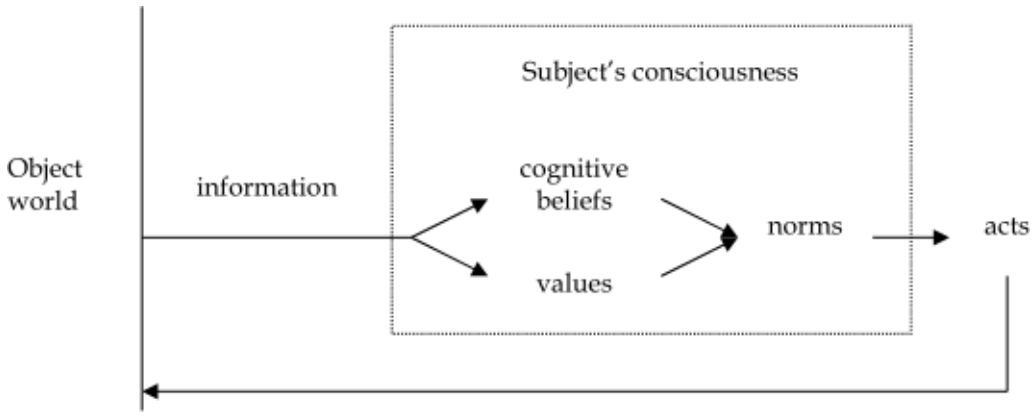

FIGURE 13. Human action as a subject-object interaction (Aulin 1982, p. 15)

The norms obviously are functions of values and cognitive beliefs. Accordingly, Aulin has the preliminary scheme of the successive steps of human action shown in Figure 13.

To our mind, term 'norm' should be understood as a procedural norm, not as a collective norm, as usual. To explain our idea a bit more, we pay attention to two things. First, our beliefs contain a subjective probability component of how probable our world view is. We receive more information and our world view becomes more valid, relevant and realistic. Second, values are our preferences in priority order. The stronger a certain value connected with a particular entity is, the more committed we are to that entity.

Aulin's (1982) view differs from Myers and Klein's (2011) view as follows: Aulin bases his view on human action, a two-sided relationship (a subject-object interaction), i.e., a researcher can influence on a practitioner and the contrary.

Myers and Klein (2011) base their human view on a more restricted one, a one-sided relationship.

Hence, we have two reasons to improve Principle 2.

Principle 3 must be stronger.

Myers and Klein describe that:

> This principle [3] suggests that critical researchers should identify important beliefs and social practices and challenge them with potentially conflicting arguments and evidence.
>
> Example: Doolin (2004) considers how a medical information system was supposed to help administrators to ensure efficiency and financial viability, but he challenges the underlying beliefs and assumptions of the system using concepts from Foucault. (Myers and Klein 2011, p. 25)

The example (Doolin 2004) is a case study, and critical hermeneutics is its main research approach. Myers and Klein (2011, p. 30) write that "Myers (1994) proposed critical hermeneutics as an integrative framework with which Doolin's critical interpretivism has many similarities." Principle 3 concerns a critical research philosophy, and hence Doolin (2004) with interpretivism cannot be used as its example.

Myers and Klein (2011) used Orlikowski and Baroudi's (1991) definition of critical research (as referred above), and this definition only contains the term "contradiction" twice, i.e., Myers and Klein (2011) did not use 'contradiction' elsewhere in their article, not in Principle 3. However, a contradiction (open or hidden) is an essential characteristic of critical research. Now, Principle 3 is too weak, and it must be improved by adding a contradiction view to Principle 3.

Also Principle 4 (individual emancipation) can be rejected.

Myers and Klein (2011) took their definition of critical perspective from Orlikowski and Baroudi (1991). They express (p. 21): "Benson (1983, p. 53) observes that critical theory must be reflexive, critical, and emancipatory, thus transcending alienated theorizing." This is the only reference to 'emancipatory' in Orlikowski and Baroudi (1991), and shows that it is not considered as important in critical research.

Principle 5 (Improvements in society) can be improved and limited

Myers and Klein (2011) only consider economic factors (class relations), for example, management and working class. Orlikowski and Baroudi pay attention to other antagonistic relations:

> The critical approach also has some weaknesses, in part, these are a function of the assumptions which guide critical researchers. For example, socio-economic class is seen as the primary determinant of antagonistic social relations. This almost exclusive focus on economic factors obscures the importance of other factors such as race and gender that have also led to dominating and repressive social relations. (Orlikowski and Baroudi 1991, p. 23)

Hence, Principle 5 could be improved by other antagonistic relations, at least, race and gender.

Concerning a limitation of Principle 5 and people in an organization, there is always – or at least most cases – a hierarchy. When hierarchy is too strong, it can base on an antagonistic relation. Hence, hierarchy should be mitigated, but there is a lower limit, the Law of Requisite Variety presented by Aulin-Ahmavaara (1979) says:

> The weaker in average are the regulatory abilities and the larger the uncertainties of available regulators, the more hierarchy is needed in the organization of regulation and control to attain the same result of regulation, if possible at all. (Järvinen 2012, p. 131).

It is not impossible to reduce hierarchy under a lower limit, otherwise an anarchy will be predominant in organization.

We repeat that Principle 2 states: "Critical theorists advocate values such as open democracy, equal opportunity, or discursive ethics. These values drive or provide the basis for Principles 4 through 6." Values, such as open democracy, equal opportunity, or discursive ethics are human values. But all people do not always have the same values. When in Principles 5 and 6, there are the term "improvement", we can ask whose improvement is in question?

Also Principle 6 (Improvement in social theories) can be rejected

Myers and Klein write that Principle 6 is

> All critical theorists believe that our theories are fallible and that improvements in social theories are possible. Critical researchers entertain the possibility of competing truth claims arising from alternative theoretical categories, which can guide critical researchers in their analyses and interventions. (Myers and Klein 2011, p. 25)

In their deeper explanation Myers and Klein write:

> This last principle suggests that critical researchers should be willing to subject their own research project to self-critique. It also suggests that, in IS especially, some critical researchers should be seeking to improve socio-technical theory. (Myers and Klein 2011, p. 28)

Orlikowski and Baroudi describe that

> An important distinction of the critical research philosophy is its evaluative dimension. More than either the positivist or the interpretive research perspectives, the critical researcher attempts to critically evaluate and transform the social reality under investigation. Where the other two research perspectives are content to predict or explain the status quo, the critical perspective is concerned with critiquing existing social systems and revealing any contradictions and conflicts that may inhere within their structures. (Orlikowski and Baroudi 1991, pp. 18–19)

Hence, a system under study does not have any status quo but a system is continually changing (in motion) and researchers try to steer a system toward a certain direction. To this end, it is difficult to speak about a certain theory describing a system. When, according to Chua (1986, p. 604), "epistemological as-

sumptions decide what is to count as acceptable truth by specifying the criteria and process of assessing truth claims" and the term "truth" is not specified and how truth claims are evaluated, truth cannot use as a criterion.

Myers and Klein (2011) speak about "truth" and "theory" with Foucault only. In connection with Principle 1, we demonstrated that the concepts (italics) in three theories (Bourdieu, Foucault, Habermas) are not in a core of a social nor socio-technical theory. We understand that Principle 6 is in line with other principles, but however, Myers and Klein (2011) do not present any social nor socio-technical theory.

Principle 6 must be rejected, because we do not have any certain measurement for improvement nor any certain social theory.

Totality forgotten

To our mind, Myers and Klein (2011) seem completely forget the term totality. We describe the term by referring to Chua, and Orlikowski and Baroudi (1991). Chua describes two beliefs. First, it

> is the belief that every state of existence, be it an individual or a society, posses historically constituted potentialities that are unfilled. Everything is because of what it is and what it is not (its potentiality). (Chua 1986, p. 619)

Second, concerning totality,

> Another belief concerns the relationship between parts (individuals, groups, organizations) and the whole (society). Critical researchers argue that because any finite thing is both itself and its opposite, things are taken as isolated particulars are always in complete. The particular exists only in and through the totality of relations of which it is a part. Therefore, what a finite thing is and what it is not may only be grasped by understanding the set of relations that surround it. (Chua 1986, p. 619)

Concerning totality, Orlikowski and Baroudi see that

> Another important idea in critical philosophy is that of totality, which implies that things can never be treated as isolated elements. A particular element exists only in the context of the totality of relationships of which it is a part, and the element and the whole are bound by an essential rather than a contingent interdependence. This dialectical relationship between elements and the totality is understood to be shaped by historical and contextual conditions. (Orlikowski and Baroudi 1991, p. 19)

It seems to us that the term totality is very essential in critical research. When the term totality is completely lacking in the article of Myers and Klein (2011), new criteria (principles) for critical research are needed.

Our alternative

We base our alternative (Table 11) by first presenting an aim of critical studies, we then propose and prefer to correct potential "injustice and inequalities" than seeking the values "open democracy, equal opportunity and discursive ethics". The term "democracy" is problematic, because, for example, we in Finland officially have a different meaning of democracy than in Putin's Russia. Finally, we take two main ideas of concerning a physical and social reality and emphasize people's potentiality and totality among elements.

TABLE 11. Alternative set of principles (guidelines) for critical research

1. Critical studies aim to critique the status quo. We recommend to take a critical stance towards taken-for-granted assumptions about organizations and information systems, and a dialectical analysis which attempted to reveal the historical, ideological, and contradictory nature of existing social practices. It is necessary to expose what are believed to be deep-seated, structural contradictions within social systems, and thereby to transform these alienating and restrictive social conditions. (cf. Orlikowski and Baroudi, pp. 5–6)
2. Try to correct injustice and inequalities Bring to consciousness the restrictive conditions of the status quo, thereby initiating change in the social relations and practices, and helping to eliminate the bases of alienation and domination (Orlikowski and Baroudi 1991, p. 21). It is intended that social change may be initiated such that injustice and inequities may be corrected (Chua 1986, p. 621).
3. Fill people's potentiality The central idea within critical philosophy is the belief that social reality is historically constituted, and hence that human beings, organizations, and societies are not confined to existing in a particular state (Chua 1986, p. 619). Every thing possesses an unfulfilled potentiality, and people, by recognizing these possibilities, can act to change their material and social circumstances. (Orlikowski and Baroudi 1991, p. 19)
4. Remember totality Another important idea in critical philosophy is that of totality, which implies that things can never be treated as isolated elements. A particular element exists only in the context of the totality of relationships of which it is a part, and the element and the whole are bound by an essential rather than a contingent interdependence. (Orlikowski and Baroudi 1991, p. 19)

We have demonstrated many lighter or stronger weaknesses in Alvesson and Deetz' (2000) three elements (insight, critique, and transformation) of critical research, weaknesses also in six principles presented and a lack of totality in Myers and Klein (2011). Then, we have presented four new tentative principles for critical research. Other researchers can improve our principles and formulate more concrete ones.

2.9 Summary of new research guidelines

We collect our results to Table 12. Three columns of Table 12 are: author(s), methodology, and guidelines. The last one contains our contributions in italics. In Chapter 2, earlier guidelines are stronger (critical research) or weaker reanalyzed. Because of a larger variety of analysis, we hope that Table 12 gives an overview picture of changes proposed by us.

TABLE 12. Traditional guidelines and our corrections

Author(s)	**Methodology**	**Guidelines** (*revised*)
Benbasat et al. (1987) Eisenhardt (1989)	Positivist case study	Step 1 (Getting Started) '*begin*' and '*end*' Step 8 (Reaching Closure) Steps 2, ... , Step 7 and *change-over*
Straub et al. (1994)	Positivist studies	*contribution to knowledge,* *logical rigor,* *theory and* *coverage of significant literature*
Klein and Myers (1999)	Interpretive in depth case study and interpretive field study	*0. Principle of Communication* 1. Fundamental Principle of the Hermeneutic Circle 2. Principle of Contextualization 3. Principle of Interaction between the Researchers and the Subjects 4. Principle of Abstraction and Generalization 5. Principle of Dialogical Reasoning 6. Principle of Multiple Interpretations 7. Principle of Suspicion
Hevner, March, Park and Ram (2004) March and Smith (1995)	Design science	1. Design as an artifact 2. Problem relevance 3. Design evaluation 4. Research contributions 5. Research rigor 6. Design as a search process or a *development* activity 7. Communication of research
Davison et al. (2004, 2012)	Canonical action research	1. Researcher-Client Agreement (RCA) 2. Cyclical Process Model 3. Theory (*focal* ones; a *problem solving* instead of an instrumental theory) 4. Change through Action 5. Learning through Reflection
Hirschheim (2008)	Conceptual research	either '*mosaic*' 1. Introduction 2. Content 3. Presentation and structure 4. Theoretical foundation 5. Data Analysis, interpretation and argumentation 6. Results 7. Conclusions or *axioms* can be based on e.g., conceptual modeling
Urquhart et al. (2010)	Grounded theory studies	1. Constant comparison 2. Iterative conceptualization 3. Theoretical sampling *4. Develop a formal theory*

Author(s)	**Methodology**	**Guidelines** (*revised*)
Myers and Klein (2011) Critical theories Bourdieu Foucault Habermas	Critical research	*1. Critical studies aim to critique the status quo.* *2. Try to correct injustice and inequalities* *3. Fill people's potentiality* *4. Remember totality*

Explanations

Positivist case study – begin, end and change-over

In operations research, a process is often surrounded with begin and end. When we have multiple cases and then change-over, research results from the earlier case are moved to the next one.

Positivist studies – contribution to knowledge, logical rigor, theory and coverage of significant literature

Straub et al. (1994) proposed factor analysis for diminishing the number of 15 guidelines. They received 4 factors problematic to apply to. Therefore, they chose those four important guidelines (italics above). We support their solution.

Interpretive in depth case study and interpretive field study – The Principle of Communication

Klein and Myers (1999) emphasized analysis of data. They forget data gathering from people. Then, a researcher must understand a local language (cf. Deetz (1996). Therefore, communication capabilities are needed.

Design science – development

Hevner et al. (2004) proposed 7 guidelines. We liked to amend Guideline 6 (Design as a search process) by adding a development of a new artifact for supplementing a search process.

Canonical action research – focal theories; a problem solving instead of an instrumental theory

Focal theories proposed and demonstrated by Davison et al. (2012) were accepted. But a proposal for instrumental theories was rejected, because an instrumental theory is needed only once per a certain CAR project. Then, a moving problem from the initial state to the goal state must be solved.

Conceptual research – either ('mosaic') 1. ... 7. ... or (axioms) ...

Prof. Shneiderman visited 1991 in Finland and then told, that he and many other researchers empirically study a certain new restricted part of IT use and express their results in such a way (like parts or components) that some other researcher then can combine them to a mosaic. – But it is also possible to start a conceptual development from axioms toward a structural description of an object under study.

Grounded theory (GT) studies – Develop a formal theory

We replace two Urquhart et al.'s (2010) guidelines (4 Scaling up and 5 Theoretical integration) with one guideline (4. Develop a formal theory) based on a proposal presented by GT founders (Glaser and Strauss).

Critical research – four new principles

We showed drawbacks in old six principles and proposed four new ones.

1. Critical studies aim to critique the status quo

We took a description of critical research presented by Orlikowski and Baroudi (1991, pp. 5–6). It is based on Chua's (1986) text that is much used in IS.

2. Try to correct injustice and inequalities

We replace Myers and Klein's (2011) principle taking a value position, where values such as open democracy, equal opportunity, or discursive ethics are recommended by values (injustice and inequalities) proposed by Orlikowski and Baroudi (1991), and the latter are not easily criticized.

3. Fill people's potentiality

We refer to Chua's idea that "human beings, organizations, and societies are not confined to existing in a particular state" (Chua 1986, p. 619). Orlikowski and Baroudi (1991, p. 19) continue that people etc. "possesses an unfulfilled potentiality". – Chua, Orlikowski and Baroudi consider potentiality of human/ social resource. We could also consider potentiality of technical and informational resources. Then, potentialities of technical and informational resources must be further researched.

4. Remember totality

Orlikowski and Baroudi (1991, p. 19) explain that

> things can never be treated as isolated elements. A particular element exists only in the context of the totality of relationships of which it is a part, ... (Orlikowski and Baroudi 1991, p. 19)

Almost all the methodologies in Table 12 concern empirical studies. Only Hirschheim thinks about conceptual (non-data) analysis. Studies exploring something that does not have a connection with the real world are lacking. This means mathematical and philosophical approaches. They must be analyzed in future studies.

3 NEW TAXONOMY OF RESEARCH METHODOLOGIES

Different taxonomies for research methods have been advanced, such as Galliers (1991) and March and Smith (1995). We find their taxonomies wanting in some respects, as, for example, they do not cover all research approaches. To this end, we proffer a new taxonomy of research methodologies. Our taxonomy endeavours to cover all potential alternatives. It can also be used for finding a purposeful research method for a research question, and hopefully a novice researcher finds a suitable research method by using it. We show different steps by giving articles referring to those taxonomies.

Galliers and Land (1987) Galliers (1991)

One of the first studies to give an overview of research methods might be Galliers and Land (1987). They develop two types of taxonomy, dividing them into different methodologies (1. positivism and 2. interpretivism):

1. Modes for traditional empirical approaches (observations):
   a. Theorem proof,
   b. Laboratory experiment,
   c. Field experiment,
   d. Case study,
   e. Survey,
   f. Forecasting,
   g. Simulation;
2. Modes for newer approaches (interpretation):
   a. (Game/role playing) subjective/argumentative,
   b. Descriptive/interpretive,
   c. Action research.

Galliers and Land then describe each approach stating which object an approach concerns. They divide objects to classes: Society, organization and group, individual, technology and methodology. Table 13 [Table 4] describes Galliers's (1991) taxonomy (amendment p. 339).

TABLE 13. Information systems research approaches: A revised taxonomy (amended from Galliers and Land 1987, Table 1, p 901)

	Modes for traditional empirical approaches (observations)							**Modes for newer approaches (interpretation)**		
Object	theo-rem proof	lab. exp.	field exp.	case study	sur-vey	f	s	subjective / argu-mentative	descrip-tive/ interpre-tive	action re-search
society	no	no	possi-bly	possi-bly	yes			yes	yes	possi-bly
org/g	no		yes	yes	yes			yes	yes	yes
indiv	no	yes	yes	possi-bly	possi-bly			yes	yes	possi-bly
techn	yes	yes	yes	no	possi-bly			possibly	possibly	no
meth-od	no	no	yes	yes	yes			yes	yes	yes
build-ing	no	no	no	yes	yes			yes	yes	yes
testing	yes	yes	yes	possi-bly	possi-bly			no	possibly	possi-bly
exten-sion	possi-bly	possi-bly	possi-bly	possi-bly	possi-bly			no	possibly	possi-bly

f = Forecasting and Future Research
s = Simulation and Game / role playing

To our mind, Galliers and Land's taxonomy differentiates traditional approaches from newer ones (i.e., positivism from interpretivism). This taxonomy presents many known approaches and describes its objects. However, it also has some drawbacks:

1. The taxonomy knows an interpretive perspective but calls a positivist one as traditional and forget other perspectives like critical and critical realist ones;
2. The taxonomy does no differentiate empirical approaches from theoretical/conceptual one, except theorem proof;
3. Action research is classified as an interpretive approach, although action research strives utility, not truth.

Galliers (1991) repeats the earlier results and present two uses of a revised taxonomy: to identify

1. possible research methodologies,
2. most likely approach of a study for theory building, theory testing or theory extension (Figure 14).

Galliers (1991) considers the theory extension approach the most demanding.

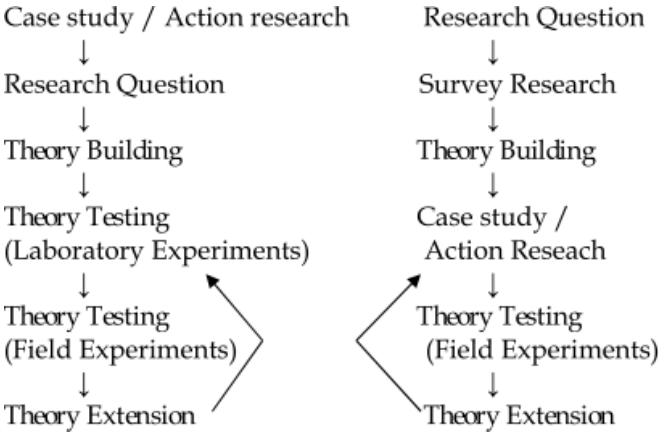

FIGURE 14. Use of alternative information system research approaches in the process of theory building, testing and extension (Galliers 1991, Figure 1)

March and Smith (1995)

We here repeat March and Smith's (1995) main results in Figure 15. March and Smith (1995) differentiate natural sciences from design sciences. The latter are new ones compared with Galliers (1991), and their goal function is utility. The other new results are a differentiation between build and evaluate activities in design sciences, and theorize and justify activities in natural sciences. The two latter are also called exploratory and confirmatory activities, respectively. Hevner et al. (2004, p. 76) show that "the behavioral-science paradigm has its roots in natural science research methods."

		Research activities			
		Build	Evaluate	Theorize	Justify
Research outputs	Constructs				
	Model				
	Method				
	Instantiation				

FIGURE 15. Research framework (March and Smith 1995, p. 255)

Our taxonomy

We base our taxonomy on different methodologies in Sections 2.1–2.8. When a selection of an appropriate method is a typical task for a researcher, we present our taxonomy as a form of questions in Figure 16. A new taxonomy is a little extension from Järvinen (2012). According to Bunge (1967, p. 75), a good classification is a) remaining permanent, b) exhaustive, c) pairwise disjoint and d) natural. In Figure 12, we have tried to apply Bunge's criteria of a good classification.

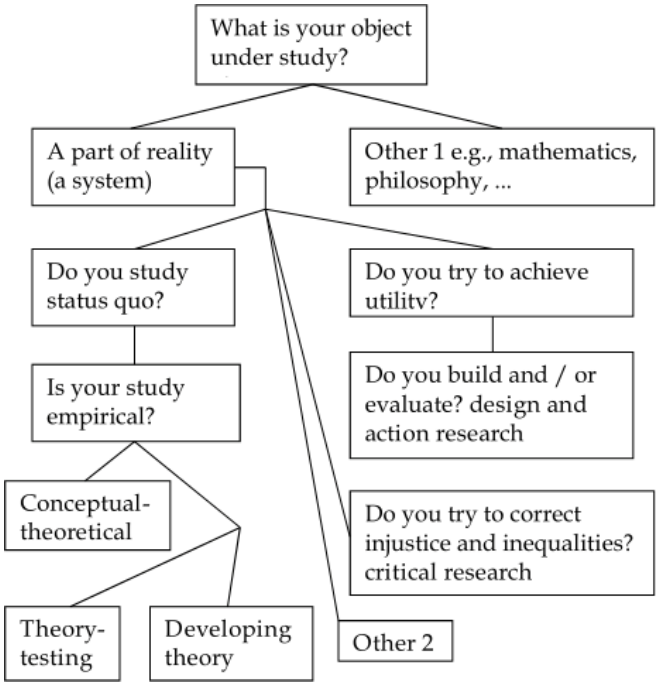

FIGURE 16. Taxonomy of research methods (derived from Järvinen 2012)

The first question in Figure 12 is: What is your object under study? Two possible answers are:

1. A part of reality (a system),
2. Other 1.

The class Other 1 concerns symbol systems having no direct reference to objects in reality. In Figure 16, we have two examples: mathematics and philosophy.

For a part of reality, we then use three research questions to differentiate:

1. Do you study status quo?
2. Do you try to achieve utility?
3. Do you try to correct injustice and inequalities?

If we do not have any alternative (a, b, c), we have unknown class called Other 2.

To separate status quo, we apply to knowledge that in two perspectives (positivism and intellectualism) assume that a part of reality under study then has status quo. Alternatives b, c and Other 2 do not have status quo.

When a researcher has utility as a goal function she will then use either design science or action research (cf. Section 2.4 or 2.5, respectively). In design science studies physical resources only are used but in action research studies all kinds of resources.

When a researcher tries "to correct injustice and inequalities", she is performing critical study (cf. Section 2.8). When a researcher meets the class Other 2, she then has a new subject under study, and she must develop a new research method or even a new research philosophy.

For a study, where status quo holds, a separating question is: Is your study empirical? If a researcher conducts a non-data study, we call it conceptu-

al-theoretical one (cf. Section 2.6). Otherwise, a study is either a theory-testing (cf. Sections 2.1 and 2.2) or developing a new tentative theory (cf. Sections 2.1, 2.3 and 2.7). Benbasat et al. (1987) demonstrated how case studies (Section 2.1) can mainly be for exploration than explanation.

We repeat that positivism, interpretivism and critical research (Alternative c) are those three perspectives that Chua (1986) presented. If Other 2 is a new research philosophy that do not exist in Chua, for example, critical realism, it must be carefully described and analyzed in future research. - In design science and action research, where utility is emphasized, researchers have often taken positivist assumptions concerning research objects.

In the previous phase (Sept. 2020) of this project Prof. Davison wrote:

> There is significance for the practice of doing research, in that if ... this thesis was published as a book (but perhaps a wiki would be better), it might be of some value to researchers, particularly junior researchers or doctoral students taking research methods classes.

Hence, we published the earlier version[1] for teaching, especially concerning a literature review (Chapter 3), eight examples (Chapter 4) and recommendations (Chapter 5), and continued to improve guidelines and a taxonomy (Chapter 2) for research methods. They are now (July 2021) presented here (above). Please, do not hesitate to ask more from the author.

[1] http://urn.fi/URN:ISBN:978-951-39-8508-0

4 DISCUSSION/CONCLUSION

In a traditional study, the Discussion/conclusion section is structured as follows: implications for theory and practice, limitations and future studies. As this work is purely theoretical and conceptual, the implications for practice will be fewer than the implications for theory, although we know "nothing so practical as a good theory" (Lewin 1945, p. 135). In addition, many limitations can be always 'converted' to future studies.

4.1 Implications for theory

Here, old and new findings are discussed in Chapters 2 and 3. Results in Chapter 2 are collected to Table 12 where the traditional guidelines and our corrections are presented. Guidelines for methodologies are in this work improved in such a way that they help researchers, reviewers and editors when they are performing their work. We shortly repeat ideas of our developments.

When Benbasat et al. (1987) did not present any set of guidelines for positivist case studies we used Eisenhardt's (1989) eight steps for our basis. We separated the 'begin' and 'end' steps from the case research process for one case. She also told multiple cases but she did not pay attention to change-over tasks.

Straub et al. (1994) collected 15 criteria from different sources for positivist studies. The number of 15 criteria is too high that all criteria are used as guidelines. Hence, Straub et al. (1994) strived to mitigate a number of criteria by using factor analysis. But factors formed by statistical analysis on the basis of criteria can be named in a way that might be difficult to understand. Hence, we proposed four important criteria that are measuring important things concerning positivist studies.

Klein and Myers (1999) proposed seven principles for interpretive studies. They based their principles mainly on Gadamer and Ricour. They admitted that it is possible to present other principles for interpretive studies, because the interpretive perspective is wide. We found that Klein and Myers' principles main-

ly concern an analysis phase after data gathering. Therefore, we proposed that a researcher must first learn a local language in order to correctly collect data.

March and Smith (1995) and Hevner et al. (2004) separated the design science approach from other IS methodologies. They presented some important properties of design science and crystallized seven principles. We proposed some minor changes and reservations for design research.

Davison et al. (2004) studied action research and its canonical version (CAR). They used then the Susman and Everett (1978) article as a basis, and derived five principles and many criteria. Davison et al. (2004, 2012) were first to propose theory as one of principles. They differentiated focal and instrumental theories and tested them in two Chinese firms. Our analysis showed that focal theories are important in CAR processes, but researchers hardly need instrumental theories, because, to our mind, it might be only once needed in a problem-solving for a change from an initial state to a goal/final state. An individual change process is always different from any other change processes.

Hirshheim (2008) guided researchers, reviewers and editors by emphasizing seven areas in conceptual research. He underlined earlier (empirical) studies from which a literature review was performed and a synthesis was submitted for publication (an inductive approach). But he forget a possibility to develop a presentation from axioms (a deductive approach).

Urquhart et al. (2010) wanted to develop a grounded theory (GT) research. They first accepted to perform three forms of processes (constant comparison, iterative conceptualization, theoretical sampling) to form a substantive theory. Then, they wanted to generalize it by proposing two other guidelines: scaling up and theoretical integration. Instead of two last ones we proposed to develop a formal theory, because we followed an original idea of Glaser and Strauss (1967) but Urquhart et al. (2010) took two dependent variables to structure a generalizing process (cf. Bunge 1967 for good classification).

Myers and Klein (2011) used three known writers (Bourdieu, Foucault, Habermas) and recommended to use their critical theories. Myers and Klein (2011) then unfortunately used the three elements of critical research (insight, critique and transformation) in their development. It led to too close connection with interpretive and critical perspectives, although they are independent (perpendicular). Myers and Klein's (2011) 6 principles mainly underline a general criticism not a critical research perspective. Based on Chua (1986), Orlikowski and Baroudi (1991) referenced by Myers and Klein (2011), we derived four totally new principles for a critical research perspective.

In Chapter 3, we considered some trials to collect research methodologies, first Galliers and Land (1987), and then March and Smith (1995). Based on our analysis for research guidelines for methodologies in Chapter 2, we develop our taxonomy of methodologies in Figure 16. An idea behind a derivation is to divide all the research approaches to smaller pairwise disjoint groups (Bunge 1967) by asking questions. We start with question: Is your object of study a part of reality or Other 1 (e.g., mathematics, philosophy, ...)? Thereafter, we ask what is an objective of your study. We assumed that there are four alternatives:

1. to correct injustice and inequalities (critical research),
2. to achieve utility,
3. to study status quo of a part of reality,
4. Other 2.

For the alternative 2, we propose to ask: Do you aim to build or evaluate a technical artifact (design science) or a new system (action research)? For the alternative 3, we are asking whether your study is conceptual or empirical. If it is the former then conceptual research, and if it is empirical then we ask, confirmatory or exploratory? If your study is confirmatory then, please use theory-testing research methods. But if it is exploratory, use theory-creating methods. When a researcher meets Other 2, then she has a research task that cannot be classified to any known class. She must then develop herself a new research approach.

In summary, in this work, there are two results: some new guidelines and a new taxonomy. In the former (guidelines), there are totally new guidelines for critical research (Section 2.8), some major changes in guidelines in Section 2.3 (interpretive studies), in Section 2.5 (canonical action research), in Section 2.6 (conceptual research) and in Section 2.7 (GT studies). In the latter (taxonomy), there are two big differentiations: Is an object under study a part of reality or something else? Is a part of reality in status quo or is it in motion? Our taxonomy demonstrates, that there are at least two alternatives without enough study.

4.2 Implications for practice

The articles in Chapter 2 concerning guidelines are intended especially for scholars. However, well-presented papers are understood by practitioners, too. Schneberger et al. (2009) demonstrate that practitioners can develop own theories for their purposes, and practitioners can give their theories to scholars when they are co-operating, and vice versa.

Our taxonomy in Chapter 3 demonstrates different alternatives for practitioners. They can pre-think alternative approaches before taking a contact with researchers.

4.3 Limitations

We have collected all the methodologies where some guidelines, principles or criteria were mentioned. We then emphasized a confirmatory/exploratory view, not a division between quantitative and qualitative views. For the latter division, there are a methodology for mixed methods and then ideas of Venkatesh et al. (2013, 2016) could be used.

It is also possible that we misinterpreted some texts we criticize. In the interest of minimizing misinterpretations and allowing transparency, throughout

this thesis, we provide direct quotations, with page numbers to allow readers to check for themselves. This is necessary as citing works without page numbers or direct quotes would make it very hard for IS readers to figure out whether our interpretations of IS literature is justified.

4.4 Future research

We highly recommend a completely new set of guidelines for positivist studies to be developed soon, because such studies are most common in our field (cf. Chen and Hirschheim 2004). A researcher should then take Siponen and Tsohou's (2018) results into account.

We also found that some research methodologies that do not refer to reality, e.g., formal languages, algebraic units etc., need guidelines. At the very least, a research philosophy called critical realism (and perhaps other 'unknown' research philosophies) needs its own set of guidelines.

Finally, the IS community must more study itself, i.e., to study published and submitted IS studies and their evaluations (reviews).

YHTEENVETO (SUMMARY IN FINNISH)

Tässä kohdassa esitämme eri tutkimusmetodologioiden ohjeiden täydennykset ja muutokset sekä niiden varaan luodun tutkimusmenetelmien taksonomian. Tarkastelemme ohjeita aikajärjestyksessä.

Tapaustutkimus

Benbasat ja muut (1987) lupasivat ehdotuksia, kuinka tehdä tapaus(case)-tutkimusta, ja kriteerejä, kuinka arvioida kyseisiä tutkimuksia. Kävi niin onnettomasti, että kirjoittajat unohtivat nimeämästä kyseisiä asioita. Onneksi pari vuotta myöhemmin Eisenhardt (1989) esitti kahdeksan askeleen mallin (taulukko 2) tapaustutkimuksesta, mutta ei ottanut malliin monen tapaus-tutkimuksen mahdollisuutta, vaan käsitteli sitä vain tekstissä. Yhden ja monen tapauksen tutkimukset eroavat toisistaan siinä, että monen tapauksen kohdalla on tietämyksen siirto edellisestä tapauksesta seuraavaan. Siirto ei ole edellisen tapauksen lopetustoimet lisättynä seuraavan tapauksen aloitustoimilla, vaikka yhden tapauksen mallissa onkin alussa aloitustoimet ja lopussa lopetustoimet (Eisenhardtin mallissa askel 1 ja askel 8 vastaavasti). Kyseessä monitapaus-tilanteessa on esim. alustavan teorian siirto edellisestä tapauksesta seuraavaan. Yleisesti keskeytyvässä toiminnassa on aloitustoimet ja lopetustoimet. Kun on kyse keskeytyvästä erästä, siinä on alussa aloitustoimet ja lopussa lopetus-toimet sekä siirto erän jäsenestä seuraavaan. Eisenhardt (1989) katsoo, että hänen tapaustutkimusmallinsa sopii positivistiseen case-tutkimukseen ja on eksploratiivinen eli tuottaa ilmiöstä alustavan teorian. Verrattuna Siposen ja Tsohoun (2018) positivistisen IS-tutkimuksen (information systems, IS, tieto-järjestelmätiede) kriteereihin, aikaisemmat IS-tutkimukset ovat harvoin jos koskaan olleet täsmälleen katsottuna positivistisia.

Positivistiset tutkimukset

Straub ja muut (1994) ovat keränneet tietojärjestelmätieteen lähitieteistä ohjeita positivistiselle tutkimukselle, jonka keskeisiä tyyppejä heidän mielestään ovat laboratorio-, kenttä- ja luonnollinen koe. He ovat löytäneet 15 eri ohjetta. Luku 15 on käytännössä tutkijan, arvioijan ja toimittajan kannalta suuri ajatellen käyttäjän lähimuistia (Miller 1956). Straub ja muut katsoivat, että faktori-analyysi sopii ohjeiden lukumäärän pienentämiseen. He saivat faktorianalyysin avulla 4 faktoria, joka ovat kohtisuorassa toisiaan vasten, ja nimittävät faktoreita positivistisen tutkimuksen standardeiksi. Kukin faktori sisältää muutaman ohjeen komponentin yhdistelmän. Standardia on vaikea mieltää ohjeiden komponenttien yhdistelmänä. Straub ja muut (1994 ovat nimenneet standardit, mutta artikkelin lukija tuskin saa samaa käsitystä standardista kuin sen tekijöillä on. Straub ja muut (1994) kuitenkin poimivat 15 ohjeesta mielestään neljä tärkeintä: Tutkimuksen tuottaman uuden tietämyksen lisäys, looginen täsmällisyys, teoria ja aiheen merkittävän kirjallisuuden kattavuus. Karahanna ja muut (2018) tutkivat kolmea koetta (laboratorio-, kenttä- ja luonnollista koetta) ja antavat ohjeet, kuinka niiden suhteen toimitaan, kun tietoja on suoraan saatavissa (online)

uuden IT:n avulla. Kolmea eri koetta käyttävät tutkimukset ovat teoriaa testaavia (confirmatory).

Syvällinen tapaustutkimus ja tulkinnallinen tutkimus

Klein ja Myers (1999) perustavat tämän tutkimustyypin seitsemän ohjetta kahden tutkijan, Gadamerin ja Ricourin filosofisiin töihin. Taustalla on Chuan (1986) jako kolmeen perspektiiviin: Valta-, tulkinnallinen ja kriittinen tutkimusfilosofinen perspektiivi. Muut ovat sanoneet valtaperspektiiviä nimellä positivistinen. Yhteistä positivistiselle ja tulkinnalliselle tutkimukselle on, että ne tutkivat reaalimaailman osan tasaantunutta tilaa (status quo). Klein ja Myers (1999) keskittyvät hankittujen datojen analyysiin. Siksi ehdotamme uutta ohjetta, kommunikointia, datojen hankintaa varten. Tulkinnallisen tutkimuksen olettamusten vallitessa on huomattu, että paikallisilla toimijoilla on käytössä oma paikallinen kieli. Ilmiötä tutkivilla henkilöillä (tutkijoilla, arvioijilla, toimittajilla) on oma 'tieteen' kieli (Deetz 1996). Nämä kaksi henkilöryhmää eivät aina täysin ymmärrä toisiaan, vaan tutkijan on panostettava kommunikointiin ja sitä varten pyrittävä oppimaan paikallisten kieli (vrt. Barley 1986).

Suunnittelututkimus

March ja Smith (1995) toivat ensimmäisenä esille suunnittelututkimuksen poikkeavan luonteen muusta IS-tutkimuksesta (kuvio 2). Kirjoittajat erottivat toisistaan suunnittelutieteen ja luonnontieteen, ja jatkoivat erottelua seuraavasti: rakentaminen ja arviointi (suunnittelu) sekä teorian laatiminen ja testaus (luonnontiede). Myöhemmin Hevner ja muut (2004) kertoivat, että käyttäytymistieteiden taustalla on luonnontieteiden jäsennykset, ja että IS-tiede on yksi käyttäytymistieteistä. He painottivat myös, ettei kannata tutkia mitä tahansa, vaan kannattaa valita tutkimuskohteeksi joku hyödyllinen kohde. Hevner ja muut (2004) antoivat seitsemän ohjetta, joista yhtä (6. suunnittelu artefaktin etsintäprosessina) ehdotamme muutettavaksi niin, että valmiin ohjelma- tai IT-komponentin etsinnän rinnalle otettaisiin uuden komponentin kehittely.

Toimintatutkimus

Davison et al. (2004, 2012) painottivat ehkä ensimmäisinä tutkijoina teorian roolia CAR- toimintatutkimuksessa, jolla he viittaavat artikkelissa Susman and Evered (1978) esitettyyn toimintatutkimuksen CAR-muotoon. CAR-tutkimuksella halutaan parantaa tietyn yrityksen tietosysteemin hyödyllisyyttä. Mielestämme yrityksen vastuuhenkilöt lopulta määrittävät tavoitellun uuden tietosysteemin hyödyllisyyden, johon CAR-tutkimuksella pyritään. Davison ja muut (2004) esittävät viisi periaatetta:

1. Tutkijan ja asiakkaan välinen sopimus (RCA),
2. Syklinen prosessimalli (CPM),
3. Teoria,
4. Muutos toiminnan avulla,
5. Oppiminen reflektoimalla.

Kuviossa 7 on viisi toimintoa sisältävä sykli, sykliin liitettynä aloitustoimet ja lopetustoimet sekä syklin keskellä RCA. Sykli on otettu artikkelista Susman and Evered (1978). Viiden periaatteen ja kuvion 7 vertailu osoittaa, että

a. suuri osa periaatteen 1 asioista hoidetaan aloitustoimien yhteydessä,
b. artikkelin Susman and Evered (1978) viidestä vaiheesta oppiminen on nostettu omaksi periaatteekseen, muut vaiheet on koottu periaatteeseen 4,
c. koko syklinen malli (periaate 2) sisältää periaatteet 4 ja 5.

Periaatteet 1–5 eivät muodosta hyvää luokitusta (vrt. Bunge 1967).

Jälkimmäisessä tutkimuksessaan (2012) Davison et al. esittävät ja kokeilevat kahta teoriatyyppiä (focal, instrumental) CAR-tutkimuksissaan kahdessa kiinalaisessa yrityksessä. Focal-teoria sopii toimintatutkimuksen lähtö- ja tavoite/lopputilojen kuvaukseen. Instrumental-teoria on tarkoitettu tukemaan tietosysteemin muutosta alkutilasta lopputilaan. Tunnistimme, että systeemin siirto alkutilasta lopputilaan on tehtävä kerran, ja kun tapaukset vaihtelevat, niin usein on kysymys ongelman ratkaisemisesta: Kuinka siirtää systeemi alkutilasta lopputilaan? Siksi viimemainittuun ongelmaan ei ole teoriaa.

Käsitteellinen tutkimus

Hirschheim esittää askeleet (A) johdanto, (B) sisältö, (C) esitys ja rakenne, (D) teoreettinen perusta, (E) data-analyysi /tutkinta / argumentointi, (F) tulokset, ja (G) johtopäätökset. Askeleet on tarkoitettu aiheesta aikaisemmin tehtyjen tutkimusten yhteisen rakenteen ja yhteisten tulosten koostamiseksi. Ben Shneiderman vertasi koostamista mosaiikin luomiseksi. Hirschheim jätti melkein huomiotta käsitteellisen pohdinnan lähtien tutkittavan kohteen aksioomista. Esimerkkinä viimemainitusta on käsitteellinen mallintaminen.

Grouded theory (GT) tutkimus

GT-tutkimus pyrkii muodostamaan alustavan teorian jostakin ilmiöstä. Urquhart et al. (2010) kutsuvat kyseistä teoria substantiiviseksi. Substantiivinen teoria saadaan kirjoittajien mukaan aikaan noudattamalla kolmea ohjetta:

1. Vertaile jatkuvasti (uusia datoja kehkeytyvään teoriaan).
2. Etene (tietojen keruussa ja) käsitteellistämisessä iteratiivisesti.
3. Noudata teoreettista otantaa (uusien datojen etsinnässä).

Kirjoittajat haluavat yleistää substantiivisen teorian ja analysoivat kuvion 12 avulla GT-tutkimuksia. Kuvion vaaka-akseli kuvaa prosessia ja pystyakseli prosessin tulosta. Urquhart et al. (2010) itsekin sanovat, että akselit eivät ole suorassa kulmassa vaan keskenään riippuvia. Kirjoittajat esittävät taulukossa 7 viisi ohjetta, joista kolmea ensimmäistä on kuvattu yllä ja suositettu käyttämään iteratiivisesti. Kahta viimeistä (4. teorian abstraktiotason nostaminen ja 5. teoreettinen integrointi) perustellaan kuviolla 12. Taulukon 7 viisi lineaarisesti esitettyä ohjetta eivät noudata hyvän luokituksen piirteitä (Bunge 1967). Siksi esitämme ohjeiden 4 ja 5 sijasta uuden ohjeen: Laadi formaali teoria. Perustelemme sitä GT:n perustajien, Glaserin ja Straussin (1967) omalla suosituksella. Ar-

tikkelissa Urquhart et al. (2010) paljon käytettyä category-termiä ei ole määritelty. Lisäksi toteamme, että metodi GT sopii hyvin tulkinnallisiin tutkimuksiin, mutta ei positivistisiin eikä kriittistä tutkimusfilosofiaa noudattaviin tutkimuksiin. Kun tutkija aktiivisesti osallistuu datojen keräämiseen, hän ei voi olla ulkopuolinen kuten positivistinen ote vaatii. Tulkinnallinen tutkimusfilosofia olettaa status quo:n, mutta kriittinen tutkimusfilosofia kiistää sen.

Kriittinen tutkimus

Chen ja Hirschheim (2004) tekivät laajan IS-kirjallisuuskatsauksen vuosilta 1991–2001 eivätkä löytäneet yhteen kriittistä tieteenfilosofiaa noudattanutta tutkimusta. Richardson ja Robinson (2007) löysivät samalta ajalta 31 kriittistä tutkimusta.

Myers ja Klein (2011) käyttivät artikkelin Alvesson ja Deetz (2000) kolmea toisiinsa suhteessa olevaa elementtiä (insight, critique, and transformation) johtaessaan kriittisen tutkimuksen kuutta periaatetta. Kuitenkaan ensimmäistä elementtiä (insight) ei ole kriittisessä tutkimuksessa vaan tulkinnallisessa. Myers and Klein (2011) pohtivat vielä artikkelinsa lopussa tulkinnallisen ja kriittisen perspektiivin suhteita, mutta se on turhaa siksi, kun kolme Chuan (1986) perspektiiviä (vallitseva, tulkinnallinen, kriittinen) eivät ole riippuvaisia keskenään.

Myers ja Klein (2011) esittävät kuusi periaatetta (taulukko 10) ohjaamaan kriittistä tutkimusta. Kolme ensimmäistä on johdettu elementtiin critique ja kolme jälkimmäistä elementtiin transformation perustuen Arvioimme niitä seuraavassa.

1. Käytä kriittisen sosiaalitutkijan ydinkäsitteitä

Myers ja Klein (2011) haluavat, että IS-tutkijat käyttävät kriittisessä tutkimuksessaan sosiaaliteoreetikkojen Bourdieau, Foucault ja Habermas käsitteitä. Myers ja Klein (2011) ovat artikkelissaan merkinneet näiden teoreetikkojen termejä kursiivilla, mutta meistä kyseiset termit ovat vieraita IS-tutkijoille ja vaikeasti ymmärrettävissä. Siksi periaate 1 on hylättävä.

2. Painota arvoja

Myers ja Klein (2011) puoltavat sellaisia arvoja kuin avoin demokratia, yhtäläiset mahdollisuudet ja diskurssiivinen etiikka. Termillä demokratia on eri yhteisöissä (esim. länsimaissa ja Putin'in Venäjällä) eri merkitys. Siksi tätä periaatetta on ainakin parannettava niin, että arvolla on mahdollisimman yksikäsitteinen merkitys, ellemme sitten kokonaan hylkää periaatetta 2.

3. Paljasta vallitsevat sosiaaliset käytännöt ja uskomukset

Tämän periaatteen yhteydessä Myers ja Klein (2011) käyttävät hyvänä esimerkkinä kriittistä hermeneutiikkaa soveltavaa artikkelia Doolin (2004), mutta artikkeli kuuluu tulkinnallisen tutkimuksen piiriin. Lisäksi Myers ja Klein (2011) vaativat tutkijaa tunnistamaan tärkeät uskomukset ja sosiaaliset käytännöt sekä haastamaan niitä vastakkaisilla perusteilla. Nuo vaatimukset ovat meistä lieviä, sillä kriittisessä tutkimuksessa tavallisesti selvitetään eri osapuolien välisiä risti-

riitoja ja keskinäisiä hegemonioita. Siksi emme voi suositella periaatteen 3 noudattamista.

4. Rohkaise yksilötason vapautumiseen

Myers ja Klein (2011) eivät artikkelissaan näe yksilötasolla mahdollisuuksia, vaan mieluummin painottavat yhteisötasoa. Siksi emme suosittele tätä periaatetta.

5. Ehdota parannuksia yhteisössä

Myers ja Klein (2011) mainitsevat johtavan ja työväen luokkien taloudelliset erot yhteisössä. Orlikowski ja Baroudi (1991) mainitsevat lisäksi rotuun ja sukupuoleen perustuvat erot. Näihin ja muihin eroihin on saatavissa parannuksia. Yritykset ja julkiset hallintoyksiköt vaativat toimiakseen tietyn hierarkian. Usein hierarkia on liiallista, mutta Aulin-Ahmavaaran (1979) mukaan on myös tietty alin taso, jota enempää hierarkiaa ei voi purkaa. Sitä koskee Riittävän Hierarkian Laki.

6. Tarkista, onko syytä parantaa sosiaalisia teorioita

Periaate 6 on linjassa muiden periaatteiden kanssa, mutta Myers ja Klein (2011) eivät esitä yhtään sosiaalista eikä sosioteknistä teoriaa. Periaate 6 pitää hylätä, kun ei ole mitään, millä mitata parannusta eikä ole esitetty mitään sosiaalista teoriaa.

Olemme yllä käsitelleet, mitä artikkelissa Myers ja Klein (2011) on kriittisestä tutkimuksesta. Sitten on vielä katsottava, mitä artikkelista puuttuu. Näyttää, että termi totaliteetti, joka on ihan olennainen kriittiselle tutkimukselle, puuttuu. Siksi artikkelin Myers ja Klein (2011) kriteerijoukko, joka on tarkoitettu kriittiselle tutkimukselle, on hylättävä.

Vaihtoehtomme

Vaihtoehto on esitetty taulukossa 11, johon on otettu mielestämme keskeiset kriittisen tieteenfilosofian asiat. Olemme poimineet kriteerit hyvistä lähteistä. Olemme suomentaneet taulukon (Table 14).

TABLE 14. Vaihtoehtoinen joukko kriittisen tutkimuksen kriteerejä (periaatteita)

1. Kriittiset tutkimukset pyrkivät kritisoimaan statu quo:ta. Suosittelemme ottamaan kriittisen kannan organisaatiota ja informaatiosysteemejä koskeviin ennalta annettuihin oletuksiin sekä dialektisesti analysoimaan ja yrittämään paljastaa olemassa olevien sosiaalisten käytäntöjen historiallinen, ideologinen ja vastakkainen luonne. On välttämätöntä asettaa esille, mitkä uskotaan olevan syvälliset, rakenteelliset vastakkainasettelut sosiaalisissa systeemeissä ja sen vuoksi transformoimaan nämä vieraannuttavat ja rajoittavat sosiaaliset ehdot. (cf. Orlikowski and Baroudi, pp. 5–6)
2. Yritä korjata epäoikeudenmukaisuus ja eriarvoisuus Tuo tietoisuuteen status quo:n rajoittavat ehdot ja sen vuoksi käynnistä muutos sosiaalisissa suhteissa ja käytännöissä sekä auta eliminoimaan vieraantumisen ja dominoinnin lähtökohdat. (Orlikowski and Baroudi 1991, p. 21). On tarkoitettu, että sosiaalinen muutos käynnistetään epäoikeudenmukaisuuden ja eriarvoisuuden korjaamiseksi (Chua 1986, p. 621).

3. Tyydytä ihmisten potentiaalisuus Kriittisen filosofian keskeinen idea on uskomus siitä, että sosiaalinen on historiallisesti rakentunut, eikä tästä syystä ihmisiä, organisaatioita ja yhteisöjä ole rajoitettu olemaan tietyssä tilassa (Chua 1986, p. 619). Jokaisella on käyttämätöntä potentiaalia, ja kun ihmiset tunnistavat nämä mahdollisuudet, he voivat toimia muuttaakseen heidän materiaaliset ja sosiaaliset olosuhteensa. (Orlikowski and Baroudi 1991, p. 19)
4. Muista totaliteetti Toinen tärkeä idea kriittisessä filosofiassa on totaliteetti, mikä merkitsee, ettei asioita koskaan käsitellä eristettyinä elementteinä. Tietty elementti on vain suhteiden totaliteetin kontekstissa ja siinä osana, elementti ja kokonaisuus ovat olennaisen pikemmin kuin satunnaisen toisiinsa sitomia. (Orlikowski and Baroudi 1991, p. 19)

Yhteenvetona voidaan todeta, että artikkelin Alvesson and Deetz (2000) ja sen kolmen elementin (insight, critique, and transformation) vuoksi Myers ja Klein (2011) ovat sitoneet kriittistä tutkimusta tulkinnalliseen tutkimuksen kanssa, vaikka nuo kaksi perspektiiviä ovat riippumattomia. Lisäksi kirjoittajien Myers ja Klein (2011) esittämät kriittisen tutkimuksen kuusi ohjetta kehottavat mieluummin yleiseen kriittisyyteen kuin kriittisen filosofian mukaan tehtyyn tutkimukseen. Siksi olemme yllä esittäneet neljä uutta kriteeriä, jotka mielestämme täsmällisesti perustuvat arvostettuihin lähteisiin. Muut tutkijat voivat parantaa meidän neljää kriteeriämme myöhemmin.

Taksonomia

Esitämme ohjeisiin, niiden parannuksiin ja muutoksiin perustuvan taksonomian joukkona kysymyksiä nojaten kuvioon 16. Kysymysten avulla voi valita tutkimukseen sopivan tutkimustyypin ja sen metodin.

Tutkimusmenetelmän valinta

Mikä on tutkimuskohteesi?
Other 1 (esim. matematiikka, filosofia, ...)
Osa todellisuutta

Oletatko, että tutkimuskohteessa vallitsee status quo?
Onko tutkimuksesi empiirinen?
on
Onko tutkimuksesi **teoriaa testaava** vai
Onko tutkimuksesi **uutta teoriaa luova**?
ei **– käsitteellis-teoreettinen tutkimus**

Oletatko, että tutkimuskohde on tai toivotaan olevan liikkeessä?
Tavoitellaanko tutkimuksessa hyötyä (utility)?
Luodaanko ratkaisussa **uusi IT-artefakti** (**suunnittelututkimus**) vai
Luodaanko ratkaisussa **uusi systeemi** eri resursseja käyttäen?
toimintatutkimus
Halutaanko tutkimuksessa korjata epäoikeudenmukaisuus ja eriarvoisuus?
kriittinen tutkimus

Tutkijan pitää tuottaa uusi metodi tai metodologia **Other 2**

Tutkimusmenetelmän valinta -kuvauksessa on itse asiassa kuvattuna puu (vrt. kuvio 16). Puun lehdet, tutkimustyypin valinnan tulokset, on tummennettu. Kullakin rivillä on sivuttaissiiroilla yritetty kuvata 'samanaikaiset' kysymykset, esimerkiksi pari: Oletatko, että tutkimuskohteessa vallitsee status quo? ja Oletatko, että tutkimuskohde on tai toivotaan olevan liikkeessä? sisältää kaksi 'samanaikaista' kysymystä. Kysymyspari on laadittu niin, että vastaukset kattavat kaikki vaihtoehdot. Puun laatimisessa on noudatettu Bungen (1967) suosituksia hyvästä luokituksesta.

Kohta Other1 tarkoittaa, että kun tutkimuskohde ei ole osa reaalitodellisuutta, niin sille ei ole olemassa määrättyä suositusta tutkimustyypiksi ja metodiksi. Sama koskee kohtaa Other 2. Ei ole vielä tiedossa muita tutkimuskysymyksiä kuin kuvauksessa esitetyt. Siis kun tutkitaan osaa todellisuudesta ja oletetaan, että tutkimuskohde on tai sen toivotaan olevan liikkeessä, eikä ole muita kysymyksiä kuin kuvauksessa esitetyt, täytyy kehitellä uusi tutkimusmetodi (Other 2).

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