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Analyzing Case Study Evidence

How to Start Your Analysis, Your Analytic Choices, and How They Work

AN ANALYTIC STRATEGY: MORE THAN FAMILIARITY WITH ANALYTIC TOOLS

Need for an Analytic Strategy

Introduction. The analysis of case study evidence is one of the least developed and most difficult aspects of doing case studies. Too many times, investigators start case studies without having the foggiest notion about how the evidence is to be analyzed (despite Chapter 3's recommendation that the analytic approaches be considered when developing the case study protocol). Such investigations easily become stalled at the analytic stage; this author has known colleagues who have simply ignored their case study data for month after month, not knowing what to do with the evidence.

Because of the problem, the experienced case study investigator is likely to have great advantages over the novice at the analytic stage. Unlike statistical analysis, there are few fixed formulas or cookbook recipes to guide the novice. Instead, much depends on an investigator's own style of rigorous empirical thinking, along with the sufficient presentation of evidence and careful consideration of alternative interpretations.

Investigators and especially novices do continue to search for formulas, recipes, or tools, hoping that familiarity with these devices will produce the needed analytic result. The tools are important and can be useful, but they are usually most helpful if you know what to look for (i.e., have an overall analytic strategy), which unfortunately returns you back to your original problem, if you hadn't noticed.

Computer-assisted tools. For instance, computer-assisted routines with prepackaged software such as Atlas.ti, HyperRESEARCH, NVivo, or The Ethnograph

Tip: How do I start analyzing my case study data?

You might start with questions (e.g., the questions in your case study protocol) rather than with the data. Start with a small question first, then identify your evidence that addresses the question. Draw a tentative conclusion based on the weight of the evidence, also asking how you should display the evidence so that readers can check your assessment. Continue to a larger question and repeat the procedure. Keep going until you think you have addressed your main research question(s).



Could you have started with the data instead of the questions?

all are examples of computer-assisted qualitative data analysis software (CAQDAS—e.g., Fielding & Lee, 1998). The software has become more diverse and functional over the past decade. Essentially, the tools can help you code and categorize large amounts of narrative text, as might have been collected from open-ended interviews or from large volumes of written materials, such as newspaper articles. Guidance on coding skills and techniques also has improved (e.g., Boyatzis, 1998).

Key to your understanding of the value of these packages are two words: *assisted* and *tools*. The software will not do any analysis for you, but it may serve as an able assistant and reliable tool. For instance, if you enter your textual data and then define an initial set of codes, one or another of the various

software packages will readily locate in the textual data all words and phrases matching these codes, count the incidence or occurrence of the words or codes, and even conduct Boolean searches to show when and where multiple combinations are found together. You can do this process iteratively, gradually building more complex categories or groups of codes. However, unlike statistical analyses, you cannot use the software's outputs themselves as if they were the end of your analysis.

Instead, you will need to study the outputs to determine whether any meaningful patterns are emerging. Quite likely, any patterns—such as the frequency of codes or code combinations—will still be conceptually more primitive (lower) than the initial “how” and “why” research questions that might have led to your case study in the first place. In other words, developing a rich and full explanation or even a good description of your case, in response to your initial “how” or “why” questions, will require much post-computer thinking and analysis on your part.

Backtracking, you also will need to have clarified the reasons for defining the initial codes or subsequent codes, as well as connecting them to your original research design (you, not the software, created them). In what ways do the codes or concepts accurately reflect the meaning of the retrieved words and phrases, and why? Answering these questions requires your own analytic rationale.

Under some circumstances, the computerized functions can nevertheless be extremely helpful. The minimal conditions include when (a) the words or verbal reports represent verbatim records and are the central part of your case study evidence and (b) you have a large collection of such data. Such conditions commonly occur in research using *grounded theory* strategies (e.g., Corbin & Strauss, 2007), where the surfacing of a new concept or theme can be highly valuable. However, even under the best of circumstances, nearly all scholars express strong caveats about any use of computer-assisted tools: You must still be prepared to be the main analyst and to direct the tools; they are the assistant, not you.

Most case studies pose a more serious challenge in efforts to use computer-assisted tools: Verbatim records such as interviewees' responses are likely to be only part of the total array of case study evidence. The case study will typically be about complex events and behavior, occurring within a possibly more complex, real-life context. Unless you convert all of your evidence—including your field notes and the archival documents you might have collected—into the needed textual form, computerized tools cannot readily handle this more diverse array of evidence. Yet, as emphasized in Chapter 4, such an array should represent an important strength of your case study. For a diverse set of evidence, you therefore need to develop your own analytic strategies.

A helpful starting point is to “play” with your data. One set of analytic manipulations has been comprehensively described and summarized by Miles and Huberman (1994) and includes

- ◆ Putting information into different arrays
- ◆ Making a matrix of categories and placing the evidence within such categories
- ◆ Creating data displays—flowcharts and other graphics—for examining the data
- ◆ Tabulating the frequency of different events
- ◆ Examining the complexity of such tabulations and their relationships by calculating second-order numbers such as means and variances
- ◆ Putting information in chronological order or using some other temporal scheme

These are indeed useful and important manipulations and can put the evidence in some preliminary order. Moreover, conducting such manipulations is one way of overcoming the stalling problem mentioned earlier. Without a broader strategy, however, you are still likely to encounter many false starts and potentially waste large chunks of your time. Furthermore, if after playing with the data, a general strategy does not emerge (or if you are not facile in playing with the data to begin with), the entire case study analysis is likely to be in jeopardy.

Any preliminary manipulations, such as the preceding, or any use of computer-assisted tools therefore cannot substitute for having a general analytic

strategy in the first place. Put another way, all empirical research studies, including case studies, have a “story” to tell. The story differs from a fictional account because it embraces your data, but it remains a story because it must have a beginning, end, and middle. The needed analytic strategy is your guide to crafting this story, and only rarely will your data do the crafting for you.

Once you have a strategy, the tools may turn out to be extremely useful (or irrelevant). The strategy will help you to treat the evidence fairly, produce compelling analytic conclusions, and rule out alternative interpretations. The strategy also will help you to use tools and make manipulations more effectively and efficiently. Four such strategies are described below, after which five specific techniques for analyzing case study data are reviewed. These strategies or techniques are not mutually exclusive. You can use any number of them in any combination. A continued alert is to be aware of these choices *before* collecting your data, so that you can be sure your data will be analyzable.

Four General Strategies

Relying on theoretical propositions. The first and most preferred strategy is to follow the theoretical propositions that led to your case study. The original objectives and design of the case study presumably were based on such propositions, which in turn reflected a set of research questions, reviews of the literature, and new hypotheses or propositions.

The propositions would have shaped your data collection plan and therefore would have given priorities to the relevant analytic strategies. One example, from a study of intergovernmental relationships, followed the proposition that federal funds have redistributive dollar effects but also create new organizational changes at the local level (Yin, 1980). The basic proposition—the creation of a “counterpart bureaucracy” in the form of local planning organizations, citizen action groups, and other new offices within a local government itself, but all attuned to specific federal programs—was traced in case studies of several cities. For each city, the purpose of the case study was to show how the formation and modification in local organizations occurred *after* changes in related federal programs and how these local organizations acted on behalf of the federal programs even though they might have been components of local government.

This proposition is an example of a theoretical orientation guiding the case study analysis. Clearly, the proposition helps to focus attention on certain data and to ignore other data. (A good test is to decide what data you might cite if you had only 5 minutes to defend a proposition in your case study.) The proposition also helps to organize the entire case study and to define alternative

explanations to be examined. Theoretical propositions stemming from “how” and “why” questions can be extremely useful in guiding case study analysis in this manner.

Developing a case description. A second general analytic strategy is to develop a descriptive framework for organizing the case study. This strategy is less preferable than relying on theoretical propositions but serves as an alternative when you are having difficulty making the first strategy work. For instance, you actually (but undesirably) may have collected a lot of data without having settled on an initial set of research questions or propositions. Studies started this way inevitably encounter challenges at their analytic phase.

Sometimes, the original and explicit purpose of the case study may have been a descriptive one. This was the objective of the famous sociological study *Middletown* (Lynd & Lynd, 1929), which was a case study of a small midwestern city. What is interesting about *Middletown*, aside from its classic value as a rich and historic case, is its compositional structure, reflected by its chapters:

- ◆ Chapter I: Getting a Living
- ◆ Chapter II: Making a Home
- ◆ Chapter III: Training the Young
- ◆ Chapter IV: Using Leisure
- ◆ Chapter V: Engaging in Religious Practices
- ◆ Chapter VI: Engaging in Community Activities

These chapters cover a range of topics relevant to community life in the early 20th century, when *Middletown* was studied. Note how the descriptive framework organizes the case study analysis but also assumes that data were collected about each topic in the first place. In this sense, you should have thought (at least a little) about your descriptive framework before designing your data collection instruments. As usual, the ideas for your framework should have come from your initial review of literature, which may have revealed gaps or topics of interest to you, spurring your interest in doing a case study. Another suggestion is to note the structure of existing case studies (e.g., by examining the original versions of those cited in the BOXES throughout this book) and at least to observe their tables of contents as an implicit clue to different descriptive approaches.

In other situations, the original objective of the case study may not have been a descriptive one, but a descriptive approach may help to identify the appropriate causal links to be analyzed—even quantitatively. BOX 25 gives an

example of a case study that was concerned with the complexity of implementing a local public works program in Oakland, California. Such complexity, the investigators realized, could be *described* in terms of the multiplicity of decisions, by public officials, that had to occur in order for implementation to succeed. This descriptive insight later led to the enumeration, tabulation, and hence quantification of the various decisions. In this sense, the descriptive approach was used to identify (a) an embedded unit of analysis (see Chapter 2) and (b) an overall pattern of complexity that ultimately was used in a causal sense to “explain” why implementation had failed.

BOX 25

Quantifying the Descriptive Elements of a Case Study

Pressman and Wildavsky's (1973) book, *Implementation: How Great Expectations in Washington Are Dashed in Oakland*, is regarded as one of the breakthrough contributions to the study of implementation (Yin, 1982b). This is the process whereby some programmatic activity—an economic development project, a new curriculum in a school, or a crime prevention program, for example—is installed in a specific setting (e.g., organization or community). The process is complex and involves numerous individuals, organizational rules, social norms, and mixtures of good and bad intentions.

Can such a complex process also be the subject of quantitative inquiry and analysis? Pressman and Wildavsky (1973) offer one innovative solution. To the extent that successful implementation can be *described* as a sequence of decisions, an analyst can focus part of the case study on the number and types of such decisions or elements.

Thus, in their chapter titled “The Complexity of Joint Action,” the authors analyze the difficulties in Oakland: To implement one public works program required a total of 70 sequential decisions—project approvals, negotiation of leases, letting of contracts, and so on. The analysis examined the level of agreement and the time needed to reach agreement at each of the 70 decision points. Given the normal diversity of opinion and slippage in time, the analysis illustrates—in a quantitative manner—the low probability of implementation success.

Using both qualitative and quantitative data. This third strategy may be more attractive to advanced students and scholars and can yield appreciable benefits. Certain case studies can include substantial amounts of quantitative data. If these data are subjected to statistical analyses at the same time that qualitative data nevertheless remain central to the entire case study, you will have successfully followed a strong analytic strategy.

The quantitative data may have been relevant to your case study for at least two reasons. First, the data may cover the behavior or events that your case study is trying to explain—typically, the “outcomes” in an evaluative case study. Second, the data may be related to an embedded unit of analysis within your broader case study. In either situation, the qualitative data may be critical in explaining or otherwise testing your case study’s key propositions. So, imagine a case study about a school, a neighborhood, an organization, a community, a medical practice, or some other common case study topic. For these topics, the outcomes of an evaluative case study might be, respectively, student achievement (for the case study about the school), housing prices (for the neighborhood), employees’ salaries (for the organization), various crime rates (for the community), or the course of an illness (for the medical practice). Alternatively, the embedded units might be students (or teachers), census blocks (or single-family housing), employees (for the organization), persons arrested (for the community), or patients (for the medical practice).

All of the illustrative outcomes or embedded units can be the occasion for having collected fine-grained quantitative data. Yet, the main case study questions might have been at a higher level: a single school (not its students), the neighborhood (not its housing units), a business firm (not its employees), a community (not its residents), or a new medical practice (not the patients). To explore, describe, or explain events at this higher level, you would have collected and used qualitative data. Thus, your case study would have deliberately used both qualitative and quantitative data.

If you attempt this third strategy, be prepared for the skills you will need. Beyond knowing how to do the case study well, you may have to master certain statistical techniques. Mentioned later in this chapter (but only in passing) are regression discontinuity analyses, hierarchical linear models, and structural equation models. Do you believe that any of them can be part of a case study analysis?

EXERCISE 5.1 Using Quantitative Data in a Case Study

Select one of your own empirical studies—but *not* a case study—in which you analyzed some quantitative data (or choose such a study from the literature). Describe how the data were analyzed in this study. Argue whether this same analysis, virtually in its same form, could be found as one part of a fuller case study analysis. Do you think that quantitative data are less relevant to case studies than qualitative data?

Examining rival explanations. A fourth general analytic strategy, trying to define and test rival explanations, generally works with all of the previous

three: Initial theoretical propositions (the first strategy above) might have included rival hypotheses; the contrasting perspectives of participants and stakeholders may produce rival descriptive frameworks (the second strategy); and data from comparison groups may cover rival conditions to be examined as part of using both quantitative and qualitative data (the third strategy).

For instance, the typical hypothesis in an evaluation is that the observed outcomes were the result of an intervention supported by public or foundation funds. The simple or direct rival explanation would be that the observed outcomes were in fact the result of some other influence besides the intervention and that the investment of funds may not actually have been needed. Being aware (ahead of time) of this direct rival, your case study data collection should then have included attempts to collect evidence about the possible “other influences.” Furthermore, you should have pursued your data collection about them vigorously—as if you were in fact trying to prove the potency of the other influences rather than rejecting them (Patton, 2002, p. 553; P. R. Rosenbaum, 2002, pp. 8–10). Then, if you had found insufficient evidence, you would less likely be accused of stacking the deck in favor of the original hypothesis.

The direct rival—that the original investment was not the reason for the observed outcomes—is but one of several types of rival explanations. Figure 5.1 classifies and lists many types of rivals (Yin, 2000). For each type, an informal and more understandable descriptor (in the parentheses and quotation marks in Figure 5.1) accompanies the formal social science categorization, making the gist of the rival thinking clearer.

The list reminds us of three “craft” rivals that underlie all of our social science research, and textbooks have given much attention to these craft rivals. However, the list also defines six “real-life” rivals, which have received virtually no attention by other textbooks (nor, unfortunately, do most texts discuss the challenges and benefits of rival thinking or the use of rival explanations). These real-life rivals are the ones that you should carefully identify prior to your data collection (while not ignoring the craft rivals). Some real-life rivals also may not become apparent until you are in the midst of your data collection, and attending to them at that point is acceptable and desirable. Overall, the more rivals that your analysis addresses and rejects, the more confidence you can place in your findings.

Rival explanations were a critical part of several of the case studies already contained in the BOXES cited earlier (e.g., refer to BOXES 1 and 11 in Chapters 1 and 2, respectively). The authors of these case studies used the rivals to drive their entire case study analysis. Additional examples—covering cases of university innovation and of drug abuse prevention but deliberately

TYPE OF RIVAL	Description or Examples
<i>Craft Rivals:</i>	
1. The Null Hypothesis	The observation is the result of chance circumstances only
2. Threats to Validity	e.g., history, maturation, instability, testing, instrumentation, regression, selection, experimental mortality, and selection-maturation interaction
3. Investigator Bias	e.g., “experimenter effect”; reactivity in field research
<i>Real-Life Rivals:</i>	
4. Direct Rival (Practice or Policy)	An intervention (“suspect 2”) other than the target intervention (“suspect 1”) accounts for the results (“ <i>the butler did it</i> ”)
5. Commingled Rival (Practice or Policy)	Other interventions and the target intervention both contributed to the results (“ <i>it wasn’t only me</i> ”)
6. Implementation Rival	The implementation process, not the substantive intervention, accounts for the results (“ <i>did we do it right?</i> ”)
7. Rival Theory	A theory different from the original theory explains the results better (“ <i>it’s elementary, my dear Watson</i> ”)
8. Super Rival	A force larger than but including the intervention accounts for the results (“ <i>it’s bigger than both of us</i> ”)
9. Societal Rival	Social trends, not any particular force or intervention, account for the results (“ <i>the times they are a-changin</i> ”)

Figure 5.1 Brief Descriptions of Different Kinds of Rival Explanations

SOURCE: Yin (2000).

focusing on the essence of the evidence about rival explanations—are found in Yin (2003, chaps. 4 and 5).

Summary. The best preparation for conducting case study analysis is to have a general analytic strategy. Four have been described, relying on theoretical propositions, case descriptions, a dual use of both quantitative and qualitative

data, and rival explanations. All four strategies underlie the analytic techniques to be described below. Without such strategies (or alternatives to them), case study analysis will proceed with difficulty.

The remainder of this chapter covers the specific analytic techniques, to be used as part of and along with any of the general strategies. The techniques are especially intended to deal with the previously noted problems of developing *internal validity* and *external validity* in doing case studies (see Chapter 2).

EXERCISE 5.2 Creating a General Analytic Strategy

Assume that you have begun analyzing your case study data but still do not have an overall analytic strategy. Instead of staying stalled at this analytic step, move to the next step and speculate how you might organize your (later) case study report into separate chapters or sections. Within each chapter or section, create substantive titles and headings (e.g., instead of "introduction," make the title say what the introduction is about, even if more than a few words are needed). Try different sequences of titles and headings, noting how such differences might dictate the creation of different analytic strategies. Now choose one sequence and start sorting your data into the designated chapters or sections. You should be on your way to analyzing your case study data.

FIVE ANALYTIC TECHNIQUES

None of the analytic techniques should be considered easy to use, and all will need much practice to be used powerfully. Your objective should be to start modestly, work thoroughly and introspectively, and build your own analytic repertoire over time. The reward will eventually emerge in the form of compelling case study analyses and, ultimately, compelling case studies.

Pattern Matching

For case study analysis, one of the most desirable techniques is to use a pattern-matching logic. Such a logic (Trochim, 1989) compares an empirically based pattern with a predicted one (or with several alternative predictions). If the patterns coincide, the results can help a case study to strengthen its *internal validity*.

If the case study is an explanatory one, the patterns may be related to the dependent or the independent variables of the study (or both). If the case study

is a descriptive one, pattern matching is still relevant, as long as the predicted pattern of specific variables is defined prior to data collection.

Nonequivalent dependent variables as a pattern. The dependent-variables pattern may be derived from one of the more potent quasi-experimental research designs, labeled a “nonequivalent, dependent variables design” (Cook & Campbell, 1979, p. 118). According to this design, an experiment or quasi-experiment may have multiple dependent variables—that is, a variety of relevant outcomes. For instance, in quantitative health studies, some outcomes may have been predicted to be affected by a treatment, whereas other outcomes may have been predicted *not* to be affected (Rosenbaum, 2002, pp. 210–211). For these studies as well as a case study, the pattern matching occurs in the following manner: If, for each outcome, the initially predicted values have been found, and at the same time alternative “patterns” of predicted values (including those deriving from methodological artifacts, or “threats” to validity) have not been found, strong causal inferences can be made.

For example, consider a single case in which you are studying the effects of a newly decentralized office computer system. Your major proposition is that—because each peripheral piece of equipment can work independently of any server—a certain pattern of organizational changes and stresses will be produced. Among these changes and stresses, you specify the following, based on propositions derived from previous decentralization theory:

- ◆ employees will create *new applications* for the office system, and these applications will be idiosyncratic to each employee;
- ◆ traditional *supervisory links* will be threatened, as management control over work tasks and the use of central sources of information will be diminished;
- ◆ *organizational conflicts* will increase, due to the need to coordinate resources and services across the decentralized units; but nevertheless,
- ◆ *productivity* will increase over the levels prior to the installation of the new system.

In this example, these four outcomes each represent different dependent variables, and you would assess each with different measures. To this extent, you have a study that has specified *nonequivalent* dependent variables. You also have predicted an overall pattern of outcomes covering each of these variables. If the results are as predicted, you can draw a solid conclusion about the effects of decentralization. However, if the results fail to show the entire pattern as predicted—that is, even if one variable does not behave as predicted—your initial proposition would have to be questioned (see BOX 26 for another example).

BOX 26**Pattern Matching on Each of Multiple Outcomes**

Researchers and politicians alike recognize that U.S. military bases, located across the country, contribute significantly to a local economy's housing, employment, and other markets. When such bases close, a corresponding belief is that the community will suffer in some catastrophic (both economic and social) manner.

To test the latter proposition, Bradshaw (1999) conducted a case study of a closure that had occurred in a modestly sized California community. He first identified a series of sectors (e.g., housing sales, civilian employment, unemployment, population turnover and stability, and retail markets) where catastrophic outcomes might have been feared, and he then collected data about each sector before and after the base closure. A pattern-matching procedure, examining the pre-post patterns of outcomes in every sector and also in comparison to other communities and statewide trends, showed that the outcomes were much less severe than anticipated. Some sectors did not even show any decline. Bradshaw also presented evidence to explain the pattern of outcomes, thereby producing a compelling argument for his conclusions.

This first case could then be augmented by a second one, in which another new office system had been installed, but of a centralized nature—that is, the equipment at all of the individual workstations had been networked. Now you would predict a different pattern of outcomes, using the same four dependent variables enumerated above. And now, if the results show that the decentralized system (Case A) had actually produced the predicted pattern and that this first pattern was different from that predicted and produced by the centralized system (Case B), you would be able to draw an even stronger conclusion about the effects of decentralization. In this situation, you have made a *theoretical replication* across cases. (In other situations, you might have sought a *literal replication* by identifying and studying two or more cases of decentralized systems.)

Finally, you might be aware of the existence of certain threats to the validity of this logic (see Cook & Campbell, 1979, for a full list of these threats). For example, a new corporate executive might have assumed office in Case A, leaving room for a counterargument: that the apparent effects of decentralization were actually attributable to this executive's appointment and not to the newly installed office system. To deal with this threat, you would have to identify some subset of the initial dependent variables and show that the pattern would have been different (in Case A) if the corporate executive had been the actual reason for the effects. If you only had a single-case study, this type of

procedure would be essential; you would be using the same data to rule out arguments based on a potential threat to validity. Given the existence of a second case, as in our hypothetical example, you also could show that the argument about the corporate executive would not explain certain parts of the pattern found in Case B (in which the absence of the corporate executive should have been associated with certain opposing outcomes). In essence, your goal is to identify all reasonable threats to validity and to conduct repeated comparisons, showing how such threats cannot account for the dual patterns in both of the hypothetical cases.

Rival explanations as patterns. The use of rival explanations, besides being a good general analytic strategy, also provides a good example of pattern matching for independent variables. In such a situation (for an example, see BOX 27), several cases may be known to have had a certain type of outcome, and your investigation has focused on how and why this outcome occurred in each case.

BOX 27

Pattern Matching for Rival Explanations and Replicating across Multiple Cases

A common policy problem is to understand the conditions under which new research findings can be made useful to society. This topic was the subject of a multiple-case study (Yin, 2003, chap. 1, pp. 20–22). For nine different cases, the investigators first provided definitive evidence that important research findings had indeed been put into practical use in every case.

The main research inquiry then dealt with “how” and “why” such outcomes had occurred. The investigators compared three theories (“rivals”) from the prevailing literature, that (a) researchers select their own topics to study and then successfully disseminate their findings to the practical world (technology “push”), (b) the practical world identifies problems that attract researchers’ attention and that then leads to successful problem solving (demand “pull”), and (c) researchers and practitioners work together, customizing an elongated process of problem identification and solution testing (“social interaction”). Each theory predicts a different pattern of rival events that should precede the preestablished outcome. For instance, the demand “pull” theory requires the prior existence of a problem as a prelude to the initiation of a research project, but the same condition is not present in the other two theories.

For the nine cases, the events turned out to match best a combination of the second and third theories. The multiple-case study had therefore pattern-matched the events in each case with different theoretical predictions and also used a replication logic across the cases.

This analysis requires the development of rival theoretical propositions, articulated in operational terms. The desired characteristic of these rival explanations is that each involves a pattern of independent variables that is mutually exclusive: If one explanation is to be valid, the others cannot be. This means that the presence of certain independent variables (predicted by one explanation) precludes the presence of other independent variables (predicted by a rival explanation). The independent variables may involve several or many different types of characteristics or events, each assessed with different measures and instruments. The concern of the case study analysis, however, is with the overall pattern of results and the degree to which the observed pattern matches the predicted one.

This type of pattern matching of independent variables also can be done either with a single case or with multiple cases. With a single case, the successful matching of the pattern to one of the rival explanations would be evidence for concluding that this explanation was the correct one (and that the other explanations were incorrect). Again, even with a single case, threats to validity—basically constituting another group of rival explanations—should be identified and ruled out. Moreover, if this identical result were additionally obtained over multiple cases, *literal replication* of the single cases would have been accomplished, and the cross-case results might be stated even more assertively. Then, if this same result also failed to occur in a second group of cases, due to predictably different circumstances, *theoretical replication* would have been accomplished, and the initial result would stand yet more robustly.

Simpler patterns. This same logic can be applied to simpler patterns, having a minimal variety of either dependent or independent variables. In the simplest case, where there may be only two different dependent (or independent) variables, pattern matching is possible as long as a different pattern has been stipulated for these two variables.

The fewer the variables, of course, the more dramatic the different patterns will have to be to allow any comparisons of their differences. Nevertheless, there are some situations in which the simpler patterns are both relevant and compelling. The role of the general analytic strategy would be to determine the best ways of contrasting any differences as sharply as possible and to develop theoretically significant explanations for the different outcomes.

Precision of pattern matching. At this point in the state of the art, the actual pattern-matching procedure involves no precise comparisons. Whether one is predicting a pattern of nonequivalent dependent variables, a pattern based on rival explanations, or a simple pattern, the fundamental comparison between

the predicted and the actual pattern may involve no quantitative or statistical criteria. (Available statistical techniques are likely to be irrelevant because each of the variables in the pattern will probably represent a single data point, and none will therefore have a “variance.”) The most quantitative result will likely occur if the study had set preestablished benchmarks (e.g., productivity will increase by 10%) and the value of the actual outcome was then compared to this benchmark.

Low levels of precision can allow for some interpretive discretion on the part of the investigator, who may be overly restrictive in claiming a pattern to have been violated or overly lenient in deciding that a pattern has been matched. You can make your case study stronger by developing more precise measures. In the absence of such precision, an important suggestion is to avoid postulating very subtle patterns, so that your pattern matching deals with gross matches or mismatches whose interpretation is less likely to be challenged.

Explanation Building

A second analytic technique is in fact a special type of pattern matching, but the procedure is more difficult and therefore deserves separate attention. Here, the goal is to analyze the case study data by building an explanation about the case.

As used in this chapter, the procedure is mainly relevant to explanatory case studies. A parallel procedure, for exploratory case studies, has been commonly cited as part of a hypothesis-generating process (see Glaser & Strauss, 1967), but its goal is not to conclude a study but to develop ideas for further study.

Elements of explanations. To “explain” a phenomenon is to stipulate a presumed set of causal links about it, or “how” or “why” something happened. The causal links may be complex and difficult to measure in any precise manner (see BOX 28).

In most existing case studies, explanation building has occurred in narrative form. Because such narratives cannot be precise, the better case studies are the ones in which the explanations have reflected some theoretically significant propositions. For example, the causal links may reflect critical insights into public policy process or into social science theory. The public policy propositions, if correct, can lead to recommendations for future policy actions (see BOX 29A for an example); the social science propositions, if correct, can lead to major contributions to theory building, such as the transition of countries from agrarian to industrial societies (see BOX 29B for an example).

BOX 28**Explanation Building in a Single-Case Study**

Why businesses succeed or fail continues to be a topic of popular as well as research interest. Explanations are definitely needed when failure occurs with a firm that, having successfully grown for 30 years, had risen to become the number two computer maker in the entire country and, across all industries, among the top 50 corporations in size. Edgar Schein's (2003) single-case study assumed exactly that challenge and contains much documentation and interview data (also see BOX 46, Chapter 6, p. 188).

Schein, a professor at MIT, had served as a consultant to the firm's senior management during nearly all of its history. His case study tries to explain how and why the company had a "missing gene"—one that appeared critical to the business's survival. The author argues that the gene was needed to overcome the firm's other tendencies, which emphasized the excellent and creative quality of its technical operations. Instead, the firm should have given more attention to its business and marketing operations. The firm might then have overcome its inability to address layoffs that might have pruned deadwood in a more timely manner and set priorities among competing development projects (the firm developed three different PCs, not just one).

BOX 29**Explanation Building in Multiple-Case Studies****29A. A Study of Multiple Communities**

In a multiple-case study, one goal is to build a general explanation that fits each individual case, even though the cases will vary in their details. The objective is analogous to creating an overall explanation, in science, for the findings from multiple experiments.

Martha Derthick's (1972) *New Towns In-Town: Why a Federal Program Failed* is a book about a housing program under President Lyndon Johnson's administration. The federal government was to give its surplus land—located in choice inner-city areas—to local governments for housing developments. But after 4 years, little progress had been made at the seven sites—San Antonio, Texas; New Bedford, Massachusetts; San Francisco, California; Washington, D.C.; Atlanta, Georgia; Louisville, Kentucky; and Clinton Township, Michigan—and the program was considered a failure.

Derthick's (1972) account first analyzes the events at each of the seven sites. Then, a general explanation—that the projects failed to generate sufficient local support—is found unsatisfactory because the condition was not dominant at all of the sites.

According to Derthick, local support did exist, but “federal officials had nevertheless stated such ambitious objectives that some degree of failure was certain” (p. 91). As a result, Derthick builds a modified explanation and concludes that “the surplus lands program failed both because the federal government had limited influence at the local level and because it set impossibly high objectives” (p. 93).

29B. A Study of Multiple Societies

An analytic approach similar to Derthick’s is used by Barrington Moore (1966) in his history on the *Social Origins of Dictatorship and Democracy*. The book serves as another illustration of explanation building in multiple-case studies, even though the cases are actually historical examples.

Moore’s (1966) book covers the transformation from agrarian to industrial societies in six different countries—England, France, the United States, China, Japan, and India—and the general explanation of the role of the upper classes and the peasantry is a basic theme that emerges and that became a significant contribution to the field of history.

Iterative nature of explanation building. The explanation-building process, for explanatory case studies, has not been well documented in operational terms. However, the eventual explanation is likely to be a result of a series of iterations:

- ◆ Making an initial theoretical statement or an initial proposition about policy or social behavior
- ◆ Comparing the findings of *an initial case* against such a statement or proposition
- ◆ Revising the statement or proposition
- ◆ Comparing other details of the case against the revision
- ◆ Comparing the revision to the facts of *a second, third, or more cases*
- ◆ Repeating this process as many times as is needed

In this sense, the final explanation may not have been fully stipulated at the beginning of a study and therefore differs from the pattern-matching approaches previously described. Rather, the case study evidence is examined, theoretical positions are revised, and the evidence is examined once again from a new perspective in this iterative mode.

The gradual building of an explanation is similar to the process of refining a set of ideas, in which an important aspect is again to entertain other *plausible or*

rival explanations. As before, the objective is to show how these rival explanations cannot be supported, given the actual set of case study events.

Potential problems in explanation building. You should be forewarned that this approach to case study analysis is fraught with dangers. Much analytic insight is demanded of the explanation builder. As the iterative process progresses, for instance, an investigator may slowly begin to drift away from the original topic of interest. Constant reference to the original purpose of the inquiry and the possible alternative explanations may help to reduce this potential problem. Other safeguards already have been covered by Chapters 3 and 4—that is, the use of a case study protocol (indicating what data were to be collected), the establishment of a case study database for each case (formally storing the entire array of data that were collected, available for inspection by a third party), and the following of a chain of evidence.

EXERCISE 5.3 Constructing an Explanation

Identify some observable changes that have been occurring in your neighborhood (or the neighborhood around your campus). Develop an explanation for these changes and indicate the critical set of evidence you would collect to support or challenge this explanation. If such evidence were available, would your explanation be complete? Compelling? Useful for investigating similar changes in another neighborhood?

Time-Series Analysis

A third analytic technique is to conduct a time-series analysis, directly analogous to the time-series analysis conducted in experiments and quasi-experiments. Such analysis can follow many intricate patterns, which have been the subject of several major textbooks in experimental and clinical psychology with single *subjects* (e.g., see Kratochwill, 1978); the interested reader is referred to such works for further detailed guidance. The more intricate and precise the pattern, the more that the time-series analysis also will lay a firm foundation for the conclusions of the case study.

Simple time series. Compared to the more general pattern-matching analysis, a time-series design can be much simpler in one sense: In time series, there may only be a single dependent or independent variable. In these circumstances, when a large number of data points are relevant and available, statistical tests can even be used to analyze the data (see Kratochwill, 1978).

However, the pattern can be more complicated in another sense because the appropriate starting or ending points for this single variable may not be clear. Despite this problem, the ability to trace changes over time is a major strength of case studies—which are not limited to cross-sectional or static assessments of a particular situation. If the events over time have been traced in detail and with precision, some type of time-series analysis always may be possible, even if the case study analysis involves some other techniques as well (see BOX 30).

BOX 30

Using Time-Series Analysis in a Single-Case Study

In New York City, and following a parallel campaign to make the city's subways safer, the city's police department took many actions to reduce crime in the city more broadly. The actions included enforcing minor violations ("order restoration and maintenance"), installing computer-based crime-control techniques, and reorganizing the department to hold police officers accountable for controlling crime.

Kelling and Coles (1997) first describe all of these actions in sufficient detail to make their potential effect on crime reduction understandable and plausible. The case study then presents time series of the annual rates of specific types of crime over a 7-year period. During this period, crime initially rose for a couple of years and then declined for the remainder of the period. The case study explains how the timing of the relevant actions by the police department matched the changes in the crime trends. The authors cite the plausibility of the actions' effects, combined with the timing of the actions in relation to the changes in crime trends, to support their explanation for the reduction in crime rates in the New York City of that era.

The essential logic underlying a time-series design is the match between the observed (empirical) trend and either of the following: (a) a theoretically significant trend specified before the onset of the investigation or (b) some rival trend, also specified earlier. Within the same single-case study, for instance, two different patterns of events may have been hypothesized over time. This is what D. T. Campbell (1969) did in his now-famous study of the change in Connecticut's speed limit law, reducing the limit to 55 miles per hour in 1955. The predicted time-series pattern was based on the proposition that the new law (an "interruption" in the time series) had substantially reduced the number of fatalities, whereas the other time-series pattern was based on the proposition that no such effect had occurred. Examination of the actual data points—that is, the annual number of fatalities over a period of years before and after the law was passed—then determined which of the alternative time series best

matched the empirical evidence. Such comparison of “interrupted time series” within the same case can be used in many different situations.

The same logic also can be used in doing a multiple-case study, with contrasting time-series patterns postulated for different cases. For instance, a case study about economic development in cities may have examined the reasons that a manufacturing-based city had more negative employment trends than those of a service-based city. The pertinent outcome data might have consisted of annual employment data over a prespecified period of time, such as 10 years. In the manufacturing-based city, the predicted employment trend might have been a declining one, whereas in the service-based city, the predicted trend might have been a rising one. Similar analyses can be imagined with regard to the examination of youth gangs over time within individual cities, changes in health status (e.g., infant mortality), trends in college rankings, and many other indicators. Again, with appropriate data, the analysis of the trends can be subjected to statistical analysis. For instance, you can compute “slopes” to cover time trends under different conditions (e.g., comparing student achievement trends in schools with different kinds of curricula) and then compare the slopes to determine whether their differences are statistically significant (see Yin, Schmidt, & Besag, 2006). As another approach, you can use regression discontinuity analysis to test the difference in trends before and after a critical event, such as the passing of a new speed limit law (see D. T. Campbell, 1969).

Complex time series. The time-series designs can be more complex when the trends within a given case are postulated to be more complex. One can postulate, for instance, not merely rising or declining (or flat) trends but some rise followed by some decline within the same case. This type of mixed pattern, across time, would be the beginning of a more complex time series. The relevant statistical techniques would then call for stipulating nonlinear models. As always, the strength of the case study strategy would not merely be in assessing this type of time series but also in having developed a rich explanation for the complex pattern of outcomes and in comparing the explanation with the outcomes.

Greater complexities also arise when a multiple set of variables—not just a single one—are relevant to a case study and when each variable may be predicted to have a different pattern over time. Such conditions can especially be present in embedded case studies: The case study may be about a single case, but extensive data also cover an embedded unit of analysis (see Chapter 2, Figure 2.3). BOX 31 contains two examples. The first (see BOX 31A) was a single-case study about one school system, but hierarchical linear models were used to analyze a detailed set of student achievement data. The second (see

BOX 31B) was about a single neighborhood revitalization strategy taking place in several neighborhoods; the authors used statistical regression models to analyze time trends for the sales prices of single-family houses in the targeted and comparison neighborhoods and thereby to assess the outcomes of the single strategy.

BOX 31

More Complex Time-Series Analyses: Using Quantitative Methods When Single-Case Studies Have an Embedded Unit of Analysis

31A. Evaluating the Impact of Systemwide Reform in Education

Supovitz and Taylor (2005) conducted a case study of Duval County School District in Florida, with the district's students serving as an embedded unit of analysis. A quantitative analysis of the students' achievement scores over a 4-year period, using hierarchical linear models adjusted for confounding factors, showed "little evidence of sustained systemwide impacts on student learning, in comparison to other districts."

The case study includes a rich array of field observations and surveys of principals, tracing the difficulties in implementing new systemwide changes prior to and during the 4-year period. The authors also discuss in great detail their own insights about systemwide reform and the implications for evaluators—that such an "intervention" is hardly self-contained and that its evaluation may need to embrace more broadly the institutional environment beyond the workings of the school system itself.

31B. Evaluating a Neighborhood Revitalization Strategy

Galster, Tatian, and Accordino (2006) do not present their work as a case study. The aim of their study was nevertheless to evaluate a single neighborhood revitalization strategy (as in a single-case study) begun in 1998 in Richmond, Virginia. The article presents the strategy's rationale and some of its implementation history, and the main conclusions are about the revitalization strategy. However, the distinctive analytic focus is on what might be considered an "embedded" unit of analysis: the sales prices of single-family homes. The overall evaluation design is highly applicable to a wide variety of embedded case studies.

To test the effectiveness of the revitalization strategy, the authors used regression models to compare pre- and postintervention (time series) trends between housing prices in targeted and comparison neighborhoods. The findings showed that the revitalization strategy had "produced substantially greater appreciation in the market values of single-family homes in the targeted areas than in comparable homes in similarly distressed neighborhoods."

In general, although a more complex time series creates greater problems for data collection, it also leads to a more elaborate trend (or set of trends) that can strengthen an analysis. Any match of a predicted with an actual time series, when both are complex, will produce strong evidence for an initial theoretical proposition.

Chronologies. The compiling of chronological events is a frequent technique in case studies and may be considered a special form of time-series analysis. The chronological sequence again focuses directly on the major strength of case studies cited earlier—that case studies allow you to trace events over time.

You should not think of the arraying of events into a chronology as a descriptive device only. The procedure can have an important analytic purpose—to investigate presumed causal events—because the basic sequence of a cause and its effect cannot be temporally inverted. Moreover, the chronology is likely to cover many different types of variables and not be limited to a single independent or dependent variable. In this sense, the chronology can be richer and more insightful than general time-series approaches. The analytic goal is to compare the chronology with that predicted by some explanatory theory—in which the theory has specified one or more of the following kinds of conditions:

- ◆ Some events must always occur before other events, with the reverse *sequence* being impossible.
- ◆ Some events must always be followed by other events, on a *contingency* basis.
- ◆ Some events can only follow other events after a prespecified *interval of time*.
- ◆ Certain *time periods* in a case study may be marked by classes of events that differ substantially from those of other time periods.

If the actual events of a case study, as carefully documented and determined by an investigator, have followed one predicted sequence of events and not those of a compelling, rival sequence, the single-case study can again become the initial basis for causal inferences. Comparison to other cases, as well as the explicit consideration of threats to internal validity, will further strengthen this inference.

Summary conditions for time-series analysis. Whatever the stipulated nature of the time series, the important case study objective is to examine some relevant “how” and “why” questions about the relationship of events over time, not merely to observe the time trends alone. An interruption in a time series will be the occasion for postulating potential causal relationships; similarly, a chronological sequence should contain causal postulates.

On those occasions when the use of time-series analysis is relevant to a case study, an essential feature is to identify the specific indicator(s) to be traced over time, as well as the specific time intervals to be covered and the presumed temporal relationships among events, *prior to* collecting the actual data. Only as a result of such prior specification are the relevant data likely to be collected in the first place, much less analyzed properly and with minimal bias.

In contrast, if a study is limited to the analysis of time trends alone, as in a descriptive mode in which causal inferences are unimportant, a non-case study strategy is probably more relevant—for example, the economic analysis of consumer price trends over time.

Note, too, that without any hypotheses or causal propositions, chronologies become *chronicles*—valuable descriptive renditions of events but having no focus on causal inferences.

EXERCISE 5.4 Analyzing Time-Series Trends

Identify a simple time series—for example, the number of students enrolled at your university for each of the past 20 years. How would you compare one period of time with another within the 20-year period? If the university admissions policies had changed during this time, how would you compare the effects of such policies? How might this analysis be considered part of a broader case study of your university?

Logic Models

This fourth technique has become increasingly useful in recent years, especially in doing case study evaluations (e.g., Mulroy & Lauber, 2004). The logic model deliberately stipulates a complex chain of events over an extended period of time. The events are staged in repeated cause-effect-cause-effect patterns, whereby a dependent variable (event) at an earlier stage becomes the independent variable (causal event) for the next stage (Peterson & Bickman, 1992; Rog & Huebner, 1992). Evaluators also have demonstrated the benefits when logic models are developed collaboratively—that is, when evaluators and the officials implementing a program being evaluated work together to define a program's logic model (see Nesman, Batsche, & Hernandez, 2007). The process can help a group define more clearly its vision and goals, as well as how the sequence of programmatic actions will (in theory) accomplish the goals.

As an analytic technique, the use of logic models consists of matching empirically observed events to theoretically predicted events. Conceptually, you therefore may consider the logic model technique to be another form of pattern

matching. However, because of their sequential stages, logic models deserve to be distinguished as a separate analytic technique from pattern matching.

Joseph Wholey (1979) was at the forefront in developing logic models as an analytic technique. He first promoted the idea of a “program” logic model, tracing events when a public program intervention was intended to produce a certain outcome or sequence of outcomes. The *intervention* could initially produce activities with their own *immediate* outcomes; these immediate outcomes could in turn produce some *intermediate* outcomes; and in turn, the intermediate outcomes were supposed to produce final or *ultimate* outcomes.

To illustrate Wholey’s (1979) framework with a hypothetical example, consider a school intervention aimed at improving students’ academic performance. The hypothetical intervention involves a new set of classroom activities during an extra hour in the school day (*intervention*). These activities provide time for students to work with their peers on joint exercises (*immediate outcome*). The result of this immediate outcome is evidence of increased understanding and satisfaction with the educational process, on the part of the participating students, peers, and teachers (*intermediate outcome*). Eventually, the exercises and the satisfaction lead to the increased learning of certain key concepts by the students, and they demonstrate their knowledge with higher test scores (*ultimate outcome*).

Going beyond Wholey’s (1979) approach and using the strategy of rival explanations espoused throughout this book, an analysis also could entertain rival chains of events, as well as the potential importance of spurious external events. If the data were supportive of the preceding sequence involving the extra hour of schooling, and no rivals could be substantiated, the analysis could claim a causal effect between the initial school intervention and the later increased learning. Alternatively, the conclusion might be reached that the specified series of events was *illogical*—for instance, that the school intervention had involved students at a different grade level than whose learning had been assessed. In this situation, the logic model would have helped to explain a spurious finding.

The program logic model strategy can be used in a variety of circumstances, not just those where a public policy intervention has occurred. A key ingredient is the claimed existence of repeated cause-and-effect sequences of events, all linked together. The links may be qualitative or, with appropriate data involving an embedded unit of analysis, even can be tested with structural equation models (see BOX 32). The more complex the link, the more definitively the case study data can be analyzed to determine whether a pattern match has been made with these events over time. Four types of logic models are discussed next. They mainly vary according to the *unit of analysis* that might be relevant to your case study.

BOX 32**Testing a Logic Model of Reform in a Single School System**

An attempted transformation of a major urban school system took place in the 1980s, based on the passage of a new law that decentralized the system by installing powerful local school councils for each of the system's schools.

Bryk, Bebring, Kerbow, Rollow, and Easton (1998) evaluated the transformation, including qualitative data about the system as a whole and about individual schools (embedded units of analysis) in the system. At the same time, the study also includes a major quantitative analysis, taking the form of structural equation modeling with data from 269 of the elementary schools in the system. The path analysis is made possible because the single case (the school system) contains an embedded unit of analysis (individual schools).

The analysis tests a complex logic model whereby the investigators claim that pre-reform restructuring will produce strong democracy for a school, in turn producing the systemic restructuring of the school, and finally producing innovative instruction. The results, being aggregated across schools, pertain to the collective experience across all of the schools and not to any single school—in other words, the overall transformation of the system (single case) as a whole.

Individual-level logic model. The first type assumes that your case study is about an individual person, with Figure 5.2 depicting the behavioral course of events for a hypothetical youth. The events flow across a series of boxes and arrows reading from left to right in the figure. It suggests that the youth may be at risk for becoming a member of a gang, may eventually join a gang and become involved in gang violence and drugs, and even later may participate in a gang-related criminal offense. Distinctive about this logic model is the series of 11 numbers associated with the various arrows in the figure. Each of the 11 represents an opportunity, through some type of planned intervention (e.g., community or public program), to prevent an individual youth from continuing on the course of events. For instance, community development programs (number 1) might bring jobs and better housing to a neighborhood and reduce the youth's chances of becoming at risk in the first place. How a particular youth might have encountered and dealt with any or all of the 11 possible interventions might be the subject of a case study, with Figure 5.2 helping you to define the relevant data and their analysis.

Firm or organizational-level logic model. A second type of logic model traces events taking place in an individual organization, such as a manufacturing firm. Figure 5.3 shows how changes in a firm (Boxes 5 and 6 in Figure 5.3)

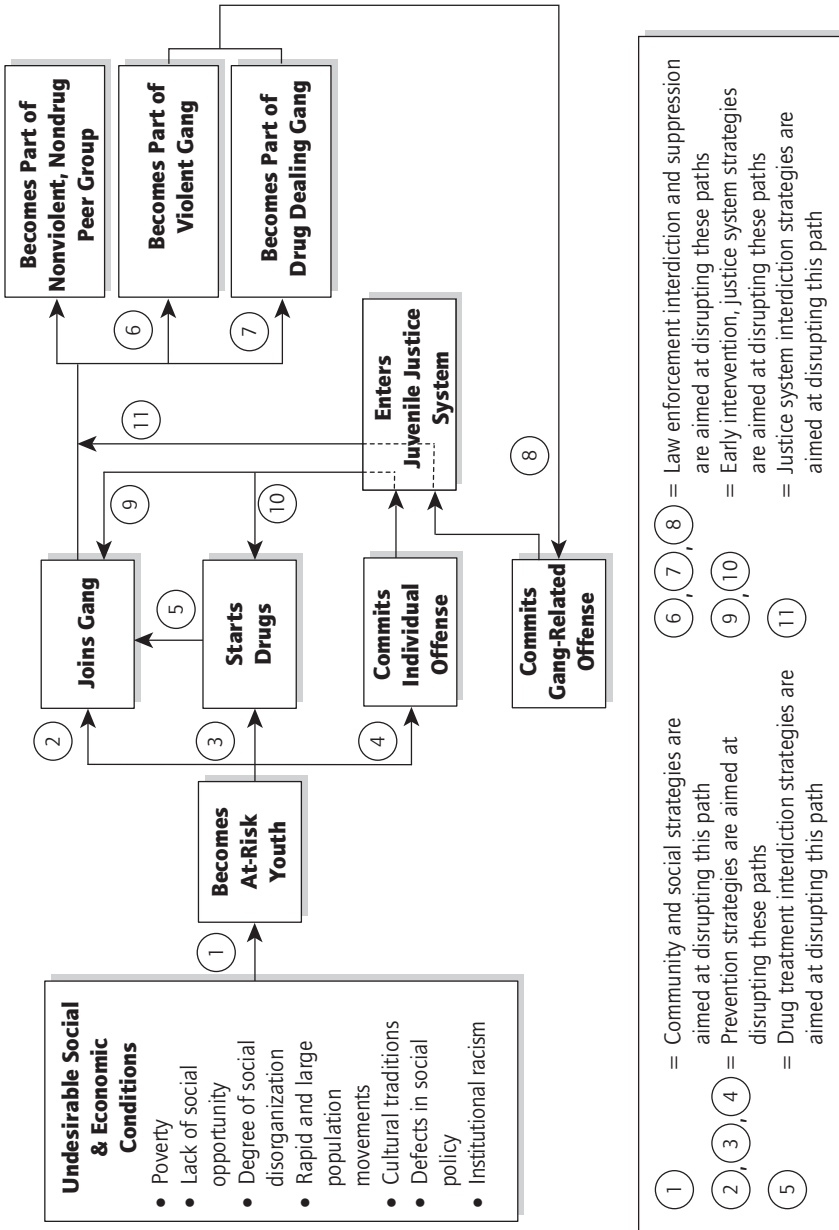


Figure 5.2 Youth Behavior and 11 Possible Interventions

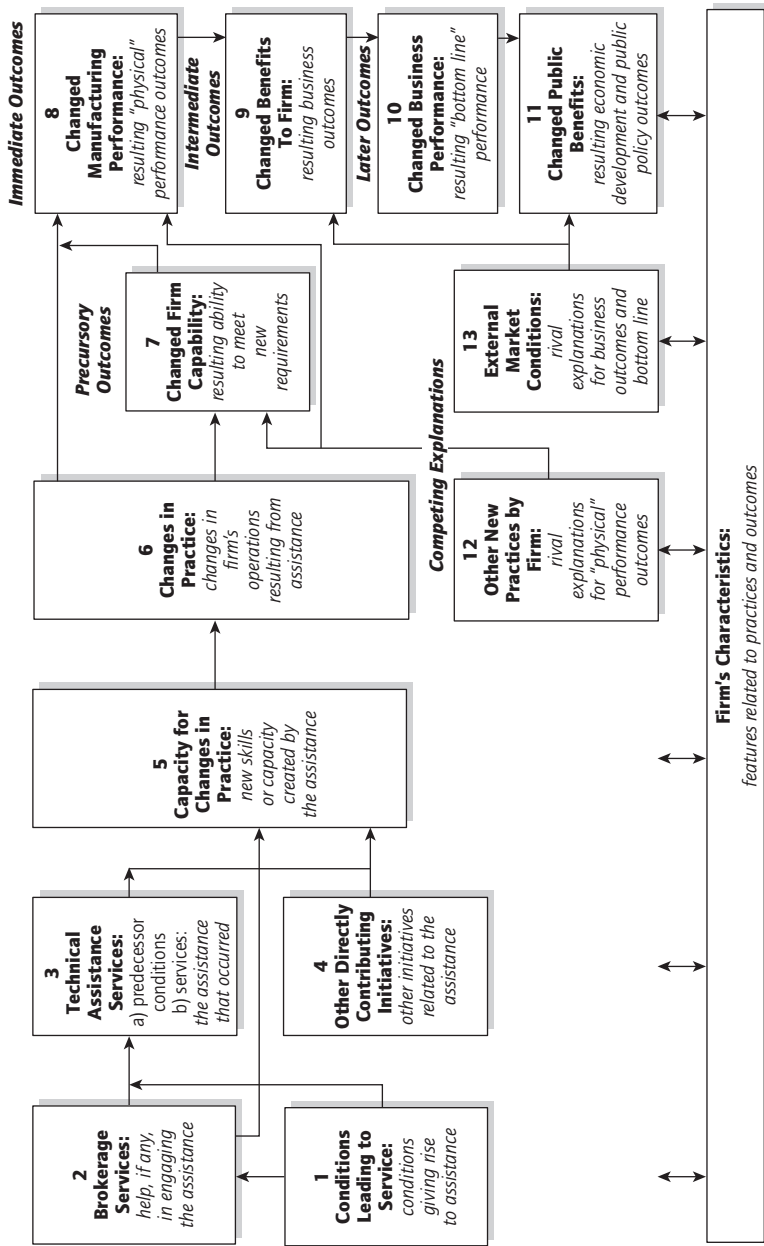


Figure 5.3 Changes in Performance in a Manufacturing Firm
 SOURCE: Yin and Oldsman (1995).

are claimed to lead to improved manufacturing (Box 8) and eventually to improved business performance (Boxes 10 and 11). The flow of boxes also reflects a hypothesis—that the initial changes were the result of external brokerage and technical assistance services. Given this hypothesis, the logic model therefore also contains rival or competing explanations (Boxes 12 and 13). The data analysis for this case study would then consist of tracing the actual events over time, at a minimum giving close attention to their chronological sequence. The data collection also should have tried to identify ways in which the boxes were actually linked in real life, thereby corroborating the layout of the arrows connecting the boxes.

An alternative configuration for an organizational-level logic model. Graphically, nearly all logic models follow a linear sequence (e.g., reading from left to right or from top to bottom). In real life, however, events can be more dynamic, not necessarily progressing linearly. One such set of events might occur in relation to the “reforming” or “transformation” of an organization. For instance, business firms may undergo many significant operational changes, and the business’s mission and culture (and even name) also may change. The significance of these changes warrants the notion that the entire business has been transformed (see Yin, 2003, chaps. 6 and 10, for a case study of a single firm and then the cross-case analysis of a group of transformed firms). Similarly, schools or school systems can sufficiently alter their way of doing business that “systemic reform” is said to be occurring. In fact, major public initiatives deliberately aim at improving schools by encouraging the reform of entire school systems (i.e., school districts). However, neither the business transformation nor school reform processes are linear, in at least two ways. First, changes may reverse course and not just progress in one direction. Second, the completed transformation or systemic reform is not necessarily an end point implied by the linear logic model (i.e., the final box in the model); continued *transforming* and *reforming* may be ongoing processes even over the long haul.

Figure 5.4 presents an alternatively configured, third type of logic model, reflecting these conditions. This logic model tracks all of the main activities in a school system (the initials are decoded in the key to the figure)—over four periods of time (each time interval might represent a 2- or 3-year period of time). Systemic reform occurs when all of the activities are aligned and work together, and this occurs at t_3 in Figure 5.4. At later stages, however, the reform may regress, represented by t_4 , and the logic model does not assume that the vacillations will even end at t_4 . As a further feature of the logic model, the entire circle at each stage can be positioned higher or lower, representing the level of student performance—the hypothesis being that systemic reform will be associated with the highest performance. The pennants in the middle of the circle indicate the number of schools or classrooms implementing the desired

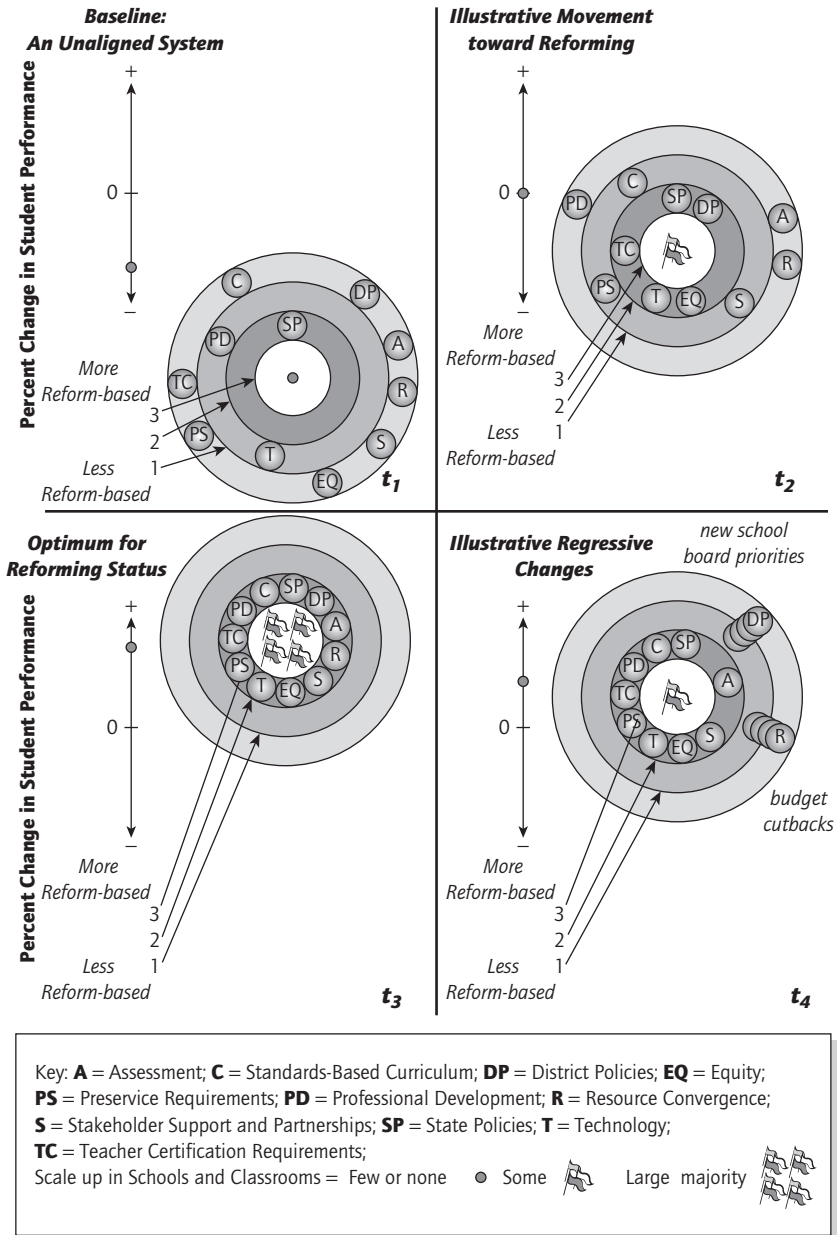


Figure 5.4 Hypothetical States of an Education (K–12) Reforming System

SOURCE: Yin and Davis (2007).

reform practices, and this number also can vacillate. Finally, the logic model contains a “metric,” whereby the positioning of the activities or the height of the circle can be defined as a result of analyzing actual data.

Program-level logic model. Returning to the more conventional linear model, Figure 5.5 contains a fourth and final type of logic model. Here, the model depicts the rationale underlying a major federal program, aimed at reducing the incidence of HIV/AIDS by supporting community planning and prevention initiatives. The program provides funds as well as technical assistance to 65 state and local health departments across the country. The model was used to organize and analyze data from eight case studies, including the collection of data on rival explanations, whose potential role also is shown in the model (see Yin, 2003 chap. 8, for the entire multiple-case study).

Summary. Using logic models represents a fourth technique for analyzing case study data. Four types of logic models, applicable to different units of analysis and situations, have been presented. You should define your logic model prior to collecting data and then “test” the model by seeing how well the data support it (see Yin, 2003, for several examples of case studies using logic models).

Cross-Case Synthesis

A fifth technique applies specifically to the analysis of multiple cases (the previous four techniques can be used with either single- or multiple-case studies). The technique is especially relevant if, as advised in Chapter 2, a case study consists of at least two cases (for a synthesis of six cases, see Ericksen & Dyer, 2004). The analysis is likely to be easier and the findings likely to be more robust than having only a single case. BOX 33 presents an excellent example of the important research and research topics that can be addressed by having a “two-case” case study. Again, having more than two cases could strengthen the findings even further.

Cross-case syntheses can be performed whether the individual case studies have previously been conducted as independent research studies (authored by different persons) or as a predesigned part of the same study. In either situation, the technique treats each individual case study as a separate study. In this way, the technique does not differ from other research syntheses—aggregating findings across a series of individual studies (see BOX 34). If there are large numbers of individual case studies available, the synthesis can incorporate quantitative techniques common to other research syntheses (e.g., Cooper & Hedges, 1994) or meta-analyses (e.g., Lipsey, 1992). However, if only a modest number of case studies are available, alternative tactics are needed.

One possibility starts with the creation of word tables that display the data from the individual cases according to some uniform framework. Figure 5.6 has an

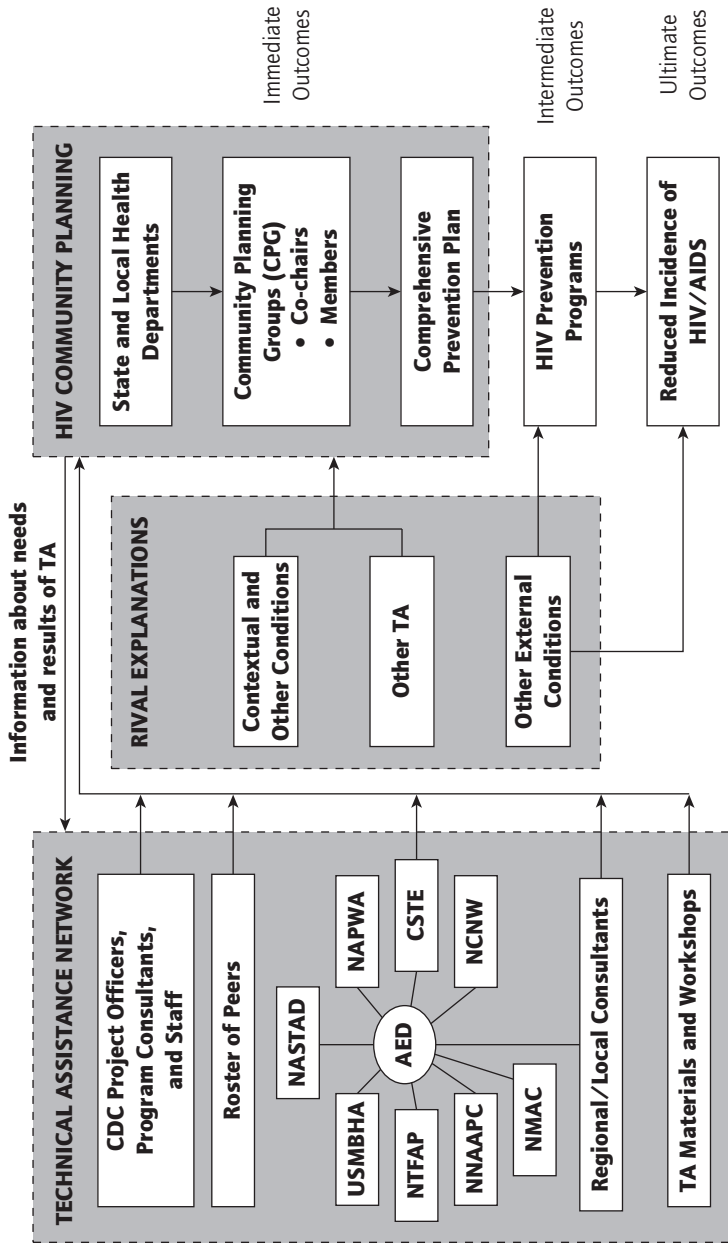


Figure 5.5 Improving Community Planning for HIV/AIDS Prevention
 SOURCE: Yin (2003, chap. 8).

BOX 33**Using a “Two-Case” Case Study to Test a Policy-Oriented Theory**

The international marketplace of the 1970s and 1980s was marked by Japan’s prominence. Much of its strength was attributable to the role of centralized planning and support by a special governmental ministry—considered by many to be an unfair competitive edge, compared to the policies in other countries. For instance, the United States was considered to have no counterpart support structures. Gregory Hooks’s (1990) excellent case study points to a counterexample frequently ignored by advocates: the role of the U.S. defense department in implementing an industrial planning policy within defense-related industries.

Hooks (1990) provides quantitative data on two cases—the aeronautics industry and the microelectronics industry (the forerunner to the entire computer chip market and its technologies, such as the personal computer). One industry (aeronautics) has traditionally been known to be dependent upon support from the federal government, but the other has not. In both cases, Hooks’s evidence shows how the defense department supported the critical early development of these industries through financial support, the support of R&D, and the creation of an initial customer base for the industry’s products. The existence of both cases, and not the aeronautics industry alone, makes the author’s entire argument powerful and persuasive.

BOX 34**Eleven Program Evaluations and a Cross-“Case” Analysis**

Dennis Rosenbaum (1986) collected 11 program evaluations as separate chapters in an edited book. The 11 evaluations had been conducted by different investigators, had used a variety of methods, and were not case studies. Each evaluation was about a different community crime prevention intervention, and some presented ample quantitative evidence and employed statistical analyses. The evaluations were deliberately selected because nearly all had shown positive results. A cross-case analysis was conducted by the present author (Yin, 1986), treating each evaluation as if it were a separate “case.” The analysis dissected and arrayed the evidence from the 11 evaluations in the form of word tables. Generalizations about successful community crime prevention, independent of any specific intervention, were then derived by using a replication logic, given that all of the evaluations had shown positive results.

example of such a word table, capturing the findings from 14 case studies of organizational centers, with each center having an organizational partner (COSMOS Corporation, 1998). Of the 14 centers, 7 had received programmatic support and were considered intervention centers; the other 7 were selected as comparison centers. For both types of centers, data were collected about the center’s ability to

CENTERS	Characteristics of Co-Location
Intervention Centers:	
1	Partnering staff are located in the same facility as Center 1 and follow Center 1's policies that were in place prior to the partnership. Center 1 receives \$25,000 annually from the partnership budget for software and peripherals, and communication and supplies.
2	As a business unit of Center 2, the partnering staff are housed within Center 2's offices. Center 2's parent organization contributes \$2,500 for space and \$23,375 for indirect expenses annually to the partnership budget.
3	Five partnership offices are co-located with Center 3's staff.
4	Center 4 and its partner share office space.
5	Center 5 staff and the partnering staff are located in the same building, but do not share office space.
6	The two organizations are not co-located.
7	Partnering staff are located in Center 7's offices.
Comparison Centers:	
8	Center 8 and its partner share office space in eight locations statewide.
9	Some sites are co-located.
10	Center 10 and its partner are not co-located.
11	The partnering and center staff share office space.
12	Center 12 and its partner's staff are located in the same building.
13	Center 13 and its partner's staff are located in the same office.
14	Center 14 shares office space with three regional partners.

Figure 5.6 Co-location of Interorganizational Partners (14 Centers and Their Counterpart Organizations)

SOURCE: COSMOS Corporation (1998).

co-locate (e.g., share facilities) with its partnering organization—this being only one of several outcomes of interest in the original study.

The overall pattern in the word table led to the conclusion that the intervention and comparison centers did not differ with regard to this particular outcome. Additional word tables, reflecting other processes and outcomes of interest, were examined in the same way. The analysis of the entire collection of word tables enabled the study to draw cross-case conclusions about the intervention centers and their outcomes.

Complementary word tables can go beyond the single features of a case and array a whole set of features on a case-by-case basis. Now, the analysis can start to probe whether different groups of cases appear to share some similarity and deserve to be considered instances of the same “type” of general case. Such an observation can further lead to analyzing whether the arrayed case studies reflect subgroups or categories of general cases—raising the possibility of a typology of individual cases that can be highly insightful.

An important caveat in conducting this kind of cross-case synthesis is that the examination of word tables for cross-case patterns will rely strongly on argumentative interpretation, not numeric tallies. Chapter 2 has previously pointed out, however, that this method is directly analogous to cross-*experiment* interpretations, which also have no numeric properties when only a small number of experiments are available for synthesis. A challenge you must be prepared to meet as a case study investigator is therefore to know how to develop strong, plausible, and fair arguments that are supported by the data.

PRESSING FOR A HIGH-QUALITY ANALYSIS

No matter what specific analytic strategy or techniques have been chosen, you must do everything to make sure that your analysis is of the highest quality. At least four principles underlie all good social science research (Yin, 1994a, 1994b, 1997, 1999) and require your attention.

First, your analysis should show that you attended to *all the evidence*. Your analytic strategies, including the development of rival hypotheses, must exhaustively cover your key research questions (you can now appreciate better the importance of defining sharp as opposed to vague questions). Your analysis should show how it sought to use as much evidence as was available, and your interpretations should account for all of this evidence and leave no loose ends. Without achieving this standard, your analysis may be vulnerable to alternative interpretations based on the evidence that you had (inadvertently) ignored.

Second, your analysis should address, if possible, *all major rival interpretations*. If someone else has an alternative explanation for one or more of your findings, make this alternative into a rival. Is there evidence to address this

rival? If so, what are the results? If not, should the rival be restated as a loose end to be investigated in future studies?

Third, your analysis should address *the most significant aspect* of your case study. Whether it is a single- or multiple-case study, you will have demonstrated your best analytic skills if the analysis focuses on the most important issue (preferably defined at the outset of the case study). By avoiding a detour to a lesser issue, your analysis will be less vulnerable to the possibility that the main issue was being avoided because of possibly negative findings.

Fourth, you should use your own *prior, expert knowledge* in your case study. The strong preference here is for you to demonstrate awareness of current thinking and discourse about the case study topic. If you know your subject matter as a result of your own previous investigations and publications, so much the better.

The case study in BOX 35 was done by a research team with academic credentials as well as strong and relevant practical experience. In their work, the authors demonstrate a care of empirical investigation whose spirit is worth considering in all case studies. The care is reflected in the presentation of the cases themselves, not by the existence of a stringent methodology section whose tenets might not have been fully followed in the actual case study. If you can emulate the spirit of these authors, your case study analysis also will be given appropriate respect and recognition.

BOX 35

Analytic Quality in a Multiple-Case Study of International Trade Competition

The quality of a case study analysis is not dependent solely on the techniques used, although they are important. Equally important is that the investigator demonstrate expertise in carrying out the analysis. This expertise was reflected in Magaziner and Patinkin's (1989) book, *The Silent War: Inside the Global Business Battles Shaping America's Future*.

The authors organized their nine cases in excellent fashion. Across cases, major themes regarding America's competitive advantages (and disadvantages) were covered in a replication design. Within each case, the authors provided extensive interview and other documentation, showing the sources of their findings. (To keep the narrative reading smoothly, much of the data—in word tables, footnotes, and quantitative tabulations—were relegated to footnotes and appendices.) In addition, the authors showed that they had extensive personal exposure to the issues being studied, as a result of numerous domestic and overseas visits.

Technically, a more explicit methodological section might have been helpful. However, the careful and detailed work, even in the absence of such a section, helps to illustrate what all investigators should strive to achieve (also see BOX 5B, Chapter 2, p. 31).

EXERCISE 5.5 Analyzing the Analytic Process

Select and obtain one of the case studies described in the BOXES in this book. Find one of the case study's chapters (usually in the middle of the study) in which evidence is presented, but conclusions also are being made. Describe how this linkage—from cited evidence to conclusions—occurs. Are data displayed in tables or other formats? Are comparisons being made?

SUMMARY

This chapter has presented several ways of analyzing case studies. First, the potential analytic difficulties can be reduced if you have a general strategy for analyzing the data—whether such a strategy is based on theoretical propositions, rival explanations, or descriptive frameworks. In the absence of such strategies, you may have to “play with the data” in a preliminary sense, as a prelude to developing a systematic sense of what is worth analyzing and how it should be analyzed.

Second, given a general strategy, several specific analytic techniques are relevant. Of these, five (pattern matching, explanation building, time-series analysis, logic models, and cross-case syntheses) can be effective in laying the groundwork for high-quality case studies. For all five, a similar replication logic should be applied if a study involves multiple cases. Comparisons to rival propositions and threats to internal validity also should be made within each individual case.

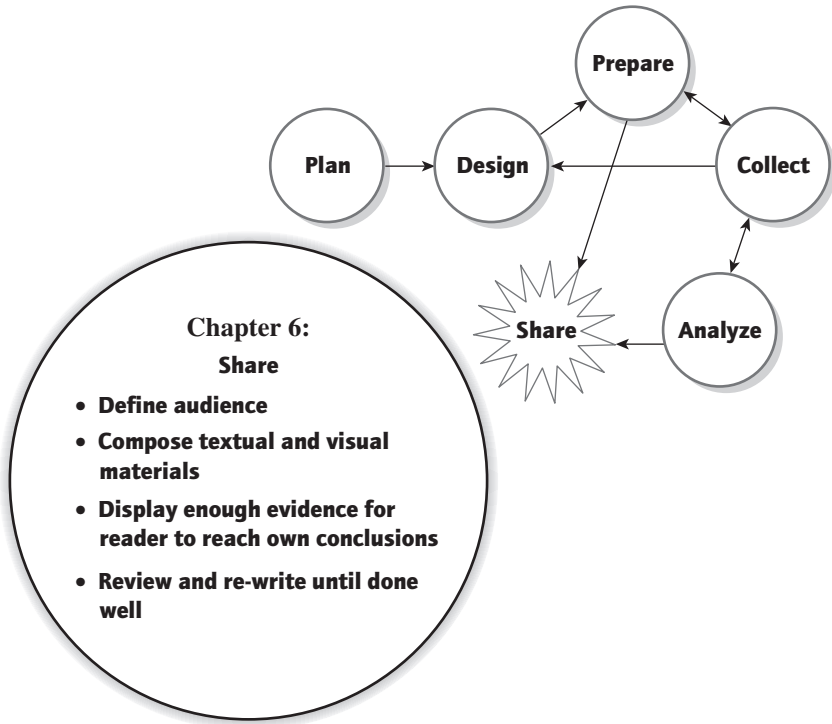
None of these techniques is easy to use. None can be applied mechanically, following any simple cookbook procedure. Not surprisingly, case study analysis is the most difficult stage of doing case studies, and novice investigators are especially likely to have a troublesome experience. Again, one recommendation is to begin with a simple and straightforward case study (or, more preferably, a “two-case” design), even if the research questions are not as sophisticated or innovative as might be desired. Experience gained in completing such straightforward case studies will lead to the ability to tackle more difficult topics in subsequent case studies.

REFERENCE TO EXPANDED CASE STUDY MATERIALS FOR CHAPTER 5

For selected case studies cited in the text of this chapter, two anthologies contain either a more extensive excerpt or the full case study. The table below crosswalks the reference in this book to the location of the excerpt or full rendition.

<i>Chapter 5 Chapter Topic and Page Number</i>	<i>Topics of Illustrative Case Studies</i>	<i>Reference to Lenghier Material</i>
An Analytic Strategy: More Than Familiarity with Analytic Tools		
BOX 25, p. 5-8	Local economic development	CSA-5
p. 5-114 text	University innovation	ACSR-4
p. 5-114 text	Drug abuse prevention	ACSR-5
Five Specific Analytic Techniques		
BOX 26, p. 5-14	Local economic development	CSA-18
BOX 27, p. 5-15	Making research useful	ACSR, pp. 20–22
BOX 28, p. 5-18	Business and industry	None
BOX 29A, p. 5-18	Local economic development	CSA-8
BOX 29B, p. 5-18	Societies	None
BOX 30, p. 5-21	Crime prevention	CSA-17
BOX 31A, p. 5-23	Schools	None
BOX 31B, p. 5-23	Neighborhoods	None
BOX 32, p. 5-27	Schools	CSA-11
p. 5-29 text	Business and industry	ACSR-6 & 10
p. 5-30 text	Health (HIV/AIDS) care	ACSR-8
p. 5-31 text	Three different case studies	ACSR-6, 8, & 10
BOX 33, p. 5-31	Business and industry	CSA-7
BOX 34, p. 5-32	Crime prevention	None
Pressing for a High-Quality Analysis		
BOX 35, p. 5-34	Business and industry	CSA-6

NOTE: CSA = *Case Study Anthology* (Yin, 2004). ACSR = *Applications of Case Study Research* (Yin, 2003). The number denotes the chapter number in the book.



ABSTRACT

Reporting a case study means bringing its results and findings to closure. Regardless of the form of the report, similar steps underlie the case study composition: identifying the audience for the report, developing its compositional structure, and having drafts reviewed by others.

Once composed, the case study may be finished—or it may be joined with data collected through other methods, as part of a broader, mixed methods study. Such studies can be advantageous and represent a further challenge in doing case study research.

Whether serving as a finished case study or as part of a mixed methods study, creating a case study report is one of the most challenging aspects of doing case studies. The best general advice is to compose portions of the case study early (e.g., the bibliography and the methodology section), rather than waiting until the end of the data analysis process. As for compositional structures, six alternatives are suggested: linear-analytic, comparative, chronological, theory-building, “suspense,” and unsequenced structures. The case study report also presents a choice regarding the disclosure or anonymity of case identities. A final plea is to worry about producing high-quality and not just run-of-the-mill case studies.