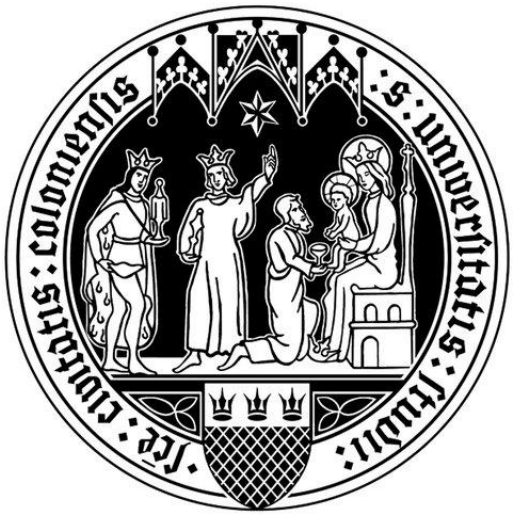
Case Study Research

A Review of Positivist Case Study Research in Information Systems



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List of abbreviations

[AIS]	[Association for Information Systems]
[CS]	[Case Study]
[CSR]	[Case Study Research]
[IS]	[Information Systems]
[JSIS]	[Journal of Strategic Information Systems]
[MISQ]	[Management Information Systems Quarterly]

1 Introduction

1.1 Motivation, Problem and Research Questions

The research method of Case Study Research (CSR) is becoming more and more important and it is being used in increasing numbers. The trend of increasing use of CSR refers to research in general (Liu and Myers, 2011, p. 11), but the acceptance and usefulness of this method is also increasing within the Information Systems (IS) research community (Paré, 2004, p. 234). In the first decade of this millennium, CSR in IS has already been conducted at a rate of 21% in six prestigious journals (Keutel et al., 2014, p. 261). However, there has been few studies on how CSR in IS discipline is applied in research practice. The methodological basis of this research can be traced back to the book "Case Study Research: Design and Methods" (Yin, 2014), which serves as an important foundation for recommendations on how to conduct CSR. Moreover, comparable studies on this work have already been addressed in some published articles. Positivist articles addressing case studies (CS) from 1990 to 1999 were classified using established characteristics from the relevant literature and examined for methodological precision (Dubé & Paré, 2003). Further research in this area examined articles from 1998 to 2007, highlighting differences in applied methodology between European and US journals (Liu & Myers, 2011), and an examination of positivist and interpretivist articles from 2001 to 2010, which highlighted differences in the two philosophical approaches in terms of methodological recommendations (Keutel et al., 2014). The results of previous IS research reveal shortcomings in the application of methodologies in CSR that have persisted for decades.

A case study is defined as an empirical investigation that examines a present phenomenon in its real-world context, especially when the boundaries between phenomenon and context are not clear (Yin, 2014, p. 16). CSR is appropriate in IS because observations in this research discipline are often complex and cannot be studied outside of their occurring context (Benbasat et al., 1987, p. 371; Orlikowski, 1992, p. 402). The relevance of CSR is supported by a change in the predominant use of the mode of inquiry. While descriptive studies were more commonly used in the past (Dubé & Paré, 2003, p. 605), exploratory and explanatory studies have been the

most common in recent years (Keutel et al., 2014, p. 258). Therefore, CSR is often used to develop or test new theories (Recker, 2021, p. 124).

Despite the frequent use of CSR, existing research has revealed problematic issues in the application of this research method. Scientific methodology is not always or only partially followed in CSR. A gap exists between the recommendations given in the methodological literature and actual research practice. The background to this discrepancy needs to be explored and recommendations for future CSR derived from the findings.

The narrowing down to positivist CSR is done in this paper because, according to the research findings regarding philosophical principles, positivist CSR tends to have more shortcomings in IS than interpretive CSR (Keutel et al., 2014, p. 266). Furthermore, previous research focusing on positivist CSR dates back several years (Dubé & Paré, 2003). Consequently, it requires an updated assessment. Therefore, this thesis examines positivist CSR from 2014 to 2021 for possible more conscientious application of the recommended methodology and compares it with the findings of comparable previous research. Thus, the research questions of this thesis are:

- *How has CSR been applied in positivist IS research from 2014 to 2021?*
- *How has CSR in positivist IS research changed over the years in terms of methodological recommendations?*

1.2 Research Objective

The aim of this paper is to examine existing positivist CSR articles in the IS in terms of the methodology used in each. An attempt will be made to determine if the discrepancy regarding methodology in these types of articles has changed in comparison to similar previous research. Furthermore, lessons learned will be used to highlight best practices and derive recommendations for future CSR implementation.

To achieve this goal, the positivist CSR articles are examined for predefined attributes. These attributes are established based on accepted basic literature. The CSR articles examined will then be coded for these characteristics to subsequently identify any patterns. In order to set uniform standards for coding, rules for classifying the characteristics are also established. The findings obtained will be interpreted and used to determine changes to results from similar research in the past. In addition, the results will be used to generate ideas and recommendations for future CSR.

Since this work is embedded in another study concerning review of CSR in IS in terms of methodological application, the remainder is organized as follows according to an unpublished ongoing study (Michalik et al.): in the next chapter, the theoretical background for this thesis is established based on the relevant literature. This is followed by a description of the method of systematic literature review, which forms the basis for the subsequent analysis. After that, the results are discussed before a conclusion is drawn.

2 Theoretical Background

This chapter defines the relevant terms for this thesis. First, the CS as a research method is described. The narrowing down to CS as a research method is done because it is the only method that is the object of investigation in this thesis. Second, the philosophical approach of positivism is described. The relevance is that the underlying philosophical assumptions strongly influence the choice of methods and have implications for the research design of the study (Orlikowski & Baroudi, 1991, p. 2; Mingers, 2001, p. 236). CSR can be understood as a research strategy that allows the use of different research methods and is therefore "compatible with different philosophical assumptions" (Keutel et al., 2014, p. 257). Since CSR is flexible in its implementation, this can lead to versatile applications of CSR (Orlikowski & Baroudi, 1991, p. 2). The underlying philosophical paradigm in this thesis is limited to the positivist CSR articles. This narrowing down is done because as described in the introductory section, positivist CSR has more shortcomings in IS than interpretive research. This goes back to the leading use of positivist approaches in research. Researchers who follow the philosophical approach of positivism, due to its establishment, do not see an urgent need to conduct their studies extensively according to the methodological recommendations. Interpretivist research, on the other hand, is not yet popular to this extent and therefore pursues a closer application of research to the recommended methodological standards (Keutel et al., 2014, p. 266). Therefore, this chapter defines the philosophical approach of positivism and distinguishes it from other philosophical paradigms.

2.1 Case Study Research

The CSR method is appropriate when a phenomenon is broad, complex, and needs to be investigated holistically to its full extent. Moreover, the phenomenon

cannot be explored without the associated context in which it occurs (Benbasat et al. 1987, p. 371; Bonoma 1985, p. 204; Feagin et al. 1991, p. 10; Yin 2014, p. 16). According to the complexity of a phenomenon, CSR can be used to extract rich information about it (Eisenhardt, 1989, p. 548; Walsham, 1995a, p. 75; Darke et al., 1998, pp. 282-283). Therefore, it is suitable for collecting a variety of empirical data. Additionally, meaningful case descriptions help to gain a better understanding of the situation under study (Keutel et al., 2014, p. 258). Conducting a CS requires intensive research of the phenomenon in its natural environment over a reasonable timespan. The process of a CSR involves interdependence and iterations of the steps of planning, designing, preparing the data, collecting the data, analyzing the data, and distributing the results (Recker, 2021, p. 125). A CSR often uses multiple qualitative methods to collect data, such as interviews, documentation, and observations. But it may also include quantitative data, such as questionnaires and time series. Furthermore, generalization from CSR is increasingly from analytical rather than statistical results (Meredith, 1998, p. 448; Dubois & Gadde, 2002, p. 559; Lee & Baskerville, 2003, p. 222; Yin, 2014, p. 41). Because CS is adaptable, it can be conducted in any philosophical context (Dubé & Paré, 2003, p. 598). The philosophical approaches of positivism, interpretivism and criticism are explained below.

2.2 Philosophical Approach of Positivism

In this section, positivism is distinguished from the other two popular philosophical approaches of interpretivism and criticism. To do this, each of the three paradigms will be briefly defined.

Historically, positivism has been the most widely used philosophical approach in the IS research field (Orlikowski & Baroudi, 1991, p. 6; Dubé & Paré, 2003, p. 604; Chen & Hirschheim, 2004, p. 207). Pioneers of the methodology advocate positivist research (Eisenhardt, 1989, p. 546; Yin, 2014, p. 40), which emerged from the natural sciences. There, the assumption is that an objective reality exists independent of the observer (Walsham, 1995a, p. 76). The world can be understood by identifying unidirectional cause-effect relationships and rules are not bound by context and time (Orlikowski & Baroudi, 1991, p. 9).

Interpretivism is another philosophical assumption applied in IS research (Walsham, 1995b, p. 376). Contrary to positivism, interpretivist research views reality as a socially created product (Walsham, 1995a, p. 75; Klein & Myers, 1999, p. 69).

From the interpretivists' perspective, the understanding of a phenomenon is dependent on the meaning assigned to it by society (Klein & Myers, 1999, p. 69).

The third philosophical paradigm is critical research (Orlikowski & Baroudi, 1991, p. 18). In contrast to positivism and interpretivism, critical researchers aim not only to understand and explain the phenomenon under study, but also to question established social structures (Klein, 1999, p. 16; Cecez-Kecmanovic et al., 2008, p. 126; Klein, 2009, p. 266). In relation to IS studies, critical research primarily examines and questions the expected role of IS in a given context (Cecez-Kecmanovic, 2011, p. 442). Critical researchers take explicit positions and are therefore concerned with moral and normative ethical interests (Stahl, 2008, p. 148; Cecez-Kecmanovic, 2011, p. 442).

3 Method

3.1 Journal Selection

As a methodological approach, this thesis conducts a systematic literature review (Webster & Watson, 2002). It includes a descriptive part, revealing patterns and trends of methodological shortcomings in positivist CSR, and a critical part, assessing methodological precision in positivist CSR and providing recommendations for improvement for future research (Paré et al., 2015, p. 189; Rowe, 2014, p. 242).

Journals from the Senior Scholars' Basket of Eight are suitable for this study as they represent reputable journals according to the Association for Information Systems (AIS) and experienced scholars in the field of IS (Liu & Myers, 2011, p. 6). These journals also cover the subject area of IS internationally and broadly in terms of topics. The scope of this paper is limited to the selection of two of these journals. Accordingly, the choice falls on the Management Information Systems Quarterly (MISQ) and the Journal of Strategic Information Systems (JSIS), as they are considered to be of superior quality across the board. The MISQ has already been studied in previous research (Dubé & Paré, 2003, p. 600; Keutel et al., 2014, p. 259), while the JSIS is part of an unpublished ongoing study (Michalik et al.). Therefore, and because it is a high-quality journal, the JSIS is suitable to be included in this work and to be evaluated in terms of methodological precision for CSR. Thus, the results of these two journals can be compared with previous results from top journals. The articles from the selected journals were published between the years 2014 and 2021, as they were timed to follow

the call for greater precision in CSR and to provide an up-to-date assessment of following the methodological recommendations in these journals (Dubé & Paré, 2003, pp. 626-627).

3.2 Article Selection

The process for selecting articles involved three stages. At the beginning, all articles from MISQ and JSIS between the years 2014 and 2021 were selected. In the first stage, the articles were filtered by CSR. The basis for identifying CSR articles is the definition of a CS (Yin, 2014, p. 16) and established CS characteristics according to further literature (Benbasat et al., 1987, p. 370; Dubé & Paré, 2003, p. 600). These describe CSR as:

- "a contemporary phenomenon is examined in a real-life context or setting
- one or few entities (person, group, organization, technology) are examined
- the complexity of the unit is studied intensively
- the phenomenon of interest is not isolated from its context, especially at the data analysis stage
- no controlled observation that involves manipulation is involved" (Dubé & Paré, 2003, p. 600).

In the second stage, all articles that do not perform CSR as a primary research method are excluded. In the third and last stage, the articles that are subject to positivism as a primary philosophical paradigm remain. The criteria for this come from relevant methodological literature (Cecez-Kecmanovic, 2011, p. 444; Chen & Hirschheim, 2004, p. 201; Eisenhardt, 1989, p. 533; Klein, 2009, p. 261; Klein & Myers, 1999, p. 69; Mingers, 2004, p. 89; Orlikowski & Baroudi, 1991, p. 5; Smith, 2006, p. 195; Walsham, 1995a, pp. 75-76; Yin, 2003, p. 163; Yin, 2014, p. 45). In addition, established criteria from comparable previous research were used. These include:

- "adoption of a positivist perspective clearly stated in the study
- evidence of formal research hypotheses or propositions
- evidence of qualitative and/or quantitative measures of variables or constructs
- explicit purpose of theory testing or theory building

- concern for validity and reliability issues as used in the natural sciences" (Dubé & Paré, 2003, p. 604).

3.3 Process of Categorization and Coding

The team for categorization consisted of three persons, two researchers and the author of this thesis, and the categorization was done by at least one of them. Each article was classified by a first categorizer. If no uncertainties occurred, the classification of the first categorizer was taken as final categorization. If the first categorizer identified critical or borderline cases, these were reviewed by another categorizer for validation by researcher triangulation as recommended (Denzin, 2009, p. 303). The second coder's classification was additionally added to the critical article. In each critical case at least one experienced researcher took part in the classification process. If any differences occurred in the two categorizations of the critical articles, these differences were discussed between the two categorizers until an agreement was reached for final classification. New coders were instructed in the process of categorization with the guidelines described in the subchapter above and the advice to focus on the described methods in the articles. For the categorization of all articles a spreadsheet was used to record the categorizers' and the final classification. Critical cases also got a comment to retrace the decision for the final categorization. The author of this work mainly took part as first categorizer in the process but also was assigned to second categorizing in some critical cases.

The coding was done by the author of this thesis. For this, each positivist CS article was examined individually according to a previously applied coding scheme (Dubé & Paré, 2003, pp. 634-635). This coding scheme originally comprises 54 attributes and is extended to 77 attributes in this work, as further research recommends (Keutel et al., 2014, p. 267). The newly added attributes come from the research in progress (Michalik et al.) and are taken for this work to provide a rich insight into the application of methodological recommendations of the positivist CS under study. The entire list of established characteristics can be seen in Appendix A. New attributes are formatted in bold text, and new values for characteristics are formatted in italics. For the coding process a spreadsheet was created containing basic information about the articles as well as columns for all attributes and an additional detail column for each attribute. The respective value from the coding scheme for the article was entered in the cells for the attributes and the fitting text passage or a justification for the value

was entered in the corresponding detail column, if available. For each attribute rules are established to ensure standardized coding. Through these rules the coding assessments are made according to the most possible objective standards. In this regard, the established rules are derived from the literature and are also stated in Appendix A. The analysis of the coding was performed using Jupyter Notebook. The presentation of the results in tabular form (Chapter 4 Analysis and Appendix C) and the coding scheme were adapted from the unpublished ongoing work (Michalik et al.). The coding rules (Appendix A) and examples from articles for coding (Appendix B) were newly developed as part of this work.

This method described above is appropriate for this thesis as existing research is collected, read and each case is examined for defined characteristics in order to gather comparable findings to previous research. These findings are used to give an updated assessment regarding the initially presented problem of CSR not following the methodological recommendations.

4 Analysis

4.1 Analysis of the Identified Positivist Case Studies

The categorization of 605 research articles published in the JSIS and MISQ between 2014 and 2021 includes 80 (13%) articles (Table 1) that use CSR. 69 (11%) of the sample use CSR as a primary method. Compared to the previous comparable study, this means a slight decrease in case studies (15%) and primary case studies (12%) (Dubé & Paré, 2003, p. 602). This is contrary to the statement that CSR has gained in relevance over the years (Liu and Myers, 2011, p. 11). The current figures rather indicate a stagnation of usage of CSR.

It is worth noting that 94% of the studied positivist research articles that use CSR as their primary method state the use of CSR. However, statements in this regard were often made late in the article. In some cases, the use of CSR was not used in the introduction and was only mentioned in the methods section. But one study worth mentioning directly linked the use of CSR in the introduction to the formulated research questions (e.g., Wiener & Saunders, 2014, p. 211). In addition, the mentioning of CS in the keywords was used in 26% of the investigated articles. In the studied articles, there are twelve studies that use multiple CS. However, seven (58%)

of these articles use the term ‘case studies’ instead of ‘multiple case study’. Although this finding is meticulous, it is indicative of a lack of methodological precision.

Table 1. Number and Percentage of Articles Applying CSR per Year

Year	# of full research articles	# of full research articles applying CSR	% of full research articles applying CSR	# of full research articles applying CSR as a primary method	% of full research articles applying CSR as a primary method	# of full positivist research articles applying CSR as a primary method	% of full positivist research articles applying CSR as a primary method
2014	72	16	22%	12	17%	4	6%
2015	59	10	17%	10	17%	6	10%
2016	66	7	11%	7	11%	4	6%
2017	77	6	8%	5	6%	3	4%
2018	81	12	15%	9	11%	5	6%
2019	83	11	13%	10	12%	6	7%
2020	78	13	17%	11	14%	5	6%
2021	89	5	6%	5	6%	2	2%
Total	605	80	13%	69	11%	35	6%

Table 2. Number and Percentage of Articles Applying CSR per Journal

Year	# of full research articles	# of full research articles applying CSR	% of full research articles applying CSR	# of full research articles applying CSR as a primary method	% of full research articles applying CSR as a primary method	# of full positivist research articles applying CSR as a primary method	% of full positivist research articles applying CSR as a primary method
JSIS	148	43	29%	40	27%	19	13%
MISQ	457	37	8%	29	6%	16	4%
Total	605	80	13%	69	11%	35	6%

The comparison of the two studied journals in the period from 2014 to 2021 can be seen in Table 2. There are major differences between the two journals in terms of CSR usage. Although in JSIS significantly fewer articles (148) are published during the studied period than in MISQ (457), JSIS nevertheless contains more articles that use CSR in absolute terms (43) than MISQ (37). This also carries over into the relative proportion of positivist research articles that use CSR as their primary method (13% JSIS vs. 4% MISQ).

Examination of the underlying philosophical paradigm reveals 35 positivist, 26 interpretivist, 7 critical CS, and one dialogical approach (Figure 1). The trend in philosophical perspectives continues to be that positivism and interpretivism most often underlie CS, which is in line with recent research (Hirschheim & Klein, 2012, p.

218; Keutel et al., 2014, p. 261; Liu & Myers, 2011, p. 10; Walsham, 2006, pp. 320-321). It is noticeable that the most frequent use of interpretive CS occurs at the beginning (2014 with six studies) and towards the end (2020 with five studies) of the time span studied. Positivism is frequently underlying as a philosophical paradigm throughout, with a slight decline towards the end (2021 with two studies). Criticism is not regularly used in each year of the observed period and peaks in 2018 with three studies. Worth mentioning is the use of a new philosophical approach in 2016. This study is subject to the dialogical approach paradigm (Figure 2). In addition, the call for a broader mix of philosophical paradigms in IS CSR (Lee, 1991, p. 363; Orlikowski & Baroudi, 1991, p. 7) was heeded (Figure 3).

Figure 1: Ratio of the Followed Philosophical Paradigms

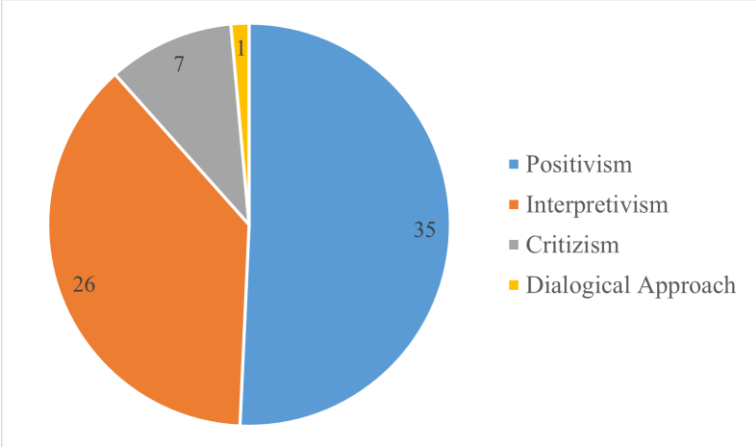


Figure 2: Chronological Trend of Followed Philosophical Paradigms

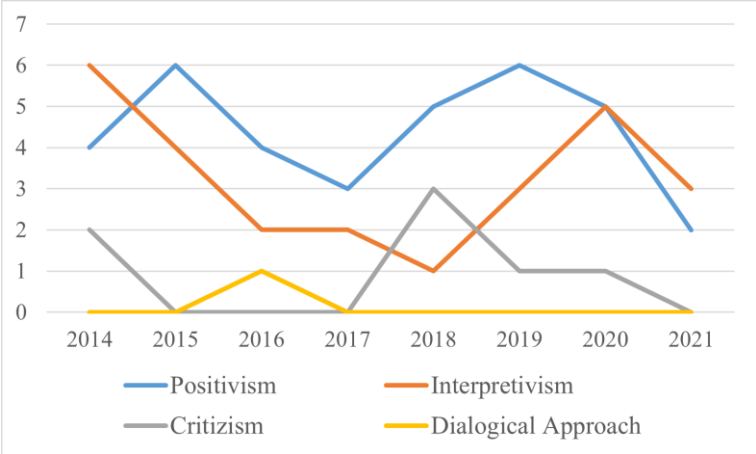
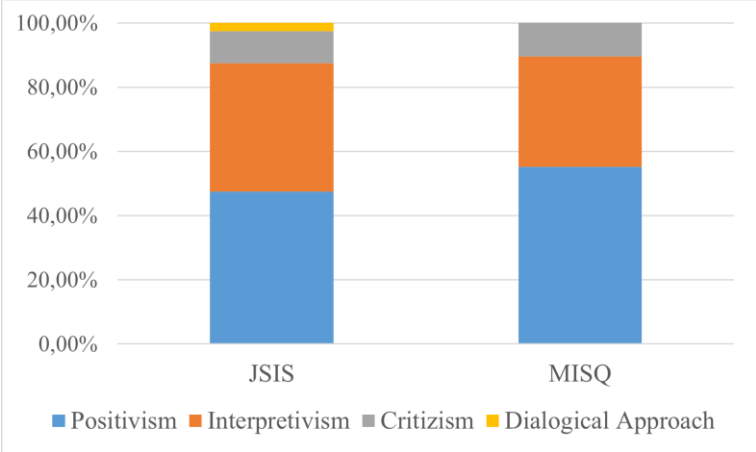


Figure 3: Ratio of the Followed Philosophical Paradigms in Different Journals



4.2 Rigor of the Examined Positivist Case Studies

The categorization of the articles mentioned leads to 35 positivist case studies. In this chapter the results are presented according to the recommended structure for case studies (Dubé & Paré, 2003). This includes the research design, data collection and data analysis. The research design covers the attributes related to the overall design of the study. The data collection refers to the attributes that reflect the quality of the collected data and corresponding methods, the data analysis includes the attributes related to the quality of the used methods in analysis process.

The studied articles are distinguished between descriptive, exploratory and explanatory research purposes. If the observed phenomenon is described without deriving a theory, then it is a descriptive case study. A case study is exploratory if the primary goal is to establish a theory or framework. The explanatory research purpose underlies a study when it is used to test an existing theory (Dubé & Paré, 2003, p. 605). As mentioned in the introductory section, descriptive studies have been the most frequently used research purpose in the past (Dubé & Paré, 2003, p. 605). In this study, exploratory case studies turn out to be the most frequently used (91%), whereas descriptive (6%) or explanatory (3%) research purposes are less underlying. Since descriptive (N = 2) and explanatory (N = 1) CSR occur in small numbers in this examined sample, the results of these two research purposes should be viewed with caution. Results from previous studies confirm that in many cases research purposes are not explicitly described (Benbasat et al., 1987, p. 380; Dubé & Paré, 2003, p. 605). Although this is the case to a large extent in this sample, there are also reviewed CS

which explicitly mention the underlying research purpose (e.g., Baker & Niederman, 2014, p. 116; Salovaara et al., 2019, p. 556).

In the following sections, the results are presented in tables. The tables include the attributes studied, the key findings, recommendations for improvement, and selected examples for each attribute. In addition, there is an assessment (+/-) of each attribute in terms of a satisfactory fulfillment in the examined sample. This assessment considers on the one hand the comparison for each attribute with results from past research (Dubé & Paré, 2003), but on the other hand also the necessary degree of fulfillment with respect to corresponding criteria of each attribute (e.g., in an extreme single case scenario it is not possible to conduct a pilot study).

4.2.1 Research Design

The results from the two examined journals show that the methodological recommendations regarding research design are followed more closely in current studies (Table 3). These include, for example, the attributes ‘Clear research question’ and ‘A priori specification of constructs’. However, some attributes are still neglected, such as ‘Pilot study’ or ‘Different roles for investigators’. Further recommendations and discussions regarding research design can be seen in chapter 5 Discussion.

In addition to the attributes listed in Table 3, which are based on previous research (Dubé & Paré, 2003, pp. 607-612), this paper adds an additional attribute. This new attribute describes the case acquisition for the cases studied. In doing so, the description of case acquisition leads to an in-depth understanding of the study, primarily by establishing criteria for selecting cases and the obstacles encountered during the process of case selection (Marshall & Rossman, 2015, p. 20). In this work, four studies (11%) described how cases were acquired. Researcher’s interest in the studied topic is one of many ways cases can be acquired. In this acquisition strategy, researchers continually monitor the topic and can respond to emerging opportunities. This was the case in one of the four cases (e.g., Syed, 2019, p. 263). Another case extraction was based on the selected cases of a larger related research study (e.g., Street et al., 2018, p. 62). Moreover, one study established criteria for eligible companies and used these to contact gatekeepers in those companies (e.g., Kaltenecker et al., 2015, p. 238). In another case, a researcher was contacted by a company, which led to the researcher's curiosity about the case and thus opened the study (e.g., Möhlmann et al., 2021, p. 2002).

Table 3: Key Findings, Recommendations for Further Improvement, and Outstanding Examples of Research Design

Attribute	**Key findings**	**+/ -**	**Recommendations for Further Improvement**	**Selected Examples**
Clear research questions	In the examined positivist CS, 89% state a clear research question or a goal with interrogative. The differences between the research purposes or the two journals are only minimal and therefore close the gap to the previous investigation (Dubé & Paré, 2003, p. 607).	+	Clear research questions should still be formulated in CSR. The research question is the beginning of the structure in a CS. This ensures that the researcher is guided through the study focused by the research question (Eisenhardt, 1989, p. 533).	*Clear research question:* Wiener & Saunders, 2014, p. 211 *Goal with interroga-tive:* Syed, 2019, p. 258
	Among the types of research questions, ‘how’ questions are clearly the most used, followed by ‘what’ and ‘why’ questions. From the 31 articles stating a clear research question or a goal with interrogative, only one question type was indicated with ‘does’.	+		
A priori specifi-cation of constructs (explora-tory studies only)	A priori specified constructs underlie a large proportion of the exploratory CS analyzed (88%). In JSIS (94%), this attribute was followed more frequently than in MISQ (80%).	+	A priori specified constructs help the reader to go back to basics and understand what the study is based on. This supports the general understanding of the study or helps to provide background knowledge if this is not intuitive. Furthermore, underlying constructs lead the researcher to build new theory (Dubé & Paré, 2003, p. 607).	Leonard & Higson, 2014, p. 66; Iannaccia, 2019, p. 311
Clean theoretical slate (explora-tory studies only)	Less than half (47%) of the examined exploratory CS report research with a clean theoretical slate. Only one study in the reviewed sample explicitly report on a clean theoretical slate. In this clear example the authors state: "In keeping with the principle of theoretical sensitivity, we were careful not to force any theoretical	-	Researchers should be careful to enter the research with a clean theoretical slate to avoid biases as well as limiting the possible outcomes (Eisenhardt, 1989, p. 536). The goal is to conduct the study in an unbiased manner so that all possible outcomes can be considered.	Liu et al., 2021, p. 8

	constructs onto the data set" (Liu et al., 2021, p. 8).			
Theory of interest (explanatory studies only)	In the examined explanatory CS, the theory of interest is stated (100%).	+	Authors of explanatory CSR should continue to describe the theory of interest.	Gregory et al., 2018, p. 1226
Predictions from theory (explanatory studies only)	In the explanatory CS studied, predictions from theory are given (100%).	+	Researchers should also take care to derive and describe predictions from theory. By establishing predictions, researchers are able to derive a starting point for the search for evidence (Dubé & Paré, 2003, p. 608).	Gregory et al., 2018, pp. 1242-1246.
Rival theories (explanatory studies only)	No rival theories are used in the examined explanatory CS (0%).	-	In CSR, rival theories should be increasingly considered. This can lead to different explanations for the theory to be tested (Lee, 1989, p. 42; Yin, 2014, pp. 37-38).	-
Number of cases	Among the studied articles, single CS (66%) are used more frequently than multiple CS (34%). The number of cases in the multiple CS ranges from two (e.g., Karoui et al., 2015, p. 19; Leonard & Higson, 2014, p. 68) to 22 cases (e.g., Baker & Niederman, 2014, p. 116). The average number of cases in multiple CS is 5.75 cases, and the median is 2.5 cases. There is a large difference between the two journals studied. While in JSIS the difference is moderate (58% single CS vs 42% multiple CS), in MIQS single CS (75%) are performed much more frequently than multiple CS (25%). Moreover, both descriptive CS are performed with multiple cases, the explanatory CS with one case.	+/-	On the one hand, a criticism of single CS is that they have limited generalizability, whereas on the other hand they can be used to disconfirm theories (Dubé & Paré, 2003, p. 609). Therefore, the use of single CS should always be justified. Otherwise, multiple CS are preferable as they provide richer results and increase generalizability (Benbasat et al., 1987, p. 373; Dubé & Paré, 2003, p. 609; Eisenhardt, 1989, p. 537; Lee, 1989, p. 41; Yin, 2014, pp. 56-57).	*Single case study:* Eaton et al., 2015, p. 221 *Multiple case study:* Baker & Niederman, 2014, p. 116; Karoui et al., 2015, p. 19; Leonard & Higson, 2014, p. 68

Case selection	In 87% of the analyzed single CS the case selection is justified. The nature of single CS is explicitly or implicitly identifiable in 57%. Most of the information on the nature of single CS is implicit, sometimes with references to the methodological literature (e.g., Salovaara et al., p. 562). But the nature of single CS was also explicitly stated in some studies (e.g., Ayala et al., 2020, p. 5).	+	The researchers should continue to justify the selection of cases (Dubé & Paré, 2003, p. 618; Yin, 2003, pp. 10-12; Yin, 2014, pp. 51-54., pp. 56-58, pp. 61-62). In addition, authors should describe the nature of single CS or to what extent similar or different results are expected in multiple CS (Gibbert & Ruigrok, 2010, p. 728). Due to the sensitivity of single CS, it is imperative that a rationale for conducting a single CS is made (Paré, 2004, p. 234; Yin, 2003, p. 5; Yin, 2014, pp. 18-19, pp. 51-52, pp. 56-57, pp. 61-62, pp. 63-64).	Ayala et al., 2020, p. 5; Salovaara et al., p. 562
	In 75% of the analyzed multiple CS the selection of cases is justified. Furthermore, the examined multiple CS are divided into 42% literal and 33% theoretical replication logic. In few studies the replication logic is explicitly stated (e.g., Karoui et al., 2015, p. 19).			Karoui et al., 2015, p. 19
Definition of the unit of analysis	In less than one of four examined CS (23%), the unit of analysis is specified. The JSIS, with 16%, and the MISQ, with 31%, differ greatly in this respect. Moreover, in 100% of the articles the case under investigation is indicated. In 86% of the cases, the case design is embedded, which is in few cases explicitly stated (e.g., Oshri et al., 2018, p. 6), and holistic in 14% of the examined studies.	-	In the future, authors should frequently state the unit of analysis of the CS, as it sets the boundaries of the study (Benbasat et al., 1987, p. 372; Dubé & Paré, 2003, p. 610; Miles & Huberman, 1994, p. 25; Yin, 2014, pp. 31-34). This not only leads the reader to understand the phenomenon under study, but also reminds the researcher of the limitations of the study. Therefore, the authors should always define both, the case and the unit of analysis.	*General examples:* Eaton et al., 2015, p. 221; Salovaara et al., p. 563 *Holistic design:* Rahrovani, 2020, p. 4 *Embedded design:* Oshri et al., 2018, p. 6
Pilot study	No authors of the CS in the examined sample considered the use of a pilot study (0%).	-	Although it is not necessary or possible to test the research design in every study, it can be useful to clarify ambiguities or discover unforeseen problems. In addition, a pilot study	-

			can address the unit of analysis and allow researchers to become familiar with the phenomenon under study (Dubé & Paré, 2003, p. 610; Yin, 2014, pp. 31-32).	
Context of the case study	In the analyzed positivist CS, the researchers describe the research site in 69% in detail and in 23% at least roughly. Among the examined studies, there is one meaningful example of detailed description (e.g., Liu et al., 2021, pp. 5-6). Furthermore, the case period is described in more than every second CS (54%) and 83% of the authors describe the time spent on site. The shortest time spent in this context is 23 days (Syed, 2019, p. 263), whereas the longest time spent is twelve years (Iannaccia et al., 2019, p. 314). However, only 34% of studies report a longitudinal design. The nature of data is recognizable in almost all CS (97%), of which 40% are on-going, 29% retrospective and 28% both, on-going and retrospective. But these are mostly implicitly identifiable. However, there are also exceptions in which the nature of data is explicitly reported (e.g., Kaltenecker et al., 2015, p. 238). This approach differs from the comparable study from the past, as there were only those CS considered in which the nature of data was explicitly stated (Dubé & Paré, 2003, p. 611).	+/-	Future CS researchers should provide more information about the research context. Some information, such as the research site and time spent on site, are already fulfilled to a large extent, but in many cases some information is still missing, e.g., whether a longitudinal research design was used. It would also be beneficial if the authors explicitly mention the nature of data, as it is not always easy to obtain this information implicitly. This additional information would help the reader to understand the context of the study.	*Research site:* Kankanhalli Liu et al., 2021, pp. 5-6 *Case period:* Jenkin et al., 2019, p. 655. *Time spent on site:* Iannaccia et al., 2019, p. 314; Syed, 2019, p. 263. *Longitudinal design:* Iannaccia et al., 2019, p. 314. *Nature of data:* Kaltenecker et al., 2015, p. 238

Team-based research	Authors indicate in 69% of the positivist CS articles at least partially how many researchers undertook tasks in data collection or data analysis. In this sample, 91% of the studies were conducted by a team of researchers. In this attribute there is a difference between the journals, as in MISQ the team-based research rate is 100%, whereas in JSIS the rate is only 84%. Overall, 20% of the investigated CS were conducted by two researchers, 46% by three, 20% by four, and 3% each by five and six researchers, respectively.	+	The results confirm that team-based research is gaining popularity. The information about the different tasks of the researchers during data collection and data analysis has increased, but it is sometimes too imprecise regarding the number of researchers for the different processes. Here, it is important that the authors describe these division of tasks precisely in future articles.	*Data collection:* Ayala et al. 2020, p. 6 *Data Analysis:* Jenkin et al., 2019, p. 655. *Data collection and Data Analysis:* Baker & Niederman, 2014, pp. 116-117
Different roles for investi-gators	Only in 17% of the analyzed CS different roles for investigators are stated. The different roles are mainly recognizable through an 'insider-outsider' research team. These teams include researchers who are part of the object under investigation, e.g., employees, as well as researchers who are not related to the examined object (Eisenhardt, 1989, p. 538).	-	Researchers should make more frequent use of different roles for investigators, as the 'insider-outsider' research team can offer advantages (Eisenhardt, 1989, p. 538). Nevertheless, it is important to ensure the neutrality of the insider-researcher in relation to the object under investigation.	Rossi et al., 2020, p. 4

4.2.2 Data Collection

In the data collection, an increase in following the methodological recommendations is recognizable. The attributes 'Elucidation of the data collection process' and 'Data triangulation' are highlighted in terms of methodological application. But some attributes still continue to be neglected, such as 'Use of a case study protocol' and 'Use of a case study database', or are even followed less than in the past, e.g., the collection of quantitative data. Although 'Elucidation of the data collection process' is described more frequently than in the past, the processes of data collection methods are often described only superficially. This is especially true for the methods of documentation and observation, which are usually only mentioned in

one sentence, but are not described in further detail. Moreover, it should be noted that the attribute of 'Elucidation of the data collection process' is not representative of the other attributes of data collection. Findings for all attributes of the data collection are listed in Table 4.

Table 4: Key Findings, Recommendations for Further Improvement, and Outstanding Examples of Data Collection

Attribute	**Key findings**	+/-	**Recommendations for Further Improvement**	**Selected Examples**
Elucida-tion of the data collection process	In 100% of the examined positivist CS articles the process of data collection is described (89% in detail and 11% roughly).	+	Researchers should continue to describe the process of data collection and enrich it with tables and figures. In addition, they should take care to write details about each data collection method and not just mention them. Additional material, such as interview guides, should be included in the appendix.	Jenkin et al., 2019, pp. 655-656; Möhlmann et al., 2021, pp. 2002-2003.
Applied data collection methods	Interviews are the most frequently used data collection method (91%). Observation (57%) and documentation (80%) are used somewhat less frequently, and questionnaires are not used at all in this sample (0%). In the totality of all analyzed CS that use interviews as a data collection method (N = 32), only 25% of the studies provide the complete interview guide (all of them in the appendix). Still, 28% provide examples from the interview guide and 13% mention that an interview guide was used. Only 3% report that the interview guide was tested or validated beforehand.	+/-	In future CSR articles, the researchers should ensure that descriptions of data collection methods are detailed. Mentioning the used methods is not sufficient, since detailed information on these methods is required. If additional information about the data collection methods does not fit into the text, then authors should at least provide them in the appendix so that the reader can assess the extent and quality of the data collection (Lee, 1989, p. 37; Yin, 2014, p. 102). Interviews: This data collection method is described in the most	*Interviews:* Liu et al., 2021, p. 6 *Documents:* Rahrovani, 2020, p. 24; Yeowa et al., 2018, p. 48 *Obser-vation:* Gregory et al., 2018, p. 1231; Rahrovani, 2020, p. 24 *Questionnai res*: -

	Additionally, the use of semi-structured interviews (59%) is mentioned clearly more often than structured interviews (6%). The sampling strategy in most cases is implicitly identifiable, with maximum variation being the most frequently used strategy. However, there are also cases where the sampling strategy is explicitly stated (e.g., Baker & Niederman, 2014, p. 116). The number of interviewees is reported in 69% and the number of interviews conducted in 75% of the examined articles. Interviews are largely recorded and/or transcribed (88%). But only every fourth interview (25%) was reviewed and even fewer researchers conducting interviews considered follow up contacts for clarification (19%). Information about observation (N = 20) and documentation (N = 28) rarely goes beyond a mention. However, there are cases where these data collection methods are reported in some detail, either textual (e.g., Yeowa et al., 2018, p. 48) or in the appendix (e.g., Rahrovani, 2020, p. 24).		detail, but there is still potential for more precise descriptions. Researchers should test the interview guide beforehand, if possible, in order to identify and eliminate any problems that may arise early on, or to restructure the guide. Researchers should also get into the habit of specifying the number of interviews and interviewees by default. Observation: Researchers should describe when, where, how long and, if applicable, who or what is observed during which activity, as well as how the data is recorded. Documentation: Researchers should describe which and how many documents were collected in which context. Questionnaires: This method of quantitative data collection should be increasingly considered again. In addition, when using questionnaires, the questionnaire itself should be specified and tested in advance.	
Multiple data collection methods	In 89% of the articles examined, more than one data collection method is used. Although no questionnaires were used in the examined sample, 40% of the CS collected data used all three qualitative methods. However, the individual data collection methods are often	+	Researchers should continue to use multiple data sources. Only through multiple data sources data triangulation is possible (Yin, 2014, pp. 118-122; Dubé & Paré, 2003, p. 615). Furthermore, researchers should	Du & Mao, 2018, p. 300; Rahrovani, 2020, p. 5, p. 24

	not described in detail. The listed examples used all three qualitative data collection methods and performed data triangulation.		consider using questionnaires again to enable a mix of all four data collection methods.	
Mix of qualitative and quantitative data	Since in this sample of positivist CS articles the quantitative methods for data collection are neglected for the most part, there is a mix of qualitative and quantitative data in only 6%. This is described in an article where quantitative data was collected in documents in the form of a financial report (e.g., Baker & Niederman, 2014, p. 117).	-	In future research the mix of qualitative and quantitative data should be considered more frequently because it allows a deeper understanding of the data collected and additionally this ensures the triangulation of data (Yin, 2014, pp. 120-122).	Baker & Niederman, 2014, p. 117
Data triangulation	In 63% of the CS articles the authors state that data triangulation was performed. There is a slight difference between the two journals studied, as data triangulation was mentioned in 68% of the CS in JSIS, but only in 56% in MISQ. However, the process of data triangulation is often only mentioned and not further described, but there are exceptions (e.g., Singh et al., 2015, p. 650, pp. 664-665).	+/-	Researchers should perform more data triangulation in the studies, since data triangulation prevents misleading information (Yin, 2014, pp. 120-122). In addition, the data found are more convincing when they come from multiple sources (Dubé & Paré, 2003, p. 615), especially in conjunction with the mix of qualitative and quantitative data described above.	Singh et al., 2015, p. 650, pp. 664-665; Street et al., 2018, p. 63
Use of a case study protocol	Only in 11% of the analyzed positivist CS the use of a case study protocol is stated. Moreover, this is mostly limited to mentioning the protocol and, in just one case, additionally for justifying the reliability of the study (e.g., Ayala et al., 2020, p. 8). There are differences in the research purposes in terms of case study protocol, as authors of descriptive studies have considered a case study protocol in 50% of the studies, whereas a case study	-	Some researchers already state that keeping a case study protocol leads to increased reliability of the study (Dubé & Paré, 2003, p. 615). This should be increasingly considered by researchers in the future, as the use of case study protocols has been very low so far. Furthermore, it should not only be mentioned in the articles, but also the content and	Ayala et al., 2020, p. 8; Liu et al., 2021, p. 5

	protocol was used much less in exploratory (13%) and explanatory (0%) studies.		context of the research should be described.	
Use of a case study database	Like the case study protocol, a case study database was used in only 11% of the analyzed CS. Although, all studies that mention a case study database (N = 4) do not provide further information about its content.	-	The case study database is another means to ensure the reliability of a study (Yin, 2014, p. 124). Therefore, a case study database should be created in much higher number in CS. Moreover, a detailed description about the content of the database is necessary, which leads to reader's comprehension of the case and the study.	Ayala et al., 2020, pp. 6-8; Eaton et al., 2015, p. 222.

4.2.3 Data Analysis

Compared to the results of previous comparable research (Dubé & Paré, 2003), most improvements are evident in the area of data analysis. The most noticeable improved attributes include 'Elucidation of the data analysis process', 'Coding', 'Data displays' and 'Excerpts of raw data'. In the past, data analysis was the area with the greatest deficiencies in terms of methodological recommendations. Therefore, the extensive improvements in this area are especially remarkable. As with data collection, the 'Elucidation of the data analysis process' does not represent all the attributes of data analysis in general. Even though the 'Elucidation of the data analysis process' is described in detail in many cases, some attributes still need improvements regarding the methodological recommendations. These mainly concern the attributes 'Flexible and opportunistic process', 'Project reviews', and 'Comparison with conflicting literature'. Findings for all attributes of the data analysis are listed in Table 5.

Table 5: Key Findings, Recommendations for Further Improvement, and Outstanding Examples of Data Analysis

Attribute	**Key findings**	**+/ -**	**Recommendations for Further Improvement**	**Selected Examples**
Elucida-tion of the data analysis process	In 97% of the examined positivist CS, the authors explain the data analysis process (83% in detail and 14% roughly). This means a	+	The elucidation of the data analysis process has reached a satisfying level. Researchers should keep this	Miranda et al., 2016, pp. 311-312; Salovaara et al., 2019, pp.

	great progress in this attribute.		development up in the future and describe the data analysis as much detailed as possible, "since a clear description of the analytic strategies and/or procedures allows the external observer to better understand the findings" (Dubé & Paré, 2003, p. 616).	564-565; Selander & Jarvenpaa, 2016, pp. 336-338
Field notes	In less than half (43%) of the analyzed positivist CS, field notes were taken. Thereby, noticeably more field notes were taken in MISQ (56%) than in JSIS (32%). In the examined sample are studies in which the extensive use of field notes is reported (e.g., Ayala et al., p. 6).	-	Field notes can record additional information and impressions of the researcher that occur during the study. The notes should be taken by the researchers in as much detail as possible (Paré, 2004, p. 251). Consequently, more field notes should be made in CSR in the future, ideally by multiple researchers.	*General example:* Salovaara et al., 2019, p. 564 *By more than one researcher:* Ayala et al., p. 6
Coding	Authors of 89% of the analyzed positivist CS report a conducted type of coding. The analysis method of coding was used more frequently in JSIS (95%) than in MISQ (81%). In only 10% of all studies that performed some form of coding (N = 31), the coding scheme was pre-tested or subject to validation. In 35% of the cases, the coding scheme is provided in full (to 16% as part of the text and to 19% in the appendix) and in 35% of the cases at least parts of the coding scheme are presented. However, only in 39% examples of the coding are shown on original data. In 29% of the investigated studies coding software for data analysis was used. Nvivo (16%) was used slightly more frequently than ATLAS-ti (13%).	+	Authors of a large proportion of the current positivist CS in the examined sample use coding for analysis, thus, the result is satisfying. However, to ensure the reliability of the coding, the coding schemes need to be tested or validated much more frequently in advance in the future. Furthermore, the authors should describe the coding as detailed as possible. The description should be supported by additional materials, such as the complete coding scheme and examples from raw data for the coding. In future research, an inter-rater reliability test should be conducted more often, and additionally, the authors are encouraged to	*General example:* Huang et al., 2017, pp. 303-304; Liu et al., 2021, pp. 8-9 *Validation of coding scheme:* Eaton et al., 2015, p. 222 *Coding scheme available*: Rossi et al., 2020, pp. 5-7; Salovaara et al., 2019, pp. A5-A6 *Example codes available:*

	Furthermore, only 9% of the researchers performed an inter-rater reliability test and state an associated ratio. Of note is one study in which an inter-rater reliability test was conducted in every stage of coding and the ratio of agreement was reported each time (e.g., Syed, 2019, pp. 264-265). However, in only one of the three cases in which an inter-rater reliability test was performed the authors report how the result was obtained. In this case it was obtained through Cohen's Kappa (Cohen, 1960, pp. 39-41) (e.g., Jenkin et al., 2019, p. 657).		describe the test in depth rather than just presenting the final rate.	Sandberg et al., 2020, pp. 148-151; Selander & Jarvenpaa, 2016, p. 339 *Inter-rater reliability test:* Jenkin et al., 2019, p. 657; Syed, 2019, pp. 264-265
Data displays	In all (100%) of the studied positivist CS, data displays are used. In some studies, data display techniques are derived from literature and the creation of data displays is described (e.g., Jenkin et al., 2019, pp. 657-660).	+	Data displays are a means of presenting results from data analysis. The rate of data displays is satisfactory and should continue to be followed by researchers. The underlying technique should be more frequently described by the authors with references to the literature of the applied technique.	Jenkin et al., 2019, pp. 657-660; Mehrizi et al., 2019, pp. 156-160
Flexible and opportu-nistic process	Only in 6% of the analyzed CS a flexible and opportunistic process is reported. The described flexibility in the studies of this sample is limited to adjustments of the interview guide or the extension of models.	-	The rate shows that researchers hardly make use of the flexible and opportunistic process. Researchers should consider this option in the future because CS are suitable to make changes during the research, e.g., to adapt the research question or to change the scope of the study. Possible adjustments must be weighed up in a controlled manner and changes must be described transparently	Gleasure, 2015, p. 223; Leonard & Higson, 2014, p. 70

			(Eisenhardt, 1989, p. 539).	
Logical chain of evidence	Authors maintained a logical chain of evidence in almost all cases (97%) of the examined sample. This rate shows a high difference compared to 19% from the past study (Dubé & Paré, 2003, p. 618). On the one hand, this difference can be explained due to the fact that this attribute allows for subjective tendencies. But on the other hand, this can also be explained by the higher rates of the other attributes. Since the descriptions in the studies are nowadays much more detailed and transparent, the individual steps taken in the studies are easier to follow. Studies that explicitly emphasized a logical chain of evidence are listed as examples of this attribute.	+	Researchers should continue to be careful to describe all steps of their research in detail, beginning from the research question till conclusion, but "with minimal cross-referencing to methodological procedures and to the resulting evidence." (Dubé & Paré, 2003, p. 618). Thus, it is possible for the reader to follow a logical chain of evidence.	Ayala et al., pp. 6-8; Liu et al., 2021, p. 5
Empirical testing (explanatory studies only)	The only explanatory CS in this sample (100%) implicitly contrasts its theoretical predicted patterns with the empirical results through investigation.	+	Researchers should continue to conduct empirical testing in their studies, but in future this should be explicitly described in most cases.	Gregory et al., 2018, pp. 1242-1246
Explanation building (exploratory studies only)	In 97% of the examined exploratory CS, the explanation building is detailed and comprehensible. However, the explanation building is rarely explicitly stated by the authors.	+	Authors in exploratory studies should still pursue detailed textual explanations. In future research, more attention should be given to the explicit mention of this feature, so that the researchers themselves keep the explanation building in mind.	Baker & Niederman, 2014, p. 117; Gleasure, 2015, pp. 223-227
Time series analysis (explanatory studies only)	In the only explanatory CS in this sample, a time series analysis was applied (100%). Although, this is not described in detail. It is only mentioned that the researchers "focused on the sequencing of events on the	+/-	Authors of explanatory CS should consider time series analysis more often as a method of analysis when the context of the study enables multiple data points and patterns over	Gregory et al., 2018, p. 1232

	case timeline, delineated phases, and identified transition triggers" (Gregory et al., 2018, p. 1232).		time are apparent (Dubé & Paré, 2003, p. 619). Furthermore, this analysis should be described in more detail.	
Searching for cross-case patterns (multiple case studies only)	In the examined multiple CS, the researchers searched in 92% of the cases for cross-case patterns. It can also be seen that a large proportion of authors explicitly state the searching for cross-case patterns (e.g., Kaltenecker et al., 2015, pp. 243-247; Mehrizi et al., 2019, p. 160, p. 161).	+	Searching for cross-case patterns in multiple CS is fulfilled to a satisfying extent. Researchers have understood the relevance of cross-case patterns and provide enough space for the cross-case analysis in the articles. The relevance of cross-case analysis lies in highlighting similarities and differences in cases and, in addition, limiting researcher bias (Dubé & Paré, 2003, p. 619). One way to clearly present cross-case patterns is to compare results in a table (e.g., Mehrizi et al., 2019, p. 160) or to describe them in a separate chapter or section (e.g., Kaltenecker et al., 2015, pp. 243-247).	*General examples:* Karoui et al., 2015, pp. 27-28 *Compact and clear presen-tation:* Mehrizi et al., 2019, p. 160, p. 161 *Separate section for cross-case patterns:* Kaltenecker et al., 2015, pp. 243-247
Use of natural controls (explana-tory single case studies only)	Natural controls were not used in the studied explanatory single CS (0%).	-	Natural controls are still rarely used in single explanatory CS. Researchers should consider the use of natural controls in future studies, as the influence of one variable on another can be detected and investigated (Dubé & Paré, 2003, p. 619; Lee, 1989, p. 35).	-
Excerpts of raw data	In 91% of the analyzed positivist CS, excerpts of raw data are presented. In most cases, these are quotes that are embedded in the analysis section or used as examples for coding. In CS where excerpts of raw data are presented (N = 32), at least quotes as an excerpt type are	+	In the future, researchers should continue to provide excerpts of raw data in articles. These help the reader to gain deeper insights into the study and enable conclusions to be drawn (Yin, 2014, p. 123). When presenting	*General examples:* Gregory et al., 2018, pp. 1233-1242 *Quotes displayed in tables*:

	indicated. Other types of excerpts of raw data in the sample include screenshots, excerpts from a blog, and photographs. But these other types are limited to only one article each.		excerpts of raw data researchers should take care to embed these appropriately in the article and provide information about context and the role of the person cited in case of quotes.	Liu et al., 2021, pp. 10-11 *Excerpts of raw data for coding:* Sandberg et al., 2020, pp. 148-151
Project reviews	Project reviews were examined in only 40% of the investigated positivist CS. The project reviews in the sample were conducted exclusively with informants who were involved in the study.	-	In the future, CS should be reviewed more often to validate findings and interpretations (Dubé & Paré, 2003, p. 620; Yin, 2014, pp. 198-199). Furthermore, researchers are advised not only to mention the project reviews but also to describe them in detail if discrepancies with the reviewers occur.	Cui et al., 2017, p. 8; Gleasure, 2015, p. 223
Compari-son with similar and conflicting literature (explora-tory case studies only)	In the studied exploratory CS, 94% of the results are compared with similar literature and 53% are compared with conflicting literature.	+/-	The comparisons with similar and conflicting literature have increased in frequency. For comparison with conflicting literature there is still potential for a higher rate, if there is any corresponding conflicting literature, to increase generalizability and validity (Eisenhardt, pp. 544-545). For future research, it would be useful if the comparison with similar and conflicting literature were not described exclusively in the text, but also presented clearly in a table, for example.	*Comparison with similar literature:* Mehrizi et al., 2019, p. 155; Syed, 2019, p. 269 *Comparison with conflicting literature:* Mehrizi et al., 2019, p. 161; Wiener & Saunders, 2014, pp. 221-222

5 Discussion

After categorizing 605 research articles from the journals JSIS and MISQ for the years 2014 to 2021 and analyzing 35 positivist case studies for methodological precision, the result of this work shows that CSR in IS has made some progress over

time. Nevertheless, there are also attributes that still have shortcomings. The overall results of this study and a comparison with the results of the previous study are listed in Table 6. The key findings of the analysis are summarized below before the results are discussed.

- Compared to previous comparable research (Dubé & Paré, 2003), case studies and primary case studies are conducted slightly less frequently in research articles.
- The share of exploratory research purpose has risen sharply in the articles studied, whereas descriptive and explanatory research purposes underlie only a small number of examined CS. Accordingly, CSR as a means of developing new theories is used more frequently.
- Many of the examined attributes have advanced to more rigor compared to the previous study (Dubé & Paré, 2003). Ten attributes have improved significantly better and can now be classified as satisfying (e.g., 'Team-based research', 'Elucidation of the data collection process', 'Elucidation of the data analysis process', 'Data displays', 'Excerpts of raw data'). Another nine attributes are also followed significantly better, but not to a satisfactory level.
- However, there are also attributes that are fulfilled less frequently compared to the previous investigation (Dubé & Paré, 2003). Significant changes with respect to this concern 'Clean theoretical slate' and the use of quantitative data associated with a 'Mix of qualitative and quantitative data'.
- Related to the exploratory research purpose, these specific attributes are followed in a mixed way. While 'Comparison with similar literature' (94%) is satisfactorily followed, 'Clean theoretical slate' (47%) is comparatively neglected. This pattern is also evident in explanatory CSR, as 'Theory of interest' (100%) is satisfactorily followed in contrast to 'Use of natural controls' (0%).
- The differences between the two studied journals are not particularly remarkable. For most attributes, the differences in methodological precision are hardly noteworthy. The largest differences occur in the attributes 'Field notes' (32% in JSIS vs. 56% in MISQ) and 'Number of cases' (58% single CS and 42% multiple CS in JSIS vs. 75% single CS and 25% multiple CS in MISQ).

Table 6. Comparison between Dubé & Paré's (2003) and This Work's Results

	Dubé & Paré (2003) (1990-1999)	This Work's Results (2004-2013)	Change[1]
Research Design Attributes			
N (all positivist case studies)	183	35	
Clear research questions	76 **(42%)**	31 **(89%)**	**+*** **
A priori specification of constructs (exploratory case studies only)	42 **(78%)**	28 **(88%)**	+
Clean theoretical slate (exploratory case studies only)	44 **(81%)**	16 **(47%)**	-**
Theory of interest (explanatory case studies only)	17 **(100%)**	1 **(100%)**	o
Predictions from theory (explanatory case studies only)	16 **(94%)**	1 **(100%)**	+
Rival theories (explanatory case studies only)	5 **(29%)**	0 **(0%)**	-
Multiple-case design	74 **(40%)**	12 **(34%)**	-
Case selection specified (single case studies only) (converted from *Case selection not specified* (Dubé & Paré, 2003))	16 **(15%)**	20 **(87%)**	**+*** **
Case selection specified (multiple case studies only) (converted from *Case selection not specified* in Dubé & Paré, 2003)	24 **(32%)**	9 **(75%)**	**+** **
Definition of the unit of analysis	14 **(8%)**	8 **(23%)**	**+***
Pilot study	4 **(2%)**	0 **(0%)**	-
Team-based research	132 **(72%)**	32 **(91%)**	**+***
Different roles for investigators	8 **(4%)**	6 **(17%)**	**+***
Data Collection Attributes			
Elucidation of the data collection process (a) in detail, (b) roughly	107 **(58%)**	35 **(100%)** (a) 31 **(89%)** (b) 4 **(11%)**	**+*** **
N (data collection described in detail or roughly elucidated)	107	35	
Multiple data collection methods	83 **(78%)**	31 **(89%)**	+
Mix of qualitative and quantitative data	33 **(31%)**	2 **(6%)**	**-** **
Data triangulation	32 **(30%)**	22 **(63%)**	**+** **
Use of a case study protocol	5 **(5%)**	4 **(11%)**	**+**
Use of a case study database	6 **(6%)**	4 **(11%)**	**+**

[1] Because the data includes two categorical variables (i.e., the previous study (Dubé & Paré, 2003) vs. this work's results and attribute's criterion fulfilled vs. attribute's criterion not fulfilled) a Pearson chi-square test (Fisher, 1922, p. 87; Pearson, 1990, pp. 157-167) is conducted to determine if the differences between the groups are statistically significant (Field, 2013, p. 71). In addition, Fisher's (1922) exact test (Field, 2013, pp. 723-724; Fisher, 1922, pp. 88-91) is conducted in cases where the expected frequency counts are below five.

Data Analysis Attributes			
N (all positivist case studies)	183	35	
Elucidation of the data analysis process (a) in detail, (b) roughly	43 **(23%)**	34 **(97%)** (a) 29 **(83%)** (b) 5 **(14%)**	**+*** **
Field notes	9 **(5%)**	15 **(43%)**	**+*** **
Coding	12 **(7%)**	31 **(89%)**	**+*** **
Data displays	100 **(55%)**	35 **(100%)**	**+*** **
Flexible and opportunistic process	5 **(3%)**	2 **(6%)**	+
Logical chain of evidence	35 **(19%)**	34 **(97%)**	**+*** **
Empirical testing (explanatory case studies only)	11 **(65%)**	1 **(100%)**	+
Explanation building (exploratory case studies only)	32 **(59%)**	31 **(97%)**	**+*** **
Time series analysis (explanatory case studies only)	2 **(12%)**	1 **(100%)**	+
Searching for cross-case patterns (multiple case studies only)	45 **(61%)**	11 **(92%)**	**+* **
Use of Natural Controls (explanatory single case studies only)	0 **(0%)**	0 **(0%)**	o
Excerpts of raw data	61 **(33%)**	32 **(91%)**	**+** **
Project reviews	27 **(15%)**	14 **(40%)**	**+** **
Comparison with similar literature (exploratory case studies only)	20 **(37%)**	30 **(94%)**	**+*** **
Comparison with conflicting literature (exploratory case studies only)	6 **(11%)**	17 **(53%)**	**+*** **
*Confidence interval 0.95; Level of significance: * 0.05; ** 0.01; *** 0.001*			

In general, it can be seen in the results that the current research follows the methodological recommendations more closely. There are even considerable improvements at the top, especially for the attributes 'Coding' (+82%), 'Logical chain of evidence' (+78%) and 'Elucidation of the data collection process' (+74%)[2]. Nevertheless, there are still attributes that are not satisfactorily taken into account with regard to the methodological recommendations or are even followed to a much lesser extent. These are mainly the attributes 'Clean theoretical slate' (-34%) and 'Mix of qualitative and quantitative data' (-25%). Therefore, the call for more methodological precision in CSR is reiterated in this paper (Dubé & Paré, 2003, pp. 626-627). Four recommendations are made below, based on the results of the analysis:

[2] The attribute Time Series Analysis is also used 88% more often. But because only one explanatory study was examined in this work, this attribute is not explicitly mentioned.

(1) Report appropriately: CSR articles continue to be insufficiently documented regarding data collection and data analysis. Although attributes are now considerably more described than in the past, this concerns especially 'Elucidation of the data collection process' and the 'Elucidation of the data analysis process', some of these are on the borderline of insufficient descriptions. Moreover, the data collection methods observation and documentation are in most cases only mentioned without further information given. The aim of future research should be to describe these data collection methods in more detail with their respective contexts and surroundings. Compared to these two methods, interviews are described in detail and an underlying interview guide is often mentioned and included, but not yet to a satisfying extent. A related interview guide should be included as standard in the appendix to provide more understanding for the reader.

(2) Capitalize on CSR's Diversity: In the context of this work, it is striking that hardly any quantitative methods were used for data collection. No questionnaires were used and only in two studies the use of quantitative data is mentioned while just in one of them the source is explicitly described. Accordingly, a 'Mix of qualitative and quantitative data' was rarely pursued in the examined CS. Future research should increasingly consider the method of questionnaires for data collection. The suggestions from (1) should also be followed, such as documenting the method in detail and attaching the questionnaire in the appendix. By considering quantitative methods, qualitative methods should not be neglected, so that again a 'Mix of qualitative and quantitative data' is used more often in future CS research. The use of a mix of these data increases the credibility of the results. But it should be noted that not every data collection method needs to be conducted or even is able to be conducted in every CS. There are studies where certain methods cannot be used or are not useful. Therefore, a compliance rate of 100% for all data collection methods should not be aimed for, as this rate is not realistic. Nevertheless, researchers should consider all possible qualitative and quantitative methods in every CS and then decide which methods are appropriate for the study.

(3) Act smart: CSR enables a flexible research design. However, this has not been used to a satisfactory extent in research to date. The overlap of data collection and data analysis should be considered more often in order to regularly gain new insights and apply them in the next phase of data collection and/or data analysis. Another similar result in this work is the shortcoming of flexible and opportunistic

processes. Using emerging possibilities to adapt the research design during the investigation is a strength of CSR and researchers should take advantage of it more frequently (Dubé & Paré, 2003, p. 618; Eisenhardt, 1989, p. 539; Miles & Huberman, 1994, p. 50; Yin, 2014, p. 65). In general, researchers are advised "not to blindly follow blueprints given in previously published case studies but to carefully revise different possible design alternatives. All design decisions should be made consciously with regard to the specific research situation. Case study researchers should be open to, and sometimes try, new approaches in order to capture the most of this research strategy's potential" (Keutel et al., 2014, p. 266).

(4) Perform Obligatory Duties: It is striking that in many cases the methodological literature for CSR is cited, foremost Eisenhardt (1989) and different editions of Yin, especially the fourth edition (2009) (Appendix C). However, it often remains only with mentioning the literature that a CS is conducted. Detailed suggestions and descriptions derived from the literature are rarely used throughout the study. But because researchers are citing methodological literature, albeit to a limited extent, they should apply other recommendations from this available literature as well. Most importantly, the case study protocol (Yin, 2014, pp. 84-94) and the case study database (Yin, 2014, pp. 123-127) should be used and documented, as these are a foundation for successfully conducting a CSR. In combination with excerpts of the case study protocol and the case study database in the appendix, this can lead to better comprehensibility for the reader as well as increase the credibility of conducting the study (Dubé & Paré, 2003, p. 615; Yin, 2014, p. 124).

In addition to Eisenhardt (1989) and Yin (2009), Dubé & Paré (2003) are frequently cited (Appendix C). In conjunction with other methodological literature cited, which is not limited to case studies, it is evident that the methodology is relevant to researchers to some extent. It is also noteworthy that other methodological CS literature is catching up with the established literature. For example, Gerring (2007) was cited only once less than Benbasat et al. (1987) and with four references as many times as Dubé & Paré (2003) in both journals during the studied period.

In general, it is important for at least some of the attributes studied to have a high degree of fulfillment. These include the following attributes:

- State clear research questions
- Justify single and multiple case selection

- Consider conducting a pilot study
- Consider different methods of data collection, especially quantitative methods
- Use and document a case study protocol
- Use and document a case study database
- Review the results and interpretations of the project
- Compare findings with similar and conflicting literature

Moreover, it is worth mentioning that when following methodological recommendations, it always depends on the individual case whether certain recommendations should be followed or not. Even the methodological literature describes that the recommendations should not be seen as a general valid guide, but it always depends on the case studied because "[t]he attributes may certainly contribute to rigor, but they do not guarantee it" (Dubé & Paré, 2003, p. 628). Finally, the recommendations are not static and evolve over time in terms of attribute values as well as new attributes which can be added to the methodological recommendations. Also, CSR itself is changing as can be seen in the shift from mostly descriptive research in the past to most frequent use of exploratory research nowadays.

6 Conclusion

6.1 Contribution

Some time has passed since the underlying research of this work has examined rigor of positivist CSR (Dubé & Paré, 2003). This work updates the research of CS in terms of methodological recommendations for the period from 2014 till 2021 and makes four contributions. First, in this work the current rigor of positivist CSR is presented. The results can serve as a basis to adapt methodological literature with respect to those attributes that do not exhibit high methodological precision and accordingly could be highlighted in the future. Second, the results of this paper show a positive development of positivist CSR regarding methodological rigor. This development contributes to increased reputation in the research community and shows that the call for more methodological rigor in CSR has been heeded. By highlighting common shortcomings, researchers are reminded to avoid these shortcomings in future CSR. Third, in this work CSR articles are highlighted which follow the methodological

recommendations. By mentioning these positive examples, practical recommendations for the implementation of CSR should be passed on to researchers. For both CSR newcomers and experienced researchers, these examples are intended to provide guidance and valuable insights. The highlighted positive examples can be seen in Tables 3-5 in the section 'Selected Examples'. Fourth, rules derived from methodological literature are created (Appendix A) to ensure an objective coding for future research in the area of reviewing positivist CSR in IS. The rules are applied and supported by examples of coding for each attribute (Appendix B).

6.2 Limitations and Further Research

This work has some limitations. In previous comparable research, there was always a limitation of the study in terms of the number of journals and the period of time. In most previous studies, the selection was limited to six to eight reputable journals and to a timespan of ten years. This is also the case in this paper because it is limited to the two journals of JSIS and MISQ and the period between 2014 and 2021. However, there are many other positivist CSR articles from other sources that have not been the subject of research in this or previous studies. The results of these articles are unknown and therefore the possibilities exist that these articles may have similar precision in terms of methodological recommendations for CSR or may differ greatly from previous research. Also related to the limited number of cases studied, descriptive and explanatory case studies are underrepresented in this thesis. Therefore, the analyses concerning these two research purposes should be viewed cautiously. In addition, previous research always used a classification of articles based on a certain number of attributes. A common outlook of this research for further CSR recommended an expansion of the attributes set up. This has been done in this thesis, however, there remains the potential to set up further characteristics for future research. But related to this, coding is a potentially error-prone construct. In this thesis rules for coding are established to ensure a more objective coding (Appendix A). Although these rules are based on literature, they may still have subjective tendencies or be interpreted differently by readers. As a recommendation for future research, rules should always be given for coding so that assessments can be retraced. It is necessary to make the rules as objective as possible, so that future comparisons can be made accurately.

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A. Appendix: Coding Scheme

Table 7: Coding Scheme

Attributes	Values	Rules	Literature
Area: Categorization			
Use of CSR stated	**Yes or No**	**Explicit mention by the authors that CSR was used as a research method.**	-
CSR used in keywords	Yes or No	**Indication of "Case Study" in keyword section of the article.**	-
"Case studies" stated instead of "multiple case study"	**Yes or No**	**If authors use the term "case studies" as a research method, but they conducted a multiple CS.**	Dubé & Paré, 2003, p. 609
CSR used as primary research method	Yes or No	Indication (explicit or implicit) that CSR is used as the primary research method.	Dubé & Paré, 2003, p. 601
Paradigm	Positivism, interpretivism, critical research, critical realism, mixed	Characteristics derived from literature serve as criterion for the classification of philosophical paradigms. If more than one paradigm underlies, then classify as "mixed".	- Positivism: Eisenhardt, 1989, p. 546; Dubé & Paré, 2003, pp. 601-604; Mingers, 2004, p. 89; Orlikowski & Baroudi, 1991, p. 5, pp. 8-13; Smith, 2006, pp. 193-195; Yin, 2003, p. 163; Yin, 2014, p. 17, p. 40 - Interpretivism: Klein & Myers, 1999, p. 69; Orlikowski & Baroudi, 1991, p. 5, pp.13-18; Smith, 2006, pp. 195-198; Walsham, 1995, pp. 74-76 - Criticism: Cecez-Kecmanovic, 2011, pp. 442-444; Klein, 2009, p. 266; Orlikowski &

			Baroudi, 1991, pp. 5-6, pp. 18-21
Paradigm stated	**Yes or No**	**Explicit mention by the authors about the underlying philosophical paradigm.**	Keutel et al., 2014, pp. 261-262; Walsham, 1995, p. 76
Research purpose	Descriptive, exploratory, explanatory	Indication of which research purpose the study is subject to (can be derived by definitions of research purposes according to Yin): - descriptive: description or derivation of recommendations - exploratory: building a theory or framework - explanatory: testing a theory	Dubé & Paré, 2003, p. 605; Yin, 2014, pp. 10-11
Research purpose stated	**Yes or No**	**Explicit or implicit mention of the authors what the underlying research purpose is (exploratory, explanatory, descriptive).**	Benbasat et al., 1987, p. 380; Dubé & Paré, 2003, p. 605
Area: Research Design			
Rationale for conducting CSR	**Yes or not specified**	**Information about rationale or justification by the authors why CS was chosen as the research method.**	Benbasat et al., 1987, p. 380
Clear research questions	Yes, *goal with interrogative*, *goal without interrogative*, no	Statement of a research question or *objective with* or *without a question:* - yes: clear research question given - *goal with interrogative: Goal is described and is based on an (unwritten) question.* - *goal without interrogative: goal is described, but is not oriented to a question*	- Benbasat et al., 1987, p. 371; Eisenhardt, 1989, p. 536; Mays & Pope, 1995, p. 110; Miles & Huber-man, 1994, pp. 22-23
Types of research questions	How, Why, What, Who, etc.	Specification about the question type of research question or *goal with interrogative* - or beginning of the research question.	Yin, 2014, pp. 10-11

A priori specification of constructs	Yes or No	Statement of underlying concept (whole or partial construct) - often stated in theoretical background (or possibly stated in outcome) - e.g., researchers apply existing theories/models/ frameworks to a case/ industry/environment/etc. (exploratory CS only).	Dubé & Paré, 2003, p. 607; Eisenhardt, 1989, p. 536
Clean theoretical slate	Yes or No	Research is conducted without bias or underlying theoretical assumptions. The authors let the theory emerge from the data. Often authors don't state a clean theoretical slate. Signal words for no clean theoretical slate are, e.g., use of a theoretical lens, proposition, framework or construct combined with theory building (exploratory CS only).	Dubé & Paré, 2003, p. 607; Eisenhardt, 1989, p. 536; Walsham, 2006, p. 324
Theory of interest stated	Yes or No	Explicit statement about the theory - usually at the beginning (explanatory CS only).	Lee, 1989, p. 42
Predictions from theory stated	Yes or No	Explicit statement of predictions arising from the theory (explanatory CS only).	Lee, 1989, p. 42
Use of rival theories	Yes or No	Use of rival theories (to establish different theses) in the study to increase the theory's predictive power (explanatory CS only).	Lee, 1989, p. 42, p. 44; Yin, 2014, pp. 37-38
Case acquisition strategy	**Acquisition strategy or not specified**	**Description of how the researchers acquired the case/s and additional background information how the contact was made.**	Marshall & Rossman, 2015, p. 20
Number of cases	*Number of cases*	Details about the number of examined cases.	Dubé & Paré, 2003, p. 626
Rationale for conducting a single/multiple case study	**Yes or not specified**	**Rationale or justification for selecting a single case or multiple case approach for the study.**	Paré, 2004, p. 234; Yin, 2003, p. 5; Yin, 2014, pp. 18-19, pp. 51-53, pp. 56-57, pp. 61-62, pp. 63-64

Nature of single-case design	Unique or extreme, revelatory, critical, *intensity, criterion, convenience, theory-based, confirming and disconfirming, typical***,** or not specified	Information about the type of single cases (explicit or implicit): - unique or extreme: a case is very rare, so it is worth studying individually - the case is information-rich and unusual - revelatory: a case previously inaccessible to research - critical: a case whose circumstances make it possible to test a theory - the case is information-rich or revealing - study is suitably represented by the case *- intensity: phenomenon in the case is very pronounced - the case illustrates very well the phenomenon studied - similar to extreme case, but to a less unusual extent* *- criterion: a case was selected according to established criteria* *- convenience: opportunistic decision for selecting a case - e.g., for convenience, occurring chance to investigate a case or because the case is easy to reach* *- theory-based: selection of a case based on the underlying a priori theory* *- confirming/disconfirming: selected case supports or challenges the study* *- typical: ordinary, standard characteristic and relevant cases in relation to the phenomenon under study (the opposite of extreme)*	- unique or extreme: Paré, 2004, p. 243; Patton, 2015, pp. 277-278; Yin, 2014, p. 52 - revelatory: Yin, 2014, p. 52 - critical: Kuzel, 1999, p. 40; Paré, 2004, p. 242; Patton, 2015, pp. 275-276; Yin, 2014, p. 51 - *intensity*: Paré, 2004, p. 243; Patton, 2015, p. 279 - *criterion*: Paré, 2004, p. 243; Patton, 2015, p. 281 - *convenient*: Kuzel, 1999, p. 39; Paré, 2004, p. 243; Patton, 2015, p. 264 - *theory-based*: Kuzel, 1999, p. 40; Paré, 2004, p. 242; Patton, 2015, p. 289 - *confirming/ disconfirming*: Kuzel, 1999, p. 40; Patton, 2015, p. 302 - *typical*: Paré, 2004, p. 243; Patton, 2015, p. 284; Kuzel, 1999, p. 40; Yin, 2014, p. 52
Replication logic in multiple-case design	Literal, theoretical, *both***,** or not specified	Use of reproduction logic in multiple CSR (explicit or implicit): - literal: circumstances of different CS predict same results - within literal replication, cases are selected based on their similarities,	Yin, 2014, pp. 57-58

		and are chosen because they specifically support the theoretical explanation - theoretical: circumstances of different CS predict different results - theoretical replication occurs when cases are chosen because they produce contrasting results for predictable reasons - both: literal and theoretical	
Case/s reasonably chosen	**Yes or not specified**	**Description by the authors why the case/s was/were selected and, at best, justification why a type of case (unique, extreme etc. for single case) is used or to what extent cases have similar and/or different results (for multiple case).**	Dubé & Paré, 2003, p. 618; Gibbert & Ruigrok, 2010, p. 728; Yin, 2003, p. 10-12; Yin, 2014, pp. 51-53, pp. 57-58, pp. 61-62
Case	**Case or not specified**	**Authors' description and definition of the case/s.**	Dubé & Paré, 2003, p. 599; Miles & Huberman, 1994, p. 25; Yin, 2014, pp. 31-34
Unit of analysis	*Unit of analysis* or not specified	Information about the unit of analysis to define what is inside and outside the boundaries of the study - e.g., a technology, a process, or an organization.	Benbasat et al., 1987, p. 372; Dubé & Paré, 2003, p. 610; Miles & Huberman, 1994, p. 25; Yin, 2014, pp. 31-34
Rational for choosing the unit of analysis	**Yes or not specified**	**Rationale or justification why a unit of analysis was selected for analysis.**	Dubé & Paré, 2003, p. 610; Yin, 2014, pp. 31-32
Use of a pilot case	Yes or not specified	Performing a test case in advance to narrow down the unit of analysis, optimize data collection tools and familiarize researchers with the phenomenon.	Dubé & Paré, 2003, p. 610; Yin, 2014, pp. 98-100
Site description	*In detail*, *rough***,** or no	Information about the context of the investigated case and description where the research was carried out.	Benbasat et al., 1987, p. 373; Dubé & Paré, 2003, pp. 610-611; Yin, 2014, pp. 183-184
Case period	Yes or not specified	Contextual information about the case - description of the	Benbasat et al., 1987, p. 373; Dubé

		specific observed period of time.	& Paré, 2003, p. 610
Longitudinal design	Yes or not specified	Indication if data was collected and analyzed at multiple points in time.	Benbasat et al., 1987, p. 381; Dubé & Paré, 2003, p. 611
Time spent on site	Number of months or not specified	Indication of the timespan during which the data was collected.	Benbasat et al., 1987, p. 374; Dubé & Paré, 2003, p. 611
Nature of data	Retrospective, on-going, *both*, or not specified	Information about how the data was collected in terms of time: - retrospective: data collection took place after occurrence of the examined subject of interest, e.g., through data collection method of documentation or interviews - on-going: data collection took place at the same time as occurrence of the examined subject of interest, e.g., through data collection methods interviews or observation - both: retrospective and on-going	Benbasat et al., 1987, pp. 377-378; Dubé & Paré, 2003, p. 611
Number of authors	*Number of authors*	Details about how many authors published the article (usually stated at the beginning of the article).	Dubé & Paré, 2003, p. 612
Different roles for multiple investigators	Yes or not specified	Details about the roles and responsibilities of the various researchers in the study: 1) insider-outsider researchers: at least one researcher is part of the subject of interest (insider), e.g., an employee, vs. at least one researcher who is not part of it (outsider) 2) different described tasks for researchers: e.g., researchers asking questions during interviews vs. researchers taking notes	Dubé & Paré, 2003, pp. 611-612; Eisenhardt, 1989, p. 538

		3) very roughly described task distribution of researchers: coder taking part in data collection process vs. those not participating in data collection process	
Area: Data Collection			
Elucidation of the data collection process	*In detail, rough,* or no	Authors describe how data was collected: - in detail: extensive description of the process; indications: information should be provided about each method of data collection (interviews are usually the main method, so this process should be written about a lot and tends to be the most); an indication of a detailed description can be that the methodological literature on CS data collection (e.g. Benbasat et al. (1987), Eisenhardt (1989), Yin (2014)) is used; the length of the text depends on the number of used methods and the extent of the description is not necessarily linked to the degree of detail, quality is more important than quantity; tables, figures or appendices increase the degree of detail - rough: no focus on an extensive description of the process, but information is evident; if the indications for detailed description are not or only partially followed	Benbasat et al., 1987, p. 381; Dubé & Paré, 2003, p. 627; Eisenhardt, 1989, p. 548
Interviews	Yes or No	Authors explicitly mention or describe details about the use of interviews for data collection.	Dubé & Paré, 2003, pp. 613-614; Yin, 2014, pp. 110-113
Kind of interviews	**Structured, semi-structured etc.**	**Description of how the interview is structured:** **- structured: questions have been predetermined and the order is fixed**	Benbasat et al., 1987, p. 381; Yin, 2014, p. 110

		- semi-structured: questions were predetermined and the order is flexible	
Sampling strategy (interviews) (up to three)	Convenient, snowball, random, whole population, *homogenous quota, maximum variation, opportunistic, purposeful (in any other sense)*, or not specified	Details about how data was collected from interviews: - convenient: participants are in the close vicinity of the study and can be easily recruited - snowball: one participant recommends other suitable participants - random: random selection of participants - whole population: all those affected by the phenomenon are interviewed (e.g., all participants in a project or a company department) *- homogeneous quota: all participants are selected based on one or more common characteristics* *- maximum variation: participants have different characteristics (e.g., different positions, roles, companies or departments)* *- opportunistic: occurring chance or unexpected opportunities to recruit participants* *- purposeful (in every other respect): reasonable selection that specific participants are suitable for this study*	- convenient: Patton, 2015, pp. 309-310 - snowball: Kuzel, 1999, p. 41; Lincoln and Guba 1985, p. 233; Paré, 2004, p. 246; Patton, 2015, pp. 298-299; Yin, 2014, p. 111 - random: Patton, 2015, p. 286 - whole population: Patton, 2015, p. 285 - *homogeneous quota*: Benbasat et al., 1987, p. 381; Paré, 2004, p. 246; Patton, 2015, p. 285 - *maximum variation*: Kuzel, 1999, pp. 39-40; Paré, 2004, p. 246; Patton, 2015, p. 283 - *opportunistic*: Paré, 2004, p. 247; Patton, 2015, p 300 - *purposeful*: Kuzel, 1999, p. 41; Paré, 2004, p. 247; Patton, 2015, p. 265
Number of interviewees	Number of interviewees or not specified	Indication of how many people were interviewed.	Dubé & Paré, 2003, p. 614
Number of interviews	Number of interviews or not specified	Indication of how many interviews were conducted.	Dubé & Paré, 2003, p. 614
Use of an interview guide	*Yes, complete (in text), yes, complete (in appendix), yes, concrete*	Details of whether an interview guide was used: *- yes, complete (in text): Interview questions*	Benbasat et al., 1987, p. 381; Dubé & Paré, 2003, p. 614

	examples, yes, broad overview, yes, only mentioned, on request, or not specified	*embedded in the text (e.g., in a table)* *- yes, complete (in appendix): Interview questions attached in the appendix* *- yes, concrete examples: Excerpt of interview questions (e.g., integrated in text)* *- yes, broad overview: description of the interview questionnaire (e.g., structure, topic)* *- yes, only mentioned: short indication that a guide was used, but no detailed description about it* *- on request: the guide will be provided on request (explicitly mentioned by the authors)*	
Pre-test of interview guide	Yes or not specified	Authors give information about whether the interview guide has been tested in advance or validated.	Dubé & Paré, 2003, p. 614
Interview transcription	**Yes or not specified**	**Indication of whether interviews were recorded and/or transcribed.**	Dubé & Paré, 2003, p. 614; Yin, 2014, p. 110
Interview review	**Yes or not specified**	**Indication of review and validation of conducted interviews for agreement (mostly with interviewees).**	Yin, 2014, p. 113
Follow up interviews	**Yes or not specified**	**Details whether the researchers contacted, e.g., the interviewees, after conducting interviews to clarify issues or uncover discrepancies.**	Benbasat et al., 1987, p. 381
Observation	Yes or No	Authors explicitly mention or describe details about the use of observations for data collection.	Yin, 2014, pp. 113-117 Benbasat et al., 1987, p. 374; Dubé & Paré, 2003, p. 614
Documentation	Yes or No	Authors explicitly mention or describe details about the use	Benbasat et al., 1987, p. 374; Dubé & Paré, 2003, p.

		of documentations for data collection.	614; Yin, 2014, pp. 105-109
Questionnaires	Yes or No	Authors explicitly mention or describe details about the use of questionnaires for data collection.	Benbasat et al., 1987, p. 382; Dubé & Paré, 2003, p. 614; Yin, 2014, pp. 112-113
Questionnaires provided	**Yes, complete (in text), yes, complete (in appendix), yes, concrete examples, yes, broad overview, yes, only mentioned, on request, or not specified**	**Information on whether questionnaires were provided:** **- yes, complete (in text): questionnaire questions are embedded in the text (e.g., in a table)** **- yes, complete (in appendix): questionnaire is attached in the appendix** **- yes, concrete examples: excerpt of questionnaire is provided (e.g., in a table)** **- yes, broad overview: description of the questionnaire (e.g., structure, topic)** **- yes, only mentioned: brief indication that a questionnaire was used, but no detailed description of it** **- on request: the questionnaire will be provided on request (explicitly mentioned by the authors)**	Dubé & Paré, 2003, p. 627
Kind of data collected	**Qualitative, quantitative, or both**	**The type of collected data:** **- qualitative: e.g., data collected from interviews, observations, documentation** **- quantitative: e.g., data collected from questionnaires, artifacts, time series** **- both: qualitative and quantitative**	Benbasat et al., 1987, p. 382; Dubé & Paré, 2003, pp. 612-614; Yin, 2014, p. 105-117
Data triangulation	Yes or not specified	Authors explicitly mention that data triangulation has been performed or description that different data	Dubé & Paré, 2003, p. 615; Yin, 2014, pp. 118-122;

		was compared against each other.	
Researcher triangulation during data collection	**Yes or not specified**	**Explicit indication of whether researcher triangulation was performed during the data collection process or description that researchers compared their collected data against each other.**	Denzin, 2009, p. 303
Number of researchers conducting data collection	**Number of researchers**	**Details about the number of researchers involved in the data collection process of the study.**	Dubé & Paré, 2003, p. 612
Involvement of the researcher	**Involved or not involved**	**Details about the researchers' roles in the study – typically is an 'insider-outsider' research team: insider is part of the examined case, e.g., researcher is employed at the examined company/ organization (involved); outsider is a researcher who is not involved in a typical workday of the case (not involved).**	Eisenhardt, 1989, p. 538; Louis & Bartunek, 1992, p. 102
Case study protocol	Yes or not specified	Indication whether a CS protocol has been used - a CS protocol contains, for example, processes and rules for the instruments used to collect data - requires an explicit mentioning by the authors.	Dubé & Paré, 2003, pp. 615-616; Yin, 2014, pp. 84-94
Case study database	Yes or not specified	Indication of whether a CS database has been created - a CS database contains, e.g., raw data (such as quotes), interview protocols, researcher notes, coded data, coding scheme, analytical materials, and representations of the data - requires an explicit mentioning by the authors that a database was used.	Dubé & Paré, 2003, pp. 615-616; Yin, 2014, pp. 123-127
Overlap of data collection and analysis	**Yes or not specified**	**Description by the authors (explicit or implicit) whether a flexible design is**	Eisenhardt, 1989, pp. 538-539; Miles & Huberman,

		used in the study - primarily through overlap of data collection and data analysis (e.g., both conducted in tandem).	1994, p. 50; Recker, 2021, p. 125
Area: Data Analysis			
Elucidation of the data analysis process	*In detail, rough,* or no	Description of how data was analyzed: - in detail: extensive, clear and detailed description of the analysis process; points of reference: information should be provided on each method of data analysis (usually coding is an important component nowadays, so this process should be written about a lot, at best, with information about the coding scheme); an indication of a detailed description can be that the methodological literature on CS data analysis (e.g. Eisenhardt (1989), Yin(2014)) is cited; the extent of the text depends on the number of methods and the amount of the description is not necessarily connected with the degree of detail, quality is more important than quantity; tables, figures or appendices increase the level of detail - rough: no focus on an extensive description of the process, but details are evident (short description); if the indications for detailed description are not or only partially followed	Dubé & Paré, 2003, p. 616; Eisenhardt, 1989, pp. 538-539
Field notes	Yes or not specified	Indication whether field notes were taken by researchers during the research (preferably as complete as possible, e.g., including non-verbal communication and description of context).	Dubé & Paré, 2003, p. 616; Van Maanen, 2011, p. 6, pp. 117-118; Yin, 2014, pp. 124-125

Coding of raw data	Yes or not specified	Indication if data analysis method of coding has been used.	Dubé & Paré, 2003, p. 605; Miles & Huberman, 1994, pp. 55-57; Corbin & Strauss, 2014, pp. 220-238
Coding scheme available	*Yes complete (in text), yes, complete (in appendix), yes, partially, on request*, or no	Authors' indication whether a used coding scheme is attached: *- yes, complete (in text): information about the used coding scheme is embedded in the text (e.g., in tables)* *- yes, complete (in appendix): the whole coding scheme is provided in the appendix* *- yes, partially: the coding scheme is not provided completely, but partial extracts or information are shown, e.g., description of coding or parts of coding attributes* *- on request: indication that scheme will be provided on request (explicit mention by the authors)*	Dubé & Paré, 2003, p. 616
Validation of coding scheme	Yes or not specified	Indication whether the coding scheme has been validated or researchers agreed on the coding scheme in advance.	Dubé & Paré, 2003, p. 616
Example codes available	**Yes or No**	**Authors provide examples of coding, e.g., coding of raw data excerpts are attached in the appendix or embedded in the text.**	Dubé & Paré, 2003, p. 616
Researcher triangulation during data analysis	**Yes or not specified**	**Explicit or implicit indication whether researcher triangulation was performed during data analysis - implicit indication could be stated through comparison between the outcomes of the different researchers.**	Denzin, 2009, p. 303
Number of researchers conducting data analysis	**Number of researchers**	**Details about the number of researchers who carried out the data analysis.**	Dubé & Paré, 2003, p. 612

Inter-rater reliability test	Yes or not specified	Indication if results have been validated by an interrater reliability test, e.g., Cohen's Kappa (Cohen, 1960, p. 39-41).	Dubé & Paré, 2003, p. 616
Inter-rater agreement ratio	Ratio or not specified	Indication of the agreement ratio if researchers performed an inter-rater reliability test.	Dubé & Paré, 2003, p. 616
Coding software	Coding software or not specified	Information about used software for coding (e.g., ATLAS-ti or Nvivo).	Dubé & Paré, 2003, p. 599; Fielding & Lee, 1998, p. 178; Kelle, 1995, pp. 49-50; Weitzman & Miles, 1995, p. 220; Yin, 2014, pp. 134-135
Data displays	Yes or not specified	Clear and graphical presentation of analysis processes or results (e.g., in tables, figures, matrices, graphs). At best, the technique for data displays is derived from literature and described.	Dubé & Paré, 2003, p. 618; Miles & Huberman, 1994, p. 11, pp. 91-98; Yin, 2014, pp. 178-179, pp. 183-184
Flexible and opportunistic process	Yes or not specified	Mentioning of flexible or opportunistically perceived ways to customize the research design during the study (e.g., extended interview guide, adjusted research question or changed unit of analysis).	Dubé & Paré, 2003, p. 618; Eisenhardt, 1989, p. 539; Miles & Huberman, 1994, p. 50; Yin, 2014, p. 65
Logical chain of evidence	Yes or No	The derivation of evidence and data of the research is recognizable. Comprehensibility is guaranteed for readers in each step of the study from initial research question to conclusion.	Benbasat et al., 1987, p. 374; Dubé & Paré, 2003, p. 618; Yin, 2014, pp. 127-128
Empirical testing	Yes or No	The authors compare the observations of the research with the established hypotheses derived from the theory: a) Tests for qualitative research: contrasting verbal	Campbell, 1975, pp. 181-182; Dubé & Paré, 2003, p. 619; Lee, 1989, p. 35, p. 42; Wilson & Woodside, 1999, pp. 217-218; Yin, 2014, pp. 143-147

		statements with verbal hypotheses (Lee, 1989) b) Tests for explanatory CS: pattern-matching (Yin, 2014) c) Testing CS theories: Degree of freedom analysis - based on pattern-matching (Campbell, 1975; Wilson & Woodside, 1999)	
Explanation building	Yes or No	Building of a text-based explanation through the evidence of the case (exploratory CS only).	Dubé & Paré, 2003, p. 619; Yin, 2014, pp. 147-150
Time series analysis	Yes or No	Collection of large amounts of data over time and comparison of the results at different points in time (explanatory CS only).	Dubé & Paré, 2003, p. 619; Yin, 2014, pp. 150-155
Use of natural controls	Yes or No	Indication that research should show that its examined variable has influence or no influence on other variables, e.g., using test and control groups (explanatory single CS only).	Dubé & Paré, 2003, pp. 619-620; Lee, 1989, p. 39
Search for cross-case patterns	Yes or No	Exemplary procedure: Authors establish categories and examine the various cases for similarities and differences (multiple CS only).	Dubé & Paré, 2003, p. 619; Eisenhardt, 1989, pp. 540-541; Miles & Huberman, 1994, pp. 172-177; Yin, 2014, pp. 164-168
Description of the observed world	**In detail, rough, or no**	**Authors describe information and details about the conducted CS, i.e., descriptions about the studied events, documented findings, observations etc. of the case/s.**	Dubé & Paré, 2003, p. 605
Excerpts of raw data in case report	**Quotes, screenshots, pictures, or no**	**Authors integrate data from data collection into the text or appendix, e.g., quotes or screenshots. Typically quotes of interviewees are embedded as citations in text or as examples for coding.**	Dubé & Paré, 2003, p. 620; Fetterman, 2009, pp. 126-127; Yin, 2014, p. 126

Project reviews	Yes or not specified	Indication if researchers have asked research subjects or participants to check the credibility of interpretations and results (i.e., external verification).	Devers, 1999, pp. 1170-1174; Dubé & Paré, 2003, p. 620; Lincoln & Guba, 1985, pp. 372-373; Patton 1999, pp. 1195-1196; Yin 2014, pp. 198-199
Comparison with conflicting literature	Yes or No	Indication of use of literature that conflicts with the established theory, usually mentioned in the discussion section. This comparison strengthens results through creative and/or unconventional research (exploratory CS only).	Dubé & Paré, 2003, p. 620; Eisenhardt, 1989, p. 544
Comparison with similar literature	Yes or No	Indication of use of literature that is in line with the established theory, usually mentioned in the discussion section. This comparison strengthens results by showing commonalities of phenomena that are not normally considered to be related - strengthens validity and generalizability (exploratory CS only).	Dubé & Paré, 2003, p. 620; Eisenhardt, 1989, p. 544
Area: Other			
Key case study characteristics summarized	**In table, in figure, or no**	**Specification about CS characteristics (in table or figure), e.g., according to Benbasat et al. (1987), Dubé & Paré (2003) and Yin (2014) - the research itself is assessed by the authors based on the attributes.**	Examples for literature established CS characteristics: Benbasat et al., 1987; Dubé & Paré, 2003; Eisenhardt, 1989; Yin, 2014
Methodological literature cited	**Methodological literature or not specified**	**Information about the literature of methodological application - e.g., methodological CSR literature according to Benbasat et al. (1987), Dubé & Paré (2003) and Yin (2014), but other methodological literature is also possible.**	Examples for frequently cited methodological literature: Benbasat et al., 1987; Dubé & Paré, 2003; Eisenhardt, 1989; Yin, 2014

Other case studies cited	**Case studies or not specified**	**Indication if the authors cited other CS in the research.**	-
Online-Appendix	**Yes or No**	**Explicit information with a provided link that the whole or parts of the appendix are online retrievable.**	-
New coding attributes are marked bold, new possible values for existing coding attributes are marked italic.			

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B. Appendix: Coding Examples

Table 8: Coding Examples

Attributes	Examples
Area: Categorization	
Use of CSR stated	"To develop a deeper understanding of this model, our longitudinal case study aims to answer the following two research questions" (Wiener & Saunders, 2014, p. 211).
CSR used in keywords	In the chosen example the term "Case study" is stated in the keywords section (e.g., Karoui et al., 2015, p. 15).
"Case studies" stated instead of "multiple case study"	"We built our case studies upon primary and secondary data" (Leonardi et al., 2016, p. 465).
CSR used as primary research method	"To develop a deeper understanding of this model, our longitudinal case study aims to answer the following two research questions" (Wiener & Saunders, 2014, p. 211).
Paradigm	"We adopted an empirical case study research approach based on qualitative data collection and analysis (Yin, 2009). As stated by Tsang (2014), case studies are an important method for theory building in Strategic Information System research, providing an in-depth understanding of different phenomena" (Ayala et al., 2020, p. 5).
Paradigm stated	"This investigation was conducted as an exploratory positivist case study (Pare, 2004)" (Baker & Niederman, 2014, p. 116).
Research purpose	"We adopted an empirical case study research approach based on qualitative data collection and analysis (Yin, 2009). As stated by Tsang (2014), case studies are an important method for theory building in Strategic Information System research, providing an in-depth understanding of different phenomena" (Ayala et al., 2020, p. 5).
Research purpose stated	"This investigation was conducted as an exploratory positivist case study (Pare, 2004)" (Baker & Niederman, 2014, p. 116).
Area: Research Design	
Rationale for conducting CSR	"There were four reasons for choosing the case method. First, the literature comparing types of entrepreneurial action is still growing and case studies are a useful technique for exploring and validating emerging research concepts (Yin, 2009)" (Street et al., 2018, p. 62).
Clear research questions	"To develop a deeper understanding of this model, our longitudinal case study aims to answer the following two research questions: (1) How can a client organization foster both competition and cooperation among its multiple vendors?

	(2) How can it manage the delicate balance between vendor competition and cooperation?" (Wiener & Saunders, 2014, p. 211)
Types of research questions	"How can a client organization foster both competition and cooperation among its multiple vendors?" (Wiener & Saunders, 2014, p. 211)
A priori specification of constructs	"An activity theory framework for Strategy as Practice (Jarzabkowski, 2005) has also been developed. This paper uses a modified form of the activity framework, which Fig. 1 illustrates" (Leonard & Higson, 2014, p. 66).
Clean theoretical slate	"In keeping with the principle of theoretical sensitivity, we were careful not to force any theoretical constructs onto the data set" (Liu et al., 2021, p. 8).
Theory of interest stated	"Consistent with the idea that fieldwork is done with an "open mind" but not with an "empty head" (Dey 1999), we utilize the meta-theoretical lens of punctuated equilibrium theory (Tushman and Anderson 1986; Tushman and Romaneli 1985) and view IT governance as a part of an organization's deep structure, that is, a set of fundamental choices an organization has made concerning the basic organizing parts and activity patterns that maintain its existence (Gersick 1991)" (Gregory et al., 2018, p. 1226).
Predictions from theory stated	"Thus, we utilize the findings from our in-depth case study and the punctuated equilibrium meta-theoretical lens to develop a mid-range theory including a set of propositions (see Figure 2). In what follows, we discuss the model and its propositions in detail and integrate our emergent theorizing into the prior literature" (Gregory et al., 2018, p. 1242).
Use of rival theories	"In the following, we present two different theoretical explanations originating from other research contexts that are both transferrable to the business/IT interface and thus can offer an explanation to the deviations of actual from planned interaction structures at the business/IT interface. Yet, they do not provide congruent answers and their predictions might be contradictory. Therefore, our explanatory research needs to determine which of the two explanations does more accurately explain deviations between formal and actual interaction structures at the business/IT interface" (Zolper et al, 2013, p. 335).
Case acquisition strategy	"The starting point for this study was our observation that Uber drivers were switching between different platforms. In December 2015, an Uber driver sent one of us a text message offering a voucher for free Lyft rides. This critical observation aroused our intellectual curiosity and triggered more intense observations and discussions with drivers during Uber rides in our first wave of data collection (see Table 1)" (Möhlmann et al., 2021, p. 2002).
Number of cases	"The selection of our two cases was guided by the principle of theoretical replication (Yin, 1994)" (Karoui et al., 2015, p. 19).
Rationale for conducting a single/multiple case study	"The multi-case research methodology is particularly appropriate for this study for several reasons. First, this paper aims to answer the ''How" question, i.e. ''How do social entrepreneurs orchestrate resources to achieve e-commerce enabled social innovation?", and the

	case study method is particularly suitable for answering the ‘‘How” question (Eisenhardt and Graebner, 2007), as this method allows researchers to understand the nature and complexity of the processes taking place (Benbasat et al., 1987)” (Cui et al., 2017, p. 7).
Nature of single-case design	“we conducted an exploratory case study by focusing our observation and analysis of “a phenomenon previously inaccessible to social science inquiry” (Yin 2009, p. 48)” (Salovaara et al., 2019, p. 562).
Replication logic in multiple-case design	“Two case studies were used, so that patterns that they had in common could be identified, and compared with their context” (Leonard & Higson, 2014, p. 68).
Case/s reasonably chosen	“The case was selected by means of theoretical sampling. According to Eisenhardt and Graebner (2007), theoretical sampling means that cases are selected because of their suitability for shedding light on particular constructs. For this study we were specifically seeking a manufacturing firm that met certain criteria. First, the firm should have developed new products with suppliers in the three types of configurations described by Petersen et al. (2005). Second, we took into account the risk related to the development of the product delegated to supplier since the higher the risk, the greater the need for collaboration between buyer and supplier (Le Dain et al., 2010) and, thus, the higher the need for IT-leveraging capability. For this reason, the firm studied should have at least one risky NPD project for each supplier involvement configuration” (Ayala et al., 2020, p. 5).
Case	“Our two cases are public sector administrative offices in France” (Karoui et al., 2015, p. 20).
Unit of analysis	“The analysis scope encompassed all activities involved in detecting and addressing potential malware threats. These activities are what we have denoted above as operations, human-based and digital alike, all of them “concerned with managing inputs (or resources) through transformation processes to deliver outputs” (Rowbotham et al. 2007, p. 2)” (Salovaara et al., 2019, p. 563).
Rational for choosing the unit of analysis	“We select Apple’s iOS service system as the single locus for our embedded case study for the following reasons. First, Apple’s iOS is a an exemplary digital service system, where large numbers of heterogeneous actors contribute to rich and diverse service and service system innovation through the use of digital technology. Second, Apple’s service system is considered to be dynamic and innovative. It has the potential for providing ample examples of boundary resource creation and evolution to study. Last of all, given the popularity and the high profile of the company and the service system that it enables, a rich body of secondary data is generated, which allows for in-depth empirical analysis. Within the iOS case, we study the emergence and dynamics of boundary resources” (Eaton et al., 2015, p. 221).
Use of a pilot case	“The first organisation, referred to as UniCan, was selected as a pilot study, primarily on the basis of access and geographical proximity” (Cram & Brohman, 2013, p. 141).
Site description	“Data were collected via semi-structured interviews in the mayoral offices of two cities in France (see Table 2)” (Karoui et al., 2015, p. 20).

	In the following the authors described each office more in detail, e.g., "Northern Suburb is a city located in the north of France with a population of 30,000. The city is primarily dedicated to private residents rather than businesses or tourists. Among the roughly 800 agents employed in Northern Suburb's mayoral office, only about 400 of them use information technology" (Karoui et al., 2015, p. 21).
Case period	"The conceptual scaffolding is applied in an exploratory longitudinal case study on product platform change in a leading process automation manufacturer (ABB) between 1983 and 2016" (Sandberg et al., 2020, p. 130).
Longitudinal design	"The observed IT governance transformation formed a key part of GlobalBank's broader digital transformation journey and occurred from 2013 to 2017. Data collection and analysis across multiple points in time during this five-year transformation period, in addition to five years of retrospective data collection and analysis to cover the antecedent equilibrium period, enabled our longitudinal single-case design (Gerring 2007)" (Gregory et al., 2018, p. 1229).
Time spent on site	"As shown in Table 3, we collected data in two periods (2007–2010 and 2011–2017) through interviews, participant observation, and searches of archival data" (Sandberg et al., 2020, p. 134).
Nature of data	"We collected blog data concerning events in Apple's service system occurring over the five-year period starting in January 2007 through to the end of December 2011 … These public documents were updated several times by Apple over the five-year period forming the focus of our study, and we tracked the changes made" (Eaton et al., 2015, p. 222).
Number of authors	The amount of the stated authors in the beginning of a research paper, e.g., three authors (e.g., Karoui et al, 2015, p. 15).
Different roles for multiple investigators	"The one of the researchers had worked as an IT consultant for several years, and was familiar with the case company's history, products and services, customers, competitors, and business environment. During the first year of the research, the one of the researchers had full access to the case company's intranet including all documents related to the company's ERP and other technologies, strategy, and transformation process. Thereafter, the research team had basic research access to the company" (Rossi et al., 2020, p. 4).
Area: Data Collection	
Elucidation of the data collection process	The example for a detailed elucidation of the data collection process starts as follows: "In three waves of data collection, we used multiple sources of qualitative data, including observations, written dialogue, and interviews" (Möhlmann et al., 2021, p. 2002). Each of the three waves of data collection is described in detail with some background information. Additionally, the different data collection methods are summarized in a table (Möhlmann et al., 2021, p. 2002-2003). Furthermore, the initial version of the interview guide is attached in the appendix (Möhlmann et al., 2021, p. 2022).
Interviews	"We conducted three intensive waves of onsite interviews in 2004, 2005, and 2010, including 24 formal interviews with 21 informants at the two

	organizations, many of whom commented on multiple projects" (Jenkin et al., 2019, p. 655).
Kind of interviews	"We employed semi-structured interviews as a primary source of data collection" (Ayala et al., 2020, p. 6).
Sampling strategy (interviews) (up to three)	"Several semi-structured interviews with managers and specialists (face-to-face or by telephone) formed the basis of the data collection process […] The managers recommended employees who were familiar with the transformation process and were therefore suitable candidates for further interviews" (Kaltenecker et al., 2015, p. 238-239).
Number of interviewees	"In all, we conducted 25 semi-structured interviews (20 in-person and 5 via telephone) with 19 informants (see Table 2)" (Singh et al., 2015, p. 650).
Number of interviews	"In all, we conducted 25 semi-structured interviews (20 in-person and 5 via telephone) with 19 informants (see Table 2)" (Singh et al., 2015, p. 650).
Use of an interview guide	"The interview protocol investigated several aspects of post M&A IS integration and strategies, with specific open-ended questions pertaining to overall business and IS specific strategy. This allowed interviewees flexibility in their responses. (See Appendix B for the interview protocols.)" (Baker & Niederman, 2014, p. 117).
Pre-test of interview guide	"An initial interviewing instrument was developed using the preliminary constructs extracted from a brief review of the literature. The initial interviewing guide was assessed for face validity using an iterative pre-test. After validating the interviewing instrument, interviews were conducted and project, process, and methodology documentation were collected (see Table 2)" (Jenkin & Chan, 2010, p. 38).
Interview transcription	"Interviews were recorded and 214 pages of transcripts were produced" (Jenkin et al., 2019, p. 655).
Interview review	"We recorded and transcribed each interview, which lasted on average an hour (with significant variance upward), compiled researchers' notes of meetings and workshops, and verified transcripts' correctness with the interviewees" (Sandberg et al., 2020, p. 147).
Follow up interviews	"When discrepancies were identified between interviewees or other sources, we used a second and third round of interviews to clarify these differences until consolidated and convergent agreement about collaboration intensity was achieved" (Ayala et al., 2020, p. 6).
Observation	"Primary interview data was complemented in our case with detailed observations collected during field visits to the headquarters of the bank" (Gregory et al., 2018, p. 1231). Furthermore, the authors describe the conducted observation in more detail. Information about what and who was observed are given (Gregory et al., 2018, p. 1231).
Documentation	„In addition to the interviews, we also reviewed a wide range of documents, including company documents (e.g., Brand book, country contracts, 2016 strategy and plans, yearly departmental plans, etc.), presentation slides for the B2C proposal and updates to management,

	archives (e.g., historical marketing campaigns, website contracts, etc.), emails (e.g., between owner and management group, between management group and the digital team, etc.), and meeting minutes (of meetings with different Hummel country partners, management and marketing meetings)“ (Yeow et al., 2018, p. 48).
Questionnaires	“We test two contrasting explanations by analyzing four rich case studies, using data from 56 interviews and 47 complementary employee questionnaires, which allow us to gain deep insight into the planned and actual interaction structures and driving forces behind them” (Zolper et al, 2013, p. 334).
Questionnaires provided	“An outline of this questionnaire can be found in Appendix A” (Zolper et al, 2013, p. 338).
Kind of data collected	„Multiple sources of data were collected, including semi-structured interviews, documentations, on-site observation and informal dialogues” (Huang et al., 2014, p. 33).
Data triangulation	“Specifically, we made within-source comparisons (e.g., comparing a data slice from one part of a forum thread with another, or from an initial interview with a later one) and cross-source comparisons (e.g., comparing sampled written dialogue from the UberPeople.net forum with interview data)” (Möhlmann et al., 2021, p. 2004).
Researcher triangulation during data collection	“Notes were taken by four researchers: this approach helped us contrast and compare impressions from each researcher during the interviews, thus allowing us to obtain a more complete view of each case and reduce observer bias, as suggested by Yin (2009)” (Ayala et al., 2020, p. 6).
Number of researchers conducting data collection	“The two researchers independently conducted these interviews with key IS practitioners across all levels within several different companies who had experienced mergers and acquisitions” (Baker & Niederman, 2014, p. 116).
Involvement of the researcher	“The two researchers independently conducted these interviews with key IS practitioners across all levels within several different companies who had experienced mergers and acquisitions” (Baker & Niederman, 2014, p. 116).
Case study protocol	„Our case inquiries were conducted in accordance with prevailing case study field procedures, including the development of a case study protocol prior to data collection, triangulation using multiple sources of evidence, and the maintenance of a chain of evidence (Paré, 2004; Yin, 2009)” (Liu et al., 2021, p. 5).
Case study database	“We updated our database with recent posts from the UberPeople.net forum in order to extend the period of our dataset and identify any potential changes in platform-driver relationships and day-to-day platform work” (Möhlmann et al., 2021, p. 2002).
Overlap of data collection and analysis	“In line with most case studies, the data collection and data analysis were conducted in tandem” (Oshri et al., p. 8).

Area: Data Analysis	
Elucidation of the data analysis process	The authors of the chosen example describe their method as "four overlapping, iterative phases of data collection and analysis" (Salovaara et al., 2019, p. 563). They describe each phase in detail and provide a summary of this process in a table (Salovaara et al., 2019, p. 563-565). Moreover, the used coding scheme is attached in the appendix with examples of coding (Salovaara et al., 2019, p. A5-A6).
Field notes	"As recommended by Glaser (1978), we also wrote memos, which allowed us to ''connect the data and final analysis explicitly by conceptually raising the analytic formulation of the codes" (p. 84)" (Wieder & Saunders, 2014, p. 215).
Coding of raw data	"Our data analysis consisted of multiple phases of coding that were recursively executed" (Liu et al., 2021, p. 8).
Coding scheme available	"Our final coding system is shown in Appendix C" (Salovaara et al., 2019, p. 564).
Validation of coding scheme	"Three of the authors first examined a subset of the blog data covering events from October 2009 to September 2010 in order to establish a coding scheme. Once the three coders agreed on a coding scheme behind 11 contested cases identified in this period, the first author then completed the data analysis, which results in 45 instances of contested code (including the original 11)" (Eaton et al., 2015, p. 222).
Example codes available	The authors provide coded examples from the raw data, e.g., shown in a table in the appendix (e.g., Sandberg et al., 2020, p. 148-151).
Researcher triangulation during data analysis	"To tackle the well-known problem of wrestling with preconceptions in coding for new theory development (Charmaz 2014), we invited an unbiased additional author to the team at a later stage of our research. This triggered a complete recoding of our dataset, comparison of the results with previous coding, and intensive discussions within the team of coders to develop a shared and internally validated interpretation of the data" (Möhlmann et al., 2021, p. 2004).
Number of researchers conducting data analysis	"Using these codes, the first and third authors independently coded the case narrative for each organization. The second author independently compared the coding results and highlighted discrepancies; this discussion continued until 100% agreement was reached on the coding" (Street et al., 2018, p. 63).
Inter-rater reliability test	"For categorical data (mechanisms), Cohen's Kappa was 1.00 (100% agreement); for ordinal data (low, moderate, high), intraclass correlation was 0.91, indicating excellent agreement (Cicchetti 1994)" (Jenkin et al., 2019, p. 657).
Inter-rater agreement ratio	"For categorical data (mechanisms), Cohen's Kappa was 1.00 (100% agreement); for ordinal data (low, moderate, high), intraclass correlation was 0.91, indicating excellent agreement (Cicchetti 1994)" (Jenkin et al., 2019, p. 657).
Coding software	"Our data analysis entailed open, axial and selective coding using Nvivo to help organize the analysis" (Karoui et al., 2015, p. 21).

Data displays	"To identify patterns across projects in terms of MU and project success, we created two 3-by-3 matrices. As recommended by Monge (1990), we used one matrix (Figure 5) to examine projects based on the initial MU level (low, moderate, high) and the magnitude of change (low, moderate, high) in MU during the project. We used a second matrix (Figure 6) to classify projects based on success and average MU. We also used detailed data displays for the projects in Alpha (Figure 3) and Beta (Figure 4). These analyses led to the patterns discussed next" (Jenkin et al., 2019, p. 567-660).
Flexible and opportunistic process	"Axial coding was performed iteratively after each interview to relate and compare concepts identified in open coding and to ensure the evolving interview protocol captured emerging constructs and relationships" (Gleasure, 2015, p. 223).
Logical chain of evidence	"Our case inquiries were conducted in accordance with prevailing case study field procedures, including the development of a case study protocol prior to data collection, triangulation using multiple sources of evidence, and the maintenance of a chain of evidence (Paré, 2004; Yin, 2009)" (Liu et al., 2021, p. 5).
Empirical testing	In the chosen example each proposition is verified or refuted. For example the proposition "Accumulation of IT governance misalignments caused by the enactment of everyone's IT beliefs by consumer-customers will likely lead to the transformation of functional IT governance, requiring radical changes in its focus, scope, and patterns" (Gregory et al., 2018, p. 1246) is verified by the statement "Consistent with the punctuated equilibrium theory, our findings suggest that the unresolved cognitive dissonance acts as a trigger releasing significant energy to drive the deep structural change of functional IT governance (Ambos and Birkinshaw 2010; Guillemette and Paré 2012b). A variety of revolutionary period dynamics, including engagement of outsiders and shared learning of diverse organizational stakeholders, unfold to help advance fresh search activities by the managers (Gersick 1991). We observed many of these dynamics in our case as inputs into the fresh search efforts of senior managers at GlobalBank originating from a variety of internal sources (e.g., a boundary-spanning IT unit that actively engaged with the special regime business groups) and external sources (e.g., an external consulting firm specializing in bank automation that supported GlobalBank's initiative of building a digital services platform). Ultimately, a fresh search leads to the development of a critical insight suggesting that the new governance framework must be aligned" (Gregory et al., 2018, p. 1246).
Explanation building	"Finally, selective coding required transcripts were revisited and recoded according for the final set of constructs and themes to reinforce the validity and trustworthiness of the study (Denzin and Lincoln, 2000) and to ensure the reliability and replicability of findings (Mays and Pope, 1995)" (Gleasure, 2015, p. 223). In addition to that the authors provide in the findings and theory building section tables with an explanation column (Gleasure, 2015, p. 224-227).
Time series analysis	"In addition to our use of grounded theory, we used process theorizing techniques. In analyzing our data, we focused on the sequencing of events on the case timeline, delineated phases, and identified transition

	triggers (see Figure 2) (Langley 1999; Van de Ven 2007)" (Gregory et al., 2018, p. 1232).
Use of natural controls	"This setting allows us to control for many network (group) factors and thus isolate user-system effects on group-level outcomes" (Kane & Labianca, 2011, p. 508).
Search for cross-case patterns	"Having examined each case separately, our discussion will now compare and contrast the two cases" (Karoui et al., 2015, p. 27). After this introductory sentence the authors describe the similarities and differences of the cases (Karoui et al., 2015, p. 27-28).
Description of the observed world	In this chosen example the authors describe and "present a process account that explains how discontinuance progressed as various SRMs were ceased (downward movements in Figures 1–4) or intensified (upward movements in Figures 1–4)" (Mehrizi et al., 2019, p. 147) for each case. Observations and findings are presented in detail and illustrated by the mentioned figures and a table (Mehrizi et al., 2019, p. 147-154).
Excerpts of raw data in case report	"An IT department member stated: In 2002, we started to buy BlackBerries. We sealed and secured them and handed them over to business users.…everybody was happy" (Gregory et al., 2018, p. 1233).
Project reviews	"After finishing the narratives and the case analysis, we sent them to informants and peers to check the description and the model until achieving an agreement" (Cui et al., 2017, p. 8).
Comparison with conflicting literature	"Second, the phases help us show that the IS discontinuance process does not merely require ceasing underlying SRMs, which is often proposed by the current theories (Stache and Sydow 2014; Sydow et al. 2009). Rather, paradoxically, it also involves phases through which some SRMs are temporarily intensified to enable the subsequent cessation of other SRMs" (Mehrizi et al., 2019, p. 142).
Comparison with similar literature	"Further, in line with recent research that explores the impact of crisis response strategies on publicized corporate reputation ranks (Gwebu et al., 2018), our conceptualization sets the ground for analyzing the influence of crisis response strategy on social media reputation as well as the impact on publicized corporate reputation ranks" (Syed, 2019, p. 269).
Area: Other	
Key case study characteristics summarized	The authors of the chosen example assess their study based on validity and reliability criteria derived from literature. The assessment is shown in a table, e.g., the construct validity criteria "A chain of evidence was established (Yin, 1994)" (Jenkin & Chan, 2010, p. 38) was fulfilled in the study by "Evidence was coded and analyzed in NVivo. See Table 3 for codes used" (Jenkin & Chan, 2010, p. 38).
Methodological literature cited	"We adopted an empirical case study research approach based on qualitative data collection and analysis (Yin, 2009)" (Ayala et al., 2020, p. 5).

Other case studies cited	"Very few prior studies, however, with the notable exception of Adler et al. (1999), explain how ambidexterity is created through what people actually do, including what they do with IT (even Galliers, 2011 in his discussion of strategizing rather than strategy, does not get into the detail of what this involves in practice)" (Huang et al., 2014, p. 32).
Online-Appendix	"Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.jsis.2018.12.001" (Syed, 2019, p. 272).

Case Study References

Case studies marked with an asterisk (*) are part of the examined sample of this work.

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C. Appendix: Aggregated Statistics

Table C1: Case Study Design Attributes according to Research Purpose

	Descriptive	Exploratory	Explanatory	Total
N (all positivist case studies)	2 **(6%)**	32 **(91%)**	1 **(3%)**	35 **(100%)**
Clear research questions	2 **(100%)**	28 **(88%)**	1 **(100%)**	31 **(89%)**
A priori specification of constructs		28 **(88%)**		
Clean theoretical slate		15 **(47%)**		
Theory of interest			1 **(100%)**	
Predictions from theory			1 **(100%)**	
Rival theories			0 **(0%)**	
Number of cases and case selection	see Table C2			
Definition of the unit of analysis	0 **(0%)**	8 **(25%)**	0 **(0%)**	8 **(23%)**
Pilot study	0 **(0%)**	0 **(0%)**	0 **(0%)**	0 **(0%)**
Description of the research context	see Table C3			
Team-based research	2 **(100%)**	29 **(91%)**	1 **(100%)**	32 **(91%)**
Different roles for investigators	0 **(0%)**	6 **(19%)**	0 **(0%)**	6 **(17%)**

Table C2: Case Selection in Single- and Multiple-Case Designs

	Single Case Designs	Multiple Case Designs
N (all positivist case studies)	23 **(66%)**	12 **(34%)**
Unique or extreme case	6 **(26%)**	
Revelatory case	5 **(22%)**	
Critical	0 **(0%)**	
Intensity	1 **(4%)**	
Criterion Case	1 **(4%)**	
Convenient case	1 **(4%)**	
Theoretical	1 **(4%)**	
Case selection not specified	10 **(43%)**	3 **(25%)**
Literal replication		5 **(42%)**
Theoretical replication		4 **(33%)**
Literal and theoretical replication		0 **(0%)**
Note: Numbers do not add up to 100% due to rounding.		

Table C3: Research Context of Analyzed Positivist Case Studies

	Number and Proportion of Analyzed Positivist Case Studies
N (all positivist case studies)	35 **(100%)**
Description of the site(s) (a) in detail, (b) rough	(a) 24 **(69%)** (b) 8 **(23%)**
Case period	19 **(54%)**
Time spent on site by the researcher(s)	29 **(83%)**
Longitudinal design	12 **(34%)**
Nature of data (a) retrospective, (b), on-going, (c) both	(a) 10 **(29%)** (b) 14 **(40%)** (c) 10 **(29%)**

Table C4: Data Collection Attributes per Research Purpose

	Descriptive	Exploratory	Explanatory	Total
N (all positivist case studies)	2 **(6%)**	32 **(91%)**	1 **(3%)**	35 **(100%)**
Elucidation of the data collection process (a) in detail, (b) roughly	(a) 2 (**100%**) (b) 0 **(0%)**	(a) 28 **(88%)** (b) 4 **(13%)**	(a) 1 **(100%)** (b) 0 **(100%)**	(a) 31 **(89%)** (b) 4 **(11%)**
N (data collection described in detail or roughly elucidated)	2 **(100%)**	32 **(100%)**	1 **(100%)**	35(**100%)**
Applied data collection methods	see Table C5			
Multiple data collection methods	2 **(100%)**	28 **(88%)**	1 **(100%)**	31 **(89%)**
Mix of qualitative and quantitative data	0 **(0%)**	2 **(6%)**	0 **(0%)**	2 **(6%)**
Data triangulation	2 **(100%)**	19 **(59%)**	1 **(100%)**	22 **(63%)**
Use of a case study protocol	1 **(50%)**	3 **(9%)**	0 **(0%)**	4 **(11%)**
Use of a case study database	0 **(0%)**	4 **(13%)**	0 **(0%)**	4 **(11%)**
Note: Numbers do not add up to 100% due to rounding.				

Table C5: Applied Data Collection Methods in IS Positivist Case Research

	Number (%) of Analyzed Positivist Case Studies*
N (data collection in detail or roughly elucidated)	35 **(100%)**
Interviews	32 **(91%)**
Documentation	28 **(80%)**
Observation	20 **(57%)**
Questionnaires	0 **(0%)**
* In total, more than 35 (100%), as most studies used multiple data collection methods.	

Table C6: Data Analysis Attributes per Research Purpose

	Descriptive	Exploratory	Explanatory	Total
N (all positivist case studies)	2 **(6%)**	32 **(91%)**	1 **(3%)**	35 **(100%)**
Elucidation of the data analysis process (a) in detail, (b) roughly	(a) 2 **(100%)** (b) 0 **(0%)**	(a) 26 (**81%)** (b) 5 **(16%)**	(a) 1 **(100%)** (b) 0 **(0%)**	(a) 29 **(83%)** (b) 5 **(14%)**
Field notes	1 **(50%)**	13 **(41%)**	1 **(100%)**	15 **(43%)**
Coding	2 **(100%)**	28 **(88%)**	1 **(100%)**	31 **(89%)**
Data displays	2 **(100%)**	32 **(100%)**	1 **(100%)**	35 **(100%)**
Flexible and opportunistic process	0 **(0%)**	2 **(6%)**	0 **(0%)**	2 **(6%)**
Logical chain of evidence	2 **(100%)**	31 **(97%)**	1 **(100%)**	34 **(97%)**
Empirical testing			1 **(100%)**	
Explanation building		31 **(97%)**		
Time series analysis			1 **(100%)**	
Searching for cross-case patterns	2 **(100%*)**	9 **(90%*)**	0 **(0%*)**	11 **(92%*)**
Use of natural controls			0 **(0%**)**	
Excerpts of raw data	1 **(50%)**	30 **(94%)**	1 **(100%)**	32 **(91%)**
Project reviews	0 **(0%)**	14 **(44%)**	0 **(0%)**	14 **(40%)**
Comparison with similar literature		30 **(94%)**		
Comparison with conflicting literature		17 **(53%)**		
* Percentage of all analyzed multiple positivist case studies (n = 2, 10, 0, 12) ** Percentage of all analyzed explanatory positivist single case studies (n = 1)				

Table C7: Methodological Literature Cited

Literature	Number of citations
Eisenhardt, 1989	11
Langley, 1999	9
Miles & Huberman, 1994	9
Yin, 2009	7
Corbin & Strauss, 1990	6
Benbasat et al., 1987	5
Charmaz, 2006	5
Eisenhardt & Graebner, 2007	5
Pan & Tan, 2011	5
Yin, 1994	5
Yin, 2003	5
Dubé & Paré, 2003	4
Gerring, 2007	4
Klein & Myers, 1999	4
Strauss & Corbin, 1998	4
Walsham, 2006	4
Glaser, 1978	3
Glaser & Strauss, 1967	3
* Methodological literature with at least three citations in the examined sample of positivist case studies are taken into consideration	

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Declaration

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(●) Prüfungsordnung 2015
examination regulation 2015

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( ) Prüfungsordnung 2007/2008
examination regulation 2007/2008

Prüfungsnummer / examination number

Eidesstattliche Versicherung

declaration in lieu of an oath

(●) zur Bachelorarbeit im Studiengang / to the bachelor thesis in the degree program

Wirtschaftsinformatik / Information Systems

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A Review of Positivist Case Study Research in Information Systems

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