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Critical Appraisal Guidelines for Single Case Study Research

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ABSTRACT

The use of critical appraisal guidelines to assess the validity of research findings has become an established technique in those disciplines, such as healthcare and medicine, that encourage the use of evidence-based practice. Critical appraisal guidelines provide a rigorous set of criteria, often in the form of a checklist, against which a piece of research can be assessed. Although well established criteria exist for many forms of quantitative research, such as clinical trials and cohort studies, qualitative research is less well served. Through a synthesis of existing best practices in interpretative research this paper provides comprehensive guidelines for the conduct of single case study research and extrapolates from them a set of critical appraisal guidelines to assist in the evaluation of such work.

1. INTRODUCTION

The use of critical appraisal guidelines for assessing the relevance and rigour of research findings has become an established technique in those disciplines which encourage the use of evidence-based practice (Crombie, 1996). Partly because the principles of evidence based practice began in the medical field and partly because the nature of the research methods lend themselves to careful measurement, critical appraisal guidelines for surveys, cohort studies, clinical trials and case-control studies are well established (Crombie, 1996). As the application of evidence-based thinking has been considered in areas such as nursing (Blomfield & Harvey, 2000), education (Hammersley, 2000), social work (Trinder, 2000), information systems (Atkins & Louw, 2000) and human resource management (Briner, 2000), the crucial need for a similar measures for qualitative research methods has been recognised. Klein and Myers (1999) for example, comment that as "the interest in interpretative research has increased…researchers, reviewers and editors have raised questions about how interpretive field research should be conducted and how its quality can be assessed"(p.67). Critical appraisal guidelines, specific to a research method, provide an easily accessible and comprehensive checklist of questions that can be used to evaluate the quality of a particular piece of research, undertaken according to that method, and thus an indication of the reliability of the findings.

Through the work of researchers such as Benbasat *et al.* (1987) and Yin (1984) case studies, particularly those designed to be consistent with positivist criteria, are accepted as a legitimate and useful method of IS research (Klein and Myers, 1999). Their purpose is to try to understand, or

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interpret, phenomena in terms of the subjective meanings people bring to them (Denzin, 1994). However, as Walsham (1995) suggests "the most appropriate method for conducting empirical research in the interpretative tradition is the in-depth case study" and as Klein and Myers (1999) point out "positivist criteria…are inappropriate for interpretive research" (p.68). While recognising that cases studies are not necessarily qualitative, (Stake, 1994) the guidelines we present are focused on qualitative studies.

Evidence based practice in other areas has highlighted the importance of providing an agreed protocol for both the conduct and presentation of specific research approaches, particularly as an aid to determining the reliability of the 'evidence' embodied in research findings. Although there is a body of writing describing good practice in case study research, we noted that an agreed set of comprehensive and practical guidelines were not offered and the focus of the work described here was thus to synthesise information from the relevant literature to guide both researchers and reviewers. This paper then draws together related work both from different disciplines (particularly, Greenhalgh, 1997; Miles and Huberman, 1994) and from within Information Systems (IS) on other qualitative methods, (e.g. Walsham, 1995; McKay and Marshall, 2000; Carroll and Swatman, 2000; Klein and Myers, 1999) to construct a set of critical appraisal guidelines to assist in both undertaking and appraising single case study research.

2. CONDUCT OF THE RESEARCH

The research described here was undertaken in five stages. Firstly, relevant literature was consulted and suggestions for ensuring high quality research were extracted. Secondly, a conceptual framework in which the suggestions could be organised was adopted and this was then instantiated with the guidelines taken from the literature and from the experience of the researchers themselves. Guidelines for the appraisal of such research were then extrapolated from these and compared with those of McKay and Marshall (2000). Differences were noted and a final set of critical appraisal guidelines was constructed and later trialled (Wheeler, 2000).

3. THE LITERATURE

A number of authors have provided guidance on the conduct of high quality interpretative research (e.g. Miles and Huberman (1994); Klein and Myers, 1999; McKay and Marshall, 2000) and case studies, in particular (e.g. Yin, 1984; Walsham, 1995; Darke *et al.*, 1998) although some are often either focused on specific problems or on specific aspects. For example, Darke *et al.* (1998) address five specific difficulties: selecting appropriate research, designing, shaping, and scoping a case study research project, obtaining the participation of organisations, collecting case study data from case participants and establishing rigour in writing up case study research. In contrast, Carroll and Swatman (2000) provide a framework to assist in undertaking and assessing the theory building aspects of interpretive IS research. Yin (1984) describes a protocol for case studies, which, as he suggests, "contains the instrument but also contains the procedures and the general rules that should be followed in using the instrument." (p.63) and McKay and Marshall (2000) provide a set of guidelines for the conduct and appraisal of action research. Greenhalgh (1997) has proposed nine questions for evaluating papers that describe qualitative research in general based on her own research and from the research of Denzin and Lincoln (1994), Mays and Pope (1996) and Britten *et al.* (1995). These guidelines which are illustrated at Table 1.

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1	Did the paper describe an important clinical problem addressed via a clearly formulated question?
2	Was a qualitative approach appropriate?
3	How were the setting and the subjects selected?
4	What was the researcher's perspective, and has this been taken into account?
5	What methods did the researcher use for collecting data, and are these described in enough detail?
6	What methods were used to analyse the data , what quality control measures were implemented?
7	Are the results credible, and if so, are they clinically important?
8	What conclusions were drawn, and are they justified by the results?
9	Are the findings of the study transferable to other clinical settings?

Table 1: Nine guidelines for evaluating qualitative papers (Greenhalgh, 1997)

4. A CONCEPTUAL FRAMEWORK

To assist in organising the guidelines, a framework was utilised for classifying the process of case study research. Bronts *et al.* (1995) proposed a framework for investigating IS development methods, which suggested five classification elements that were useful to us: *way of thinking*, *way of working*, *way of controlling*, *way of supporting* and *way of communicating*. The *way of thinking* describes the assumptions and viewpoints of the researcher in the context of the current research and thus makes explicit the philosophical context in which the research is conducted. The *way of working* defines and orders the tasks and sub-tasks that are to be performed in the research exercise, and also provides guidelines and heuristics on how these tasks should be carried out. The *way of controlling* sets out how the research exercise should be managed while the *way of supporting* details how tools can be used to support the research exercise. The *way of communicating* describes the form in which the research is to be presented. The framework thus covers both the research approach which is "a way of going about one's research, embodying a particular style and employing different methods" and the research method which is "a way to systemise observation, describing ways of collecting evidence and indicating the type of tools and techniques to be used during data collection" (Cavaye, 1996, p.227).

5. PRACTICAL GUIDELINES FOR UNDERTAKING CASE STUDY RESEARCH

Table 2 contains the list of guidelines that were developed classified according to the framework described above. The guidelines have emerged through a synthesis of the work of: Carroll and Swatman (2000), Darke *et al.* (1998)*,* Greenhalgh (1997), Klein and Myers (1999), Maxwell (1996), Miles and Huberman (1994), Patton (1990), Richards (1997), Walsham (1995) and Yin (1984).

WAY OF THINKING

1. PROVIDE AN ARGUMENT FOR WHY A CASE STUDY IS APPROPRIATE.

This guideline requires the researcher to provide an explanation of case study research and also a justification for choosing the approach. This should involve defining the strengths and weaknesses of case studies (see Yin 1984; Cavaye 1992) and also indicate whether the approach was successful or not.

2. State philosophical stance and perspective, take any bias into account in the analysis.

It is important that the researcher reflects on her/his philosophical stance and states it clearly when writing up their work. The main reason for this is because it affects every aspect of the research process, from how the evidence is collected to how the results are interpreted. There are a number of papers and research discussing the positivist and interpretivist philosophical traditions (e.g., Hirschheim et al., 1995, Darke *et al.* 1998; Klein and Myers 1999; Travis 1999; Walsham 1995). As it is unreasonable to suggest that research of this type can be conducted in a totally objective manner, it is imperative that the researcher describes in detail the basis for their thinking and reasoning so that the

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results can be interpreted accordingly (Greenhalgh, 1997). This 'principle of suspicion' as described by Klein and Myers (1999) "requires sensitivity to possible 'biases' and systematic "distortions" in the narratives collected from the participants".

Element	Guideline	Authors
Way of thinking	Provide an argument for why a case study is appropriate.	Greenhalgh (1997), Darke *et al,* (1998).
	State philosophical stance and perspective. Take account of bias when performing data analysis.	Walsham (1995); Klein & Myers (1999).
Way of controlling	Define and use some form of quality control measures.	Greenhalgh , Miles & Huberman (1994), Yin (1984).
	Ensure that the results are credible.	Greenhalgh , Moody & Buist (1999), Mays & Pope (1996).
	Determine how to draw conclusions and justify the results through the appropriate use of theory.	Walsham (1995),Carroll & Swatman (2000).
Way of working	Construct a clearly formulated question that describes an important IS issue or problem of interest.	Greenhalgh , Yin , Darke *et al* (1998).
	Create a first cut conceptual framework	Miles & Huberman, Carroll & Swatman
	Devise first cut case study questions.	
	Make explicit the research approach.	Shanks *et al.*(1997)
	Perform a pilot case study	Yin
	Determine criteria for selecting the appropriate case and participants.	Greenhalgh, Patton, (1990) Maxwell (1996).
	Refine the case study questions based on lessons learnt from the pilot study.	
	Revisit the research purpose/question and modify the conceptual framework as necessary.	Greenhalgh, Klein & Myers, Miles & Huberman, Carroll & Swatman.
Way of supporting	Choose appropriate methods for collecting data. Ensure that these are described in enough detail.	Greenhalgh, Walsham
	Employ a systematic way to analyse the data. Ensure that these are described in enough detail	Greenhalgh, Richards (1997), Miles & Huberman.
Way of communicating	Create a plan for the final report.	Yin, Walsham.
	Determine how the case study findings might be transferable to other settings.	Greenhalgh, Miles & Huberman.
	Determine how to present the findings to the academic and practitioner communities.	Darke *et al.*, Miles & Huberman.

Table 2: Guidelines for Undertaking Case Study Research

WAY OF CONTROLLING

3.Define and use some form of quality control measures.

Quality control methods as described by Greenhalgh (1997) are concerned with ensuring that the data has been analysed by more than one researcher "to confirm that they are both assigning the same meaning to them". Triangulation too, is an accepted means of reducing bias by providing multiple instances of evidence from different sources (Miles and Huberman,1994). Indeed, Yin (1984) suggests that evidence for case studies should come from at least six sources such as documentation, archival records, interviews, direct observations, participant-observation and physical artefacts (*ibid*. pp. 78-99).

Other quality control methods, such as the creation and maintenance of a case study 'database', are recommended by Yin (1984) who also highlights the importance of demonstrating a 'chain of evidence' to increase the reliability of information in a case study. This may be achieved by cross-referencing documents during the data collection and data analysis phases, and creating an annotated bibliography of documents (Darke *et al.* 1998).

4. Determine how to draw conclusions and justify results by the appropriate use of theory.

The researcher should determine the type of generalisation relevant to their research goal and research strategy. For example, case studies may be used to develop concepts, or to generate a theory by integrating several concepts, propositions and world-views. However, the type of generalisation is likely to be dictated by the number of cases to be studied. As Darke *et al.* (1998) suggest, "single cases provide for in-depth investigation and rich description. Multiple case-designs allow literal or theoretical replication and cross-case comparison". Walsham (1995) illustrates the roles of theory with examples but warns of the danger of using theory to guide data collection and analysis commenting that, "a researcher should have an analytic framework, but should retain a degree of scepticism concerning its value…a theory is a way of seeing and a way of not-seeing, since the use of a particular theory excludes other ways of viewing the same events" (p. 70).

5. Ensure that the results are credible.

The aim of this guideline is to ensure results obtained from case study research are both credible and practical. Greenhalgh (1997) discusses the issue of assessing credibility in qualitative research, "It often takes little more than plain common sense to determine whether the results are sensible and believable and whether they matter in practice" (p.160). She emphasises that the researcher must cite actual data and ensure that the results are "independently and objectively verifiable" by indexing all quotes and examples so they can be "traced back to an identifiable subject and setting" (*ibid.* p.160). An automated qualitative data analysis tool can provide this.

WAY OF WORKING

6. Construct a clearly formulated question that describes an important IS issue.

The aim of this guideline is to remind the researcher that not only is it important to formulate a precise research question, but to also research issue that has important to the Information Systems community. Darke *et al.* (1998) support this saying, "it is important to ensure that the questions are appropriate in terms of their interest, significance and value for both the research and practitioner information system communities" (p.280). They also suggest that the research question should be one that can be answered in a useful way. Therefore, the research question should state what is to be discovered, whereas hypotheses should provide the initial answer(s) to the question. Miles and Huberman (1994) suggest that many researchers explicitly state their ideas as part of the process of theorising and data analysis. They refer to this as generating propositions rather than hypotheses. In qualitative research, hypotheses are usually developed after the researcher has begun the study, as Maxwell (1996) comments, "hypotheses in qualitative research… are grounded in the data and are developed and tested in interaction with it, rather than being prior ideas that are simply tested against data" (p.53).

7. Create a first cut conceptual framework

A conceptual framework explains, "either graphically or in narrative form, the main things to be studied - the key factors, constructs or variables - and the presumed relationships among them" (Miles and Huberman, 1994, p.18). One of the main motivations for developing a preliminary conceptual framework is to help focus the research and avoid 'information overload'. The initial conceptual framework is revised many times until the point of closure, and in some cases may change significantly. The final conceptual framework should be included in any presentation of the research.

8. Devise first cut case study questions.

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It is important to start devising interview questions early on, as they help to focus the research. The questions may be fairly broad, and may remain so until the pilot case study is completed. Once the participants have been determined, a useful guide is to group questions according to their role and care must be taken to ensure that only relevant questions are asked of each participant. Another technique is to devise questions based on the conceptual framework.

9. Make explicit the research approach

As defined earlier, the research approach is the particular style and methods used for undertaking the research (Cavaye, 1996). The purpose of this guideline is to make sure the approach and techniques for data collection and analysis are described in detail, including the rationale for their selection. For example, Shanks *et al.* (1997) described their approach pictorially (see p.351) and explicitly defined each component.

10. Perform a pilot case study

A pilot case study can be viewed as the 'dress-rehearsal' of the final case study. Performing a pilot case study can be a very useful method to ensure, for example, that interview questions are appropriate and useful for the purpose of extracting the required information.

11. Determine criteria for selecting an appropriate case study and stakeholders

This guideline emerged from the work of Patton (1990), Greenhalgh (1997) and from a particular research experience of determining appropriate criteria for selecting data warehousing projects. The researcher should conduct an intentional selection process to choose specific settings, persons or events (Patton, 1990). Likewise, Greenhalgh (1997) remarks that to gain an in-depth understanding of the participants experience we should, "deliberately seek out individuals or groups who fit the bill" (p.157).

12. Refine the case study questions based on lessons learnt from the pilot study.

The interview questions are refined after the pilot case study and other changes may also be required; for example, a different type of participant may need to be interviewed. This amendment process is the formalisation of the case study questions and logically leads onto the next guideline, 'revisit the research question'. Pilot case studies may also necessitate a change in the order of certain key questions, and the timing of discussion about the setting.

13. Revisit the research purpose/question and modify the conceptual framework as necessary.

Undertaking a pilot case study is a useful technique for refining the research question. Greenhalgh (1997) legitimises modifying the research question as these types of changes show sensitivity to the richness and variability of the subject matter. Elsewhere, Klein and Myers (1999) discuss the importance of dialogical reasoning. This principle "requires sensitivity to possible contradictions between the theoretical preconceptions guiding the research and design and actual findings with subsequent cycles for revision". They also stress that the researcher should make the historical intellectual basis of the research as clear as possible by not only refining the research question but also by explaining the reasons for these changes.

WAY OF SUPPORTING

13. Choose methods for collecting data. Ensure that these are described in sufficient detail.

Walsham (1995) suggests that interviews should be the primary data source for interpretive case studies, "since it is through this method that the researcher can best access the interpretations that the participants have regarding the actions and events which have or are taking place" (p.78). However, Yin (1984) says that at least six sources for collecting data should be accessed, including documentation, archival records, interviews, direct observations, participant-observation and physical artefacts. Useful factual information can be obtained through examining annual reports or by obtaining written answers to structured questions (Darke *et al.* 1998). Internal magazines and organisational

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bulletins may be used to supplement information gained through other sources (*ibid*. p.282). Preparing for data collection is also vitally important when undertaking case study research. Sufficient background information about a case study site should be collected and analysed. Also all names and positions of all potential case participants should be obtained and interview time should only be used to obtain information that cannot be obtained in any other way (Darke *et al.* 1998). A researcher should provide a detailed account of the data analysis methods to allow for some measure of replication. Indeed, describing the chosen data collection methods is also important because, "it may have to be lengthy and discursive since it is telling a unique story without which the results cannot be interpreted" (Greenhalgh 1997, p.159).

14.Employ a systematic way to analyse the data.

Richards (1997) comments that the main reason for using an automated qualitative data analysis tool is to enable access to large quantities of unstructured qualitative data. However, a prerequisite for using such a tool is the need for a 'thinking' researcher who has a sense for what they are trying to do. Such tools are useful for managing and presenting qualitative data but the researcher still requires an understanding of coding methods and codes should "relate to one another in coherent, study-important ways; they should be part of a governing structure" (Miles and Huberman, 1994 p.62). From this it can be deduced that, the coding structure must relate and be based upon the developing conceptual framework and research question. Other useful techniques are content analysis, conversation analysis and discourse analysis (Darke *et al.*, 1998; Miles and Huberman, 1994).

WAY OF COMMUNICATING

15.Create a plan for the final report

Throughout the conduct of the case study the researcher must dedicate some time to focusing on the design of the final report. As Yin (1984, p. 73) points out this is because there is no uniformly acceptable outline for the formatting of case study reports, unlike other research strategies. Of course, there are those principles of good research presentation that are relevant to all approaches: providing a clear description of the aims and objectives of the research, the limitations of the study, the contribution that it is making to research and possibly practice and questions or issues that are raised by the work that could become the basis for further research. However, there are other aspects specific to qualitative research in general and perhaps case study research in particular that need also need to be considered,

Walsham (1995) suggests that details of the chosen research sites, the reasons for this choice, the number of people who were interviewed, what hierarchical or professional positions they occupied, what other data sources were used, and over what period the research was conducted, how the field interviews and other data were recorded, how they were analysed and how the iterative process between field data and theory took place and evolved over time, should all be included.

To increase the reliability of information, it is important to demonstrate a chain of evidence which should also be clear in the structure of the report. A circular linkage between the sections describing the research questions, methodology, data collection and interim analyses (Miles and Huberman, 1994, p.298) which also provides history and context by referring to the research purpose can help to achieve this.

16.Determine how the case study findings might be transferable to other settings.

Greenhalgh (1997) points out that one of the most common criticisms of qualitative research is that the findings are only applicable to the limited setting in which they were obtained. On occasions this is acceptable but in some situations it may be possible to transfer the conclusions of a study to other contexts. Miles and Huberman (1994) provide a list of twelve queries for a researcher to usefully ask when considering external validity and transferability

17.Determine how to present the case findings to the academic and practitioner communities.

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The case study should be reported in a useful and accessible form to academics and practitioners which may require the generation of more than one type of paper depending on the intended audience.

6. CRITICAL APPRAISAL GUIDELINES

The guidelines described above were initially created to support the work described in Sampson and Atkins (2002). However, it was clear that an appraisal checklist could be extrapolated from them, as McKay and Marshall (2000) had done for action research. Consequently, an initial checklist was created and then refined following comparison with McKay and Marshall's (2000) work. A number of the criteria were, unsurprisingly, similar although there were certain aspects specific to the final presentation of the research that we had not explicitly addressed. The final checklist is illustrated at Table 3 and those criteria taken directly from Marshall and McKay are denoted by an asterisk.

Element	Evaluation criteria
Way of thinking	1. Is a credible argument given for why a case study is appropriate? 2. Are the philosophical stance and perspective of the authors stated? 3. Is there evidence that any bias is taken into account when performing data analysis?
Way of controlling	4. Have the criteria for analysis been confirmed by an independent researcher? 5. Have any opportunities for various forms of triangulation been exploited? 6. Is the research process auditable? 7. Has relevant literature been used to support the selection of an appropriate theoretical framework to guide the research? 8. Does the study use appropriate theory to support the findings. 9. Does the study describe how the conclusions were arrived at and how they are justified by the results? 10. Are assertions / conclusions made well grounded in the data?
Way of working	11. Are the criteria used to select the appropriate case and participants clearly described? 12. Does the study provide a clearly formulated question describing an important IS issue? 13. Are the approaches and techniques for data collection and analysis described in detail? 14. Is the conceptual framework for the research explicitly described?
Way of supporting	15. Does the study describe an orderly process for the collection of data? 16. Does the study describe and employ a systematic way to analyse the data? 17. Is the history and context of the research clearly described?
Way of communicating	18. Are the aims and objectives of the study clearly stated? 19. Are limitations to the study acknowledged and described? 20. Does the study suggest if and how the findings might be transferable to other settings? 21. Is sufficient detail given to allow readers to evaluate the potential transferability of the research to other contexts? 22. Does the report identify questions or issues for future research? 23. Is the presentation of the research appropriate to the intended audience? 24. *Could this research potentially make a contribution to the work of IS practitioners? 25. *Does the research provide new insights into some aspect of IS work? 26. *Is the research presented in such a way that there is evidence of logical rigour throughout the study? 27. *Does the study place the findings in the context of IS practice? 28. *Does the study place the findings in the context of IS research? 29. *Is the research process open to scrutiny?

Table 3 Critical Appraisal Guidelines for Single Case Studies

This checklist was subsequently used to assist in establishing the credibility of over a hundred published single case studies in both academic and research journals as part of a pilot study to trial the use of a 'systematic review of evidence' methodology for Information Systems research (Wheeler 2000). The results of this trial will be the subject of a future paper.

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7. SUMMARY

This paper has presented a comprehensive set of critical appraisal guidelines for assessing single case study research. The set of guidelines was developed by identifying 'best practices' in interpretative case study research and combining them with work that had already been completed by McKay and Marshall (2000). The guidelines are intended to assist readers of case study papers and also to assist other researchers undertaking similar research. The guidelines were constructed specifically for in-depth single case studies but it is clear, as common sense would suggest, from comparing this work with that of McKay and Marshall (2000) that the construction of a generic list appropriate for all types of interpretative research would be both possible and useful. Such a list might also provide a useful template for the reporting of interpretative research as has become common for other forms of research in the medical literature. Finally, if interpretative methods are to continue to gain credibility in IS research it is essential that we, as a community, have recognised means of evaluating the reliability of the evidence that it produces. The existence of an agreed set of critical appraisal guidelines for such evaluation is an important first step towards this goal.

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