different things. Although neither of them has the “wrong” story, neither does each one have the whole story.

In research, too, different questions yield different types of information. Different research problems lead to different research designs and methods, which in turn result in the collection of different types of data and different interpretations of those data.

Furthermore, many kinds of data may be suitable only for a particular methodology. To some extent, the data dictate the research method. As an example, consider historical data, those pieces of information gleaned from written records of past events. You cannot extract much meaning from historical documents by using a laboratory experiment. An experiment is simply not suited to the nature of the data.

Over the years, numerous research methodologies have emerged to accommodate the many different forms that data are likely to take. Accordingly, we must take a broad view of the approaches the term research methodology encompasses. Above all, we must not limit ourselves to the belief that only a true experiment constitutes “research.” Such an attitude prohibits us from agreeing that we can better understand Coleridge’s poetry by reading the scholarly research of John Livingston Lowes (1927, 1955) or from appreciating Western civilization more because of the historiography of Arnold Toynbee (1939–1961).

No single highway leads us exclusively toward a better understanding of the unknown. Many highways can take us in that direction. They may traverse different terrain, but they all converge on the same destination: the enhancement of human knowledge.

In Chapters 6 through 10 of this book we zero in on various research methodologies. But many researchers tend to categorize research studies into two broad categories: quantitative research and qualitative research. We now look at this distinction.

Comparing Quantitative and Qualitative Approaches

As you might guess, quantitative research involves looking at amounts, or quantities, of one or more variables of interest. A quantitative researcher typically tries to measure variables in some numerical way, perhaps by using commonly accepted measures of the physical world (e.g., rulers, thermometers, oscilloscopes) or carefully designed measures of psychological characteristics or behaviors (e.g., tests, questionnaires, rating scales).

In contrast, qualitative research involves looking at characteristics, or qualities, that cannot be entirely reduced to numerical values. A qualitative researcher typically aims to examine the many nuances and complexities of a particular phenomenon. You are most likely to see qualitative research in studies of complex human situations (e.g., people’s in-depth perspectives about a particular issue, the behaviors and values of a particular cultural group) or complex human creations (e.g., television commercials, works of art). Qualitative research is not limited to research problems involving human beings, however. For instance, some biologists study, in a distinctly qualitative manner, the complex social behaviors of other animal species; Dian Fossey’s work with gorillas and Jane Goodall’s studies of chimpanzees are two well-known examples (e.g., see Fossey, 1983; Goodall, 1986).

Quantitative and qualitative approaches involve similar processes—for instance, they both entail identifying a research problem, reviewing related literature, and collecting and analyzing data. Yet these processes are often combined and carried out in different ways, leading to distinctly different research methods. For instance, quantitative researchers often start with one or more specific hypotheses to be tested. They isolate the variables they want to study, use a standardized procedure to collect some form of numerical data, and use statistical procedures to analyze and draw conclusions from the data. In contrast, qualitative researchers often start with general research questions rather than specific hypotheses, collect an extensive amount of verbal data and/or nonverbal artifacts, organize those data and artifacts into some form that gives them coherence, and use verbal descriptions to portray the situation they have studied.

To some extent, quantitative and qualitative research designs are appropriate for answering different kinds of questions. As a result, we learn more about the world when we have both...
quantitative and qualitative methodologies at our disposal than when we are limited to only one approach or the other.

Let's consider how the two approaches might look in practice. Suppose two researchers are interested in investigating the “effectiveness of the case-based method of teaching business management practices.” The first researcher asks the question, “How effective is case-based instruction in comparison with lecture-based instruction?” She finds five instructors who are teaching case-based business management classes; she finds five other instructors who are teaching the same content using lectures. At the end of the semester, the researcher administers an achievement test to students in all 10 classes. Using statistical analyses, she compares the scores of students in case-based and lecture-based courses to determine whether the achievement of one group is significantly higher than that of the other group. When reporting her findings, she summarizes the results of her statistical analyses. This researcher has conducted a quantitative study.

The second researcher is also interested in the effectiveness of the case method but asks the question, “What makes case-based instruction effective or ineffective?” To answer this question, he sits in on a case-based business management course for an entire semester. He spends an extensive amount of time talking with the instructor and some of the students in an effort to try to understand the participants’ perspectives on case-based instruction. He carefully scrutinizes his data for patterns and themes in the responses. He then writes an in-depth description and interpretation of what he has observed in the classroom setting. This researcher has conducted a qualitative study.

Table 4.3 presents a summary of differences between quantitative and qualitative approaches. We briefly discuss these differences in the next few paragraphs—not to persuade you that one approach is better than the other, but to help you make a more informed decision about which approach might be better for your own research question.

**Purpose.** Quantitative researchers seek explanations and predictions that will generalize to other persons and places. The intent is to establish, confirm, or validate relationships and to develop generalizations that contribute to existing theories.

Qualitative researchers seek a better understanding of complex situations. Their work is sometimes (although not always) exploratory in nature, and they may use their observations to build theory from the ground up.

**Table 4.3**

<table>
<thead>
<tr>
<th>Question</th>
<th>Quantitative</th>
<th>Qualitative</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is the purpose of the research?</td>
<td>To explain and predict</td>
<td>To describe and explain</td>
</tr>
<tr>
<td></td>
<td>To confirm and validate</td>
<td>To explore and interpret</td>
</tr>
<tr>
<td></td>
<td>To test theory</td>
<td>To build theory</td>
</tr>
<tr>
<td>What is the nature of the research process?</td>
<td>Focused</td>
<td>Holistic</td>
</tr>
<tr>
<td></td>
<td>Known variables</td>
<td>Unknown variables</td>
</tr>
<tr>
<td></td>
<td>Established guidelines</td>
<td>Flexible guidelines</td>
</tr>
<tr>
<td></td>
<td>Predetermined methods</td>
<td>Emergent methods</td>
</tr>
<tr>
<td></td>
<td>Somewhat context-free</td>
<td>Context-bound</td>
</tr>
<tr>
<td></td>
<td>Detached view</td>
<td>Personal view</td>
</tr>
<tr>
<td>What are the data like, and how are they collected?</td>
<td>Numeric data</td>
<td>Textual and/or image-based data</td>
</tr>
<tr>
<td></td>
<td>Representative, large sample</td>
<td>Informative, small sample</td>
</tr>
<tr>
<td></td>
<td>Standardized instruments</td>
<td>Loosely structured or nonstandardized observations and interviews</td>
</tr>
<tr>
<td>How are data analyzed to determine their meaning?</td>
<td>Statistical analysis</td>
<td>Search for themes and categories</td>
</tr>
<tr>
<td></td>
<td>Stress on objectivity</td>
<td>Acknowledgment that analysis is subjective and potentially biased</td>
</tr>
<tr>
<td></td>
<td>Deductive reasoning</td>
<td>Inductive reasoning</td>
</tr>
<tr>
<td>How are the findings communicated?</td>
<td>Numbers</td>
<td>Words</td>
</tr>
<tr>
<td></td>
<td>Statistics, aggregated data</td>
<td>Narratives, individual quotes</td>
</tr>
<tr>
<td></td>
<td>Formal voice, scientific style</td>
<td>Personal voice, literary style (in some disciplines)</td>
</tr>
</tbody>
</table>
Process. Because quantitative studies represent the mainstream approach to research, carefully structured guidelines exist for conducting them. Concepts, variables, hypotheses, and methods of measurement tend to be defined before the study begins and remain the same throughout. Quantitative researchers choose methods that allow them to objectively measure the variable(s) of interest. They also try to remain detached from the phenomena and participants they are observing so that they can draw unbiased conclusions.

The qualitative research process is often more holistic and "emergent," with the specific focus, design, measurement instruments (e.g., observations, interviews), and interpretations developing and possibly changing along the way. Researchers enter the setting with open minds, prepared to immerse themselves in the complexity of the situation and interact with their participants. Categories (variables) emerge from the data, leading to "context-bound" information, patterns, and/or theories that help explain the particular phenomenon under study.

Data collection. Quantitative researchers identify one or a few variables that they intend to study and then collect data specifically related to those variables. Methods of measuring each variable are identified, developed, and standardized, with considerable attention to the validity and reliability of the measurement instruments. Data are collected from a population—or from one or more large samples that represent the population—in forms that are easily converted to numbers.

Qualitative researchers operate under the assumption that reality is not easily divided into discrete, measurable variables. Some qualitative researchers describe themselves as being the research instrument because the bulk of their data collection is dependent on their personal involvement in the setting. Rather than sample a large number of participants with the intent of making generalizations, qualitative researchers tend to select a few participants who might best shed light on the phenomenon under investigation. Both verbal data (interview responses, documents, field notes) and nonverbal data (drawings, photographs, videotapes) may be collected.

Data analysis. All research requires logical reasoning. Quantitative researchers tend to rely more heavily on deductive reasoning, beginning with certain premises (e.g., hypotheses, theories) and then drawing logical conclusions from them. They also try to maintain objectivity in their data analysis, conducting predetermined statistical procedures and using objective criteria to evaluate the outcomes of those procedures.

In contrast, qualitative researchers make considerable use of inductive reasoning: They make many specific observations and then draw inferences about larger and more general phenomena. Furthermore, their data analysis is more subjective in nature: They scrutinize the body of data in search of patterns—subjectively identified—that the data reflect.

It is important to note, however, that quantitative research is not exclusively deductive, nor is qualitative research exclusively inductive. Researchers of all methodological persuasions typically use both types of reasoning in a continual, cyclical fashion. Quantitative researchers often formulate a theory by inductive reasoning (e.g., by observing a few situations), engage in the theory-building process described in Chapter 1, and then try to support their theory by drawing and testing the conclusions that follow logically from it. Similarly, after qualitative researchers have identified a theme in their data using an inductive process, they typically move into a more deductive mode to verify or modify it with additional data.

Reporting findings. Quantitative researchers typically reduce their data to means, medians, correlations, and other summarizing statistics. It is not necessary to look at individual performances; rather, the averages of those performances are of greater interest. The results are usually presented in a report that employs a formal, scientific style using impersonal language.

Qualitative researchers often construct interpretive narratives from their data and try to capture the complexity of a particular phenomenon. Especially in certain disciplines (e.g., anthropology), qualitative researchers may use a more personal, literary style than quantitative researchers do, and they often include the participants' own language and perspectives. Although all researchers must be able to write clearly, effective qualitative researchers must be especially skillful writers.
Combining Quantitative and Qualitative Designs

We have drawn the preceding quantitative–qualitative distinctions, in part, as a way of pointing out the relative strengths and weaknesses of the two approaches. For example, a common weakness of quantitative research with human beings is that it is sometimes conducted in a laboratory—and thus in a somewhat artificial setting. Although contrived circumstances can give the researcher considerable control over the events that occur, the results obtained may in some cases not generalize to more naturalistic settings. In contrast, qualitative research occurs within natural contexts and so, in this respect, is more “true to life.” Yet the findings of qualitative studies may be so specific to a particular context that they do not apply (generalize) to other contexts.

Fortunately, quantitative and qualitative research designs are not necessarily mutually exclusive. Many researchers successfully combine elements of both approaches in what is sometimes called a mixed-methods design. For example, it is not unusual for researchers to count (and therefore quantify) certain kinds of data in what is, for all intents and purposes, a qualitative investigation. Nor is it unusual for quantitative researchers to report participants’ perceptions of or emotional reactions to various experimental treatments. Especially in studies of human behavior, mixed-methods designs with both quantitative and qualitative elements often provide a more complete picture of a particular phenomenon than either approach could do alone. We explore mixed-methods designs in more detail in Chapter 10.

PRACTICAL APPLICATION Choosing a General Research Approach

Although we believe that research studies are sometimes enhanced by combining both quantitative and qualitative methods, we also realize that many novice researchers may not have the time, resources, or expertise to effectively combine approaches for their initial forays into research. Furthermore, good research does not necessarily have to involve a complex, multifaceted design. For example, in an article reviewing classic studies in his own discipline, psychologist Christopher Peterson had this to say in his abstract:

Psychology would be improved if researchers stopped using complicated designs, procedures, and statistical analyses for the sole reason that they are able to do so. . . . [S]ome of the classic studies in psychology [are] breathtakingly simple. . . . More generally, questions should dictate research methods and statistical analyses, not vice versa. (Peterson, 2009, p. 7)

As you choose your own general approach to addressing your research problem—whether to use a quantitative approach, a qualitative approach, or a combination of the two—you should base your decision on the research problem you want to address and the skills you have as a researcher, not on what tasks you wish to avoid. For example, disliking mathematics and wanting to avoid conducting statistical analyses are not good reasons for choosing a qualitative study over a quantitative one. The guidelines we offer here can help you make a reasonable decision.

GUIDELINES Deciding Whether to Use a Quantitative or Qualitative Approach

Table 4.4 can help guide you in your choice between quantitative and qualitative approaches. Keep in mind that the items in the table are not necessarily ordered from most to least important. Each item should factor into your decision. Consider each component carefully before making your final selection.

Qualitative studies have become increasingly popular in recent years, even in some disciplines that have historically placed heavy emphasis on quantitative approaches. Yet we have met many students who have naïvely assumed that qualitative studies are easier or in some other way more “comfortable” than quantitative designs. Be forewarned: Qualitative studies require as much effort and rigor as quantitative studies, and data collection alone often stretches over the
course of many months. In the following paragraphs, we briefly discuss each of the components in Table 4.4 from the perspective of someone who might be inclined to “go qualitative.”

1. **Consider your own comfort with the assumptions of the qualitative tradition.** If you believe that no single reality underlies your research problem but that, instead, different individuals may have constructed different, possibly equally valid realities relevant to your problem, then qualitative research is more appropriate.

2. **Consider the audience for your study.** If your intended audience (e.g., a dissertation committee, a specific journal editor, or colleagues in your field) is not accustomed to or supportive of qualitative research, it makes little sense to spend the time and effort needed to do a good qualitative study (e.g., see Miller, Nelson, & Moore, 1998).

3. **Consider the nature of the research question.** Qualitative designs can be quite helpful for addressing exploratory or interpretive research questions. But they may be of little use in testing specific hypotheses about cause-and-effect relationships.

4. **Consider the extensiveness of the related literature.** If the literature base is weak, undeveloped, or altogether missing, a qualitative design can provide the researcher with the freedom and flexibility needed to explore a specific phenomenon so that important variables might be identified.

5. **Consider the depth of what you wish to discover.** If you want to examine a phenomenon in depth with a relatively small number of participants, a qualitative approach is ideal. But if you are skimming the surface of a phenomenon and wish to do so using a large number of participants, a quantitative study will be more efficient.

6. **Consider the amount of time you have available for conducting the study.** Qualitative studies typically involve an extensive amount of time both on site and off site. If your time is limited, you may not be able to complete a qualitative study satisfactorily.

7. **Consider the extent to which you are willing to interact with the people in your study.** Qualitative researchers who are working with human beings must be able to establish rapport and trust with their participants and interact with them on a fairly personal level. Also, gaining initial entry into a research site involves much advance planning and numerous preliminary contacts.

8. **Consider the extent to which you feel comfortable working without much structure.** Qualitative researchers typically work with few specific rules and procedures; their work is exploratory in
many respects. Thus, they must think creatively about how best to address various aspects of a research problem, and they need a high tolerance for ambiguity.

9. Consider your ability to organize and draw inferences from a large body of information. Qualitative research often involves the collection of a great many field notes, interview responses, and so on, that are not clearly organized at the beginning of the process. Working with extensive amounts of data and reasoning inductively about them require considerable self-discipline and organizational ability. In comparison, conducting a few statistical analyses—even for those who have little affection for mathematics—is a much easier task.

10. Consider your writing skills. Qualitative researchers must have excellent writing skills. Communicating findings is the final step in all research projects; the success of your research ultimately will be judged by how well you accomplish this final component of the research process.

Once you have decided whether to take a quantitative or qualitative approach, you need to pin down your research method more precisely. Table 4.5 lists some common research methodologies and the types of problems for which each is appropriate.

<table>
<thead>
<tr>
<th>Method</th>
<th>Characteristics of the Method and the Research Goals the Method Attempts to Achieve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action research</td>
<td>A type of applied research that focuses on finding a solution to a local problem in a local setting. For example, a teacher might investigate whether a new spelling program she has adopted leads to improvement in her students' achievement scores. (See Merriam [2009] or Mills [2011] for guidance on conducting action research.)</td>
</tr>
<tr>
<td>Case study</td>
<td>A type of qualitative research in which in-depth data are gathered relative to a single individual, program, or event, for the purpose of learning more about an unknown or poorly understood situation. (See Chapter 7.)</td>
</tr>
<tr>
<td>Content analysis</td>
<td>A detailed and systematic examination of the contents of a particular body of material (e.g., television shows, magazine advertisements, Internet websites, works of art) for the purpose of identifying patterns, themes, or biases within that material. (See Chapter 7.)</td>
</tr>
<tr>
<td>Correlational research</td>
<td>A statistical investigation of the relationship between two or more variables. Correlational research looks at surface relationships but does not necessarily probe for causal reasons underlying them. For example, a researcher might investigate the relationships among high school seniors' achievement test scores and their grade point averages a year later when they are first-year college students. (See Chapter 9.)</td>
</tr>
<tr>
<td>Developmental research</td>
<td>An observational-descriptive type of research that either compares people in different age groups (a cross-sectional study) or follows a particular group over a lengthy period of time (a longitudinal study). Such studies are particularly appropriate for looking at developmental trends. (See Chapter 9.)</td>
</tr>
<tr>
<td>Ethnography</td>
<td>A type of qualitative inquiry that involves an in-depth study of an intact cultural group in a natural setting. (See Chapter 7.)</td>
</tr>
<tr>
<td>Experimental research</td>
<td>A study in which participants are randomly assigned to groups that undergo various research-imposed treatments or interventions, followed by observations or measurements to assess the effects of the treatments. (See Chapter 10.)</td>
</tr>
<tr>
<td>Ex post facto research</td>
<td>An approach in which one looks at conditions that have already occurred and then collects data to investigate a possible relationship between these conditions and subsequent characteristics or behaviors. (See Chapter 10.)</td>
</tr>
<tr>
<td>Grounded theory research</td>
<td>A type of qualitative research aimed at deriving theory through the use of multiple stages of data collection and interpretation. (See Chapter 7.)</td>
</tr>
<tr>
<td>Historical research</td>
<td>An effort to reconstruct or interpret historical events through the gathering and interpretation of relevant historical documents and/or oral histories. (See Chapter 8.)</td>
</tr>
<tr>
<td>Observation study</td>
<td>A type of quantitative research in which a particular aspect of behavior is observed systematically and with as much objectivity as possible. (See Chapter 9.)</td>
</tr>
<tr>
<td>Phenomenological research</td>
<td>A qualitative method that attempts to understand participants' perspectives and views of social realities. (See Chapter 7.)</td>
</tr>
<tr>
<td>Quasi-experimental research</td>
<td>A method similar to experimental research but without random assignment to groups. (See Chapter 10.)</td>
</tr>
<tr>
<td>Survey research</td>
<td>A study designed to determine the incidence, frequency, and distribution of certain characteristics in a population; especially common in business, sociology, and government research. (See Chapter 9.)</td>
</tr>
</tbody>
</table>
Considering the Validity of Your Method

No matter what research methodology you choose, you must think about the validity of your approach. We have already described the importance of validity in measurement instruments. But here we are talking about the validity of the research project as a whole—it’s accuracy, meaningfulness, and credibility. Your research effort will be worth your time and effort only to the extent that it allows you to draw meaningful and defensible conclusions from your data.

When researchers consider the validity of a research study, they need to ask themselves two basic questions. First, does the study have sufficient controls to ensure that the conclusions drawn are truly warranted by the data? And second, can the results obtained reasonably be used to make generalizations about the world beyond that specific research context? The answers to these two questions address the issues of internal validity and external validity, respectively.

Internal Validity

The internal validity of a research study is the extent to which its design and the data it yields allow the researcher to draw accurate conclusions about cause-and-effect and other relationships within the data. To illustrate, we present three situations in which the internal validity of a study is suspect:

1. A marketing researcher wants to study how humor in television commercials affects sales in the United States and Canada. To do so, the researcher studies the effectiveness of two commercials that have been developed for a new soft drink called Zowie. One commercial, in which a well-known but humorless television actor describes how Zowie has a zingy and refreshing taste, airs during the months of March, April, and May. The other commercial, a humorous scenario in which several teenagers spray one another with Zowie on a hot summer day, airs during the months of June, July, and August. The researcher finds that in June through August, Zowie sales are almost double what they were in the preceding three months. “Humor boosts sales,” the researcher concludes.

2. An industrial psychologist wants to study the effects of soft classical music on the productivity of a group of typists in a typing pool. At the beginning of the month, the psychologist meets with the typists to explain the rationale for the study, gets their consent to play the music during the working day, and then begins to have music piped into the office where the typists work. At the end of the month, the typists’ supervisor reports a 30% increase in the number of documents completed by the typing pool that month. “Classical music increases productivity,” the psychologist concludes.

3. An educational researcher wants to study the effectiveness of a new method of teaching reading to first graders. The researcher asks all 30 of the first-grade teachers in a particular school district whether they would like to receive training in the new method and then use it during the coming school year. Fourteen teachers volunteer to learn and use the new method; 16 teachers say that they would prefer to use their current approach. At the end of the school year, students who have been instructed with the new method have, on average, significantly higher average scores on a reading achievement test than students who have received more traditional reading instruction. “The new method is definitely better than the old one,” the researcher concludes.

Did you detect something wrong with the conclusions these researchers drew? If not, go back and read the three descriptions again. None of the conclusions is warranted from the study conducted.

In the first research study, the two commercials apparently differed from each other in many ways (e.g., the presence of teenagers, the amount of action) in addition to humor. And, of course, we should not overlook the fact that the humorous commercial aired during the summer months. People are more likely to drink soft drinks (including Zowie) when they are hot!

In the second study, the typists knew they were participating in a research study; they also knew the nature of the researcher’s hypothesis. Sometimes the participants in a research study
change their behavior simply because they know they are in a research study and are getting extra attention as a result. This effect, known as the Hawthorne effect,\(^3\) is an example of reactivity, a more general phenomenon in which people change their behavior when they are aware that they are being observed. But other explanations for the second study's results are possible as well. Perhaps the typists typed more because they liked the researcher and wanted to help him support his hypothesis. Perhaps the music perked up the typists for a few weeks simply because it was a change in their environment—a phenomenon known as the novelty effect. (In such a situation, reverting back to no music after a month or two might also lead to an increase in productivity.) Furthermore, the researcher did not consider the number of people who were working before and after the music started. Perhaps productivity increased simply because two people in the typing pool had just returned from vacation!

In the third study, notice that the researcher looked for volunteers to use the new method for teaching reading. Were the volunteer teachers different in some way from the nonvolunteers? Were they better educated or more motivated? Did they teach with more enthusiasm and energy because they expected the new method to be more effective? Or did the volunteer teachers happen to teach in areas of the school district where children had a better head start in reading skills before coming to school? Perhaps the children in the volunteers' classrooms performed better on the achievement test not because the instructional method was more effective, but because, as a group, they had been read to more frequently by their parents, gone to better preschools, and so on.

To ensure the internal validity of a research study, researchers need to take whatever precautions they can to eliminate other possible explanations for the results observed. Following are several strategies researchers sometimes use to increase the probability that their explanations are the most likely ones for the observations they have made:

- **A controlled laboratory study.** An experiment is conducted in a laboratory setting so that environmental conditions can be carefully regulated.

- **A double-blind experiment.** In a situation where two or more different interventions are being compared, neither the participants in the study nor the people administering the interventions (e.g., teachers, research assistants) know which intervention each participant is receiving. Such lack of knowledge ("blindness") decreases the likelihood that people's expectations for outcomes might influence the actual outcomes.

- **Unobtrusive measures.** People are observed in such a way that they do not know their actions are being recorded. We offer two real-life examples to illustrate. In one case, a university library measured student and faculty use of different parts of the library by looking at wear-and-tear patterns on the carpet. In another situation, researchers for the U.S. National Park Service looked at hikers' frequency of using different hiking trails by installing electronic counters in hard-to-notice locations beside the trails (R. K. Ormrod & Trahan, 1982). (Note that ethical issues sometimes arise when we observe people without their permission; we discuss ethics a bit later in this chapter.)

- **Triangulation.** Multiple sources of data are collected with the hope that they will all converge to support a particular hypothesis or theory. This approach is especially common in qualitative research; for instance, a researcher might engage in many informal observations in the field and conduct in-depth interviews, then look for common themes that appear in the data gleaned from both methods. Triangulation is also common in mixed-methods designs, in which both quantitative and qualitative data are collected to answer a single research question.

Internal validity is especially of concern in experimental designs, where the specific intent is to identify cause-and-effect relationships; accordingly, we will revisit this issue in Chapter 9. But to some degree, internal validity is important in any research study. The researcher must have confidence that the conclusions drawn are warranted from the data collected.

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\(^3\)The effect owes its name to the Hawthorne Works, an industrial complex in Illinois where the effect was first observed.
**External Validity**

The external validity of a research study is the extent to which its results apply to situations beyond the study itself—in other words, the extent to which the conclusions drawn can be generalized to other contexts. As a general rule, researchers contribute more to humanity’s knowledge about the world when they conduct research that has implications that extend far beyond the specific situation studied.

Following are three commonly used strategies that enhance the external validity of a research project:

- **A real-life setting.** Earlier we mentioned that researchers sometimes use laboratory experiments to help them control the environmental conditions in which a study takes place. Laboratory studies have a downside, however: They provide an artificial setting that may be quite different from real-life circumstances. Research that is conducted in the outside world, although it may not have the tight controls of a laboratory project, may be more valid in the sense that it yields results with broader applicability to other real-world contexts.  

- **A representative sample.** Whenever researchers seek to learn more about a particular category of objects or creatures—whether they are studying rocks, salamanders, or human beings—they often study a sample from that category and then draw conclusions about the category as a whole. (Here is a classic example of inductive reasoning.) For example, to study the properties of granite, researchers might take pieces of granite from anywhere in the world and assume that their findings based on those pieces might be generalizable to granite found in other locations. The same might hold true for salamanders if researchers limit their conclusions to the particular species of salamander they have studied.

  Human beings are another matter. The human race is incredibly diverse in terms of culture, child-rearing practices, educational opportunities, personality characteristics, and so on. To the extent that researchers restrict their research to people with a particular set of characteristics, they may not be able to generalize their findings to people with a very different set of characteristics. Ideally, then, researchers want participants in a research study to be a representative sample of the population about which they wish to draw conclusions. In Chapter 8, we consider a number of strategies for obtaining representative samples.

- **Replication in a different context.** Imagine that one researcher draws a conclusion from a particular study in a specific context, and another researcher who conducts a similar study in a very different context reaches the same conclusion, and perhaps additional researchers also conduct similar studies in dissimilar contexts and, again, draw the same conclusion. Under such circumstances, these studies, taken together, provide evidence that the conclusion has validity and applicability across diverse contexts and situations.

Any researcher should consider both internal validity and external validity when designing a research project. One’s conclusions are valid and meaningful only to the extent that they are warranted based on the data collected and have applicability beyond the specific research situation itself.

In Chapter 2 we introduced you to the distinction between basic and applied research. Well-designed basic research—research conducted under tightly controlled (and possibly artificial) conditions—ensures internal validity; that is, it allows the researcher to rule out other possible explanations for the results obtained. Applied research—research conducted in more naturalistic but invariably more complex environments—is more useful for external validity; that is, it increases the chances that a study’s findings are generalizable to other real-life situations and

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4The artificial nature of laboratory research has been a concern in psychology for many years. Anderson, Lindsay, and Bushman (1999) compared the results of laboratory and field studies related to a wide variety of psychological phenomena. They discovered that the two kinds of studies typically yield similar results—that studies conducted in the lab and those conducted in natural settings lead to the same conclusions about human nature. In their own words, “The psychological laboratory has generally produced psychological truths, rather than trivialities” (p. 3).
problems. Keep in mind, however, that the basic-versus-applied distinction is really a continuum rather than a dichotomy: Research studies can have varying degrees of artificiality versus real-world authenticity.

**Validity in Qualitative Research**

The concepts of internal and external validity originated in discussions of quantitative research (Campbell & Stanley, 1965), and some qualitative researchers have questioned their relevance to qualitative designs. For instance, Lincoln and Guba (1985) and Creswell (2007) have suggested that, for qualitative research, such words as **credibility, trustworthiness, confirmability, and validation** be used instead of the term **validity**.

As noted earlier, qualitative researchers frequently use triangulation—comparing multiple data sources in search of common themes—to support the validity of their findings. Following are several additional strategies they employ:

- **Extensive time in the field.** The researcher may spend several months, perhaps even a year or more, studying a particular phenomenon, forming tentative hypotheses, and continually looking for evidence that either supports or disconfirms those hypotheses.
- **Negative case analysis.** The researcher actively looks for cases that contradict existing hypotheses, then continually revises his or her explanation or theory until all cases have been accounted for.
- **Thick description.** The situation is described in sufficiently rich, “thick” detail that readers can draw their own conclusions from the data presented.
- **Feedback from others.** The researcher seeks the opinion of colleagues in the field to determine whether they agree or disagree that the researcher has made appropriate interpretations and drawn valid conclusions from the data.
- **Respondent validation.** The researcher takes his or her conclusions back to the participants in the study and asks quite simply, Do you agree with my conclusions? Do they make sense based on your own experiences?

As you can see, then, researchers use a wide variety of approaches to support the validity of their findings. Different approaches are appropriate in different situations, depending on the nature of the data and the specific methodologies used.

Regardless of the kind of study you decide to conduct, you must address the validity of your study at the very beginning of your project—that is, **at the planning stage**. If you put off validity issues until later in the game, you may end up conducting a study that has little apparent validity, either in terms of minimizing alternative explanations for the results obtained (internal validity) or in terms of being generalizable to the world “out there” (external validity). As a result, you are almost certainly wasting your time and effort on what is, for all intents and purposes, a trivial enterprise.

**Ethical Issues in Research**

Within certain disciplines—the social sciences, education, medicine, and similar areas of study—the use of human beings in research is, of course, quite common. And in biology the subjects of investigation are often nonhuman animals. Whenever human beings or other creatures with the potential to think, feel, and experience physical or psychological distress are the focus of investigation, researchers must look closely at the ethical implications of what they are proposing to do.

Most ethical issues in research fall into one of four categories: protection from harm, voluntary and informed participation, right to privacy, and honesty with professional colleagues. In the following sections we raise issues related to each of these categories. We then describe the internal review boards and professional codes of ethics that provide guidance for researchers.
Protection from Harm

Researchers should not expose research participants—whether they be human beings or nonhuman animals—to unnecessary physical or psychological harm. When a study involves human beings, the general rule of thumb is that the risk involved in participating in a study should not be appreciably greater than the normal risks of day-to-day living. Participants should not risk losing life or limb, nor should they be subjected to unusual stress, embarrassment, or loss of self-esteem.

In thinking about this issue, researchers must be particularly sensitive to and thoughtful about potential harm they might cause participants from potentially vulnerable populations (Sieber, 2000). For example, some participants may have allergies or health conditions that place them at greater-than-average risk in certain environments or with certain foods or medications. Participants of a particular gender, cultural background, or sexual orientation might feel embarrassed or otherwise uncomfortable when asked to answer some kinds of questions or engage in some kinds of activities. Special care must be taken with participants who cannot easily advocate for their own needs and desires—children, the elderly, people with disabilities, and the like.

Especially when working with human participants, a researcher should ideally also think about potential benefits that participation in a study might offer. At a minimum, the researcher should treat all participants in a courteous and respectful manner. A researcher can also consider how people might gain something useful from participating in a study—perhaps unique insights about a topic of personal interest or perhaps simply a sense of satisfaction about contributing in a small way to advancements in society’s collective knowledge about the world. In some cases a researcher can offer an incentive for participating (e.g., money or course credit), provided that it isn’t so excessive that it’s essentially a form of disguised coercion (Scott-Jones, 2000).3

In cases where the nature of a study involves creating a small amount of psychological discomfort, participants should know this ahead of time, and any necessary debriefing or counseling should follow immediately after their participation. A debriefing can simultaneously accomplish several things (Sales & Folkman, 2000):

- It can help alleviate any uncomfortable reactions—either anticipated or unanticipated—to certain questions, tasks, or activities.
- It can alert the researcher to necessary follow-up interventions for any participants experiencing extreme reactions.
- It provides an opportunity for the researcher to correct any misinformation participants might have gotten during the study.
- It provides a time during which participants can learn more about the nature and goals of the study, about how its results may fit in with what is already known about a topic, and about the nature of research more generally.

Voluntary and Informed Participation

When research involves public documents or records that human beings have previously created—birth certificates, newspaper articles, and so on—such documents and records are generally considered to be fair game for research investigation. But when people are specifically recruited for participation in a research study, they should be told the nature of the study to be conducted and given the choice of either participating or not participating. Furthermore, they should be told that, if they agree to participate, they have the right to withdraw from the study at any time. And under no circumstances should people feel pressure to participate from employers or other more powerful individuals. Any participation in a study should be strictly voluntary.

In general, research with human beings requires informed consent. That is, participants—or legal guardians in the case of children and certain other populations—must know the nature

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3 Two qualifications should be noted here. When working with children, enticing incentives should be offered only after parents have already given permission for their participation. And when offering course credit to college students, alternative ways to earn the same credit must be provided as well—for instance, reading and writing a review of a research article (Scott-Jones, 2000).
of the study and grant written permission. One common practice—and one that is required for certain kinds of studies at most research institutions—is to present an informed consent form that describes the nature of the research project, as well as the nature of one's participation in it. Such a form should contain the following information:

- A brief description of the nature and goal(s) of the study, written in language that its readers can readily understand
- A description of what participation will involve, in terms of activities and duration
- A statement indicating that participation is voluntary and can be terminated at any time without penalty
- A description of any potential risk and/or discomfort that participants may encounter
- A description of potential benefits of the study, including those for participants, science, and/or human society as a whole
- A guarantee that all responses will remain confidential and anonymous
- The researcher's name, plus information about how the researcher can be contacted
- An individual or office that participants can contact if they have questions or concerns about the study
- An offer to provide detailed information about the study (e.g., a summary of findings) upon its completion
- A place for the participant to sign and date the letter, indicating agreement to participate (when children are asked to participate, their parents must read and sign the letter)

An example of such a form, used by Rose McCallin in a research project for her doctoral dissertation, is presented in Figure 4.6. The form was used to recruit college students who were enrolled in a class in a teacher preparation program. It is missing one important ingredient: an offer to provide information about the study after its completion. Instead, McCallin appeared in class a few weeks after she had collected data to give a summary of the study and its implications for teachers.

A dilemma sometimes arises as to how informed potential participants should be. If people are given too much information—for instance, if they are told the specific research hypothesis being tested—they may behave differently than they would under more normal circumstances (recall the earlier description of a study involving classical music and typists' productivity). A reasonable compromise is to give potential participants a general idea of what the study is about (e.g., "This study is investigating the effects of a physical exercise program on people's overall mental health") and to describe what specific activities their participation will involve—in other words, to give them sufficient information to make a reasonable, informed judgment about whether they wish to participate.

On rare occasions (e.g., in some studies of social behavior), telling participants the true nature of a study might lead them to behave in ways that would defeat the purpose of the study. In general, deception of any kind is frowned on and should be used only when the study cannot meaningfully be conducted without it. Even then, the degree of deception should be as minimal as possible, and participants should be told the true nature of the research as soon as their involvement is over. (An internal review board, to be described shortly, can give you guidance regarding this matter.)

Earlier in the chapter we mentioned the use of unobtrusive measures as a strategy for measuring behavior. Strictly speaking, unobtrusive measures violate the principle of informed consent. But if people's behaviors are merely being recorded in some way during their normal daily activities—if people are not being asked to do something they ordinarily would not do—and if they are not being scrutinized in any way that might be potentially invasive or embarrassing, then unobtrusive measures are quite appropriate. Recall our two earlier examples: examining the frequency with which people use different parts of the library and the frequency with which they hike along certain trails in a national park. Both of these examples involved behaviors within the scope of participants' normal activities.
Understanding How Students Organize Knowledge

You are being asked to participate in a study investigating ways in which students organize their knowledge.

We are interested in determining how students organize their knowledge in memory and use that knowledge. It is hoped that the results of this study can be useful in helping teachers understand why students perform differently from one another in the classroom.

As a future teacher, you will most likely have to use your knowledge in a variety of situations. However, relatively little is known about relationships among factors involved in knowledge application. Your participation may help to clarify some of these relationships so that we can better identify why students perform differently. And, although you may not directly benefit from this research, results from the study may be useful for future students, both those you teach and those who, like yourself, plan to be teachers.

If you agree to participate, you will complete two activities. In addition, we need to use your anonymous grade point average (GPA) as a control variable in order to account for initial differences among students. To ensure anonymity, we will submit only your social security number to the UNC Registrar, who will use this number to locate your GPA. The Registrar will black out the first three digits of your social security number before giving us this information, and the remaining six-digit number will be used only to keep track of your performance on the other activities. You will not be putting your name on anything except this form. And, there will be no attempt to link your name with the last six digits of your social security number because individual performance is not of interest in this study. Only group results will be reported.

In the first activity, you will be asked to complete a 15-minute Self-Rating Checklist. This checklist consists of statements about knowledge application that you will judge to be true or false according to how each statement applies to you. In the second activity (which will be administered two days later), you will be given a list of concepts and asked to organize them on a sheet of paper, connect concepts you believe to be related, and describe the type of relationship between each connected pair of concepts. This activity should take about 30 minutes.

Although all studies have some degree of risk, the potential in this investigation is quite minimal. All activities are similar to normal classroom procedures, and all performance is anonymous. You will not incur any costs as a result of your participation in this study.

Your participation is voluntary. If at any time during this study you wish to withdraw your participation, you are free to do so without prejudice.

If you have any questions prior to your participation or at any time during the study, please do not hesitate to contact us.

AUTHORIZATION: I have read the above and understand the nature of this study. I understand that by agreeing to participate in this study I have not waived any legal or human right and that I may contact the researchers at the University of Northern Colorado (Dr. Jeanne Ormrod or Rose McCallin, 303-555-2807) at any time. I agree to participate in this study. I understand that I may refuse to participate or may withdraw from the study at any time without prejudice. I also grant permission to the researchers to obtain my anonymous grade point average from the UNC Registrar for use as a control variable in the study. In addition, I understand that if I have any concerns about my treatment during the study, I can contact the Chair of the Internal Review Board at the University of Northern Colorado (303-555-2392) at any time.

Participant's signature: ______________________ Date: ____________
Researcher's signature: ____________________ Date: ____________

FIGURE 4.6
Example of an informed consent form

Adapted from Knowledge Application Orientation, Cognitive Structure, and Achievement (pp. 109-110) by R. C. McCallin, 1988, unpublished doctoral dissertation, University of Northern Colorado, Greeley. Adapted with permission.

Right to Privacy

Any research study involving human beings must respect participants' right to privacy. Under no circumstances should a research report, either oral or written, be presented in such a way that other people become aware of how a particular participant has responded or behaved—unless, of course, the participant has specifically granted permission in writing for this to happen.

In general, a researcher must keep the nature and quality of individual participants' performance strictly confidential. For instance, the researcher might give each participant a unique, arbitrary code number and then label any written documents with that number rather than with the person's name. And if a particular person's behavior is described in depth in the research
report, he or she should be given a pseudonym—and other trivial, irrelevant details that might give away the person’s identity should be changed—to ensure anonymity.

In this age of the Internet, researchers must also take precautions that computer hackers cannot access participants’ individual data. Our advice here is simple: Don’t post raw data or easily decodable data about individual participants online in any form. If you use the Internet to share your data with co-researchers living elsewhere, use e-mail and well-encoded attachments to transmit your data set; send your coding scheme in a separate e-mail message at another time.

Occasionally employers or other powerful individuals in a research setting might put considerable pressure on a researcher to reveal participants’ individual responses. The researcher must not give in to such pressure. In general, knowledge about participants’ individual performances should be revealed only to any co-researchers who have a significant role in the research investigation—unless, of course, participants have specifically granted permission in writing that it be shared with certain other individuals. There is one important exception to this rule: Researchers are legally obligated to report to the proper authorities any information that suggests present or imminent danger to someone (e.g., child abuse, a planned terrorist act).

Honesty with Professional Colleagues

Researchers must report their findings in a complete and honest fashion, without misrepresenting what they have done or intentionally misleading others about the nature of their findings. And under no circumstances should a researcher fabricate data to support a particular conclusion, no matter how seemingly “noble” that conclusion might be. Such an action constitutes scientific fraud, plain and simple.

Within this context, we ask you to recall our discussion in Chapter 3 about giving appropriate credit where credit is due. Any use of another person’s ideas or words demands full acknowledgment; otherwise, it constitutes plagiarism and documentary theft. Full acknowledgment of all material belonging to another person is mandatory. To appropriate the thoughts, ideas, or words of another without acknowledgment—even if you paraphrase the borrowed ideas in your own language—is dishonest, unethical, and highly circumspect. Honest researchers do not hesitate to acknowledge their indebtedness to others.

Internal Review Boards

In the United States, any college, university, or research institution must have an internal review board (IRB) that scrutinizes all proposals for conducting human research under the auspices of the institution. This board, which is made up of scholars and researchers across a broad range of disciplines, checks proposed research studies to be sure that the procedures are not unduly harmful to participants, that appropriate procedures will be followed to obtain participants’ informed consent, and that participants’ privacy and anonymity are ensured.

It is important to note that the research is reviewed at the proposal stage. A proposal must be submitted to and approved by the IRB before a single datum is collected. Depending on the extent to which the study intrudes in some way on people’s lives and imposes risk to participants, the board’s chairperson may quickly declare it exempt from review, give it an expedited review, or bring it before the board for a full review. In any case, the researcher cannot begin the study until (a) the board has given its seal of approval to the study as originally designed or (b) the researcher has made modifications that the board requests.

The criteria and procedures of an IRB vary slightly from one institution to another. For examples of institutional policies and procedures, you might want to visit the websites of Duke University (www.ors.duke.edu), Tufts University (tnemcirb.tufts.edu), or University of New Hampshire (www.unh.edu/osr). You can find other helpful sites on the Internet by using a search engine (e.g., Google or Yahoo!) and such keywords as “IRB,” “human participants,” and “human subjects.”

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You might also see this committee called something along the lines of “Committee for Protection of Human Subjects.”
Universities and other research institutions have review boards for animal research as well. Any research that may potentially cause suffering, distress, or death to animals must be described and adequately justified to an institutional animal care and use committee (IACUC). Furthermore, the researcher must minimize or prevent such suffering and death to the extent it is possible to do so. For examples of research institutions' IACUC policies and procedures, we refer you to the University of Maryland (www.umresearch.umd.edu/IACUC) and the University of Arizona (www.uac.arizona.edu).

Professional Codes of Ethics

Many disciplines have their own codes of ethical standards governing research that involves human subjects and, when applicable, research involving animal subjects as well. One good source of discipline-specific ethical codes is, of course, the Internet. Following are examples of organizational websites with ethical codes related to research in their disciplines:

- American Anthropological Association (www.aaanet.org)
- American Association for Public Opinion Research (www.aapor.org)
- American Educational Research Association (www.aera.net)
- American Psychological Association (www.apa.org)
- American Society of Criminology (www.asc41.com)
- American Sociological Association (www.asanet.org)
- Society for Conservation Biology (www.conbio.org)

PRACTICAL APPLICATION Planning an Ethical Research Study

Ethical practices in research begin at the planning stage. The following checklist can help you scrutinize your own project for its potential ethical implications.

✓ CHECKLIST

Determining Whether Your Proposed Study Is Ethically Defensible

1. Might your study present any physical risks or hazards to participants? If so, list them here.

2. Might your study incur any psychological harm to all or some participants (e.g., offensive stimulus materials, threats to self-esteem)? If so, identify the specific forms of harm that might result.

3. Will participants incur any significant financial costs (e.g., transportation costs, mailing expenses)? If so, how might you minimize or eliminate those costs?

4. What benefits might your study have for (a) participants, (b) your discipline, and (c) society at large?
5. Do you need to seek informed consent from participants? Why or why not?

6. If you need to seek informed consent, how might you explain the nature and goals of your study to potential participants in a way that they can understand? Write a potential explanation here.

7. What specific steps will you take to ensure participants' privacy? List them here.

8. If applicable, what format might a post-participation debriefing take? What information should you include in your debriefing?

Critically Scrutinizing Your Overall Plan

At this point, you have presumably attended to the nature and availability of the data you need in order to address your research problem, identified potentially appropriate ways of measuring your observations, chosen an overall approach to your research methodology, and examined the ethical implications of what you intend to do. But ultimately, you must step back a bit and look at the overall forest—the big picture—rather than at the specific, nitty-gritty trees. And, of course, you must be realistic and practical regarding what you can reasonably accomplish. Remember the title of this book: *Practical Research*.

PRACTICAL APPLICATION Judging the Feasibility of a Research Project

Many beginning researchers avoid looking closely at the practical aspects of a research endeavor. Envisioning an exotic investigation or a solve-the-problems-of-the-world study sometimes keeps a researcher from making an impartial judgment about practicability. Completing the following checklist can help you wisely plan and accurately evaluate the research you have in mind. After you have finished, review your responses. Then answer this question: Can you reasonably accomplish this study? If your answer is no, determine which parts of the project are not terribly practical, and identify things you might do to make it more realistically accomplishable.

✔ CHECKLIST

Determining Whether a Proposed Research Project Is Realistic and Practical

THE PROBLEM

1. With what area(s) will the problem deal?
   - People
   - Things
   - Records
### Chapter 4  Planning Your Research Project

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</table>
|   | Thoughts and ideas  
|   | Dynamics and energy |
|   | 2. Are data that relate directly to the problem available for each of the categories you’ve just checked?  
|   |   Yes  
|   |   No |
|   | 3. What academic discipline is primarily concerned with the problem?  
|   |   |
|   | 4. What other academic disciplines are possibly also related to the problem?  
|   |   |
|   | 5. What special qualifications do you have as a researcher for this problem?  
|   |   Interest in the problem  
|   |   Experience in the problem area  
|   |   Education and/or training  
|   |   Other (specify):  

### The Data

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</table>
|   | 6. How available are the data to you?  
|   |   Readily available  
|   |   Available with permission  
|   |   Available with great difficulty or rarely available  
|   |   Unavailable |
|   | 7. How often are you personally in contact with the source of the data?  
|   |   Once a day  
|   |   Once a week  
|   |   Once a month  
|   |   Once a year  
|   |   Never |
|   | 8. Will the data arise directly out of the problem situation?  
|   |   Yes  
|   |   No |

If your answer is no, where or how will you obtain the data?  

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|   | 9. How do you plan to gather the data?  
|   |   Observation  
|   |   Questionnaire  
|   |   Test  
|   |   Rating scale  
|   |   Photocopying of records  
|   |   Interview and audio recording  
|   |   Specialized machine/device  
|   |   Computer technology  
|   |   Other (explain):  

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|   | 10. Is special equipment or are special conditions necessary for gathering or processing the data?  
|   |   Yes  
|   |   No |

If your answer is yes, specify:  

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</table>
|   | 11. If you will need special equipment, do you have access to such equipment and the skill to use it?  
|   |   Yes  
|   |   No |
If your answer is no, how do you intend to overcome this difficulty?

---

12. What is the estimated cost in time and money to gather the data?

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13. What evidence do you have that the data you gather will be valid and reliable indicators of the phenomena you wish to study?

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**Criteria-Based Evaluation**

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14. Does your research project meet the four criteria applicable to all research? (For a refresher on these criteria, see the section “General Criteria for a Research Project.”)

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Yes</th>
<th>No</th>
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<tbody>
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<td>Universality</td>
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<tr>
<td>Replication</td>
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<tr>
<td>Control</td>
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<td>Measurement</td>
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15. As you review your responses to this checklist, might any of the factors you’ve just considered, or perhaps any other factors, hinder a successful completion of your research project?

<table>
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<tr>
<th>Yes</th>
<th>No</th>
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If your answer is yes, list those factors.

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When You Can’t Anticipate Everything in Advance: The Value of a Pilot Study

Did you have trouble answering some of the questions in the checklist? For instance, did you have difficulty estimating how much time it would take you to gather or process your data? Did you realize that you might need to develop your own questionnaire, test, or other measurement instrument but then wonder how valid and reliable the instrument might be for your purpose?

Up to this point, we have been talking about planning a research project as something that occurs all in one fell swoop. In reality, a researcher may sometimes need to do a brief exploratory investigation, or pilot study, to try out particular procedures, measurement instruments, or methods of analysis. A brief pilot study is an excellent way to determine the feasibility of your study. Furthermore, although it may take some time initially, it may ultimately save you time by letting you know—after only a small investment on your part—which approaches will and will not be effective in helping you solve your overall research problem.

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**PRACTICAL APPLICATION Establishing Research Criteria and Justifying Your Research Methodology**

In this exercise, you will continue developing your research proposal, for which you have already conducted a review of the related literature (see Chapter 3). In writing proposals, we leave nothing unspecified. Here we explore how to treat each subproblem in terms of its data, the criteria
for the admission of those data into your study, and a justification of the methodology you propose to employ. In the form presented in Figure 4.7 (extend it as needed on either a sheet of paper or word processing document), we suggest the following approach to justify your research methods:

1. Write your principal problem at the top of the page, and divide the rest of the page into the two columns.
2. In the left-hand column, write the first subproblem.
3. Immediately below the subproblem, write a description of the data you will need to resolve that subproblem.
4. In the right-hand column, write the criteria you will establish for the admissibility of those data into your research design. In other words, what kinds of data will be acceptable and what kinds will not be acceptable for inclusion in your study? Be very specific. For instance, if you are planning to administer a questionnaire to determine people’s attitudes about a controversial issue, will you include data from questionnaires that are only partially completed, with some items left unanswered?
5. Repeat steps 2–4 for the remaining subproblems.

Now refer to the earlier sections “Comparing Quantitative and Qualitative Approaches” and “Guidelines: Deciding Whether to Use a Quantitative or Qualitative Approach.” Then do the following:

1. Describe the characteristics that the data in your research project will exhibit.
2. For the data you have just described, identify the approach—quantitative, qualitative, or some combination of the two—that would be most appropriate for collecting, analyzing, and interpreting those data. Justify your choice.

**PRACTICAL APPLICATION Developing a Plan of Attack**

Once you have determined that your research project is feasible, you can move ahead. Yet especially for a novice researcher, all the things that need to be done—writing and submitting the proposal, getting IRB or IACUC approval, arranging for access to one or more research sites, setting up any experimental interventions you have planned, collecting the data, analyzing and