The ‘Critical Case’ in Information Systems Research
Knut H. Rolland\textsuperscript{a} & Jo Herstad\textsuperscript{b}
knutr@ifi.uio.no\textsuperscript{a} and johe@ifi.uio.no\textsuperscript{b}
Department of Informatics, University of Oslo

Abstract

Information systems research has taken many different directions and a host of different approaches have been used. Different researchers within the multidisciplinary field of IS seem to prefer some approaches to others based on both epistemological and more practical grounds. In this paper we look at the case study approach in IS research and focus on the importance of selecting ‘critical cases’. A case study is an in-depth study of the particular there the researcher seeks to increase his understanding of the phenomena studied. Often case studies and particularly interpretive case studies have been criticized because of the assumed difficulty with generalizations. We argue that this critique is misdirected, and based on Flyvbjerg’s concept of a ‘critical case’, ways of generalizing from case studies are indicated.

Keywords: Case study, Information systems research, Critical case, IS and organization

1. Introduction

There exist a rich body of literature discussing epistemological and methodological issues concerning the selection and use of different approaches in information systems research (e.g. Braa & Vidgen, 1999; Cornford & Smithson, 1996; Galliers, 1992a; Hirschheim, 1992; Irani et al., 1999; Lee, 1999; 1997; Walsham, 1995). In fact, IS related literature seems to be teeming with discussions on epistemological issues, reviews of different approaches, concrete methods and techniques, and guidelines for embarking on information system research. This paper focuses on one particular approach frequently discussed and used in IS research – namely the case study.

In both IS and management related literature the problems of generalizing upon one single case has been emphasized as a serious drawback. Case studies have often been seen as a fruitful way of studying a phenomenon before using a more formal and rigorous approach for verifying or falsifying existing theory. Some researchers even define the case study in itself as almost of no value, and hence an inappropriate approach for doing scientific research. In this paper we strongly reject this view and want to focus on how case studies can make profound contributions within information systems research by selecting critical cases.
The concept of a critical case has been suggested by Flyvbjerg (1991), and a critical case is a case of particular interest and with strategic content in relation to the research questions investigated. In general, extreme and atypical cases tend to give more information, and thus the phenomenon studied becomes more visible (Stake, 1994). The different aspects of a context or mechanisms from which a particular problem situation originates become increasingly visible and more accessible for the researcher.

Our motivation for looking at critical cases in information systems research is also founded in the nature of information systems and information technologies. Critical cases where contradictory and paradoxical issues can be illuminated could contribute to existing theory or illustrate the inadequacy of theories and methods used. For example, the way in which information systems and information technologies effect individuals, organizations and societies are often contradictory. That users use work arounds and improvisations in order to integrate new technology in their context specific and situated work seems to be the rule rather than the exception. Studies of implementation of information technologies in organizations have revealed contradictory findings both within and across studies (see Robey & Boudreau, 1999).

Furthermore, on a societal level, nobody could have predicted the impact of the Internet as a global information infrastructure – which as a technology, for a very long time was seen as inferior to other approaches to data communication as for instance the OSI standard (Hanseth et al., 1996).

Defining information systems research by giving an extensive review of different research methods is not our aim here. Neither is it our objective to focus on epistemological issues – for example the question whether interpretative methods are more appropriate than positivistic research methods. We agree that these issues are important for the information systems field as an academic discipline because of the profound implications of the underlying epistemological assumptions (Checkland & Holwell, 1998). In this paper, however, we want to concentrate on the case study approach – and particularly on how and why critical cases are useful.

The paper is structured in the following way. In the following section, we discuss the case study approach in information systems research and in general – and particularly how a critical case can be used for generalizations. Next, in the discussion we exemplify this by drawing from critical cases found in the IS literature and point at the importance of understanding context in relation to IS research. Finally, we conclude that the critical case can be very valuable for generalizing upon findings in case studies within information systems research.
2. Re-thinking the case study approach in IS

2.1. The case study approach

In general, case studies are not one specific method or a methodological choice and is not the same as ethnography, and thus a case study does not need to be based on only ethnographical inquiries like participant-observation (Yin, 1989). A case study could easily include documents analysis, participant-observation and surveys. Similarly, Stake (1994) sees the case study as a choice of what object to be studied, rather than a choice of techniques or methods.

Thus, it is more relevant to talk about the case study in terms of an approach. In this way, the case study could be defined as an approach to the study of the particular – often with a special focus on what is unique and what is common in a particular case, where various research methods and data collection techniques can be used. In a more technical definition of the case study, Yin (1989: p. 23) denotes that a case study is an empirical inquiry that:

- investigates a contemporary phenomenon within its real-life context; when
- the boundaries between phenomenon and context are not clearly evident; and in which
- multiple sources of evidence are used.

The case study approach offers researchers various options and possibilities for research design regarding use of single-case or multiple cases – and what particular case to select. However, a particular research design should always relate to the research questions at hand, and Stake (1994) identifies three general types of case studies that can be applied for different purposes.

In an intrinsic case study, the researcher is interested in that particular case, and the purpose is not to understand a generic phenomenon, but simply to increase the understanding and make sense of the case being studied. Secondly, an instrumental case study is a case that has been specially selected for the refinement of a theory. Finally, a number of different cases can be studied in order to compare and draw general implications from the phenomena studied. This is by Stake called a collective case study.

2.2. Different views of the case study approach in IS research

Galliers (1992b) provides an extensive review of different information system approaches, and presents a taxonomy where the different approaches are classified as either scientific or interpretivist. The scientific approaches, according to Galliers, are grounded in a scientific tradition based on reductionism and refutability. These are two of the basic principles for doing positivistic research (Easterby-Smith, Thorpe & Lowe, 1991). Whereas positivistic epistemology sees scientific knowledge or facts as completely separated from values and interests of the researcher, interpretivist view is based on the possibility of different interpretations and that researchers are not entirely separated form the phenomena studied.

Interestingly, Galliers describes the case study approach as “essentially merely a means of describing the relationships that exist in a particular situation” (Galliers, 1992b: p. 154), and categorizes it as a “scientific approach”. Regarding the question of selecting one specific approach to another, Galliers argues that no approach has universal applicability and that one
particular approach should be selected according to the object of the study and the theories to be extended or tested. Further on, Galliers examines the strengths and weaknesses of the different approaches. The major strengths identified with the case study approach is that it captures "reality" in a greater detail and that it is possible to analyze a greater number of variables compared to other approaches. According to Galliers, difficulty in generalizing and acquiring similar data from different cases as well as the lack of control of different variables are the main weaknesses of the case study approach.

In contrast to this rather positivistic view of case studies, Walsham considers the case study approach as the most appropriate method for conducting interpretivist research in the IS field (Walsham, 1993). He rejects the position that it is impossible – or extremely difficult to generalize up on case studies:

If one adopts a positivistic epistemological stance, then statistical generalizability is the key goal. However, from an interpretive position, the validity of an extrapolation from an individual case or cases depends not on the representativeness of such cases in a statistical sense, but on the plausibility and cogency of the logical reasoning used in describing the results from the cases, and in drawing conclusions from them. (Walsham, 1999: p. 15)

Thus, following this argumentation it is neither more difficult nor “anti-scientific” to draw generalizations based on case studies. However, generalizing based on case studies are different from statistical generalizations. Walsham (1995: p. 79) identifies four different ways on how to make generalizations based on interpretive case studies:

- concepts development;
- theory generation;
- giving specific implications; and
- giving rich insight.

Firstly, it is possible to make generalizations based on the development of concepts. Case studies can provide useful illustrations for developing new concepts. Walsham refer to Zuboff’s (1988) widely recognized concepts of informate and automate, to illustrate how IT not only automates but also informates, i.e. it can give added value in form of new information, and further how this can have implications for different work practices. This way of making generalizations is linked to use of theory, there a theoretical vocabulary can be used in order to generalize and explain certain aspects of a case. A “macro” theory like Giddens’ structuration theory (see Giddens, 1984) and its vocabulary can be used in order to make generalizations from “micro” studies (Walsham, 1998). For example, structuration theory can be used to explain why implementation of an Intranet in hierarchical organizations tend to reinforce existing structures, even though the intention is to flatten the hierarchy and increase information sharing.

Secondly, case studies can be used in the generation of new theory. Orlikowski & Robey (1991) builds a framework for understanding the organizational consequences of implementing IT in organizations based on empirical material form a case study.

Thirdly, according to Walsham (1995), from some cases it is possible to draw generalizations that can be valid in similar domains. For example, consider the case described by Orlikowski (1992a), where the implementation of a Lotus Notes groupware system in a consultant company does not lead to increased sharing of knowledge as assumed. Because of cognitive and structural elements – such as the reward system in the organization, this does not imply that it is profitable for the individual consultants to share their knowledge. It is very likely that this also would be the case in similar consultant firms.
Fourthly, Walsham points at rich insight from some case studies can be good foundations to make generalizations from, and mentions Suchman’s book “Plans and situated actions” as an example. In this book, Suchman (1987) provides rich insight to the limits of machine intelligence and to the design of human-machine communication by distinguishing between the planning model of human action and the view of all human actions as situated actions.

2.3. Common misconceptions of the case study approach

The above discussion on the case study approach in information systems research reveals different views on how to make generalizations based on a case – and whether or not it is possible to make such generalizations at all. The case study as a research approach in information systems and in other fields, seems to be heavily criticized for lack of control, lack of rigor, and problems of generalization (e.g. Galliers, 1992b; Irani et al., 1999; Yin, 1989).

According to Flyvbjerg (1991: p. 137-8), the claim that one can not generalize up on a single case is a delusion, and he presents, what he sees as the five misconceptions that seem to be taken for granted:

1. context independent knowledge is more valuable than concrete and practical knowledge;
2. that it is not possible to generalize upon one single case, and hence, case studies can not contribute to scientific knowledge;
3. that the case study is only useful for generating hypothesis and not for testing them;
4. the researcher’s interests, values, and opinions often bias generalizations based on a case study more than in other approaches; and
5. that case studies in general are difficult to write-up and summarize.

In line with Flyvbjerg (1991), it can be argued this criticism of the case study approach is misdirected, and that these five misconceptions are often – at least implicitly, to be found within information systems research as well. In this paper though, the three first points related to context, generalization, and hypothesis testing will be further discussed.

In disqualifying these propositions about case studies, Flyvbjerg goes on discussing their philosophical foundations and that learning basically is based on specific and context sensitive cases or examples. Subsequently, since case studies deal with real-world situations and concepts, it is clear that case studies are important for researchers’ own learning processes. Flyvbjerg builds on Dreyfus’ five levels of learning and claims that contextless and generic concepts will only get you on the first level of learning. In order to reach the higher levels, you need to build on your own experiences and concrete cases. Experts act on a basis of thousands of different concrete cases – not purely on statistical generalizations. Furthermore, Flyvbjerg underscores that it is likely that predictive theory of human action and societies will never exist. Thus, the first proposition does not hold because context dependent knowledge could be just as valuable as context independent.

Regarding the question of generalization, Flyvbjerg (1991) emphasizes that the case study is well suited for the identification of “black swans” – or what Karl Popper has denoted falsification. Case studies are useful for falsifying existing theories, because case studies pays particularly attention to context and situations that might explain why the outcome of an action is inconsistent or consistent with theory. A critical case can often be identified as a case of
particular interest and with strategic content in relation to the research questions investigated. Similarly, Stake (1994) argue that extreme and atypical cases tend to give more information, and thus the phenomenon studied becomes more visible:

Whereas single or a few cases are poor representation of a population of cases and poor grounds for advancing grand generalization, a single case as negative example can establish limits to grand generalization. (Stake, 1994: p. 245)

Hence, in contrast to a statistical analysis of data based on surveys, which tend to exclude extreme examples in the analysis of the data, those extreme examples should be deliberately searched for when following a case study approach. Such extreme examples could be critical cases where it is possible to gain information on a particular phenomenon that opens up for falsifying or verifying existing theories. Insights based on a critical case could enable the researcher to draw logical conclusions as “if this is true for this case, then this is true for all cases” or “if this is not true for this case, then it is not true for any other case either”. The former can be referred to as “most-likely cases” and the other can be called “least-likely cases”. To be able to use a specific case for falsifying or verifying existing theories depends on how strategic the case is in relation to the given research a question. Selecting a critical case increases the possibility for making generalizations and falsifying or verifying existing theory.

Furthermore, Flyvbjerg adds that critical cases often activate a larger number of actors and fundamental mechanisms in the situation studied. The different aspects of a context or mechanisms from which a particular problem situation originates become increasingly visible and more accessible for the researcher. Thus, the second and the third propositions do not hold and Flyvbjerg even argues that in many cases it is the other way around: case studies are good basis for making generalizations and they are especially well suited.

3. Discussion

3.1. Context and cases

In relation to information systems the context in which these systems are used has been extensively discussed in the literature (e.g. Kling, 1987; Orlikowski, 1992b; Walsham, 1993). Kling (1987) underlines that information systems are not purely technical tools, but rather embedded in larger social systems which relies upon infrastructural resources and social relations. In addition, the history of commitments made in developing and operating the information system is also important. In theorizing the relationships between IT and organization Orlikowski (1992b) notes that similar technologies implemented in different contexts seem to have very different organizational outcomes. Suchman (1987) describes how an expert system lacks access to contextual and social resources that humans normally use in interaction, and thereby fails to support users interaction with a photocopier. What all these studies shows, is that design and implementation information technologies and information systems always implies taking the context where the technology is used into the account.

As discussed above, Flyvbjerg (1991) holds that context dependent and concrete cases and examples could be just as valuable as generic rules or statistical generalization. Clearly, as we can see of the brief examples from the empirical IS literature this is also relevant for information systems research. It seems to be difficult to define a priori and universal “rules” for
how IT effects and are effected by social and organizational issues, and that use of IT has contradictory organizational consequences (see Robey and Boudreu, 1999), which makes it profoundly important to look at context in information systems research. Likewise, Klein & Myers (1999) refer to the "principle of conextualization" and underlines the importance of giving information on social and historical background in which particular events take place when summarizing interpretive research in IS. In this way, a critical case becomes important because it allows the researcher to describe particular events – for example user resistance in IT implementation, within a specific social and organizational context (as done in Markus, 1983). Furthermore, knowledge of specific aspects of the context – e.g. organization structures, political conflicts among stakeholders, history of the organization, and the existing IT infrastructure, can give rich insight on the topic investigated, and thus giving an opportunity to generalize at a higher level.

However, context is profoundly important – it is also highly problematic. Since the case study approach is an empirical inquiry where the researchers is looking at a phenomenon embedded in a "real-life" context, Yin (1989) emphasizes that the boundaries between the context and the actual phenomenon studied are somewhat unclear. This issue of handling boundaries and dynamics between the “foreground” and the “background” can become extremely challenging. It is in the nature of the background of a case that it cannot be controlled and defined a priori – when the background is described and represented, something else becomes the new background (Duranti & Goodwin, 1992). As with natural language, an information system can neither be analyzed as “an encapsulated formal system that could be isolated from the rest of a society’s culture and social organization” (Goodwin and Duranti, 1992). What the relevant aspects of the background, context – or "embedding world" is for the research questions in the case study is something that must be “solved” in each different case by the researcher.

In contrast, inside the traditional “usability laboratory”, the boundary is defined by the walls of the laboratory. However, when moving out of the “laboratory” to study information systems in “real” organizations and in “real” life, this way of isolating parts of the “embedding world” becomes problematic. This is especially a critical issue when moving away from single-user computer applications, and investigating questions and problems related to use of large networked information systems and infrastructures as well as studies of mobile and wearable computers.

There are no simple rules or guidelines for how to limit the context in which the case study is situated, but guidelines may be found in for example Beyer and Holtzblatt (1998). Here the context is described and analyzed in five different models, namely the flow model, the sequence model, the artifact model, the cultural model and the physical model. However, this way of looking at context could be misleading since it is defined a priori what the relevant parts of the context are, and in these models technology seem to be explicitly separated from social and organizational issues.

### 3.2. Generalizations from case studies

Both intrinsic case studies and instrumental case studies could include a critical case. Especially when doing an instrumental case study, where the goal often is to extend existing theory the selection of a critical case can be valuable. By selecting a critical case when doing an instrumental case study it becomes easier to extend the existing theory by "adding" rich insights
from the case study. One example of this in IS research is found in a paper by Macredie and Sandom (1999). Here Orlikowski and Hofman’s improvisational change model is evaluated and extended by drawing from information on a case from a very different organizational context than the original study by Orlikowski and Hofman. The case study can be described as a “most-likely case”, which concludes that IT based improvisational change also happen in hierarchical organizations (and thus in most organizations).

There are many cases in the empirical IS literature which can be defined as being critical. Bowers, Button and Sharrock’s paper (1995) concerning the implementation and use of a workflow system in a print shop is a particularly relevant example of a critical case. This particular print shop was forced to implement a work flow system by an contractual agreement which stated their customers requirements in monitoring and ensuring that the print shop delivered the services the contract required. This case is critical in the following sense. Workflow technologies are often conceived as information systems for increasing coordination and efficiency in work processes, because its ability to pre-define, plan and automate various tasks within a certain flow of work. Because different task in a print shop is repeated over and over again, and information related to the printing process is paper-based it would not be unfair to assume that a workflow system would improve efficiency. However, this was not the case, because a smooth flow of work was accomplished by context specific adjustments by the workers as 1) re-prioritizing the work, 2) “jumping the gun”, 3) “knowing the machines”, and 4) identifying and allocating interruptible work (Bowers et al., 1995). Thus, this case is an example of a “least-likely case”, which falsify existing assumptions that workflow systems like these always improve the flow of work. However, when the workflow system disrupted this smooth flow of the work by imposing standardized ways of ordering, the workers found new ways of ensuring a smooth way of working. In that respect, this case is also critical for explaining how information systems are integrated with work practices in order to preserve a smooth flow of work. This suggests that this kind of work is coordinated by the artifacts and the work practices themselves – and not solely by “external” resources like operating procedures, plans or information systems.

Another critical case is illustrated in Monteiro (1998), which tells the story of how the next generation of the Internet protocol (IP) was established through alignment of different social groups and not only on the technical requirements. This case is critical in several different ways. Even though the complexity of the Internet Protocol (IP) is only modest, and everybody agreed that the current design was not good enough because of the number of unique addresses were running out and the fact that IP lacked quality of service the IP turned out to be considerably difficult to change. The difficulties of modifying the IP protocol illuminates the complex process of aligning different interest groups in order to ensure a successful transition (Monteiro, 1998). This implies that similar large information infrastructures will require the alignment of different interests in order to be established or re-designed. Thus, this can be said to be a “most-likely case” which indicates that the installed base of technologies, skills and practices constrain re-design of large information infrastructures, and that different interest groups must be aligned for making a certain transition possible.

In explaining the “productivity paradox”, which relates to the paradox that IT has not made organizations more productive, King (1996) draws on information from what can be called a critical case. Replacing the steam engine with electric motors took over twenty years because of the need for learning and organizational changes within industries to use new technologies. Thus, it is time-consuming for organizations to learn how to utilize new
technologies and adjust their practices. This is clearly a way of generalizing based on one single example, because it falsifies the existing “common-sense theory” that better technologies unconditionally makes organizations more efficient. In this case, statistical information can only show that the productivity paradox exists – and not why it exists. However, to explain it one has to rely on descriptions from case studies. Similarly, cases can be used for verification of theories by confirming that cases, which have the least probability for being compatible with theory, can be explained by that theory.

4. Conclusion

In this paper we have presented some arguments for using case studies in information systems research, and especially argued for the importance of selecting ‘critical cases’. A brief review of the IS literature shows various views concerning the validity of generalizations from single cases, and some – at least implicitly assumes that generic knowledge and universal rules are more useful than concrete examples and cases. On the contrary, empirical case studies in the IS literature show that such statistical generalizations and “universal rules” are not always useful, because they do not – among other things, explain the contradictory effects of IT in organizations. This is not because the case study approach is an inappropriate approach for scientific research, but due to the fact that information systems are embedded in social and cultural structures or a context through its use. However, this does not exclude quantitative techniques like surveys and statistical analysis from information systems research - but not all phenomena can be understood and explained using such techniques.

However, the critical case is no ‘silver bullet’ or a “final solution” for how to do case study based research. Identifying a critical case a priori – before the researcher has started to investigate the actual case is often difficult – or even impossible. Research projects, and especially case studies, often develop over time becoming something else than first intended. As noted by Stake (1994: p. 237) “a case study is both the process of learning about the case and the product of our learning”. It will always be easier to tell whether the case was critical or not after the study has ended. There is no generic method to apply to find out whether or not a particular case is a critical case in relation to a specific research question. However, one solution to this problem can be to look at similar cases within information systems research or related fields. For example, if you are interested in building a theory for development and diffusion of communication standards, you could build on insights from critical cases like the “standards war” between JVC and Sony and try to find similar cases or cases that seem very different. Grindley (1995) draws from this insight in understanding the profound importance of the standards involved in technology products, and particularly in IT-based products. A standard that builds up a larger installed base with complementary products, becomes more attractive, and eventually reinforces itself. JVC succeeded in the introduction of the VHS standard in competition with Sony’s Betamax not because of superior technology – but rather because JVC managed to build up a larger installed base. A complementary product, in terms of pre-recorded tapes appeared first in VHS, which resulted in rapid decrease in sales of Betamax. In addition, JVS provided other vendors with the specifications of the standard, so other complementary products and more VCRs using the VHS standard were deployed.

We will argue that even though there are no generic rules or grand theories that can explain information systems in organizations and the way IT effects and is effected by social
aspects etc., we do think it is important that IS researchers try to generalize from their findings in case studies – but not in a deterministic way. This can be done by selection of a critical case in order to be able to falsify or verify existing theory. Moreover, like Walsham (1995) has indicated, critical cases in interpretive case studies can give implications for specific domains and rich insights. By selecting a critical case specific contradictions, paradoxes and side-effects becomes increasingly visible in the phenomena studied. In this way a case study can serve as an important approach for generalizing based on rather descriptive research findings. Thus, we do not believe that the case study approach has the generic weaknesses as often anticipated – it depends on how critical the particular case is in relation to the phenomena studied and the ways in which the researcher is able to generalize from his findings.

5. References


