

1-1-2011

Case studies: A security science research methodology

Bill Bailey
Edith Cowan University

Follow this and additional works at: <https://ro.ecu.edu.au/asi>



Part of the [Computer Sciences Commons](#)

DOI: [10.4225/75/57a00c2eac5bf](https://doi.org/10.4225/75/57a00c2eac5bf)

4th Australian Security and Intelligence Conference, Edith Cowan University, Perth Western Australia, 5th -7th December, 2011

This Conference Proceeding is posted at Research Online.

<https://ro.ecu.edu.au/asi/10>

CASE STUDIES: A SECURITY SCIENCE RESEARCH METHODOLOGY

Bill Bailey
secau Security Research Centre, School of Computer and Security Science
Edith Cowan University, Perth, Western Australia
b.bailey@ecu.edu.au

Abstract

As a relatively new discipline Security Science is searching for academic acceptance very often combining established hard science approaches with those of Social Science and Humanities. Methodologies need to be developed to equip the discipline to conduct more varied research. One such method is the use of the case study approach, as it allows multiple inputs from a variety of sources to build up the research into a central review, allowing conclusions and recommendations to be drawn from the data. Though relatively common in the business world for conducting reports, this has not hitherto been the position in academia

The objective of this speculative paper develops a process used for research and seeks to open a debate as to the importance of case studies in the security field; the paper argues that it is an underutilised research paradigm. The merits of using the case study structure will be discussed, including the debate over positivism and constructivism, which will then lead on to a potential analytical method called Interpretative Phenomenological Analysis (IPA); used predominately in ethnographical studies. The importance of using a pilot study before proceeding to the full study is also suggested to avoid costly mistakes later in the research.

Keywords

Case studies; hermeneutics; interpretative phenomenological analysis; pilot studies; security science.

INTRODUCTION

The discipline of Security Science now incorporates Humanities, Social and Political Sciences as well as the hard sciences. The amalgamation of so many diverse disciplines requires adapting and adoption of research methodologies that can accommodate this evolution.

This paper discusses using the case study method based upon recent research in security science. The need to understand the multiple parameters that can be present when dealing with security issues requires a methodology that can contextualise the issues being studied and assist with understanding the potential synergies present. The use of case studies is one such approach that can offer an accepted alternative academic approach. However, an important phase when using case studies is to use what is commonly called a pilot study first, before proceeding to undertake the full data collection. There are a number of significant reasons why this should be undertaken; not least of these is the significance of maintaining transparency throughout the process if validity is to be maintained. Getting the study design right is crucial at the beginning if effort is not to be wasted or lack ultimate legitimacy.

TWO STAGE STUDY: PILOT STUDY BEFORE CASE STUDY

It is often recommended to conduct what is commonly called a 'pilot study', which is mostly done prior to the final formulation of the proposal stage of the PhD. This pilot can also be called a trail run of the research instruments. However, many researchers (Teijlingen & Hundley, 2001) point to the value of using the pilot after the first stage of the data collection process to assess the internal validity of the whole process and a check on the following:

Table 1. Improving validity

| Pilot study procedures to improve the internal validity of a questions |
|---|
| Developing and testing adequacy of research instruments |
| Administer the questions to pilot subjects in exactly the same way as it will be administered in the main study |
| Collecting preliminary data |
| Establishing whether sampling frame and technique are appropriate |
| Ask the subjects for feedback to identify ambiguities and difficult questions |
| Discard all unnecessary, difficult or ambiguous questions |
| Assess whether each question gives an adequate range of responses |
| Establish that replies can be interpreted in terms of the information that is required |
| Re-word or re-scale any questions that are not answered as expected so as shorten or revise |
| Re-assess the methodology to ensure it will deliver the required outcome. |
| Assessing the proposed data analysis techniques to uncover potential problems |
| Determining what resources are needed for main study |

(Revised and adapted from Source: Table 3.23 (Peat, Mellis, & Williams, 2002, p. 123)

Whether this is called a pilot study, trail run or a preliminary review of the first stage of data collection is immaterial, as it still serves a very important function as can be seen from the points raised in the adapted Table 1.0. This function is often misunderstood or ignored by social science and humanities researchers, particularly the benefits of this approach especially with regard to subjectively. It allows the researcher a chance to evaluate the data outcome based on the first series of data collection to establish whether or not they have achieved the desired outcomes. If it is found that they have not, then steps can be taken to rectify this problem before proceeding any further with the data gathering. The role of the pilot study is to reduce the risk of getting it wrong (Rodney Turner, 2005).

Progressively more and more researchers report not just what they have found from a piece of research, but how they have actually gone about doing it (Sampson, 2004, p. 383). Sampson considers the “importance of pilot work in undertaking qualitative and ethnographic studies, prior to researcher immersion in the ‘field’”(2004, p. 383), as a vital component of the whole research process to ensure the adequacy of the research instruments. While the benefits of doing pilot work are not new to ethnographers they are “under-discussed and to some extent under-utilized” (Sampson, 2004, p. 383).

While pilot studies can be used to refine research instruments such as questionnaires and interview schedules, they have greater use in ethnographic approaches to data collection in foreshadowing research problems and questions, in highlighting gaps and wastage in data collection, and in considering broader and highly significant issues such as research validity, ethics, representation and researcher health and safety.(Rodney Turner, 2005; Sampson, 2004; Van Teijlingen, Rennie, Hundley, & Graham, 2001)

Based upon these views it would seem a pilot is a wise process to utilise in an effort to ensure that the data collection process will achieve the desired results as set out in the proposal. Testing the research questions on a selected number of participants first can be seen as a useful tool in assessing the potential outcomes, to see if the questions meet the overall requirements of the study. Using a pilot study to validate the research design can be seen as a useful tool, which has net benefits to the next stage of the data collection process.

The use of case studies can be seen as beneficial particularly when it is an “empirical inquiry that investigates a contemporary phenomenon in depth and within its real life context” (Yin, 2009, p. 18). The case study approach is used when there are many variables of interest looking for one result. As a research strategy the use of case studies is valuable as it allows multiple focus on understanding the dynamics found in particular settings (Eisenhardt, 1989). Numerous levels of analysis can thus be performed within the same study (Yin, 2009). Furthermore, “triangulation made possible by multiple data collection methods provides stronger substantiation of the constructs and hypotheses” (Eisenhardt, 1989, p. 538), making the outcomes substantially stronger.

The case study should be designed to meet the research objectives using sufficient material as is necessary (Naumes & Naumes, 2006, p. 4). Therefore the case study inquiry considers coping with a certain set of circumstances which can be seen from various view points, but that require a single result (Yin, 2009, p. 18). The advantage in this approach, as argued by Glaser and Strauss, “it is the intimate connection with empirical reality that permits the development of a testable, relevant, and valid theory” (as cited in Eisenhardt, 1989, p. 532). Too often a theory is proposed that is not based sufficiently upon the verifiable data. Consequently, using a

case study approach should reduce this tendency and sequentially allow a theory to come out of the case study itself or provide further support for an existing theory.

The first part of the process is to undertake a literature review, which should position the study within the existing debate. The initial literature review should assist with the development of the most appropriate research questions. A good deal of preparation is required in formulating which questions would be best suited to the case study approach in order to construct a validated theory, “ a literature review is therefore a means to an end, and not-as many people have been taught to think-an end in itself”(Yin, 2009, p. 14). The nature of this methodology necessitates an ongoing approach to the literature review, as is often the case in qualitative work (Patton, 1990, p. 163).

The next normal sequence is the use a series of interviews with the selected participants using a specific participant focused sampling method. The interview is one of the most, if not the most, commonly used research tool in social and political science (King, 2004).”In fact, it is estimated that ‘90% of all social science investigations’ use interviews of some sort”(Holstein & Gubrium, 1995, p. 1). A large amount of knowledge is gained through the use of interview, therefore it is important to get it right (Morris, 2009). “The published account is not an objective rendering of ‘reality’, but it is the researcher’s interpretation of the facts that is published for public view” (Morris, 2009, p. 214). There can also be a tendency for self-serving bias and recall error by the interviewee (Patton, 1990, p. 245); hence, the need to ensure triangulation of data in an effort to diminish this propensity.

There are four types of accepted interview techniques in academic research: structured interviews, semi-structured interviews, unstructured interviews and non-directive interviews. Each one of these has its place within the research process, but will largely depend on the nature of the study together with the applied methodology guided by the literature review. It would be difficult to argue that one method is superior to another as each has its merits, but the choice should be made on the type of research design with regard to desired outcomes.

The study design then needs to consider what was being studied, what type of evidence is required and how will this support the investigation. Therefore, the next decision relates to accepting whether or not that the drafted research questions actually afford the desired results which can then be interpreted to provide a satisfactory outcome whilst also providing an accepted level of validity? This approach requires an interpretation of the results based on a philosophical approach to the concluding outcomes. Consequently a sound knowledge of philosophy is beneficial when utilising such research designs to avoid making critical errors that could cause unsubstantiated results and thus a discounted theory.

There are a number of philosophical positions (Table 2) that have found acceptance, but many are contested and debated. In simplistic terms these can be divided into either constructivism or positivism, which have become stereotyped. Each position can be associated with certain defined traditions but not with any one philosopher (Easterby-Smith, Thorpe, & Lowe, 2002, p. 29).

Positivism holds that “the social world exists externally, and that its properties should be measured through objective measures, rather than inferred subjectively through sensation, reflection or intuition”(Easterby-Smith, et al., 2002, p. 29).Conversely, constructivism or social constructivism “ focuses on the ways that people make sense of the world especially through sharing their experiences with others via the medium of language” , often referred to as Interpretative methods (Easterby-Smith, et al., 2002, p. 29).

Table 2. Contrasting essential elements of positivism and constructivism

| Element | Positivism | Social Constructivism | Applied to case studies |
|---------------------------|---|---|--------------------------------|
| The observer | Must be independent | Is part of what is being observed | Independent |
| Human interest | Should be irrelevant | Are the main drivers of science | Distant interest |
| Explanations | Must demonstrate causality | Aims to increase general understanding of the situation | Increase understanding |
| Research progress through | Hypotheses and deductions | Gathering rich data from which ideas are induced | Hypotheses and deductions |
| Concepts | Need to be operationalized so that they can be measured | Should incorporate stakeholder perspectives | A mixture of both |

| | | | |
|--|--|---|---|
| Units of analysis | Should be reduced to simplest terms | May include the complexity of 'whole' situations | May include the complexity of 'whole' situations |
| Generalization through Sampling requires | Statistical probability Large numbers selected randomly | Theoretical abstraction Small numbers of cases chosen for specific reasons | Statistical probability Small numbers of cases chosen for specific reasons |

(adapted from Easterby-Smith, et al., 2002, p. 29).

The importance of highlighting the differences between the two approaches is especially important too, if case studies are to be used as this will assist in choosing how the data will be interpreted. As multiple sources of data are normally brought together for the case study approach a more positivist methodology is often desirable.

INTERPRETATIVE PHENOMENOLOGICAL ANALYSIS (IPA)

Once the interviews have produced the data it will need to be analysed. One method of doing this could be the use of Interpretative Phenomenological Analysis (IPA). This is a qualitative methodology employing a phenomenological interpretation of personal experiences, reports or versions in an attempt to understand personal perception of these in relation to events. Most IPA work has been conducted using in-depth interviews, which enable the participant to provide a full, rich account and allow the researcher considerable flexibility in probing interesting areas which may emerge (Smith, Flowers, & Larkin, 2009). Interviews are normally audio-recorded, transcribed verbatim and subjected to detailed qualitative analysis, attempting to elicit experiential themes in the participant's narrative.

The narrative constructed from the interviews should form a focal part of the process of interpretation thus building the case study. However, all qualitative research that uses the narrative approach will, even at a subconscious level, have elements of hermeneutics within the process (Hein & Austin, 2001; Lavery, 2008). Hermeneutics has normally been considered an interpretive methodology for understanding ancient texts,

Hermeneutics is a much broader interpretive genre that has expanded the very meaning of the term *text*. In brief, texts now refer not only to documents and the like but also to social, organizational, and institutional structures and processes; cultures and cultural artifacts (sic); and so on (Prasad & Prasad, 2002, p. 7).

The evolution of this form of interpretation has been gaining ground within the social sciences, although at times its value has been over emphasised it is nonetheless a process that needs to be understood as it is evolving.

As the results of phenomenological hermeneutical investigations are about the meaning of lived experience, they can only be used to affect meaning of lived experience, i.e. as understood by the interpreter. It is not only the interpreter that interprets the text. The text also interprets the interpreter (Lindseth & Norberg, 2004, p. 151).

Essentially researchers seek meaning from the themes within the narrative that can be interpreted. Therefore, each of the respondents will have their own story, which in turn forms part of a greater story that has to be interpreted within the context of the research. Thus the end result will be the sum total of all its parts but only as told by this study. In other words the story is unique even though there may be similarities to other stories.

Hermeneutics permeates the research process, whether or not it has been chosen as a distinct methodology or not. Douglass and Moustakas (2005) contrast heuristic inquiry with phenomenal to highlight the major differences and similarities. Therefore, although there may be a degree of hermeneutics in all qualitative research methodologies simply by default, this process needs to be understood within its context and not shunned but accepted that is a tacit process taking place regardless of choice.

The crucial processes in heuristics (once one understands the values, beliefs, and knowledge inherent in the heuristic paradigm) are: concentrated gazing on something that attracts or compels one into a search for meaning; focus on a topic or formulation of the question; and methods of preparing, collecting, organizing, analyzing, and synthesizing data (Moustakas, 1994, p. 38).

There is also a need to question whether or not this form of methodology could be termed as empirical phenomenology, particularly as the observations come from a defined time and do not need to have a philosophical bias. Several authors have used both terms empirical phenomenology and hermeneutic phenomenology (Klein & Westcott, 1994; Moustakas, 1994; Von Eckartsberg, 1986) in an attempt to classify phenomenological research.

Hein has pointed out that there is not a clear distinction between any of these terms or between descriptive and interpretative; furthermore, it is not even easy to distinguish clearly between empirical and hermeneutic approaches to phenomenology (Hein & Austin, 2001). However, Allen states that a clear distinction between phenomenology and hermeneutic phenomenology does not exist (cited by Laverty, 2008, p. 27).

Nonetheless, it is necessary to explain the association between events and the narrative focusing on trying to make sense of what has happened and what does that mean in relation to the events (Smith, et al., 2009). Triangulation is achieved through the use of further qualitative data collection methods i.e. diaries, newspapers, monographs or personal accounts (Smith, et al., 2009).

The use of narrative has been used because of its attention to the structure of the story as given by the participants in the case studies, which will be sections of discourse. Although, this does necessarily mean a more hermeneutic or poststructuralist methodological approach rather than a positivistic one (Pranee & Douglas, 2005).

Scientific rationality is built out of logical, well-formed arguments that are designed to convince of truth through reference to repeatable, scientifically constructed empirical tests. The aim is to produce general laws that can be applied to particular events to explain why things happen. These laws are usually abstract and context free. (Pranee & Douglas, 2005, p. 125)

There is a fundamental reason why this approach will have greater validity as the participants find it easier to respond by placing themselves in the total situation, which in many cases requires justifying why they took a particular course of action rather than another. If the questions are exclusively directed, then this restricts the respondents desire to respond in a meaningful way as they often feel that they may be exposing themselves in some way (Chase, 1995, p. 4). Therefore, by allowing the participants to tell their stories, with subtle guidance, allows a more truthful version to emerge. The stories should then be deconstructed and interpreted within the context of the events of the time, adding triangulation wherever and whenever necessary, as well as using empirical data to verify the narratives.

Bruner (1990) proposes that in order to understand the meaning of the narrative there are two components that have to be considered: a configuring plot and secondly, the succession of events that will shape the story itself. Only when the two are in tandem can the narrative be fully understood (Pranee & Douglas, 2005).

RESEARCH INSTRUMENT

The ability of the researcher is paramount to achieving an acceptable result, “the researcher is the instrument” and the methods used are part of the process (Patton, 2002, p. 14); a stark reminder of the importance of academic experience to get it right. Furthermore, validity is dependent on careful construction of the instrument; in this case the semi-structured interviews, to ensure they are administered to measure what they set out to measure. It is important to clearly define the research questions, which are the measurement tools, within the structure of the case study approach; as a primary objective to building a sustainable theory. “The rationale for defining the research question is the same as in hypothesis-testing research. Without a research focus, it is easy to become overwhelmed by the volume of data” (Eisenhardt, 1989, p. 536). By creating a focus this has assisted with the research design through the use of instruments together with the use of the empirical data supporting the emergent theory.

Eisenhardt pointed out the advantages of early identification of the research question together with potential constructs does have its benefits, but that it must also be accepted as only tentative. “No construct is guaranteed a place in the resultant theory, no matter how well measured. Also the research question may shift during the research” (1989, p. 536). This is quiet normally during the design process.

The importance of quality in the study needs to be addressed “transparency of research methodology; clearly based on and adding to the relevant literature in terms of insight and conceptualisation” makes it important to highlight this more than may have been the case in the past (Bryman, Becker, & Sempik, 2008, p. 267). Transparency is a major consideration to ensure acceptable methods have been used in the research.

Commonly there are four accepted research quality criteria: construct validity, internal validity, external validity and reliability. These four dictate the universal credence of the results from the research undertaken and need to be incorporated throughout the entire process. The validity of the research confirms the accuracy and usefulness of the data collected through the use of the selected instrument (Pandit, 1996).

CONCLUSION

The benefits of following such a methodology have been put forward as it would seem to offer another way of conducting security science research. The advantages of using such an approach are that the design can be altered to meet the requirements of the study. Furthermore, if at the pilot stage additional data is required then adding to the case study does not pose a complete re-write of the methodology.

Using a pilot study needs to be promoted more widely too, as this improves the overall strength of the research design aiding validity and avoiding costly mistakes later. The use of a pilot study allows the study to be tested first and analysed prior to embarking on the resource intensive full study. A number of probable problems can be identified and remedied before conducting the complete study making it more reliable and robust. Maintaining validity by using multiple triangulation sources safeguards the integrity of the research study.

REFERENCES

- Bruner, J. (1990). *Acts of meaning*. Cambridge, MA: Harvard University Press.
- Bryman, A., Becker, S., & Sempik, J. (2008). Quality criteria for quantitative, qualitative and mixed methods research: A view from social policy. *International Journal of Social Research Methodology*, 11(4), 261-276. doi: 10.1080/13645570701401644
- Chase, S. (1995). Taking narrative seriously. In R. Josselson & E. Leiblich (Eds.), *Interpreting experience: The narrative study of qualitative research* (2nd edition ed., Vol. 3). London: Sage Publications.
- Chynoweth, J. (2005). *Hunting Terrorists in the Jungle: the experiences of a national service subaltern in Malaya in the 1950's*. Stroud, UK: Tempus.
- Easterby-Smith, M., Thorpe, R., & Lowe, A. (2002). *Management research: An introduction*: Sage Publications Ltd.
- Eisenhardt, K. M. (1989). Building theories from case study research. *The Academy of Management Review*, 14(4), 532-550. doi: 10.06/2011 00:03
- Hein, S. F., & Austin, W. J. (2001). Empirical and hermeneutic approaches to phenomenological research in psychology: A comparison. *Psychological Methods*, 6(1), 3. doi: 10.1037/1082-989X.6.1.3
- Holstein, J. A., & Gubrium, J. F. (1995). *The active Interview*. London: Sage.
- King, N. (2004). Using interviews in qualitative research. In Cassell. C & Symon. G (Eds.), *Essential Guide to Qualitative Methods in Organizational Research*, . London: Sage.
- Klein, P., & Westcott, M. R. (1994). The changing character of phenomenological psychology. *Canadian Psychology/Psychologie canadienne*, 35(2), 133.
- Laverty, S. M. (2008). Hermeneutic phenomenology and phenomenology: A comparison of historical and methodological considerations. *International Journal of Qualitative Methods*, 2(3), 21-35.
- Lindseth, A., & Norberg, A. (2004). A phenomenological hermeneutical method for researching lived experience. *Scandinavian Journal of Caring Sciences*, 18(2), 145-153.
- Morris, Z. S. (2009). The truth about interviewing elites. *Politics*, , 209–217, 2009 Vol 29(3), (p 209-217). doi: DOI: 10.1111/j.1467-9256.2009.01357.x
- Moustakas, C. E. (1994). *Phenomenological research methods*. Thousand Oaks, CA: Sage Publications, Inc.
- Naumes, W., & Naumes, M. J. (2006). *The art & craft of case writing*. New York: ME Sharpe Inc.
- Pandit, N. R. (1996). The creation of theory: A recent application of the grounded theory method. *The Qualitative Report*, 2(4), 1-14.
- Patton, M. Q. (1990). *Qualitative evaluation and research methods*. Newbury Park, CA: Sage Publications, Inc.
- Patton, M. Q. (2002). *Qualitative research and evaluation methods*. Thousand Oaks, CA: Sage Publications, Inc.

- Peat, J., Mellis, C., & Williams, K. (2002). *Health science research: a handbook of quantitative methods*. London: Sage Publications Ltd.
- Pranee, L., & Douglas, E. (2005). *Qualitative Research Methods* (2nd ed.). New York: Oxford University Press.
- Prasad, A., & Prasad, P. (2002). The coming of age of interpretive organizational research. *Organizational Research Methods*, 5(1), 4. doi: 10.1177/1094428102051002
- Rodney Turner, J. (2005). The role of pilot studies in reducing risk on projects and programmes. *International Journal of Project Management*, 23(1), 1-6.
- Sampson, H. (2004). Navigating the waves: the usefulness of a pilot in qualitative research. *Qualitative Research*, 4(3), 383. doi: 20/12/2010
- Smith, J. A., Flowers, P., & Larkin, M. (2009). *Interpretative phenomenological analysis: theory, method and research*. London: Sage
- Teijlingen, E., & Hundley, V. (2001). The importance of pilot studies. *Social Research Update*, 35, 1-4. doi: 20/12/2010
- Van Teijlingen, E., Rennie, A., Hundley, V., & Graham, W. (2001). The importance of conducting and reporting pilot studies: the example of the Scottish Births Survey. *Journal of Advanced Nursing*, 34(3), 289-295.
- Von Eckartsberg, R. (1986). *Life-world experience: Existential-phenomenological research approaches in psychology*. Washington: University Press of America.
- Yin, R. K. (2009). *Case study research: Design and methods* (4th ed.). London: Sage Publications, Inc.