Successfully completing case study research: combining rigour, relevance and pragmatism

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Abstract. *The organizational and social issues associated with the development, implementation and use of computer-based information systems have increasingly attracted the attention of information systems researchers. Interest in qualitative research methods such as action research, case study research and ethnography, which focus on understanding social phenomena in their natural setting, has consequently grown. Case study research is the most widely used qualitative research method in information systems research, and is well suited to understanding the interactions between information technology-related innovations and organizational contexts. Although case study research is useful as a means of studying information systems development and use in the field, there can be practical difficulties associated with attempting to undertake case studies as a rigorous and effective method of research. This paper addresses a number of these difficulties and offers some practical guidelines for successfully completing case study research. The paper focuses on the pragmatics of conducting case study research, and draws from the discussion at a panel session conducted by the authors at the 8th Australasian Conference on Information Systems, September 1997 (ACIS 97), from the authors' practical experiences, and from the case study research literature.*

Keywords: Case study research, research methods.

INTRODUCTION

There has been increasing interest within the information systems research community in organizational and social issues associated with the development and implementation of computer-based information systems (Benbasat *et al.*, 1987). This has resulted in awareness of the need to use qualitative research methods such as action research, case study research and ethnography which focus on understanding social phenomena in their natural setting and cultural context (Myers, 1998). The case study research method is the most widely used

qualitative research method in information systems research (Orlikowski & Baroudi, 1991; Myers, 1998), and is well suited to understanding the interactions between information technology (IT)-related innovations and organizational contexts. Much of the discussion of case study research within information systems has centred on the different philosophical perspectives which may be adopted (in particular, the positivist and the interpretive approaches) and their particular implications for data collection and analysis methods and for research outcomes (Cavaye, 1996; Doolin, 1996).

Although case study research is useful as a means of studying information systems development, implementation and usage in the field, there can be practical difficulties associated with attempting to undertake case studies as a rigorous and effective method of research. Designing and scoping a case study research project in order to ensure that the research question (or questions) can be appropriately and adequately answered can be difficult, and data collection for case study research can be time-consuming and tedious, and often results in the accumulation of large amounts of data (Yin, 1994, p. 10; Cavaye, 1996). The availability of suitable case study sites may be restricted, as business and other organizations are not always willing to participate in case study research. The reporting of case study research can also be difficult: the rigour of the process used to arrive at the results and the validity of the findings and the conclusions reached need to be established. Case study research has often been considered to be lacking in rigour (Yin, 1994, p. 9).

There has been relatively little discussion within the information systems research literature of the practical difficulties of undertaking and reporting case study research. This paper addresses a number of these difficulties and offers some practical guidelines for successfully completing case study research which may assist those who are contemplating the use of case study research. The initial motivation for the paper was provided by a panel session entitled 'Successfully completing case study research: practical experiences of combining rigour, relevance and pragmatism' which was organized by the authors and held at the 8th Australasian Conference on Information Systems, Adelaide, Australia, in September 1997 (ACIS 97). The panel session was intended as a forum for sharing and discussing practical experiences of completing and publishing case study research within the field of information systems. The number of attendees at the session and the lively discussion clearly indicated that there is much interest within the Australasian information systems research community in undertaking case study research. This paper is based on the discussion at the panel session. It focuses on the pragmatics of conducting case study research and draws from the discussion at the panel session, from the authors' practical experiences, and from the case study research literature within information systems in particular.

The paper first discusses the nature of case study research and its use in information systems research. Both the positivist and the interpretivist approaches to case study research are described. The third section of the paper presents a discussion of five significant practical difficulties associated with the conduct of case study research (these were the focus of the panel session held at ACIS 97) and proposes some ways of addressing them. Several recently published information systems case studies are used as examples of how some of these difficulties have been resolved. The paper concludes with a summary of the requirements for

successfully completing useful case study research which emerged from the discussion at the panel session.

CASE STUDY RESEARCH IN INFORMATION SYSTEMS

A case study is 'an empirical enquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident' and it 'relies on multiple sources of evidence' (Yin, 1994, p. 13). Case study research investigates predefined phenomena but does not involve explicit control or manipulation of variables: the focus is on in-depth understanding of a phenomenon and its context (Cavaye, 1996). Case studies typically combine data collection techniques such as interviews, observation, questionnaires, and document and text analysis. Both qualitative data collection and analysis methods (which are concerned with words and meanings) and quantitative methods (concerned with numbers and measurement) may be used (Yin, 1994, p. 14). Although similar to field studies, which also examine phenomena in their natural context, case studies differ in that the case researcher has less prior knowledge of constructs and variables (Benbasat *et al.*, 1987; Cavaye, 1996). However, the difference between the two research methods is a matter of degree and is sometimes difficult to discern, as case study researchers may have clear a priori definitions of variables to be studied and the ways in which they can be measured (Benbasat *et al.*, 1987; Yin, 1994, p. 34). Case study research also needs to be distinguished from the use of case studies as teaching devices, where the purpose is to illustrate particular situations and provide a framework for discussion amongst students (Yin, 1994, p. 10). Teaching cases do not necessarily include a complete or accurate description of actual events, as case study details and materials may be changed in order to better illustrate a specific point. The criteria for developing high-quality teaching cases are very different from those for producing high-quality case study research (Yin, 1994, p. 2).

Case study research can be used to achieve various research aims: to provide descriptions of phenomena, develop theory, and test theory. Case study research has often been associated with description and with theory development, where it is used to provide evidence for hypothesis generation and for exploration of areas where existing knowledge is limited (Cavaye, 1996). Approaches such as grounded theory (Glaser & Strauss, 1967), in which theoretical concepts and propositions emerge as the researcher gathers data and investigates phenomena, may be used to develop theory. Eisenhardt (1989) proposes a 'roadmap' for theory development from case study research which synthesizes grounded theory building and techniques from more structured approaches to qualitative data collection and analysis, such as a priori construct specification, theoretical sampling, and triangulation of data sources.

The use of case study research to test theory requires the specification of theoretical propositions derived from an existing theory. The results of case study data collection and analysis are used to compare the case study findings with the expected outcomes predicted by the propositions (Cavaye, 1996). The theory is either validated or else found to be inadequate in some way, and may then be further refined on the basis of the case study findings. Case study

research has been proposed as a valid means of testing theory within information systems research (Benbasat *et al*., 1987; Lee, 1989a). Case study research can also be combined with other research methods in studies where there is more than one research aim. Gable (1994) suggests the use of case study research to first define constructs and develop theory which can subsequently be tested using survey research methods.

Case study research has been used within both the positivist and the interpretivist philosophical traditions (Cavaye, 1996; Doolin, 1996). The positivist perspective is founded on an ontology in which an objective physical and social world exists independently of humans' knowledge of it. There are pre-existing regularities that can be discovered, investigated and characterized relatively unproblematically using constructs devised by the researcher (Orlikowski & Baroudi, 1991). Positivist research is concerned with the empirical testability of theories in order to discover the general principles or laws which govern the natural and social world (Orlikowski & Baroudi, 1991). Inquiry is assumed to be value free, so that the researcher remains detached, neutral and objective. Case study research within this perspective is designed and evaluated according to the criteria of the natural science model of research: controlled observations, controlled deductions, replicability and generalizability (Lee, 1989a). Although manipulation of variables in the experimental sense is not possible in case study research, theoretical constructs can be defined and empirically evaluated and measured, and naturally occurring controls can be identified (Lee, 1989a; Cavaye, 1996). Literal and theoretical replication provide for generalizability of case study research findings (Lee, 1989a; Yin, 1994, pp. 46–51).

An example of positivist case study research is the large study of 26 multi-business unit organizations reported by Broadbent *et al*. (1996) which examined the relationship between the theoretical constructs IT infrastructure capability and strategic context. IT infrastructure capability was defined and measured in terms of the number of services provided and their reach and range, and strategic context included industry bases, market volatility levels, the extent of business unit synergies, and the nature of business strategy formation processes. These constructs were examined and empirically evaluated in the 26 organizations using extensive quantitative and qualitative data sources, involving many business and IT partici-pants. Regularities between the constructs were identified by investigating and comparing the organizations' patterns of IT infrastructure capability as defined in the study and the nature of their strategic contexts as characterized in the study. The findings of the study indicated a positive relationship between IT infrastructure capability and particular strategic contexts. More extensive capability was found in organizations where products changed rapidly, attempts were made to identify and capture synergies across business units, greater integration of business information and IT needs occurred during planning processes, and tracking of the implementation of long-term strategy was emphasized.

The interpretivist approach is based on an ontology in which reality is subjective, a social product constructed and interpreted by humans as social actors according to their beliefs and value systems. Interpretivist research attempts to 'understand phenomena through accessing the meanings that participants assign to them' (Orlikowski & Baroudi, 1991, p. 5) and focuses on their cultural and historical context. Interpretivist research rejects the notion of value-free research and is not concerned with the repeatability of an explanation. The interpretivist

researcher attempts to gain a deep understanding of the phenomena being investigated, and acknowledges their own subjectivity as part of this process. The value of an explanation is judged in terms of the extent to which it allows others to understand the phenomena and makes sense to those being studied (Walsham, 1995). A useful discussion of key issues concerning the nature, conduct and reporting of interpretive case studies within information systems research is provided by Walsham (1995).

An example of interpretivist case study research is Myers's (1995) study of information systems implementation in three New Zealand organizations. Myers uses dialectical herme-neutics as a theoretical framework for investigating implementation in terms of how computers are used and what computers mean to people. Dialectical hermeneutics emphasizes 'both the subjective meanings for individual actors and the social structures which condition and enable such meanings and are constituted by them', and 'the researcher seeks to evaluate critically the totality of understandings in a given situation' (Myers, 1995, p. 57). The social and political action associated with information systems implementation is seen as text analogue: the interviews, documents, records and case study notes are ordered, explained and interpreted by the researcher who attempts to make sense of the whole by moving between description and understanding of the parts and of the whole. As more information is gathered, the researcher's understanding of the situation or organization as a whole and of its constituent parts increases. The hermeneutic process continues until 'the apparent absurdities, contradictions and oppositions in the organization no longer appear strange, but make sense' (Myers, 1995, p. 58). Myers examines information systems implementation in the three cases using dialectical her-meneutics to interpret the meaning of the new systems for various stakeholders in each organization. Implementation success or failure in a given situation is seen to be a matter of interpretation, not a unitary phenomenon. Interpretations may change over time. Myers's interpretive analysis of the three cases exposes the dynamics of the meanings of imple-mentation success and failure over time, and the complex and intertwined social and political interactions involved.

An overview of recent information systems case study research within both the positivist and the interpretivist traditions, including examples of published case studies drawn from each, can be found in Doolin (1996). Lee (1989b, 1991) argues that both approaches can be usefully combined and uses previously published case studies to illustrate his discussion.

Case study research may adopt single-case or multiple-case designs. A single case study is appropriate where it represents a critical case (it meets all the necessary conditions for testing a theory), where it is an extreme or unique case, or where it is a revelatory case (Yin, 1994, pp. 38–40). Single cases allow researchers to investigate phenomena in depth to provide rich description and understanding (Walsham, 1995). Examples of single-case studies within information systems research are those of Markus (1983) and Myers (1994). Multiple-case designs allow cross-case analysis and comparison, and the investigation of a particular phenomenon in diverse settings. Multiple cases may also be selected to predict similar results (literal replication) or to produce contrasting results for predictable reasons (theoretical replication) (Yin, 1994, p. 46). Examples of multiple-case studies within information systems research include those of Broadbent & Weill (1993) and Cavaye & Cragg (1995).

From a positivist perspective, a single case represents a single set of empirical circumstances, as does a single experiment, and the findings of a single case are generalizable to other empirical settings when additional cases test and confirm those findings in other settings (Lee, 1989a). Thus multiple-case studies can strengthen research findings in the way that multiple experiments strengthen experimental research findings (Benbasat *et al.*, 1987; Yin, 1994, p. 31). However, statistical generalization to a population is not the goal of case study research, as cases are not sampling units. Rather, theoretical or analytical generalization is appropriate, where case study results are used to develop theory or to test previously developed theory (Yin, 1994, pp. 30–32; Cavaye, 1996). In discussing generalizability from the perspective of interpretive case study research, Walsham (1995) identifies four possible types of generalizations: development of concepts, generation of theory, drawing of specific implications, and contribution of rich insight. These allow 'explanations of particular phenomena derived from empirical interpretive research' which may be valuable in other settings and organizations as interpretations of phenomena but which are not wholly predictive for future situations (Walsham, 1995, p. 79). Walsham describes four published interpretive case studies to illustrate the four types of generalizations.

Case study research is particularly appropriate for the study of information systems development, implementation and use within organizations (Benbasat *et al.*, 1987; Myers, 1998). It can be used in various ways from within different research perspectives using a variety of data collection and analysis methods, and producing diverse types of research outcomes (Cavaye, 1996). However, there are disadvantages associated with the use of the case study research method regardless of the philosophical perspective adopted or the particular way in which the case study strategy is employed. The data collection and data analysis processes in case study research are both subject to the influence of the researcher's characteristics and background, and rely heavily on the researcher's interpretation of events, documents and interview material (Galliers, 1992). This may limit the validity of the research findings, although, as Yin (1994, p. 10) notes, bias may enter into the design and conduct of other types of research. Case studies typically make use of qualitative data, often in combination with quantitative data. Data analysis can be difficult as qualitative data analysis methods are not as well established as quantitative methods, and the volume and variety of data collected may make analysis time-consuming (Miles & Huberman, 1984; Cavaye, 1996). These and other practical difficulties may make case study research appear to be a less desirable research strategy than experimental or survey research methods. Some of these difficulties are discussed in the next section of this paper.

THE PRAGMATICS OF CONDUCTING CASE STUDY RESEARCH: FIVE FREQUENTLY ASKED QUESTIONS

The five questions below are used to structure the discussion of how to successfully complete case study research. (These five questions were the focus of discussion at the panel session on successfully completing case study research which was conducted by the authors at ACIS 97.)

From our experience, these are the questions most often asked by those contemplating the use of case study research. The five questions are:

1 What kinds of research can be addressed using the case study research approach?
2 How can a case study research project be designed, shaped and scoped in order to adequately answer a research question?
3 How can the participation of organizations in case study research be obtained?
4 How can case study data be collected from case participants in efficient and effective ways?
5 How can rigour be established in writing up case study research so that it is publishable in academic journals?

The questions focus on the difficulties associated with undertaking case study research that is relevant and appropriately addressed using the case research strategy, with demonstrating rigour in the reporting and analysis of the results of case study research, and with improving the efficiency of data collection processes. Each of these questions is discussed in the remainder of this section, drawing on both the discussion at the panel session and the case study research literature.

Selecting appropriate research areas for using the case study research approach

Case study research is an appropriate research strategy where a contemporary phenomenon is to be studied in its natural context (Benbasat *et al*., 1987; Yin, 1994, p. 13) and 'the focus is on understanding the dynamics present in single settings' (Eisenhardt, 1989, p. 534). Case study research is considered to be particularly useful where 'research and theory are at their early, formative stages' (Benbasat *et al*., 1987, p. 369). Within information systems there are many research areas where examination and understanding of context is important. These include areas where there is little understanding of how and why processes or phenomena occur, or where the experiences of individuals and the contexts of actions are critical. For example, Markus (1983) examined why the implementation of a management information system was successful only when the organization restructured itself. Myers (1994) used critical herme- neutics to interpret case study data and showed how the perspectives of the stakeholders changed during the implementation of the system. Darke & Shanks (1997) used three case studies of systems development projects to examine how and why requirements acquisition techniques were selected and used. Using a single in-depth case study, Shanks (1997) showed that the strategic data planning process is a complex social activity in which an understanding of its organizational context is critical to its success.

There are also research areas within information systems where theory and understanding are not well developed. These include areas where a phenomenon is dynamic and not yet mature or settled, such as business strategy concerned with use of the Internet, or where terminology and a common language and set of definitions are not yet clear or widely accepted. For example, Broadbent *et al*. (1996) report a study of 26 organizations in which multiple cases are used to develop the concept of IT infrastructure capability in the evolving area of IT infrastructure. Cavaye & Cragg (1995) examined the emerging area of interorganizational

systems to identify factors contributing to successful development and implementation using a multiple-case study of nine interorganizational systems.

Although the case study research method is considered particularly useful for information systems research, there are situations where it may not be appropriate. These include areas which may be described as the converse of any of the four types of research areas identified above, i.e. where a phenomenon is well understood and mature, where constructs exist already and are well developed, where understanding of how and why the particular phenomenon occurs is not of interest, and where understanding of the contexts of action and the experiences of individuals in single settings is not relevant. For example, in order to investigate the current state of executive information systems (EIS) in large Australian organizations, Pervan & Phua (1997) conducted a survey of large Australian organizations using a questionnaire which focused on EIS development strategies, the current status of EIS in the organizations, and EIS-related issues and impacts within the organizations. In this case, the phenomenon (EIS) was relatively mature and well understood, specific contexts of action and individual settings were not of interest, and the objective of the study was to obtain quantitative data giving a comprehensive picture of the phenomenon at a specific point in time. Case study research would not be an appropriate method of addressing this research issue.

Designing, shaping and scoping a case study research project in order to adequately answer a research question

Information systems is an applied discipline, so that its research should have an applied orientation directed at improving practice (Keen, 1987). In identifying one or more research questions to be addressed using the case study approach, 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 systems communities. The research questions must also be questions that are actually able to be answered in a useful way.

The design and scoping of a case study research project requires a comprehensive literature analysis to be undertaken in order to understand the existing body of research literature within the research area and to position the research question(s) within the context of that literature. This provides a basis for careful design of the research project structure and scope so that an appropriate unit of analysis and number of cases can be determined. The unit of analysis identifies what constitutes a 'case', and a complete collection of data for one study of the unit of analysis forms a single case. The unit of analysis may be an individual, a group, an organization, or it may be an event or some other phenomenon. It is related to the way the major research question is initially defined and is likely to be at the level being addressed by the question (Yin, 1994, pp. 21–24). The unit of analysis must also provide for sufficient breadth and depth of data to be collected to allow the research question to be adequately answered. For example, Shanks (1997) examined why strategic data planning is such a difficult undertaking in practice. He selected a single case to enable a detailed study of the strategic data planning process. He adopted a process orientation focusing on the interactions over time between the individuals involved and the organizational context of their actions. The unit of analysis was the data

administration group within the organization and its interaction with information systems project teams. The major research question informed the selection of the level and scope of the unit of analysis, suggesting 'where one goes to get answers, with whom one talks, what one observes' (Miles & Huberman, 1984, p. 43).

The number of cases to be studied depends on the focus of the research question. As discussed earlier, single cases provide for in-depth investigation and rich description. Multiple-case designs allow literal or theoretical replication and cross-case comparison. There is no ideal number of cases. Yin (1994, p. 50) suggests that more replications give greater certainty, but that in some situations, for example where rival theories that are very different are being tested, fewer replications may be necessary. Eisenhardt (1989) suggests that between four and ten cases are desirable for theory building using case study research. Both single- and multiple-case designs can be adopted for exploratory research. Where explanatory research is undertaken, a single case may provide the basis for developing explanations of why a phenomenon occurs, and these may then be further investigated by applying them to additional cases in other settings.

There are other practical issues that impact upon the design and scope of a case study research project. These include the purpose for which the research is undertaken, the resources available to the researcher, and the deliverables required. Where a case study research project is undertaken by a student researcher in order to meet the requirements of doctoral or masters research or an honours research project, the resources and funding available are limited and a particular deliverable must be produced, i.e. a dissertation. In other situations, the number of researchers involved in the project, the funding available and its sources, and the expectations of funding bodies and other stakeholders will affect the scope of the questions to be addressed, the depth and extent of data collection activities, and the nature of the deliverables to be produced. Where funding and sponsorship is provided by business or other organizations it is important to differentiate between a case study research project, which should also have a wider interest for relevant research and practitioner communities, and a consulting exercise, which is tailored to the sponsoring organizations' specific interests and is undertaken solely to provide results for those organizations. In a case study research project there may be potential conflicts between the needs and interests of sponsoring organizations and the requirements of the research objectives. Researchers must exercise judgement to ensure that an appropriate balance between these is maintained.

Obtaining the participation of organizations in case study research

Research questions need to be interesting and important to the potential participant organizations to gain their support. If the research area is particularly relevant to an organization and the specific research question is one which the organization needs or wishes to address, then it is more likely that they will provide access to their people and resources. Organizations need to be very clear about the research outcomes and how their organization will benefit from involvement. The researcher needs to work with the organization to identify 'what's in it for them'. The benefits may include, for example, an overview of the organization's position in

relation to the research question, or a rich description and understanding of the nature of the phenomenon within the organization, or, within the limits of confidentiality requirements, insights gained from studies of other participating organizations. Organizations may also be encouraged to participate if it is clear to them that the research results will be pertinent to their decisions and will be available to them within a useful timeframe. Researchers need to be explicit about what type of business and IT decisions will be better informed by the research. Before commencing fieldwork at a case study site, it is essential to reach an agreement with the participating organization concerning the confidentiality requirements relating to the case study data and findings, and any limitations on the disclosure of the identities of the case study participants and the organization. Agreement also needs to be reached on publishing rights, as some organizations may wish to place restrictions on the publication of research in which they have participated.

Participant organizations need to know that adequate preparation for the study at that site has been carried out. A brief covering letter describing the nature and context of the research project and its objectives should be sent to all potential case participants. It should include attachments outlining the research timeframe, the proposed nature of the case participants' involvement in the project, and the expected research outcomes. These outcomes must be stated in terms of their value to the participant organization — this is often different from their value for the researcher.

An example of a large case study research project in which the participation of 26 organizations in five countries was obtained is the study reported in Broadbent & Butler (1997). This study focused on the links between the various types of strategic business orientations of international business organizations and their patterns of IT infrastructure capabilities and management. The sites approached saw this issue as important for their overall business operations. The benefits of participation in the research for the organizations were that each received a brief assessment of aspects of their IT infrastructure capabilities in relation to their international strategic business orientation and a summary of insights gained from the studies of the other participating organizations. A practitioner-oriented paper presenting the results of the study was sent to participating organizations within 8 months of site visits, and an academic paper describing the research and its outcomes was sent to participating organizations within 12 months of site visits.

Collecting case study data from case participants effectively and efficiently

Effective and efficient data collection for case study research requires careful planning and judicious use of both the case participants' and the researcher's time. Collecting case study data from case participants can be difficult and time-consuming (Cavaye, 1996). Researchers should prepare themselves with sufficient background information about a case study site prior to commencing data collection. Public relations departments of organizations are often useful sources of information about functional areas, reporting structures, and people's roles within organizations. The names and positions of all potential case participants should be obtained before they are contacted for participation in interviews and other data collection activities, and

interview time should be used only to obtain information that cannot be obtained in any other way. Factual and other straightforward information can be collected from other sources, for example annual reports, or by obtaining written answers to structured questions sent to case participants prior to interview sessions. Useful sources of information often overlooked are the internal magazines and other organizational bulletins which are circulated within larger organizations in particular. These can supplement information obtained from other sources and often reflect the culture within an organization and the issues which are currently of interest or concern to both management and employees.

A well-organized and categorized set of case data will facilitate the task of analysing the case study evidence in order to address the research questions which are the focus of the study. Case study data must be documented and organized as it is collected. A case study database should be planned before data collection commences and maintained throughout the process (Yin, 1994, pp. 94–98). The case study database will include the case data or evidence, such as documents, video or audio tapes of interviews, survey or other quantitative data, and the field notes and other observations of the researcher during data collection activities. A formal and presentable database can in principle be reviewed by other researchers, increasing the reliability of the study, and it could also be the subject of independent, secondary analysis in other separate studies (Yin, 1994, p. 95).

The case study database needs to be organized in a way that will ensure ready access to the case data at any point during or after the study. Methods of classifying case data and materials and mechanisms for accessing and retrieving them need to be considered. Computerized tools may be used to assist in indexing and storage of case study materials. Yin (1994, pp. 96–98) suggests four general categories of case materials as the basis for the case study database: case study field notes, case study documents, tabular materials such as surveys and quantitative data, and 'narratives' or notes compiled by the researcher during data collection which integrate or interpret some or all of the evidence collected to date. The materials can be classified according to the major areas within the study. An annotated bibliography of documents is also useful, and appropriate cross-referencing of documents and other case materials during data collection will assist in maintaining a chain of evidence to support the derivation of case study conclusions from the data collected.

Interviews are essential sources of information for case study research (Yin, 1994, p. 84), and are arguably the primary data source where interpretive case study research is undertaken as it is through interviews that researchers can best access case participants' views and interpretations of actions and events (Walsham, 1995). Tape-recording of interviews is often suggested as a means of providing a complete description of the interviewees' responses and comments. Tape-recording can inhibit the interviewee, though, and reliance on tape-recordings can prevent the researcher from listening carefully and participating fully in the interview process. If the researcher is able to take rough but extensive notes during an interview and write them up in full within 24 hours of the interview, tape-recording should not be necessary (Walsham, 1995). However, if the research is being undertaken as part of a higher education thesis process, full transcripts of interviews should be obtained. The open-ended interview should be an interesting conversation in which the researcher's interest in the topic of the

interview and in the interviewee's views and experiences is combined with the opportunity for the case participant to reflect on events and actions and provide his or her insights into these occurrences. The ideal situation is to have a team of two interviewers, where one focuses on the interviewee and the conversation and the other takes notes and prompts where necessary.

Efficient and effective data collection in the field requires planning for dealing with the difficulties of gathering data in a real-life environment not controlled by the researcher (Yin, 1994, pp. 66–69). Adequate resources, time and facilities should be provided for handling accumulated documents and other materials, for perusing and copying documents, and for making and reviewing field notes when necessary. Unanticipated changes to case participants' schedules and availability must be accommodated within the overall data collection schedule. To ensure effective and timely communication with case participants, it is advisable to use fax, electronic mail and courier services, and to avoid reliance on postal services.

Establishing rigour in writing up case study research so that it is publishable in academic journals

Regardless of the researcher's philosophical perspective or choice of research methods, in order to establish credibility to the reader the researcher must describe in detail how the research results were arrived at, and to establish validity in the view of the reader the researcher must present a coherent, persuasively argued point of view (Walsham, 1995). Sufficient evidence for the research results must be provided and alternative interpretations must be carefully considered and clear reasons given for their rejection, so that the rigour and reliability of the research are established. One of the practical difficulties of analysis of case study evidence is dealing with the amount and variety of data collected, especially as strategies and techniques for analysis of case data are generally not well defined (Yin, 1994, p. 102). It is important, however, for the case researcher to develop a general data analysis strategy as part of the case study design (Yin, 1994, Chapter 5). This will indicate what to analyse and why, and will help to ensure that data collection activities are appropriate and support the ways in which the evidence is to be analysed. It will also help the researcher select from the various data analysis techniques that are available.

Within the positivist research approach, some useful techniques for categorizing, tabulating and displaying qualitative data have been described. Data analysis focuses on discovering regularities or patterns within the case study data. Detailed case study descriptions and write-ups of the case data form the basis for this process. Both Glaser & Strauss (1967) in their inductive, grounded theory approach to qualitative data analysis and Miles & Huberman (1984), who adopt a more deductive approach, have provided extensive descriptions of systematic procedures for analysis of qualitative data. The grounded theory approach involves coding: the assignment of themes and concepts to a selected unit such as sentences taken from an interview transcript. The concepts are combined into related categories, links between categories are identified and verified against the data, and finally selective coding attempts to integrate the categories into a theory which accounts for the phenomenon being investigated. In her study of the experiences of two organizations in adopting and using CASE tools, Orlikowski

(1993) describes her use of grounded theory to develop a theoretical framework for conceptualizing the issues surrounding the adoption and use of these tools.

Miles & Huberman (1984, pp. 21–23) describe data analysis as consisting of three concurrent activities. Data reduction refers to the process of selecting, simplifying, abstracting and transforming the raw case data. Data display refers to the organized assembly of information to enable the drawing of conclusions. Data displays include narratives, matrices, graphs, tables and various charts. Conclusion drawing/verification involves drawing meaning from data and building a logical chain of evidence. Various types of matrices, clustering diagrams and causal networks are used. Several techniques are similar to those of grounded theory; these include coding of data segments into categories identified from the study's initial conceptual framework or hypotheses, subsequent pattern coding to identify patterns or repeatable regularities in the data, and memoing (making notes) as a step towards producing a conceptually coherent explanation of the phenomenon being studied. Like a number of other authors, Miles & Huberman (1984) argue that data collection and data analysis should overlap to allow for flexibility in data collection procedures and so that the researcher remains open to new ideas or patterns which may emerge. Myers (1998) suggests that this is problematic, however, as the data and the analysis can affect each other in significant ways.

The interpretive researcher is presenting 'their interpretation of other people's interpretations' Walsham (1995, p. 78). The goal of analysis in interpretive studies in information systems is to produce an understanding of the contexts of information systems and the interactions between these systems and their contexts. The strength of analysis in interpretive studies derives from the strength of the explanation of the phenomena based on the interpretation of data. Myers (1998) discusses some modes of analysis associated with interpretive research. Hermeneutics suggests a way of understanding the meaning of text data or text analogues. Interpretation aims to make sense of the object of study by iterating between understanding of the object as a whole and understanding of its parts. Myers (1994) used hermeneutics in his study of the implementation of the New Zealand Education Department's payroll system. Narrative, a tale or recital of facts, and metaphor, a way of understanding or experiencing one thing in terms of another, have more recently been used as devices for describing and explaining the behaviour of systems developers and users during the systems development process. Hirschheim & Newman (1991, p. 29) argue that such devices 'offer considerable scope in interpreting the social actions that are embodied within ISD (information systems development)'.

Semiotics, which is concerned with the meaning of signs and symbols in language in particular, is also a source of techniques that have been used for analysis of qualitative data (Myers, 1998). These techniques are based on assigning conceptual categories to words (or signs) which represent aspects of the particular theory being investigated. The importance of a concept is related to the frequency with which it occurs. For example, content analysis involves searching for structures and patterns in text as a basis for making inferences. Conversation analysis and discourse analysis are related techniques which take into account the context in which interaction represented as signs takes place.

The issue of biases introduced by the researcher during the collection and analysis of case data also needs to be considered. Two types of bias may be recognized: the effects of the

researcher on events and the behaviour of participants at the case study site, and the researcher's own beliefs, values and prior assumptions which may prevent adequate investigation and consideration of possible contradictory data and unduly influence the analysis of the case study evidence. Biases arising from researcher effects at the site are in one sense unavoidable: the researcher is influencing what is happening just by the sharing of concepts and interpretations with personnel at the site (Walsham, 1995). The interpretive researcher acknowledges that they are implicated in the phenomena being studied, either weakly by attempting to understand, describe and interpret the situation from the participants' perspectives, or more strongly by creating and enacting the reality being studied through the constructs they use to view the world (Orlikowski & Baroudi, 1991). For the positivist researcher wishing to adopt the role of a neutral observer, some ways of minimizing biases arising from researcher effects at the site have been suggested: for example, stay as long at the site as possible, spend time at the site just 'hanging around', make sure participants are fully informed about the purpose of the research and how it is to be conducted (Miles & Huberman, 1984, p. 233).

Biases in the researcher's collection and analysis of case data can be counteracted by using multiple sources of evidence (triangulation of data) to provide multiple instances from different sources (Miles & Huberman, 1984, pp. 234–235). The case study findings are strengthened by the convergence of information from a variety of sources, providing multiple measures of the same phenomenon (Yin, 1994, p. 92). Multiple sources of evidence also assist in corroborating information provided by different participants where there are conflicting accounts of events and actions. Again, the interpretive researcher acknowledges the subjectivity of their analysis in that their predispositions, beliefs, values and interests 'always intervene to shape their investigations' (Orlikowski & Baroudi, 1991, p. 15).

Whatever research philosophy is adopted and whatever the data analysis techniques used, it is important to demonstrate the trail of evidence which the analysis has followed so that the derivation of the case study conclusions from the case data is made explicit. A well-organized case study database provides the foundation for cross-referencing and citation of relevant evidence as part of this process. There are also a number of special-purpose software tools available to support qualitative research. These provide facilities for storage, indexing and analysis of qualitative data. Well-known tools include NUDIST, and The Ethnograph. Myers (1998) and Weitzman & Miles (1995) are sources of information about software tools for qualitative research.

Because of the volume of data collected and the problems of analysis of evidence, case study research can be difficult to write up so that it is suitable for publication in academic journals. When reporting case studies for this purpose, it is useful to follow a recognized case study reporting structure that has been used in published case study research literature within the field. This assists potential reviewers in readily understanding the research and its results. An exemplary case study paper may also be used as a template for presentation of case data and research results. Review of a case study paper by colleagues prior to its submission to a journal or refereed conference is another means of helping to ensure the quality of the research.

It is also important to ensure that a case study is presented as an interesting and convincing

'story'. Walsham (1995, p. 79) considers that convincing the reader of the validity of case study research is 'as much a matter of rhetorical style and flair as it is of accuracy and care in matters of theory and method', and Yin (1994, p. 151) notes that a case study report 'must be composed in an engaging manner' with not only a clear writing style but also 'one that constantly entices the reader to continue reading'. The case study report must be complete and must contain sufficient evidence to support the findings. Secondary data that is not essential for understanding and evaluating the case study analysis and conclusions should be omitted. Presentation of data in tabular form is often a useful means of summarizing and compressing data, and is effective when making comparisons either between cases or between features or aspects of a single case. The overall goals in writing up case studies are to adopt a clear and lucid writing style and to present the critical evidence judiciously and effectively.

CONCLUSION

Case study research has increasingly attracted the interest of information systems researchers as a useful means of investigating the development, implementation and use of information systems within organizations. It enables the capture and understanding of context when studying these phenomena, and can be used to achieve a variety of research aims using diverse data collection and analysis methods. Weaknesses of case study research include difficulties in generalizing research results and the subjectivity of the data collection and analysis processes. In addition, there are practical difficulties associated with undertaking case study research. This paper has focused on the pragmatics of dealing with some of these: the design and scoping of appropriate case study research projects, obtaining the participation of organizations in case study research, ensuring effective and efficient data collection processes, and establishing rigour in writing up case study research so that it is publishable in academic journals.

Successfully completing case study research within the field of information systems requires the selection of research areas that are relevant to industry and practitioners: as noted earlier, information systems is an applied discipline. However, it also requires certain qualities and skills on the part of the researcher: initiative, pragmatism, the ability to take advantage of unexpected opportunities, and optimism and persistence in the face of difficulties and unexpected events, especially during data collection activities. Because data collection procedures in case study research are not routinized, greater demands are placed on the researcher during this phase than when research strategies such as laboratory experiments or surveys are employed (Yin, 1994, p. 55). There can also be frequent overlap of data collection and data analysis activities because of the interaction between the data being collected and the theoretical issues which are the focus of the study (Eisenhardt, 1989; Yin, 1994, p. 55). Successful completion of case study research requires enthusiasm and intense curiosity about the phenomenon being investigated, and a desire to communicate the results of the research. Combined with the necessary rigour in the research design and the data collection and analysis processes, this should result in a case study that is also a stimulating and valuable report.

REFERENCES

Benbasat, I., Goldstein, D.K. & Mead, M. (1987) The case research strategy in studies of information systems. *MIS Quarterly*, **11**, 369–386.

Broadbent, M. & Butler, C. (1997) Managing information technology infrastructure capability for international business operations. *Proceedings of the Pacific Asia Conference on Information Systems, Brisbane, Australia*.

Broadbent, M. & Weill, P. (1993) Improving business and information strategy alignment: learning from the banking industry. *IBM Systems Journal*, **32**, 162–179.

Broadbent, M., Weill, P., O'Brien, T. & Neo, B.S. (1996) Firm context and patterns of IT infrastructure capability. *Proceedings of the Seventeenth International Conference on Information Systems, Cleveland, Ohio*.

Cavaye, A.L.M. (1996) Case study research: a multi-faceted research approach for IS. *Information Systems Journal*, **6**, 227–242.

Cavaye, A.L.M. & Cragg, P.B. (1995) Factors contributing to the success of customer-oriented interorganizational systems. *Journal of Strategic Information Systems*, **4**, 13–30.

Darke, P. & Shanks, G. (1997) User viewpoint modelling. Understanding and representing user viewpoints during requirements definition. *Information Systems Journal*, **7**, 213–239.

Doolin, B. (1996) Alternative views of case research in information systems. *Australian Journal of Information Systems*, **3**, 21–29.

Eisenhardt, K.M. (1989) Building theories from case study research. *Academy of Management Review*, **14**, 532–550.

Gable, G. (1994) Integrating case study and survey research methods. An example in information systems. *European Journal of Information Systems*, **3**, 112–126.

Galliers, R.D. (1992) Choosing information systems research approaches. In: *Information Systems Research: Issues, Methods and Practical Guidelines*, Galliers, R.D. (ed.), pp. 144–162. Blackwell Scientific, Oxford.

Glaser, B.G. & Strauss, A. (1967) *The Discovery of Grounded Theory: Strategies of Qualitative Research*. Weidenfeld & Nicholson, London.

Hirschheim, R. & Newman, M. (1991) Symbolism and information systems development. Myth, metaphor and magic. *Information Systems Research*, **2**, 29–62.

Keen, P.G.W. (1987) MIS research: Current status, trends and needs. In: *Information Systems Education: Recommendations and Implementation*, Buckingham, R.A., Hirschheim, R.A., Land, F.F. & Tully, C.J. (eds), pp. 1–13. Cambridge University Press, Cambridge.

Lee, A.S. (1989a) A scientific methodology for MIS case studies. *MIS Quarterly*, **13**, 33–50.

Lee, A.S. (1989b) Case studies as natural experiments. *Human Relations*, **42**, 117–137.

Lee, A.S. (1991) Integrating positivist and interpretive approaches to organizational research. *Organization Science*, **2**, 342–365.

Markus, M.L. (1983) Power, politics, and MIS implementation. *Communications of the ACM*, **26**, 430–444.

Miles, M.B. & Huberman, A.M. (1984) *Qualitative Data Analysis: A Sourcebook of New Methods*. Sage Publications, Newbury Park.

Myers, M.D. (1994) A disaster for everyone to see. An interpretive analysis of a failed IS project. *Accounting, Management and Information Technology*, **4**, 185–201.

Myers, M.D. (1995) Dialectical hermeneutics: a theoretical framework for the implementation of information systems. *Information Systems Journal*, **5**, 51–70.

Myers, M.D. (ed.) (1998) *Qualitative Research in Information Systems*. WWW document: http://www.auckland.ac.nz/msis/isworld/. Last access 14 August 1998.

Orlikowski, W.J. (1993) CASE tools as organisational change. Investigating incremental and radical changes in systems development. *MIS Quarterly*, **17**, 309–340.

Orlikowski, W.J. & Baroudi, J.J. (1991) Studying information technology in organisations. Research approaches and assumptions. *Information Systems Research*, **2**, 1–28.

Pervan, G. & Phua, R. (1997) A survey of the state of executive information systems in large Australian organisations. *Australian Computer Journal*, **29**, 64–73.

Shanks, G. (1997) The challenges of strategic data planning. An interpretive case study. *Journal of Strategic Information Systems*, **6**, 69–90.

Walsham, G. (1995) Interpretive case studies in IS research. Nature and method. *European Journal of Information Systems*, **4**, 74–81.

Weitzman, E.A. & Miles, M.B. (1995) *Computer Programs for Qualitative Analysis*. Sage Publications, Thousand Oaks.

Yin, R.K. (1994) *Case Study Research: Design and Methods*, 2nd edn. Sage Publications, Thousand Oaks.

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