Qualitative Case Study Guidelines

Saša Baškarada

Joint and Operations Analysis Division
Defence Science and Technology Organisation

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ABSTRACT

This report presents guidelines for conducting qualitative case studies. Yin's case study process is elaborated on and additional principles from the wider literature are integrated. It is expected that following the guidelines presented will facilitate the collection of the most relevant data in the most efficient and effective manner, simplify the subsequent analysis and enhance the validity of the resulting findings.

RELEASE LIMITATION

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Qualitative Case Study Guidelines

Executive Summary

The case study is rapidly gaining acceptance in many diverse scientific domains. Despite the fact that it has often been viewed as a soft research method, it is actually remarkably difficult to execute well in practice. Accordingly, having a set of clear and succinct guidelines that can be referenced and followed is critical.

This report presents a set of guidelines for conducting qualitative case studies that are based on Yin's case study process (comprising six interdependent stages) and additional principles from the wider methodological literature.

The Australian Defence Force (ADF) may benefit from the guidelines presented in this report by integrating them in Operational Evaluation, a formal process for assessing operational activities, exercises or capabilities against agreed objectives. The guidelines presented in this report may facilitate the collection of the most relevant observations in the most efficient and effective manner, simplify the subsequent analysis as well as assure the rigour of any lessons identified.

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Glossary[*]

Bias The extent to which a measurement, sampling, or analytic method systematically underestimates or overestimates the true value of an attribute.

Case Study A method for learning about a complex instance, based on a comprehensive understanding of that instance, obtained by extensive description and analysis of the instance, taken as a whole and in its context.

Construct An attribute, usually unobservable, that is represented by one or more observable measures.

Construct Validity The extent to which a measurement method accurately represents a construct and produces an observation distinct from that produced by a measure of another construct.

External Validity The extent to which a finding applies (or can be generalised) to persons, objects, settings, or times other than those that were the subject of study.

Generalisability Used interchangeably with "external validity".

Internal Validity The extent to which the causes of an effect are established by an inquiry.

Normative Question A type of evaluation question requiring comparison between what is happening (the condition) to norms and expectations or standards for what should be happening (the criterion).

Open-Ended Interview An interview in which, after an initial or lead question, subsequent questions are determined by topics raised by the interviewee; the discussion is unconstrained and interviewees are able to explore a variety of topics/issues.

Qualitative Data Information based on judgments, which may be expressed in numerical or non-numerical ways, and data that may not be based on judgments (such as state of birth) that are not meaningfully expressed numerically. The data sources are often textual and observational and expressed in words, thereby also providing context to a topic or issue discussed.

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[*] The definitions in the glossary have been adopted from [19, pp. 145-48].

Quantitative Data	Information based on measures that do not rely on judgments and that are meaningfully measured. These are usually expressed numerically and often use continuous rather than discrete or categorical levels of measurement and scales with interval or ratio properties.
Reliability	The extent to which a measurement process produces similar results on repeated observations of the same condition or event.
Structured Interview	An interview in which questions to be asked, their sequence, and the detailed information to be gathered are all predetermined; used where maximum consistency across interviews and interviewees is needed.
Triangulation	The combination of methods in the study of the same phenomenon or construct; a method of establishing the accuracy of information by comparing three or more types of independent points of view on data sources (for example, interviews, observation, and documentation; different investigations; different times) bearing on the same findings.

1. Introduction

Where quantitative research is mainly concerned with the testing of hypotheses and statistical generalisations [23], qualitative research does not usually employ statistical procedures or other means of quantification, focusing instead on understanding the nature of the research problem rather than the quantity of observed characteristics [41]. Given that qualitative researchers generally assume that social reality is a human creation, they interpret and contextualise meanings from people's beliefs and practices [14].

Case study research involves intensive analysis of an individual unit [32]—e.g. a person, a community or an organisation. As such, case studies provide an opportunity for the researcher to gain a deep holistic view of the research problem, and may facilitate describing, understanding and explaining a research problem or situation [8, 43, 44]. Whilst case studies have traditionally been viewed as soft research, Yin argues that case study research is actually remarkably difficult [48]. As described by Yin, the case study process comprises six interdependent stages (see Figure 1). The rest of the report discusses each of these stages in detail and integrates additional guidelines from the wider literature.
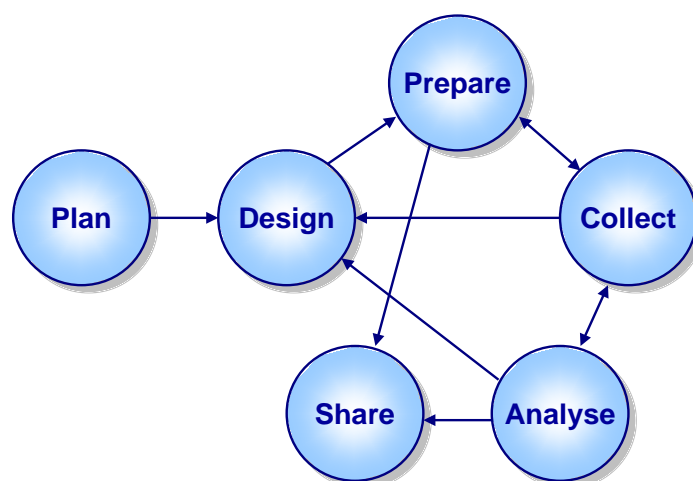
Figure 1: The Case Study Process [48, p. 1]

2. Plan

The planning stage focuses on identifying the research questions or other rationale for doing a case study, deciding to use the case study method (compared with other methods), and understanding its strengths and limitations [48]. According to Yin, clearly defining the research problem is probably the most important step in the entire research project. As such, every case study should begin with a comprehensive literature review and a careful consideration of the research questions and study objectives [34]. Another key point of the planning stage is to ensure that no mismatch exists between the research questions and the case study method [19]. The choice of research method is determined by several factors,

including the type of research question, the control an investigator has over actual behavioural events, and the focus on contemporary as opposed to historical phenomena [48]. As mentioned previously, while the case study method has traditionally been classed as soft research, the properties described above actually make case studies particularly difficult to execute well. Nevertheless, they are particularly suitable when research sponsors (rather than investigators) define the research questions [19]. Additionally, whilst experiments usually control the context in an artificial environment and have many more data points than variables of interest, case studies usually have "many more variables of interest than data points", rely "on multiple sources of evidence, with data needing to converge in a triangulating fashion", and benefit "from the prior development of theoretical propositions to guide data collection and analysis" [48, p. 18].

The United States (US) Government Accountability Office (GAO) extensively uses case studies in their evaluations. GAO defines case study as "a method for learning about a complex instance, based on a comprehensive understanding of that instance obtained by extensive description and analysis of that instance taken as a whole and in its context" [19, p. 15]. Case studies allow for confirmatory (deductive) as well as explanatory (inductive) findings [22, 48], can be based on *single* or *multiple cases,* and can include *qualitative* and/or *quantitative* data [1]. They can be *exploratory*, *descriptive*, or *explanatory*, and they have been described as the preferred research method when *how* and *why* questions are posed, the investigator has little control over events, and the focus is on a contemporary phenomenon within a real-life context [48]. According to Yin, *how* and *why* questions are better answered through case studies as such questions "deal with operational links needing to be traced over time, rather than mere frequencies or incidence" (p. 9). On the other hand, surveys, for example, are more appropriate when answering questions like *who*, *what*, *where*, *how many*, and *how much* [11]. However, as surveys are usually analysed using statistical techniques, the unit of analysis also needs to be taken into consideration. For instance, when studying groups/organisations, it may be difficult (or even impossible) to obtain a sufficiently large sample; in such instances case studies may be more appropriate. While case studies do not aim to generalise to populations (*statistical generalisation*), similar to experiments, they aim to generalise to theories (*analytical generalisation*) [48]. Thus, according to Yin, replication may be claimed "if two or more cases are shown to support the same theory" (p. 38). In any case, case studies are particularly well suited to building extensive and in-depth descriptions of complex social phenomena. As a research method, they are commonly used in psychology, sociology, political science, business, information systems, education, and the like.

However, "given the time required, the rich, in-depth, nature of the information sought, and the need to achieve credibility", case studies can also be costly to conduct [19, p. 11]. Other challenges identified by GAO include choosing the method for selecting cases, reporting the basis for selecting cases, and integrating findings across several cases when the findings in one were inconsistent with those in another.

Exploratory case studies may be undertaken prior to the definition of the research questions and hypotheses. Accordingly, they are mainly used for theory building. *Descriptive* case studies try to completely describe different characteristics of a phenomenon in its context and so they are also mainly used for theory building. *Explanatory* case studies may be

undertaken to investigate causal relationships; hence, they are mainly used for theory testing. They are characterised by *how* and *why* research questions because they investigate the relationships that are proposed between different theory components [48]. Any inconsistencies between a preliminary theory and the evidence may lead to theory modification and enhancement [3]. A notable example of an explanatory case study is the Allison & Zelikow study of the 1962 Cuban missile crisis [2], demonstrating how a "single case study can be the basis for significant explanations and generalisations" [48, p. 6].

Stake differentiates between *intrinsic*, *instrumental*, and *collective* case studies [40]. *Intrinsic* case studies only aim at acquiring better understanding of the particular case of interest. Thus, such case studies are not used for theory building. *Instrumental* case studies provide insights into an issue or are used to refine a theory, and *collective* case studies comprise several instrumental case studies. However, Stake also argues that studies seldom fit neatly into such categories, and that researchers have to make a strategic choice in deciding on the scope of the case study, since everything cannot and need not be understood [39].

GAO provides a more detailed classification, differentiating between six types of case studies: *illustrative* — this case study is descriptive in character and intended to add realism and in-depth examples to other information about a program or policy; *exploratory* — this is also a descriptive case study but is aimed at generating hypotheses for later investigation rather than for illustrating; *critical instance* — this examines a single instance of unique interest or serves as a critical test of an assertion about a program, problem, or strategy; *program implementation* — this case study investigates operations, often at several sites, and often normatively; *program effects* — this application uses the case study to examine causality and usually involves multi-site, multi-method assessments; and *cumulative* — this brings together findings from many case studies to answer an evaluation question, whether descriptive, normative, or cause-and-effect [19, pp. 9-10].

3. Design

The design stage focuses on defining the unit of analysis and the likely cases to be studied, developing theory/propositions and identifying issues underlying the anticipated study, identifying the case study design (*single*, *multiple*, *holistic*, *embedded*), and developing procedures to maintain case study quality [48]. Research design logically links the research questions to the research conclusions through the steps undertaken during data collection and data analysis [48]. Thus, research design, which can be seen as a "blueprint" for the research project, should address the research questions, relevant propositions/hypotheses, the unit of analysis, the logic linking the data to the propositions, and the criteria for interpreting the findings. Common design-related issues include choosing an inappropriate unit of analysis, inappropriate case selection, insufficient attention to alternative theories/hypotheses, and more/fewer cases selected than necessary [19, p. 81].

Individual cases may be selected based on *convenience*, *purpose*, and *probability* (see Table 1). Table 2 shows another non-mutually-exclusive taxonomy for the selection of cases. According to Yin, reasons for justifying *single-case* studies include studying a *critical case*, an *extreme case*, a *representative* or *typical case*, a *revelatory case* (involving a novel situation), and a *longitudinal case*. *Purposive* case selection provides an ability to collect the most relevant data [15], and *longitudinal* cases provide an ability to identify trends over time [19]. According to Yin, in *multi-case studies*, each case should be selected so that it either predicts similar results (*literal replication*), or predicts contrasting results but for anticipatable reasons (*theoretical replication*). If multiple cases lead to contradictory results, the preliminary theory should be revised and tested with another set of cases [48].

Table 1: Instance Selection in Case Studies [19, p. 25]

Selection Basis	When to use and what questions it can answer
Convenience	Case selected because it was expedient for data collection purposes.
Bracketing*	What is happening at extremes? What explains such differences?
Best Cases*	What accounts for an effective program?
Worst Cases*	Why isn't the program working?
Cluster*	How do different types of programs compare with each other?
Representative*	Instances chosen to represent important variations.
Typical*	Instance chosen to represent a typical case.
Special Interest*	Instances chosen based on an unusual/special attribute.
Probability	What is happening in the program as a whole, and why?

* Purpose

Table 2: Strategies for the Selection of Cases [17]

Extreme/deviant case	Extreme or unusual case.
Maximum variation cases	Cases which are very different on one dimension.
Critical case	A case with strategic importance to the general problem.
Paradigmatic case	A prototypical case.

As previously discussed, case studies are appropriate for answering *how* and *why* questions. The specific questions can be identified and developed by closely examining any previous studies and identifying any suggestions/opportunities for future research [48]. However, as the *how* and *why* questions are usually quite broad, they may not provide enough guidance on which data needs to be collected. In such cases, deriving more specific propositions/hypotheses may be of benefit. The unit of analysis defines what the case is—e.g. an event, a process, an individual, a group, or an organisation [19, 48]. While it may sound obvious and simple, identifying the appropriate unit of analysis requires careful consideration, as any confusion over it may invalidate the whole study. In addition to the scope, in the case of an event or a process, defining the time boundaries (i.e. the beginning and the end of the case) is imperative. The logic linking the data to the propositions should also ensure the correct type and amount of relevant information is collected. The criteria for interpreting the findings should include any relevant rival

theories/explanations so that relevant data can be collected during the data collection stage.

The quality of any empirical studies, including case studies, depends on *construct validity*, *internal validity*, *external validity*, and *reliability* [15]. *Construct validity*, which is especially challenging in case study research, deals with concept operationalisation. *Operationalisation* is the process of defining a concept through a set of attributes/variables in order to make it measurable through empirical observations [28]. Numerous threats to *construct validity* have been identified, including inadequate explication of constructs, construct confounding, mono-operation bias, mono-method bias, confounding constructs with levels of constructs, treatment sensitive factorial structure, reactive self-report changes, reactivity to the experimental situation, experimenter expectancies, novelty and disruption effects, compensatory equalisation, compensatory rivalry, resentful demoralisation, and treatment diffusion. Shadish, Cook, & Campbell [36] discuss each of these threats in great detail and provide recommendations on how to mitigate against them. Yin [48] provides three strategies for improving construct validity: using multiple sources of evidence, having key informants review the case study report, and maintaining a chain of evidence. Employing multiple sources of evidence can contribute to construct validity by providing multiple measures of the same phenomenon. Designing the case study so that the chain of evidence is maintained should allow reviewers to trace from conclusions back to the initial research questions, or from questions to the conclusions [35]. The corrections made through reviews by key informants may enhance the accuracy of the case study as well as identify a range of competing perspectives.

Internal validity, which is concerned with justifying causal relationships, only applies to explanatory and not to descriptive or exploratory case studies [19]. Threats to internal validity include ambiguous temporal precedence, selection, history, maturation, regression, attrition, testing, instrumentation, and additive and interactive effects of threats to internal validity. Again, Shadish, et al. [36] provide detailed explanations and recommendations. The use of methodological and data source triangulation (including cross-case comparisons) can lead to increased internal validity [19]. Other types of *triangulation* include investigator triangulation and theory triangulation [13]. In addition, a theory should be enhanced and validated by continually and iteratively evaluating cases against it [42]. It has also been argued that *pattern matching* may be used to enhance the internal validity, whereby, involving qualitative but logical deduction [26], an empirically based pattern is logically compared against a predicted pattern [48].

External validity deals with the problem of knowing whether the findings are generalisable to other cases. Threats to external validity include interaction of the causal relationship with units, interaction of the causal relationship over treatment variations, interaction of the causal relationship with outcomes, interaction of the causal relationship with settings, and context dependent mediation [36]. It has been argued that the use of one case is similar to the use of one experiment, in the sense that neither one is sufficient to reject or disprove propositions, and that several are necessary to demonstrate accuracy of a theory [26, 48]. In other words, "case studies, like experiments, are generalisable to theoretical propositions and not to populations or universes. In this sense, the case study, like the experiment, does not represent a 'sample', and the investigator's goal is to expand and

generalise theories [*analytical generalisation*] and not to enumerate frequencies [*statistical generalisation*]" [48, p. 10].

Reliability is concerned with demonstrating that same results can be obtained by repeating the data collection procedure [1]. In other words, other investigators should in principle be able to follow the same procedures and arrive at the same results. Two strategies for ensuring reliability of case studies include creation of the case study protocol, and development of a case study database [48]. The case study protocol contributes to the reliability by standardising the investigation. Relevant documents may include overview of the project, field procedures, guiding questions, and a report outline.

In addition to construct/internal/external validity and reliability, *data quality* is also a key criterion to the validity of case studies. Research has identified a range of relevant data quality dimensions, including accuracy, objectivity, believability, reputation, interpretability, ease of understanding, concise and consistent representation, relevancy, value-added, timeliness, completeness, amount of information, accessibility, and access security [47]. In relation to these dimensions, data may become corrupted during collection, transmission, storage, integration, retrieval, and analysis [6, 7].

4. Prepare

The prepare stage focuses on developing skills as a case study investigator, training for a specific case study, developing a case study protocol, conducting a pilot case, and gaining any relevant approvals [48]. Preparation should also aim to identify any relevant issues in the case study design and/or the team composition, and endeavour to address any such issues before starting the data collection stage.

According to Yin, the researchers should be sufficiently familiar with the study domain as to understand the main concepts and theoretical/methodological issues relevant to the study. They should know why the study is being done, what evidence is being sought, what empirical variations can be anticipated (including what should be done if such variations occur), and what constitutes supportive or contrary evidence. Specific preparations for data collection activities may include reviewing the original case study proposal, case study protocol, sample reports, and the like. In addition to being sufficiently familiar with the study domain, case study investigators should also be able to interpret the information in real-time and adjust their data collection activities accordingly to suit the case study [48]. As previously discussed, the use of a case study protocol positively contributes toward reliability of the study, and should ideally include introduction to the case study and the purpose of the protocol, the data collection procedures, an outline of the case study report, high-level case study questions, and any references. Pilot case studies may also be used to refine the "data collection plans with respect to both the content of the data and the procedures to be followed" [48, p. 92]. Any pilot reports should reflect on the lessons identified and, as appropriate, provide avenues for the implementation of lessons into the next iteration.

5. Collect

The collect stage involves following the case study protocol, using multiple sources of evidence, creating a case study database, and maintaining a chain of evidence [48]. GAO [19] similarly recommends that multiple sources of evidence should be used, that a case study database should be used to store relevant evidence, and that an auditable chain of evidence (also referred to as an "audit trail") should explain how any conclusions have been drawn [30].

One major difference between survey based studies and case studies is that surveys capture perceptions and attitudes about events and behaviours, whereas case studies collect direct evidence [48]. Furthermore, in case studies, data are analysed as they become available, and the emerging results are used to shape the next set of observations [19]. *Theoretical sampling*, which differs from *statistical sampling*, originated with the development of *grounded theory* [21]. In contrast to statistical sampling, the goal of theoretical sampling is not to undertake representative capture of all possible variations, but to gain a deeper understanding of the cases to facilitate the development of theories. Theoretical sampling implies that the researchers guide their data collection activities on the basis of provisionary theoretical ideas [10]. Thus, it enables answering of questions that have arisen from the analysis of and reflection on previous data, since each piece of analysed data provides indications about where to look next. As such, the theory is continually modified as a consequence of further research. Such a comprehensive data collection approach helps ensure that key aspects have not been missed, the associated flexibility provides an ability to collect the most relevant data, and multiple sources of evidence lead to enhanced validity and reduced bias [19]. In addition, the ability to search for disproving evidence may lead to a reduction in confirmation bias, and maintaining a chain of evidence allows for stronger justifications of any conclusions.

Relevant data may be collected through *documents, archival records, interviews, direct observations, and physical artefacts* [48]. According to Yin, when reviewing documents, researchers should bear in mind that they may not always accurately reflect reality (e.g. policy and process documents may be out-of-date). Archival records are arguably more reliable, as they are usually used for record keeping purposes.

A case study database allows investigators to develop an audit trail from data collection, through analysis, to final conclusions. Any interested reader should be able to link the conclusions presented in the case study report to the underlying analyses, the supporting evidence, the case study protocol, and the original research questions [48]. A case study database may include interview transcripts, investigator notes, documentary evidence, preliminary analyses, and the like. As such, the use of a case study database enhances the reliability of the study. All items in the database should be categorised, indexed, and cross-referenced in order to facilitate easy retrieval.

Before data collection is completed, researchers should ensure they have collected enough confirmatory evidence for most of the main study topics, and that the evidence included attempts to investigate major rival hypotheses or explanations. Yin argues that any case

study findings are "likely to be more convincing and accurate if [they] are based on several different sources of information" (p. 116), because multiple sources of evidence allow for data triangulation and the development of converging lines of inquiry. In other words, "examining consistency of evidence across different types of data sources is akin to verification" [19, p. 21]. Construct validity is also supported as multiple sources of evidence provide multiple measures of the same construct [48]. According to GAO [19] selection of appropriate instances/cases, triangulation, and the search for disproving evidence are the key features of case studies.

Interviews (see Table 3) are guided conversations that are usually one of the most important sources of case study evidence [48]. Even though the interview conversation has been described as a "pipeline for transmitting knowledge" [37, p. 113], effective interviewing remains a very difficult undertaking [18]. Interviews can be structured, semi-structured, or unstructured. Structured interviews involve asking pre-defined questions, with a limited set of response categories. The responses are coded by the interviewer based on an already established coding scheme [30], thus being somewhat similar to written surveys. Semi-structured interviews, or focused interviews [11], can be more flexible and allow the researcher to better understand the perspective of the interviewees [12]. In semi-structured interviews, a researcher is able to refocus the questions, or prompt for more information, if something interesting or novel emerges. Unstructured interviews, on the other hand, do not impose any predefined answer categories [18]. They utilise open-ended questions, thus allowing for even more flexibility. Whilst such interviews are least efficient, they may generate rich data and uncover surprising/unexpected evidence [12]. The experience of an interviewer with regard to technique and subject matter expertise is a key factor in identifying and maximising the collection of relevant information. It is recommended interviewers mainly use probe questions, which start with "How…?" and can not be answered with a "yes" or a "no", in unstructured interviews [33].

Table 3: Interview Process, adapted from [25, p. 77]

Orientation	Introductions and exchange of contact details. Description of the study and the interview process. Clarification of any expectations regarding non-attribution, sharing of data, and any other issues.
Information Gathering	The interviewer uses a questionnaire to guide the interview and to record responses.
Closing	The interviewer reviews the key points, any issues, and/or action items, and confirms accuracy with the respondent. The interviewee is invited to provide feedback on the interview process. The interviewer thanks the interviewee and seeks permission for any future contact.

Ideally, at least two researchers should participate in each interview, so that one can fully focus on the interview whilst the other records interviewee responses [25]. As is the case with any case study researcher, interviewers require relevant subject matter expertise as well as information collection (i.e. interviewing) skills. They also need to have a flexible approach, be objective, and critical. Some common pitfalls that can threaten an effective interview include: misinterpretation/misunderstanding of questions and answers (perhaps due to personal prejudices or convictions), leading/loaded questions and

interjecting comments that can bias the response, listening only to what is easy to understand, and making assumptions about what the interviewee may answer based on prior responses [4]. Furthermore, it has been observed that posing of *why* questions may create defensiveness on the part of the interviewees, and that *how* questions are usually a better choice [48]. Additionally, as interviewees may be biased, have poor recall, or poor articulation, it is usually necessary to corroborate such data with information from other sources. For instance, Yin argues that interviewing people with different perspectives can be a valuable approach. If possible, views of individuals from all relevant sections of the organisation should be obtained, and the views of more senior officials should not be given greater weight than views of less highly placed persons [19]. Interviewees themselves may also suggest other persons to interview, or other sources of evidence that may be of interest [48]. Any interview questionnaire used should include topic areas that address important issues; however, interviewers should preferably not read the questions but memorise the first few and refer to the instrument only occasionally [25]. Interviewers should use eye contact and a confident manner to set the tone for the interview and help establish rapport with the respondent. When tempted to omit a question because they think they already know the answer, interviewers should confirm their assumptions with the interviewee. Also, when an answer is too brief or vague, the interviewer should try to elicit more detail. This can be done by employing the silent probe (i.e. pause and wait), using overt encouragement (e.g. saying "uh-huh" or "okay"), asking for elaboration, asking for clarification, repetition (verify understanding by paraphrasing interviewee responses), and so on [25].

Using recording devices is a matter of personal preference. However, most interview methodologists do not think that mechanised recording is a good idea as recording may make interviewees uncomfortable as well as introduce additional transcription and analysis related complications [48]. In the case where the recording device malfunctions and the interviewers haven't been taking notes, the whole interview (or series of interviews) may be lost. Additionally, respondents may struggle to say things only in a socially acceptable way [25]. Instead, it is recommended interviewers mainly rely on pen and paper [46]. The scribe should record responses as they are being stated as this conveys the idea that they are interested in what the respondent is saying. Whilst the scribe does not have to write down everything, certain key phrases or quotes may need to be recorded verbatim [25]. In any case interviewers should ensure that interviewees understand how the data will be used as well as that statements can be made off-the-record.

In order to bring the interview to closure, the interviewer should review any actions and issues that were identified during the meeting. Upon the completion of the interview, researchers should discuss it as soon as possible in order to compare impressions and identify any potential misunderstandings. The interviewer should also review the interview transcript and annotate it as needed (e.g. abbreviations, incomplete thoughts, etc.) [25]. Any clarifications should be followed up with the interviewees as soon as possible. Table 4 details additional recommendations for the interviewer.

In addition to individual interviews, focus group discussions can be used to capture data on the attitudes of small groups of participants to the research problem [5]. The ideal number of participants ranges from eight to 12 [29] and, in contrast with individual

interviews, the interviewer also needs to facilitate interaction among focus group members. Whilst focus groups are usually more time and cost effective than individual interviews, they may discourage creativity or individual responsibility (e.g. through uneven participation and groupthink).

Table 4: Do's and Don'ts for the interviewer [25, p. 83]

Do's	Focus on the primary objective of the meeting. Ask every question. Manage time so that all questions are covered during the interview. Record responses on the interview form. Do not rely on an audio recording device.
Don'ts	Allow personal stories to take up valuable time. Diverge too far from the questionnaire. Allow your personal interests to become part of the discussion.

Any observation data collection instruments should be developed as part of the case study protocol [48]. Observations may be targeted at artefacts (e.g. physical audits), or any events/activities of interest (e.g. meetings). Such observational evidence (e.g. photographs) may provide additional information about the study domain or a particular event. For instance, if the case study is about a new technology, observations of the technology in the field setting can be highly valuable. Similar to interviews, having multiple investigators making the same observation may increase the reliability of the resulting evidence. Participant-observation refers to a special kind of observation where the investigator is not purely a passive observer, but an active participant in the events being studied (e.g. when the investigator is a staff member in the organisation being studied) [48]. However, participant-observations can be biased as the investigator is not an independent party. Also, such observers may find it difficult to think "outside of the box" and, as such, adopting a novel perspective may be challenging.

6. Analyse

The analyse stage relies on theoretical propositions and other strategies, considers and employs analytic techniques, explores rival explanations, and displays data (facts) apart from interpretations. Qualitative analysis has been described as both the most difficult and the least codified part of the case study process [16]. As already discussed, qualitative research aims towards analytical generalisation, as opposed to statistical generalisation usually aimed at in quantitative studies. Where statistical generalisation aims to make an inference about a population on the basis of empirical data collected from a sample, analytical generalisation uses previously developed theory with which empirical case study results are compared. As such, analytical generalisation is made to theory and not to population; the theory can be further strengthened by performing cross-case comparisons [48]. Analysing case study data in parallel with data collection activities allows the researchers to make quick adjustments to study design as required [19]. However, failing to explore rival explanations, inconsistently applying analytic techniques, only using a subset of data, and inadequately relating findings across cases can lead to unjustified conclusions.

The *constant comparative method* (CCM) and theoretical sampling form the core of qualitative analysis [10]. CCM, which was developed for the creation of theories that are grounded in the data [21], works inductively to "discover the latent pattern in the multiple participant's words" [20, p. 2]. Comparison, the main tool in qualitative analysis, is used to identify constructs, group them into themes, find negative evidence, and so on [45]. As such, the key objective of qualitative analysis is to identify conceptual similarities/differences and to discover types, classes, sequences, processes, patterns or wholes [24]. In the context of case studies "data analysis consists of examining, categorising, tabulating, testing, or otherwise recombining evidence to draw empirically based conclusions" [48, p. 126].

Computer-based tools may aid with the coding and categorising of large amounts of narrative text that may have been collected through interviews or obtained as documentary evidence [48]. An important point to make is that these tools can only assist an investigator with data analysis, and that much of their functionality is not automated, but analyst-driven, and does not negate the need for subject matter expertise. This is especially the case with the qualitative (as opposed to quantitative) data analysis tools. Any meaningful patterns and categories in qualitative data as well as any explanatory/descriptive theories need to be identified and interpreted by the analyst. With that in mind, "nearly all scholars express strong caveats about any use of computer-assisted tools" [48, p. 129].

According to Yin, the most important strategy is to follow the theoretical propositions or hypotheses that led to the case study. In other words, such propositions can help the analyst plan and focus on the most relevant data, organise the entire case study, and define alternative explanations. In the absence of any propositions/hypotheses, an alternative is to develop a descriptive framework (e.g. a draft table of contents) for organising the case study, whilst not pre-empting outcomes before the data has been fully analysed. Such a framework can help the analyst with organising the data as well as with developing a story line [48].

As researchers usually start the case study with some preconceived ideas, as already noted, in order to minimise any potential bias it is important to identify and test any rival explanations. In other words, researchers should try to anticipate potential counter arguments critical readers of the case study report may have. The process of identifying any such rival views may involve presenting preliminary analyses/findings to critical stakeholders and incorporating any feedback in the ongoing analysis. Rival views, which can often be identified via validity and reliability threats, may include the null hypothesis (the effect is the result of chance), direct rival (other interventions that account for the effect), commingled rival (other interventions contributed to the effect), rival theory (another theory explains the effect better), and so on [48].

In addition to the general strategies described above, any of the following techniques can also be used to analyse the case study evidence: *pattern matching*, *explanation building*, *time-series analysis*, *logic models*, and *cross-case analysis* [48]. *Pattern matching* is one of the most desirable techniques as it involves the comparison of predicted patterns and/or effects with the ones that have been empirically observed, and the identification of any variances

or gaps [19]. Of course, the greater the difference in rival patterns/effects, the easier it is to perform the matching, and the more convincing any resulting findings/conclusions will be. *Explanation building* is a special type of pattern matching which aims to analyse the case study data by building an explanation about the case [48]. In this context, explaining refers to the process of building a set of causal links about *how* or *why* something happened [30]. The process is usually iterative and involves making initial predictions and comparing them against the case study evidence. Then, based on any variances, the initial predictions are revised and compared against additional evidence and/or cases. This process is repeated until a satisfactory match is obtained. According to Yin, compared to surveys, "the ability to trace changes over time is a major strength of case studies" (p. 145). *Time-series analysis*, which can also be considered a type of pattern matching, involves temporal patterns, and may involve statistical analysis techniques (e.g. regression analysis). Chronological analysis of events may involve any of the following rules: event X must always occur before event Y, event X must always be followed by event Y on a contingency basis, event X can only follow event Y after a prescribed interval of time, and certain time periods in a case study may be marked by classes of events that differ substantially from those of other time periods [48]. *Logic models* are a cross between pattern matching and time-series analysis, where a predicted cause-effect chain of events is compared with the empirically observed evidence. Such logic models, which may be represented as *influence diagrams* (*causal maps*), can be used to causally model competing explanations. *Cross-case analysis*/synthesis applies to multiple cases and can involve any of the techniques described above.

According to GAO [19], the concept *observe, think, test, and revise* (OTTR) is central to case study data collection and analysis. It suggests that during and after *observations*, the researchers *think* about the meanings of information collected in terms of what it may imply. This *thinking* leads to ideas about new types of information required in order to confirm existing interpretations, or rule out alternative explanations (this is equivalent to theoretical sampling). During the *test* phase the researchers collect additional information which, when examined, may lead to *revisions* of initial interpretations. Such *revisions* may in turn lead to another *test* phase. This process can be stopped when a plausible explanation has been developed, there are no outlier or unexplained data, no further interpretations are possible, or it is obvious that any additional data will not lead to new information/insights [19]. Thus, according to GAO "in case study methods, causality is established through the internal consistency and plausibility of explanation, derived additively through the OTTR sequence" (p. 70).

As previously discussed, coding is a key step in qualitative data analysis. During qualitative analysis, the data is broken up into manageable pieces, which the researcher/analyst then reconstructs to reflect back a view of reality [9]. The initial step usually involves reading the interview transcripts, observational notes, and/or any other relevant documents, which may lead to the development of preliminary notes or memos that can then be used to formulate initial categories, themes and relationships. Memos are research notes that may contain interpretations of patterns found in the data, or general comments on issues revealed during the analysis, which can be coded in a similar way to interview transcripts. Coding is an iterative and incremental process that may be performed at differing levels of abstraction. *Descriptive coding* pertains to the broad topics

that the researcher may wish to develop prior to conducting interviews and observations [31]. *Topic coding* pertains to issues that generally only become apparent during data analysis [9]. *Analytical coding* involves arranging the coded data into a more abstract framework with categories that are generally more abstract than words in interview transcripts.

Leech & Onwuegbuzie [27] discuss several additional qualitative data analysis techniques. *Key Word In Context (KWIC) analysis* may be used to identify how words are used in context with other words (e.g. Google search). *Word count analysis* assumes that more frequently used words may be more important. *Classical content analysis*, which is similar to constant comparison analysis, counts themes or codes, and can help identify the most common concepts. *Domain analysis* (a domain is a category of categories) involves identification of cover terms (i.e. domains), included terms, and semantic relationships— e.g. strict inclusion (X is a kind of Y), spatial (X is a place in Y or X is a part of Y), cause-effect (X is a result of Y or X is a cause of Y), rationale (X is a reason for doing Y), location for action (X is a place for doing Y), function (X is used for Y), means-end (X is a way to do Y), sequence (X is a step or stage in Y), and attribution (X is an attribute or characteristic of Y) [38]. *Taxonomic analysis*, which may follow domain analysis, assumes that words can have different meanings and distinct connotations for different people. *Componential analysis* may also follow domain analysis in order to investigate if certain domains were used in different data sets.

7. Share

The share stage focuses on defining the audience, composing textual and visual materials, displaying enough evidence for a reader to reach his or her own conclusions, and reviewing and re-writing until done well [48]. GAO [19, p. 119] provides a detailed checklist for reviewing case study reports, and argues that presenting actual cases may persuade potential readers by providing an assurance of authenticity. However, common case study drawbacks include potential overgeneralisation, inadequate interpretation, unintegrated narrative, results not adequately related to research questions, and not enough evidence (i.e. raw data) being presented. The critical first step is to define/identify the audience for the case study report (e.g. industry, academia, or government). As different audiences have different needs, "no single report will serve all audiences simultaneously" [48, p. 167]. Thus, successful communication with more than one audience may require multiple versions of the case study report. Examining previous reports that were well-received by the intended audience can provide the author with useful ideas about the expected structure, type of content, report length, etc. Another important point is to start writing as early as possible. For instance, it should be possible to draft certain sections of the report (e.g. background and methodology) before data collection and analysis have been completed [48, p. 179]. Most importantly, the draft report should be reviewed by peers with relevant subject matter expertise as well as by the case study participants. The review by the case study participants provides the investigator with an opportunity to corroborate key facts as the participants may disagree

with the findings and recommendations [48]. It may even be worth considering including such review responses in the final report, perhaps as an appendix.

8. Conclusion

The case study is rapidly gaining acceptance, as a valid and worthwhile research method, in many diverse scientific domains. However, whilst it has often been viewed as a soft (easy and not particularly rigorous) research method, it is actually remarkably difficult to execute well in practice. As a result, having a set of clear and succinct guidelines that can be referenced and followed in practice is critical. This report adopted Yin's [48] case study process and integrated additional relevant guidelines from the wider methodological literature. Figure 2 summarises the key features discussed in this report that should be carefully considered as part of any case study.
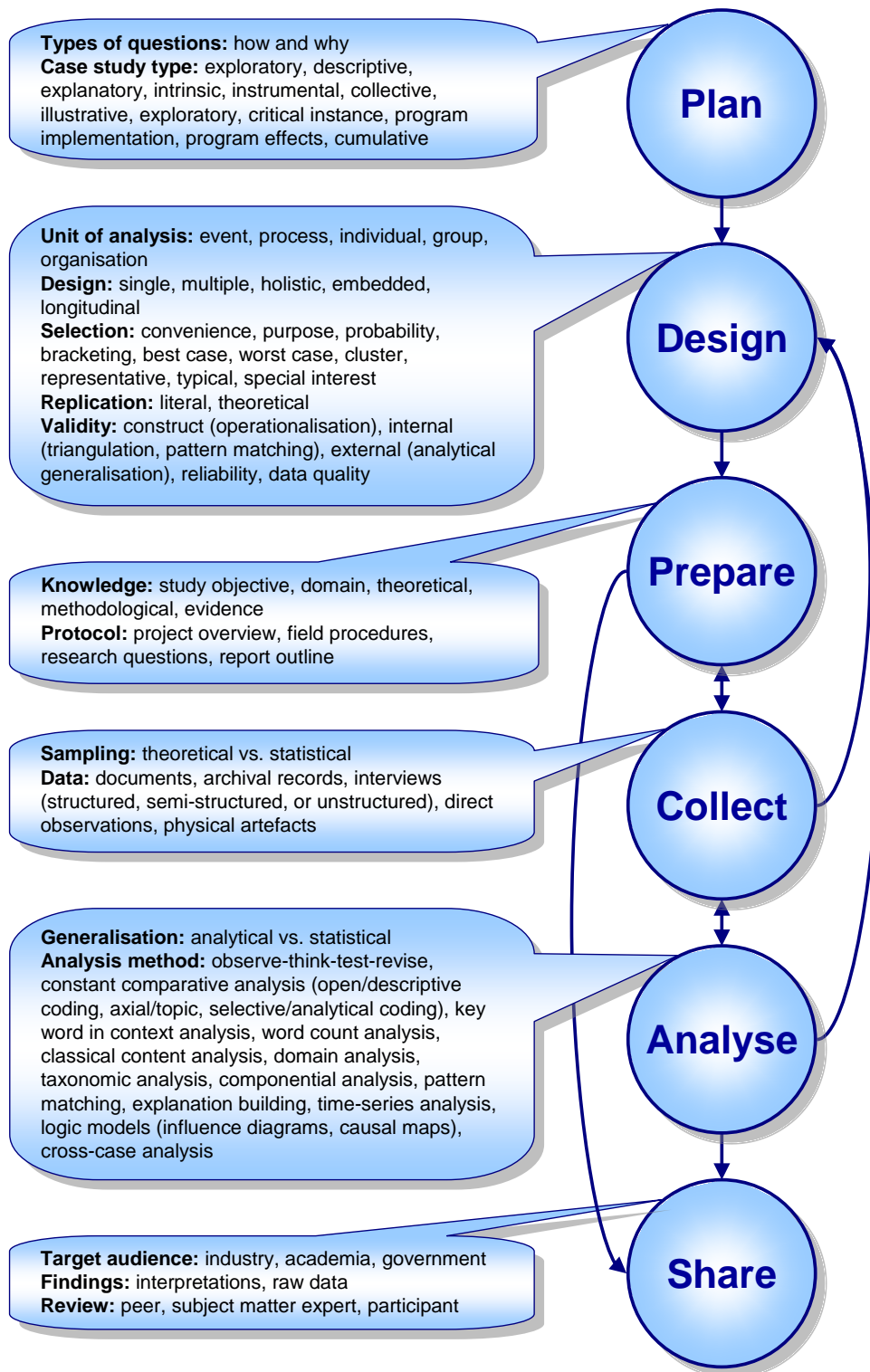
Types of questions: how and why
Case study type: exploratory, descriptive, explanatory, intrinsic, instrumental, collective, illustrative, exploratory, critical instance, program implementation, program effects, cumulative

Plan

Unit of analysis: event, process, individual, group, organisation
Design: single, multiple, holistic, embedded, longitudinal
Selection: convenience, purpose, probability, bracketing, best case, worst case, cluster, representative, typical, special interest
Replication: literal, theoretical
Validity: construct (operationalisation), internal (triangulation, pattern matching), external (analytical generalisation), reliability, data quality

Design

Knowledge: study objective, domain, theoretical, methodological, evidence
Protocol: project overview, field procedures, research questions, report outline

Prepare

Sampling: theoretical vs. statistical
Data: documents, archival records, interviews (structured, semi-structured, or unstructured), direct observations, physical artefacts

Collect

Generalisation: analytical vs. statistical
Analysis method: observe-think-test-revise, constant comparative analysis (open/descriptive coding, axial/topic, selective/analytical coding), key word in context analysis, word count analysis, classical content analysis, domain analysis, taxonomic analysis, componential analysis, pattern matching, explanation building, time-series analysis, logic models (influence diagrams, causal maps), cross-case analysis

Analyse

Target audience: industry, academia, government
Findings: interpretations, raw data
Review: peer, subject matter expert, participant

Share

Figure 2: The Case Study Process and Key Features

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Qualitative research, Case Study, Guidelines, Validity

19. ABSTRACT

This report presents guidelines for conducting qualitative case studies. Yin's case study process is elaborated on and additional principles from the wider literature are integrated and explained. It is expected that following the guidelines presented in this report will facilitate the collection of the most relevant data in the most efficient and effective manner, simplify the subsequent analysis and enhance the validity of the resulting findings.