Research Methods for Political Science

SECOND EDITION

Quantitative and Qualitative Approaches

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Routledge
Taylor & Francis Group
LONDON AND NEW YORK

First published 2010 by M.E. Sharpe

Published 2015 by Routledge
2 Park Square, Milton Park, Abingdon, Oxon OX14 4RN
711 Third Avenue, New York, NY 10017, USA

Routledge is an imprint of the Taylor & Francis Group, an informa business

Library of Congress Cataloging-in-Publication Data

McNabb, David E.
Research methods for political science : quantitative and qualitative approaches /
by David E. McNabb. — 2nd ed.
p. cm.
Includes bibliographical references and index.
ISBN 978-0-7656-2313-3 (pbk. : alk. paper)
1. Political science—Methodology. 2. Political science—Research. I. Title.
JA71.5.M34 2009
320.072—dc22 2008049000

ISBN 13: 9780765623133 (pbk)

Dedicated to
J.C., with everlasting affection, and
to the memory of my father, J.B. McNabb.

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Preface and Acknowledgments

The primary goal of all science is to expand human knowledge. For this to happen, scientists must engage in research. The discipline of political science is the branch of social science that contributes to the growth of knowledge about politics, government, and the polity. Its objective is to help us learn about our political systems and the political behavior of our fellow human beings. This book is designed to help political scientists perform research in order to expand the body of knowledge about these and related topics.

The purpose of this book is to provide in one location information about how to design, conduct, interpret, and report on research that is carried out by political scientists. It has been written to serve as a guide for designing research activities that investigate political or administrative science topics. While its focus is on how to do research for students of political science, it is hoped that it will also be a valuable tool for those persons already embarked on their careers. The text can also aid students of other social science and education disciplines who have little or no experience in writing a scholarly paper for a class. Political science graduate students will find the book especially useful for designing and completing assignments in their research methods course and for preparing their master's degree thesis or doctoral dissertation. Managers now employed in administrative and managerial positions in government, academia, and nonprofit organizations may also find the book useful as a step-by-step guide for designing and conducting a research project with their internal staff.

This second edition of the book has been extensively revised. It has been shortened and honed to provide less theoretical background information and more topical instructions on the task of conducting research. The text covers such important topics as research design, specifying research problems, designing quantitative research studies and a variety of qualitative research studies. It also includes instructions on how to mine meaning from both quantitative and qualitative research data. The book begins with a brief discussion on the types of studies and topics of interest to political science researchers. It includes a brief review of some of the underlying disciplinary questions studied by political scientists. Changes in the philosophy of science from the positivist approach to postpositivist theory and critical research are discussed.

Acknowledgments

I wish to thank the staff at M.E. Sharpe for their assistance and support throughout the preparation of this revised edition. These talented people were exceptionally helpful by providing knowledgeable, insightful editorial criticism that certainly improved the final product. I particularly wish to thank Mr. Harry Briggs, M.E. Sharpe executive editor, for his continued support and encouragement, and to thank the anonymous reviewers and adopters of the text for their guidance in preparation of the book. I am especially indebted to the faculty and administrators of Pacific Lutheran University for their moral and financial support. As always, I thank my family for their continued sustenance.

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Introduction

Research Methods for Political Science was researched and written to fill a need for a methods book that incorporates the latest thinking in the major subfields of political science, including comparative politics, international relations, and public administration, among others. It includes discussions and examples of research topics and research methods found in the current professional literature. A key advantage of the text is that it integrates *both* positivist and postpositivist approaches under one cover. It also provides specific instructions in the use of available statistical software programs. The text also illustrates some of the developments in social science research and management and organizational research, in addition to research in the political and administrative sciences.

The book is neither just another text on quantitative research methods, nor is it a statistics text. It includes elements of both in addition to a solid introduction to qualitative research approaches. However, because of the continued heavy interest in positivist research methods found in most major political science journals and papers presented at the numerous political science conferences I have attended over the past several years, the book places a slight emphasis on the statistical tools employed by today's political scientists. Both descriptive and inferential statistical methods are discussed, with step-by-step instructions for their use also included. Qualitative methods discussed include explanatory, interpretive, and critical research designs.

It is also important to know that this is not a text about political science or one of its subfields. It does not compare political systems, discuss declining citizen participation, or provide instructions on how to run a political campaign. Certainly, it must and does cite examples of such topics and of the research approaches taken and data-gathering methods used by political scientists.

What this book *is* about is how anyone considering a career as either a practicing politician, a director of political campaigns, a future academic researcher, or a political scientist in general, can design and conduct research that meets the basic requirement of being "good science."

The book draws extensively upon the findings, recommendations, conclusions, and intellectual creativity of many present and past political scientists. This guide to research methods owes an unlimited debt to their scholarship. However, these examples should not be considered to be comprehensive or fully representative of the scope of the discipline. The examples were chosen by the author, and reflect his own experience, education, and bias. Whatever errors exist, whether they are errors of omission or commission, are entirely the responsibility of this author.

Structure of the Book

The book is organized into five major sections. The first section, "Foundations of Political Science Research," contains six chapters. Chapter 1, "Research Fundamentals," is an overview of the philosophical approaches to research and science: the objectivist and the humanist approaches—more commonly known as the positivist and postpositivist approaches. This discussion is followed by an overview of the purpose and rationale of political science research in general, including a brief look at the big issues in political science. Chapter 2 expands on the topics introduced in Chapter 1, with particular emphasis on the many different quantitative and qualitative approaches and methods that can be used in political science research.

Chapter 3, "Understanding the Research Process," introduces a systematic process that all research activities typically follow, regardless of their objectives, approaches, or methods. This chapter begins with a discussion of the importance of thoroughly defining the problem before beginning the research and includes a review of different ways to organize reports of research findings. The chapter concludes with a brief review of some of the current research in the discipline.

Chapter 4, "Selecting a Research Design and Choosing a Research Topic," takes readers through the process of selecting an appropriate strategy. It also provides suggestions on how and where to begin the background research for a study, including carrying out examinations of textbooks, journals, electronically stored and retrieved articles, and other materials in sources inside and outside of the researchers' organization. The early research proposals produced by most beginning political science researchers tend to be far too broad for the resources at hand (particularly time and money). Chapter 5 leads readers through the process of preparing a research proposal, a necessary activity in all graduate studies and for applying for research grants.

Chapter 6, "The Legal and Ethical Environment of Research," includes an overview of the moral foundations upon which research decisions are based and concludes with a discussion of the moral concerns and ethical dilemmas encountered by researchers in this and related fields. Special emphasis is placed on research with human subjects.

Part 2, "Quantitative Research Approaches and Methods," begins with an overview of the fundamentals of designing and conducting research in the positivist tradition. Chapter 7, "Introduction to Quantitative Methods," explains the characteristics of measurements and includes an explanation of the types or categories of statistics used in research. This chapter continues with a review of the sampling process and chief sampling methods, including probability and nonprobability sampling. Sampling is an important concept in the use of inferential statistics, as is the nature of sample distributions; both are reviewed in this chapter.

The next three chapters in this section introduce researchers to the three chief quantitative research designs: exploratory, descriptive, and causal. Chapter 8, "Exploratory Research: The Probing Approach," is an introduction to the ways researchers use one-on-one and small group interviews to collect information for insights and ideas that can be used to design more detailed and rewarding research projects. This approach is often referred to as small-sample research. It often employs qualitative methods to bring out information that can then be used to design large-sample survey studies.

Chapter 9, "Descriptive Research: The Survey Approach," provides guidance on how to design and conduct large-sample field surveys. It includes instructions for writing questions and constructing questionnaires. This section is a practical guide to writing the many types of questions and scales that are used to measure attitudes and opinions. The chapter also includes instruction on how to put these questions into a logical sequence in the formal data-gathering instrument (the questionnaire).

Chapter 10, "Causal Research: The Experimental Approach," describes the experimental method and illustrates how political scientists conduct causal research. Experiments and experimental design are concepts used to design and conduct cause-and-effect research studies. The discussion includes an introduction to single-factor and multiple-factor design methods. Chapter 11, "Interpreting Exploratory and Descriptive Statistics," introduces the basic descriptive statistics used in research. The chapter provides simple-to-understand definitions of measures of central tendency, of variability, of relative position, and of correlation.

In Chapter 12, "Testing Research Hypotheses," readers are shown how and why statistical tests are used to communicate information that relates to the validity of the results of the research. This is the first of several chapters dealing with inferential statistics. Inferential statistics are statistical tests used with samples rather than entire populations and in which probabilities play an important role. The chapter examines one and two or more sample hypothesis tests, including the *t*-test and analysis of variance procedures.

Chapter 13, "Introduction to Nonparametric Statistics," explains the use of statistical tests on measurements that do not meet the more stringent requirements of inferential statistics. Chapter 14, "Correlation and Regression Analysis in Political Science," goes into greater detail on two related statistical tools that are a part of nearly every quantitative research report. These tools help researchers determine the strength and direction of relationships between variables, and to predict how changes in one variable may influence changes in a related variable.

Chapter 15, "Exploring Multivariate Statistics," provides a discussion and instruction on how to apply important multivariate statistical processes for association analysis, relationships, and causality. These tests can now be quickly processed with modern statistical software for personal computers. Instructions and examples of software applications are included.

Part 3, "Qualitative Research Approaches and Methods," introduces qualitative (interpretive) research strategies and methods. Chapter 16, "Introduction to Qualitative Research Methods," reviews the development and purpose of qualitative research strategies. It illustrates how qualitative designs can, for example, contribute to understanding public organizational culture and its impact upon the voting public and public agency employees. Chapter 17, "Explanatory Research: Case and Historical Methods," describes both the single- and the multi-case approach and includes an introduction to historical research methods. The case method is considered by many to be the most used qualitative design in political science. It has also been shown to be particularly valuable in public administration and nonprofit organization research. For many political scientists, history plays a critical role in developing knowledge in the discipline. However, little if any instruction on the process of historiography is included in current political science curricula. This chapter attempts to rectify that error of omission.

Chapter 18, "The Interpretive Approach I: Grounded Theory Methods," discusses research used in interpretive approaches in political science. In grounded theory studies, researchers approach a situation, event, or relationship with little or no preconceived theoretical bias; they construct a theory only after the in-depth analysis of the study data. Chapter 19, "The Interpretive Approach II: Ethnographic Research Methods," examines the research approach that involves participant observation and other culture-base investigative methods. Ethnography was originally developed by anthropologists to describe and explain phenomena in distant and what were considered to be primitive societies. It has been successfully adapted to research on modern political cultures and subcultures.

Chapter 20 is an introduction to the critical approach. The chapter focuses on feminist and empowerment research as they are used in political science research. Chapter 21, "Analysis Methods for Qualitative Data," explains some of the ways researchers go about analyzing and interpreting the data they collect in these interpretive studies. Chapter 22, "Analyzing Texts, Documents, and Artifacts," continues the discussion of the analysis of qualitative data by reviewing the chief tools used to collect, organize, and contain such data.

Part 4, “Preparing and Presenting Research Findings,” begins with Chapter 23, “Organizing Information in Tables, Charts, and Graphs,” in which these graphic tools are used to present descriptive statistical data to improve the quality and readability of research reports. Chapter 24, “Organizing and Writing a Research Report,” includes a discussion on the importance of following various organizational procedures, adhering to accepted political science research writing style, and dealing with citations and credits. The final chapter in the book, Chapter 25, is entitled “Introduction to Statistical Software.” The key element is a discussion of how computer programs are used to analyze quantitative data. The chapter includes specific steps on how to use the statistical software program SPSS.

Summary

Research and interpreting research findings are important skills required of all political scientists. Researching means gathering, processing, and interpreting data of some kind. Research results must be communicated in intelligently and cogently written reports. Political scientists also must interpret and evaluate research reports that have been produced by academics, administrators, or contract-research organizations.

There are at least five very good reasons for developing or expanding the skills needed to use research methods and prepare written research reports. The first reason is that it will help develop and hone analysis and communication skills. Second, the research process helps the political scientist remain aware of what others in the career field are doing and saying about common problems. The third reason has to do with *believability.* Anyone reading a research report must be able to achieve the same or similar results by following the same research design.

Fourth, following long-established guidelines for research and report writing makes verification through publishing easier and more likely to take place. Finally, political scientists, social workers, and public and nonprofit agency administrators are often required to make quick, intelligent decisions. The best decisions are almost always made after all the available information pertaining to outcomes of the decisions is gathered, digested, and evaluated. This usually involves some type of formal or informal research activity.

The research activity can be defined as *the process of systematically acquiring data to answer a question or solve a problem.* Research methodology refers to the steps involved in a given approach. Two philosophical approaches underlie political science research: *positivism* and *postpositivism.* The positivist approach is the traditional scientific method that involves the following steps: selection of a hypothesis, observation, data collection, hypothesis testing, and acceptance or rejection of the hypothesis. The postpositivist approach is associated with qualitative research methods; it emphasizes understanding as well as description of phenomena.

Part 1

Foundations of Political Science Research

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1 Research Fundamentals

The constantly changing and expanding environment of the social science disciplines is also reflected in the study of politics. Political science includes the study of local, state, and national politics and governance, international relations, political theory and political history, to name only a few of the wide variety of human endeavors included in the study of politics and political behavior. Thus, political science can be defined as a *diverse and constantly changing field of inquiry into the political behavior of individuals and groups of human beings, the institutions with which mankind identifies and governs itself, and the values that underlie political thought and systems.* The research conducted by political scientists necessarily addresses the many questions that arise in this wide-ranging field of social science.

Purposes of Political Science Research

Research is conducted for many different purposes. At its most fundamental level, the purpose of research may be either *basic* or *applied.* Basic research, which is also called *pure* or *theoretical* research, is conducted to increase the general storehouse of knowledge. Basic research concerns coming up with theories about what political phenomena are and why events happen the way they do. An example of basic research is the study of the fossils of life forms that existed on earth millions of years ago. This science of paleontology is characterized by an emphasis on *theory building* rather than on the application of solutions to a real-life problem. A typical theory in paleontology might be concerned with why the dinosaurs disappeared. The findings of paleontologists are interesting indeed, but to many people in the world of politics they have little immediate, practical value.

Applied research, on the other hand, is conducted to help solve practical problems or to help researchers and political scientists understand past behavior in order to guide them in their attempts at predicting future behavior. Applied researchers are concerned with developing theories about why something happened; they look for *causal* relationships. They conduct research in order to describe in detail what happened, how it happened, and why; in this way, they hope to be able to predict its happening again in the future.

Political science research is more likely to be applied than to be basic, although pure research does play a large role in the discipline's academic community. Political scientists working in both basic and applied approaches use the same methodologies, follow similar research designs, and concern themselves with performing research tasks with scientific rigor, ethics, validity, and reliability.

Describing the Purposes for Research

A number of authors have tried to develop a set of purposes that are specific to the topics and questions found in political science research. Babbie (2001), for example, identified the following three purposes of research in the social sciences, including political science: (1) the *exploration* of a topic; (2) the *description* of a topic, situation, or event; or (3) to *explain* some phenomenon. In their discussion of the comparative method in political science research, Pennings, Keman, and Kleinnijenhuis (1999), identified three purposes of research as being able to identify: (1) regularities regarding the relationship between societal and political actors, (2) the processes of institutionalization of political life, and (3) the changes in society that emerge from the first two forces.

Stallings and Ferris (1988) identified a three-category system to categorize the purposes of doing research, terming the different purposes *conceptual*, *relationship*, and *evaluative.* The purpose of a conceptual study is to establish the fundamental concepts that underlie a problem. Conceptual studies are designed to identify critical variables for further research or to frame a problem for which another study can be developed. The purpose of a relationship study is to either describe relationships between variables or to investigate the potential for causation resulting from a relationship. Finally, evaluative studies are designed to explain or evaluate an event, a program, a policy, or some other phenomenon. A different approach was taken by Lathrop (1969), who described the following four purposes in his research methods text: (1) theory testing, (2) extending the range of applicability of existing research, (3) resolving conflicting research findings, and (4) replicating previous studies.

Another way to characterize these reasons for research is to look upon them as *research objectives.* In science, research objectives and research purposes are nearly interchangeable terms. For example, three often-stated objectives for research are: (1) to *explore* a topic for the purpose of gaining insights and ideas, (2) to *describe* a topic, which typically has the purpose of counting the occurrence of one or more phenomena, or (3) to establish and/or measure *causation*; in a causal study, the purpose is to determine the power of one or more independent variables to influence change in a dependent variable. These objectives could have just as easily been termed *purposes.*

Researchers study the issues that they think should be examined, and conduct research the way that they believe knowledge is gained. Whether they are aware of it or not, researchers in all disciplines are guided in the way they conduct their studies by the underlying philosophical positions they bring to the research table (Marsh, Stoker, and Furlong 2002). The bases for these positions are cast from what in philosophy are known as *ontology* and *epistemology*, both of which are concerned with knowledge and the way scientists develop knowledge. Ontology is the field of philosophy that deals with what we can learn—what is "out there" that can be known. It has to do with what is the nature of the world we can experience. Epistemology, on the other hand, is concerned with questions about the *way* that we learn—the methods used by humans to gain knowledge. It is also concerned with the validity of knowledge; it deals with questions about how we can know anything and how we can be certain what we do know is true (Plotkin 1994).

The "Big Issues" in Political Science

In the early 1980s, the editorial board of the American Political Science Association (APSA) began a series of publications for which a variety of political scientists were invited to submit papers describing the then-current state of intellectual activity in the political science discipline. Follow-on volumes appeared in 1993 and 2002 (Finifter 1983 and 1993; Katznelson and Milner 2002). A comparative summary of the major section headings in each of the volumes is displayed in Table 1.1.

In the first edition of the *State of the Discipline* series, a major question that concerned researchers was whether research in the discipline should be *theoretical* or *applied* (Gunnell 1983,

Table 1.1

State-of-the-Discipline Section Headings in Three Editions of a Survey Volume

Section	1983	1993	2002
1	Political Science: The Discipline and Its Scope and Theory	Theory and Method	The State in the Era of Globalization
2	American Political Processes and Policymaking	Political Processes and Individual Political Behavior	Democracy, Justice, and Their Institutions
3	Comparative Political Processes and Policymaking	Political Institutions of the State	Citizenship, Identity, and Political Participation
4	Micropolitical Behavior: American and Comparative	Nations and Their Relationships	Studying Politics
5	International Politics		
6	Addresses from the Lasswell Symposium: The Uses of Social Science		

Sources: Finifter, ed., 1983, 1993; Katznelson and Milner, eds., 2002.

12). This was taking place during the peak influence of the *behavioral* focus in political science research, when politics was considered first and foremost a *behavioral system.* The behavioral emphasis had become the dominant research approach during the decades of the 1950s and the 1960s. The research of the period was described as:

> There was a distinct emphasis on pure or theoretical science and a turning away from the idea of liberal reform and social control as the rationale of social science. . . . The 1960s were a decade of optimism about the advance of scientific theory and the achievement of the behavioral goal of science of politics modeled after the [methodological rigor of the natural sciences], . . . Paramount to all of these efforts was some notion of politics as a "system." (Gunnell 1983, 12)

Gunnell described the period as one when many political science researchers were becoming dissatisfied with the behavioral/systems model. This was also a time when the idea of political science as a *policy* science emerged, with much research focusing on policy questions. However, it was also becoming more and more difficult to clearly identify any limited set of core issues in the discipline. Different interests and concerns forced different levels of emphasis. Political science became too diverse for there to be any core set of issues that people agreed should be applied across the board. "Although one could say that the field was vital, it could just as easily be said that it was without definite direction or focus" (Gunnell 1983, 33–34).

Agreement on what constitutes "appropriate" political science research is continually evolving. The big issues in political science change regularly, as evidenced in the three *State of the Discipline* volumes. By the time that an issue trickles its way down through the many academic and practicing political scientists who might have an interest in the topic, it may be outdated and something new has come along to pique the interests of researchers in the field. Heywood (2000) may have been guided by this fact when he avoided discussing specific questions in his book on

Key Concepts in Politics, and instead enumerated 15 key concepts, 20 ideologies, 19 research approaches, 25 different values, 17 different governmental systems, 28 different structures, 15 different levels of government institutions and issue focus, and 7 different ways to look at questions and concerns in political science—all of which are topics of political science research. There are enough questions named in his small volume to supply political scientists with as many ideas for research questions as they will ever need.

Fragmentation in Political Science Research

Most disciplines, including political science, have undergone substantial growth since the middle of the last century. One of the unplanned consequences of this growth has been a trend toward greater interdisciplinary research; many researchers have wandered far from a limited core of questions to look at a variety of different, unrelated questions, with the goal of "finding something new to study." This trend has brought about a fragmentation of disciplines into smaller and smaller areas of interest.

Like its sister social sciences, political science has also become segmented into many separate and increasingly focused subfields (Abramson 1997). Each of these subfields has at least one—and usually many more than one—journal dedicated to disseminating advances in its field. A review of 2001 and 2002 issues of four important journals in the discipline—the *American Journal of Political Science, American Political Science Review, Journal of Politics,* and the *Political Research Quarterly*—found papers describing research on the discipline's traditional themes of political theory, American politics, elections/voting, judiciary, comparative politics, international relations, research methodology, public administration, and program evaluation. However, papers on a wide variety of individual topics that did not fit into any of the key subfields were also published.

Currently, the *American Political Science Review* publishes research papers in five categories of inquiry: political theory, American politics, comparative politics, international relations, and public administration. The journal includes a sixth category, research methods and analysis, with an established focus on methodological issues, not on politics or political topics.

Categories of Political Science Research

In an attempt to provide some structure to the burgeoning field of political science, Fagan (2002) grouped a collection of working papers in political science into just over a dozen categories. The major topics he identified are American politics, comparative politics, political communication, political theory, public administration, international relations, political economy, public policy, and methods and data. Superimposed upon these major focus areas are a number of subfields. For example, Cochran et al. (1995) identified nine topic areas that fall under the umbrella of studies in the *public policy* subfield: intergovernmental relations, the economy in general, economic issues such as taxation and spending, energy and the environment, crime and criminal justice, health care, education, legal and social equality, and diversity and tolerance.

Ruget (2002) defined four "structuring dimensions" of political science research. These include the status of the discipline in academia, the research fields addressed by political scientists, sociological characteristics of political scientists themselves, and their political allegiance. Together, these dimensions make up the *symbolic capital* of the discipline. An important conclusion of her research is that apparently not all fields in the discipline have the same "symbolic force," which she described as follows:

> For historical and intellectual reasons, the study of American political phenomena has become dominant in the discipline, while other domains, like political theory . . . [which used to be considered the core of the field] are implicitly considered to be less professionally promising. In 1991, for example, the course "American Government" was required by 80% of the political science departments in four-year colleges and universities, whereas a general introduction to the discipline was required in only 48% of them. (Ruget 2002, 472)

This emphasis on American government has not been accidental and probably should not be considered a weakening of the discipline. American political science, like British political science, Indian political science, Russian political science, and others, has maintained its particular focus on developing specific kinds of knowledge about its own system of governance. Thus, "The modifier *American* has to be taken seriously," according to Katznelson and Milner (2002, 3).

The attempts of early political scientists to arrive at explanations for the emergence of the liberal democratic United States has naturally resulted in an emphasis on democracy and the features that have enabled democracy to endure. However, if the papers commissioned for the third volume in the *State of the Discipline* series are any indication, dramatic changes in the focus of political science are taking place—including a globalization of the discipline.

Research topics in political science in the early years of the twenty-first century range across the entire spectrum of the social sciences. Despite the widely diverse nature of the discipline, several common themes have been found to characterize the research (Katznelson and Milner 2002, 2). These include: (1) a pragmatic orientation to the concept of the state that incorporates the study of power and choice as integral features; (2) study of the nature of liberal political regimes and their stability, with an increasing focus on democracy; and (3) a commitment to the study of the state in ways that are open and systematic.

From Thematic Focus to Research Topics

How does the thematic focus of the political science discipline translate into topics for research? One way to discern what might be a legitimate topic for research in political science is to look at what other researchers are examining, and to see what is being funded and what is being published. Indicative of the variety of research topics is the following partial list of recent political science research studies that are being supported by the National Science Foundation (NSF).

In 2007, the NSF announced that it would support research that advanced "knowledge and understanding of citizenship, government, and politics. . . . Substantive areas include, but are not limited to, American government and politics, comparative government and politics, international relations, political behavior, political economy, and political institutions." Examples of program awards included research studies on bargaining processes; campaigns and elections, electoral choice, and electoral systems; citizen support in emerging and established democracies; democratization, political change, and regime transitions; domestic and international conflict; international political economy; party activism; political psychology and political tolerance; political and research methodology; and research experiences for students (NSF 2007).

Branches of Political Science

Another way to put a frame around the scope of work in political science is to look at how the discipline structures itself. Several attempts have been made to reduce the large and growing number of research topics to a smaller number of fundamental themes. The Social, Behavioral, and Economic

Sciences division (SBE) of the NSF funds research in, but not limited to, the following six political science topic areas listed above. Along these same lines, Laitin identified four branches and two support areas of the discipline:

> There are four substantive fields in political science: Political Theory, Comparative Politics, Political Institutions, and International Relations. [In addition] there is one field (Methodology) that develops tools to address the methodological problems in each of the substantive fields. There is also an applied field (Public Policy) whose practitioners address policy problems relying on the substantive knowledge and methodological skills developed in the non-applied part of the discipline. (Laitin 2001, 7)

The American Political Science Association recognizes five key thematic fields in political science: political theory, political institutions, international relations, public policy, and methods—and three nonsubstantive areas: political arenas, independent variables, and an "other" category. These fields and section subfields are listed in Table 1.2. Public administration was not identified as one of the major subfields of political science. Instead, it was included it as part of an applied public policy field.

Political Science Research in Journals

A sampling of some of the most important political science journals helps to bring closure to this problem of definition and structure. Researchers in the discipline today appear to be focusing on questions in five broad fields of inquiry. These are (1) the history, theory, and philosophy of politics; (2) American politics; (3) comparative politics; (4) public administration (including the judiciary, public law, and criminal justice); and (5) international relations and related geopolitical issues.

Rather than limit the focus to American politics exclusively, the second topic in the list (American politics) might be changed to *national politics* in recognition that significant research in political science is taking place throughout the world. Some of this national research is comparative, while other studies focus on interpreting a single national system. However, this research all addresses issues that are national in scope. Researchers in other nations substitute their own nation or region for American politics, of course, but generally follow a similar set of topic areas.

Still another way to get a handle on the huge scope of research on political science topics and themes comes from a review of the 102 journals in the discipline recognized by the American Political Science Association. Two of these are official APSA journals: *American Political Science Review* and *PS: Political Science and Politics.* Others are grouped into ten categories, two of which are affiliated in some way with the association; one affiliated category includes three APSA section journals. Sections are the topic categories of the association, such as international relations, public policy, and others. The second category includes the fifteen journals of regional, state, and national political science associations. Other journal categories recognized by APSA include American politics, international politics, comparative politics, public administration and public policy, policy studies, political theory, women and politics, and a catchall *other* category.

Researchers in the area of the history, theory, and philosophy of politics study such questions as theories of political thought, the historical foundations of governance, and related philosophical and historical issues. APSA lists nearly twenty journals in this topic area. Among them are the *Critical Review of International Social and Political Philosophy*, *History of Political Thought*, and the *Journal of Political Thought.*

Table 1.2

Conference Fields and Topics, 2001 Annual APSA Conference

Field	Section
Political Theory	Foundations of Political Thought
	Human Rights
Political Institutions	Laws and Courts
	Legislative Studies
	Political Organizations and Parties
	Representative and Electoral Systems
	Presidency Research
	Elections, Public Opinion, and Voting Behavior
International Relations	Conflict Processes
	International Security and Arms Control
	Foreign Policy
Public Policy	Public Policy
	Public Administration
	Science, Technology, and Environmental Politics
Methodology	Political Methodology
Arenas	Politics and Society in Western Europe
	Urban Politics
	State Politics and Policy
Independent Variables	Politics and History
	International History and Politics
	Religion and Politics
	Race, Ethnicity, and Politics
	Women and Politics
	Ecological and Transformational Politics
	Political Communication
	Information Technology and Politics
Other	Political Economy
	Political Psychology
	New Political Science
	Politics and Literature
	Undergraduate Education

Source: Laitin 2001.

Researchers who address questions pertaining to national politics and the political system often investigate such phenomena as development and evolution of political parties and political action. They also look at the conduct of campaigns for or against issues and candidates for elected office, the processes of forming public policy, the activities of lobbyists and special-interest groups, and related topics. *American Politics Research*, *Party Developments*, and *White House Studies* are three journals in which studies on American politics can be found. Many of the journals in the area of comparative politics, such as the *British Journal of Political Science* and *Israel Affairs*, publish studies dealing with politics in other nations and areas.

Researchers who work in the area of comparative politics examine such questions as the similarities and differences in political systems and thought within two or more countries, regions, or ideologies. They also make in-depth analyses of specific functional areas in regions and nations. Examples of comparative functional studies can be found in the journals *Comparative Strategy* and *Electoral Studies*. Examples of regional comparison studies can be found in such journals as the *International Journal of Middle East Studies*, *West European Politics*, and the *Journal of Commonwealth and Comparative Studies.*

Political scientists who study events and trends in international relations often adopt the case study method in their analyses. They describe in detail the politics, political systems, and public policies of other nations. They make comparisons of national governments and international institutions and policies such as global trade, monetary policy, defense, or environmental protection, for example. Other researchers in this field study the functions and policies of larger international bodies like the European Union, the United Nations, the North American Free Trade Agreement (NAFTA), and other issues of a bilateral, multilateral, or geopolitical nature. Examples of research in this area can be found in such journals as *Foreign Affairs*, *Foreign Policy*, *International Politics*, and the *Review of International Studies*—only a few of the nineteen journals specifically devoted to international politics.

Different Answers for Similar Problems

Researchers in each subfield begin from a common starting point—the purpose statement upon which a research hypothesis or hypotheses are formed. From this beginning, they move in different ways to accomplish what on the surface may appear to be a common goal but, in reality, is something else entirely. Say, for example, that researchers in three different subfields find themselves interested in questions dealing with how issues influence voter behavior. A researcher in political activity might want to know whether voters in California react differently than voters in Nebraska to the agriculture platform in the message of a presidential candidate. A researcher in the area of public policy might design a study to determine whether families from different ethnic groups respond differently to a candidate's stand on welfare reform training programs. Still another researcher working in the area of international relations might want to compare the way adults in the European Union vote after the introduction of a common currency. Similar differences occur in other subfields of political science.

These different researchers necessarily begin their studies with widely different assumptions. The first researcher might assume that different levels of industrialization influence the attitudes of voters in both states. The public policy researcher may assume that all ethnic groups feel the same about training and welfare reform. The researcher in international relations may assume that the citizens of all European Union nations have similar opinions about replacing their national currency with the euro, the common currency of the European Union. Each one of these assumptions is a *hypothesis* that can be tested (Mattson 1986). In turn, each hypothesis becomes the starting point for identification of a research question.

Good political science research always follows a predetermined design and method. Any topic may be investigated in a variety of different ways. The two chief approaches to research were discussed earlier—the *positivist* and the *postpositivist* approaches. However, the researcher must remember that both the design of the study and the method followed are dictated by the nature of the research problem and the objectives for the research. Following a design means always beginning with a definition of a research problem, adopting a systematic plan for collecting, analyzing, and interpreting the data and for reporting the study findings. Getting from the beginning to the end of a research project can take many different paths.

Katznelson and Milner provided a concise summary of the focus of political science research and the discipline itself at the close of their introductory chapter for the third edition of *State of the Discipline*. They wrote:

> Contested and methodologically diverse, political science nonetheless remains focused, as it has for a century, on a particular understanding of how to study the modern state and liberal

> democracy. Though there have been shifts, of course, in emphasis and method, attempts to periodize the discipline's history mislead if not grounded in these powerful continuities delineating the discipline. Moreover, though political science has not produced fixed findings in the strong sense of the term . . . its intellectual debates have been cumulative and its disputations have grown more textured, more variegated, and in many respects, though not all, more capable over time. (Katznelson and Milner 2002, 25)

Defining Research

Political science is a big field, and almost any aspect of political behavior is interesting. Deciding how to look at the problem will be suggested by the nature of the problem itself and the objectives spelled out by the researcher. Selecting which methodological tradition to adopt follows from, rather than precedes, the selection of a research topic. In this section, research and the activity of research, will be defined.

What Is Research?

Research is an important skill required of all managers in public and nonprofit organizations. Research means *gathering, processing,* and *interpreting* data, then intelligently and cogently communicating the results in a report that describes what was discovered from the research. Knowing how to interpret and evaluate research that has been done by academics, administrators, or contract research organizations is another important skill. To learn the skills needed to both conduct and evaluate research, students of public administration are often required to complete one or more courses in *research methodology*. Designing and conducting a research project is usually a requirement in those courses.

When beginning political scientists embark on what too often seems to be an extremely daunting and thoroughly confusing task, they find themselves faced with such questions as these:

- What is the purpose for doing this research?
- What is a "'research problem"?
- Who has the needed information?
- What is the best way to ask questions?
- Which research design should be followed in this situation?
- How should the data be gathered?
- How should data be processed?
- What does all this processed data mean?
- What is the best way to communicate these findings?
- And many, many more . . .

Equally important, they must decide what questions not to ask, what questions cannot be readily answered, and how much research can be conducted in the time allotted and with the people and money available.

The Research Activity

Research is the activity scientists perform to gain a better understanding of how their world works. More formally, research can be defined as *the process of systematically acquiring data to answer a question or solve a problem* (Strauss and Corbin 1998). *Research methodology* refers to the approach the researcher takes to acquire the information. In philosophy, this is the purview of epistemology. Finally, research techniques or processes refer to the steps involved in a given approach.

Achinstein (1970) defined the research activity as a *set of easily understood procedures for acquiring information*, and as a philosophical *mind-set* that people bring to any research activity. Rosenthal and Rosnow (1991) added that scientific research should not be considered simply a fixed procedure. Rather, it should be looked upon as a philosophical way of approaching all research, regardless of the problem addressed and approaches and methods employed. This scientific approach to research referred to by Achinstein and others means that researchers should approach a research problem without any preconceived answers; it requires avoiding any hint of subjective bias. It includes preparing comprehensive operational definitions, forming hypotheses and theories, and applying the appropriate quantitative or qualitative method of data analysis.

The goals that guide all research have been suggested as being: (1) *describe* some event, thing, or phenomenon; (2) *predict* future behavior or events based on observed changes in existing conditions; or (3) provide for greater *understanding* of phenomena and how variables are related (Shaughnessy and Zechmeister 1994). Today there is a growing awareness of the need to use research to better *understand* as well as to describe human events and phenomena.

The first step in scientific research is to *recognize a problem*. As noted earlier, research is problem solving. A researcher must recognize that something is not known or understood about a problem or situation. He or she must believe that the unknown information is important enough for an effort to be taken to search for the answer to the problem.

The researcher might then formulate a hypothesis or hypotheses. These are tentative explanations of a solution or interpretation of the variables or a relationship, or cause-and-effect perception of a situation. The researcher might employ *inductive reasoning*, which means moving from the specific to the general. This reasoning process is involved in the act of making an *inference*; that is, using data from a sample for describing the characteristics or behaviors of larger populations. Or the researcher might conclude that the facts in the case or situation speak for themselves.

The researcher could then test the hypothesis or hypotheses. In quantitative designs, *objective* statistical tests are used for this purpose. In qualitative designs, the researcher makes a *subjective* determination of the validity of the hypothesis. Next, the researcher examines or makes some type of observations and/or measurements of the "things" (variables) associated with the problem; this is data collection. The researcher then arranges the collected data in some meaningful order, looking for similarities and dissimilarities while doing so.

The process of gathering or accumulating data might require asking people to complete a survey questionnaire, personally interviewing a number of people, observing events or reading about them, reading and cataloging published documents, or preparing an in-depth study of one or more cases. However gathered, these data must be coded, tabulated, arranged and classified, and analyzed and interpreted if they are to become *information*. If after conducting an analysis of the data, the researcher determines the hypothesis is valid, he or she might then see if there are other applications to which the hypothesis can be applied. The researcher could propose, for example, that, "In this study, such and such was true; therefore, in further applications, the same must occur and also be true."

The final activity in this scientific approach to research is the verification of conclusions made from the research. This might entail replication of the design with a different sample. For example, the researcher asks, "If 'A' occurred once, will it occur in similar circumstances?" If it does, then the researcher might propose a *theory*. And if others accept the theory, the researcher might attempt to have it accepted as a *law*.

While there are other ways to go about conducting research, the scientific approach underlies them all. This approach emerged during the *Enlightenment*, the explosion in scientific investigation and artistic creativity that began in Europe in the seventeenth century. Early scientific investigators proposed the scientific approach to research as a way of maintaining rigor in scientific investigation. The method, simply put, meant not coming to a conclusion on a basis of preformed beliefs alone, but instead on only what can be observed or tested by the senses. Authority, custom, or tradition—the stuff of metaphysics—should not be the source of knowledge and understanding. Instead, these should come from the reality of objects themselves (Richardson and Fowers 1983).

Summary

The study of politics and political activity is the science that contributes to the growth of knowledge about the institutions and individuals that constitute the world of politics. As one of the social sciences, the research that takes place in the discipline helps us learn about political systems and the political behavior of our fellow human beings. Political science research can involve almost any method of learning available: political science researchers face an almost unlimited number of research questions toward which to direct their investigative activity. This chapter examined some of the question topics addressed by political science research and looked at some suggestions that have been made to distill the list down to a more focused set of major fields.

Research is the process of acquiring data to answer a question or solve a problem. Research methodology is the approach the researcher takes to acquire the information. In philosophy, this is the purview of *epistemology.* Finally, the terms research techniques or processes refer to the steps involved in a given approach. Research activity has been defined as a set of easily understood procedures for acquiring information, and as a philosophical mind-set that people bring to any research activity. Scientific research should not be considered simply a fixed procedure. Rather, it should be looked upon as a philosophical way of approaching all research, regardless of the problem being addressed and the approaches and methods employed. Research is conducted to (1) *describe* something; (2) *predict* future behavior or events; or (3) provide greater *understanding* of phenomena and whatever relationships are revealed.

Most political science research focuses on questions in five broad fields of inquiry: (1) the history, theory, and philosophy of politics; (2) American (or other national) politics; (3) comparative politics; (4) public administration (including the judiciary, public law, and criminal justice); and (5) international relations and related geopolitical issues. Each of the subfields of political science has its own set of common concerns and its own research traditions. However, in general, mainstream research continues to be focused on the positivist approach and the use of quantitative methods. A problem with identifying the big issues in political science is the constant change in the discipline.

Discussion Questions

1. In your own words, come up with a definition for political science research that you can use to explain the activity to people who have never done research.
2. Why is it important for political scientists to develop research skills?
3. What is meant by "scientific research"?
4. Come up with an explanation that connects knowledge, logic, and reasoning.
5. Compare inductive and deductive reasoning. Use examples.
6. What reasons do positivist/scientific/quantitative researchers give for following their approaches to political science research? How does this differ from the naturalist/interpretist/narrative/qualitative approach to political science research?

Additional Reading

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2 Research Approaches and Methods

Two major methodological positions guide political science researchers: the *positivist* or behavioralist approach, and the *postpositivist* or interpretist approach. The positivist approach is usually referred to as *quantitative* research; the postpositivist approach is referred to as *qualitative* research. The postpositivist approach is also sometimes referred to as *realist, hermeneutic,* or *narrative* research. The positivist and postpositivist approaches are the chief methodological approaches that political scientists follow to gain knowledge about the political world (Oakley 2000; Marsh, Stoker, and Furlong 2002). Each will be described in somewhat greater detail in the following pages.

The Positivist Research Approach

The positivist approach to scientific inquiry emerged as a reaction to the metaphysically based philosophy of science that characterized science up to the Age of Enlightenment, which lasted from roughly 1600 to 1800. Before then, knowledge that was developed under ecclesiastical sponsorship was ascribed to supernatural or deific forces (Trochim 2002). This science was fashioned on a belief that everything in the world was created by God, and everything in the world was as God wanted it to be. People could not hope to know *why* things existed or how they came to be (other than as a creation of God). Rather, they could only observe and describe the world and its many phenomena as it existed.

The positivist reaction to metaphysical science was *empiricism.* Empiricism means that all knowledge must be *sensed* (seen, felt, heard, measured) to be real; faith alone—the idea of knowing something is true because you *believe* it to be true—was an insufficient basis for explaining a phenomenon or as a foundation for knowledge. The idea that if phenomena cannot be measured they should not be studied was a logical extension of this reaction to metaphysics. These early positivists also believed that the goal of all science—natural and social—is to describe everything that can be experienced.

Positivists proposed cause-and-effect theories about phenomena, and then framed those theories in a way that they could be stated as *hypotheses*, which could then be tested. The preferred method of testing a hypothesis was to conduct an *experiment* in which variables were manipulated—that is, their values changed—and the results then observed and recorded. This pattern of inquiry eventually came to be called the *scientific method.* The scientific method relies on *logical reasoning*, an emphasis on *experience* (observation), and a commitment to *measurement.* While it was developed as a way of researching in the natural sciences, by the end of the nineteenth century the scientific method—with hypotheses, experimentation, observation, and quantification—was also being applied in the social sciences; it is the model of scientific inquiry that positivist researchers still follow today.

Another fundamental tenet of positivism is that science must be objective, or *value free*; scientific knowledge should be based upon what is observed, not on the opinion or beliefs of the researcher. Positivist researchers emphasize "precise quantitative data" that are gathered and analyzed using experiments, surveys, and statistics; they employ "rigorous, exact measures by carefully analyzing numbers from the measures" (Neuman 2000, 66). Neuman summarized positivism in the following way: "Positivism sees social science as an *organized method for combining deductive logic with precise empirical observations of individual behavior in order to discover and confirm a set of probabilistic causal laws that can be used to predict general patterns of human activity* [Neuman's emphasis]." The chief activity in positivist research is counting. The tools used in counting are obtrusive and controlled measurements, with data gathered by surveys, experiments, case-control studies, statistical records, structured observations, content analysis, and other quantitative techniques (Oakley 2002, 26–27).

Quantitative Methods

In political science in general, traditional research has long focused on the employment of positivist research methods with their emphasis on quantitative applications. Much social science research still follows a positivist approach (Boyte 2000). Positivist research is characterized by researchers who remain detached from their subjects in order to remain "value free" in their investigations. They produce predictive theories based on experimentation, and emphasize mathematical and statistical methods in their analysis. Smith et al. described the quantitative tradition in political science research in the preface of their text on research methods:

> Political science has changed substantially in the last thirty years. Many textbooks and most professional journals cannot be understood fully without some minimal acquaintance with the philosophy of science or social science and a wide range of empirical and statistical methods including computer science, various forms of statistical analysis, content analysis, survey research, and many others. (Smith et al. 1976, xi)

Bartels and Brady (1993) examined more than 2,000 articles in six of the most important political science journals and several different collections of papers. They concluded that quantitative methods was still predominate in political science research. Their topic organization scheme is repeated in Table 2.1. Bartels and Brady had difficulty in achieving what they hoped would be a "logical way" of organizing the large collection of studies. Rather than continuing to try, they elected instead to follow what they called "a rough logical progression from data collection through modeling to estimation." One striking conclusion that may be taken away from the Bartels and Brady discussion is not about the wide range of types of studies found in the literature but, rather, that as late as 1993, a matching *qualitative* research methodology category was not considered important enough to be included in their collection of papers on theory and method.

Yan and Anders (2000) reviewed 634 research papers published over a three-year period in eight public administration/political science professional journals. They found that most published research dealt with managerial issues relating to federal, state, or local government, with the emphasis on state and local levels. A smaller number dealt with public sector issues in general, while only a small portion addressed international issues. The primary emphasis of the examined research was on government in general or issues that concern the executive branches at all levels.

Table 2.1

A Collection of Quantitative Methods Used in Political Science Research

1. Data Collection Methods
   a. Experiments
   b. Survey Designs
   c. Events Data
2. Time-Series Analysis
   a. Box-Tiao Intervention Methods
   b. Vector Autoregression
   c. Cointegration and Error Correction Methods
   d. The Kalman Filter
3. Time-Series of Cross-Sections, Panels, and Aggregated Data
   a. Aggregated Data and Ecological Inference
   b. Time-Series Crossectional, Panel, and Pseudopanel Methods
4. Techniques Tailored to Measurement Properties of Data
   a. Event Count and Event History Models
5. Measurement Error and Missing Data
   a. The Consequences of Random and Nonrandom Measurement Error
   b. Guessing and Other Sources of Error in Survey Responses
   c. Nonrandom Samples and Sample Selection Bias
   d. Missing Data
6. Dimensional Analysis
   a. Voting Studies
   b. Perceptual Studies
   c. Legislative Studies
7. Model Specification
   a. Specification Uncertainty and the Perils of Data Dredging
   b. Sensitivity Analysis, Out-of-Sample Validation, and Cross-Validation
8. Estimation
   a. Maximum Likelihood Estimation
   b. Bootstrapping
9. Political Methodology and Political Science
   a. The Nature of Survey Response
   b. Economic Voting

Source: Bartels and Brady 1993.

Breaking with the Positivist Tradition

Not every political science researcher accepted the emphasis on positivist methodology and quantitative research methods. Referring to the positivist mind-set of political science researchers as "a silent civic disease," Boyte proposed that:

> Our implicit theories of knowledge assume the specific understanding of scientific inquiry that derives from positivism, for a time the dominant philosophy of science. This model deligitimates "ordinary knowledge" and depreciates the capacities, talents, and interests of the nonexpert and the amateur. It is antagonistic to common sense, folk traditions, and craft and practical knowledge mediated through everyday life experience. Of course, "common sense" is not always right, nor "science" always wrong. I argue only that many different kinds of valuable knowledge support public life and that conventional academic approaches slight the nonexpert. (Boyte 2000, 49)

Smith (2001) joined a group of members of the American Political Science Association in protesting the positivist tradition of political science research. The goal of what he described as a group of several hundred scholars was to "restructure the profession." According to Smith, worrisome political scientists worry that the discipline is becoming identified too closely with heavily mathematical research—either formal models or statistical analyses. It is also more about methods than substance. Yet, it still falls "woefully short, methodologically, in the eyes of mathematicians." Too often, he added, a project's "chief claim to fame" is its introduction of a new modeling or statistical technique into political science, rather than use of the model or technique to say something new or significant about politics.

More Criticisms of Positivist Research

Additional critics have attacked the traditional positivist research approach followed by many political science researchers. Their view is that political scientists still place far too great an emphasis upon *applied* research. As a result, political scientists make few if any contributions to advancing the state of knowledge in the field. Naím summed up the perception of political science research during an interview with Dr. Larry Summers, former president of Harvard University and a former Secretary of the Treasury. Naím compared what he called "the extraordinary progress in the revolution in technologies, biology and electronics, computer processing, and even astronomy" with what he then identified as "the dearth of comparable results in the social sciences, particularly in economics and political science" (Naím 2002, 38–39).

Smith offered a similar negative view in this criticism of political science research:

> [P]olitical scientists have, in recent years, put too much effort into trying to make the discipline more of a science, hence putatively superior to other sources of political knowledge, and not enough effort into making it a source of distinctive insights into substantive political questions. . . . I would have political scientists, political-science departments, university administrators, and providers of financial support for our research devote fewer resources to work that achieves greater methodological (usually mathematical) rigor in addressing minor questions, justified in the often vain hope that such efforts will serve as stepping stones toward more scientific work on larger questions. (Smith 2001, B10)

Richardson and Fowers (1983, 471) echoed the critical view of social science research with their statement that, "in spite of tremendous effort, enormous methodological sophistication, and many decades of efforts," social science has not achieved anything close to the type of "explanatory theory that counts as truth and is needed for precise prediction and instrumental control. Just describing interesting patterns of variables—which always have many exceptions—does not yield the sort of technical control over events we associate with modern physics, biology, or engineering."

It is important to know that today most political science researchers agree that no single method is the only appropriate way to conduct research. This includes positivism and post-positivism, the methodology that emerged in reaction to the strict empiricism of the positivists. Rather, there is a place and a purpose for all approaches and methods. The appropriate choice from among the growing variety of research traditions in political science must be, as Dryzek (1986, 315) has noted, "Contingent upon time and place and a given set of socio-political circumstances."

The Postpositivist Revolution

Postpositivism emerged as a reaction to the strict *empiricism* of the positivists, which holds that humans can only know what their senses tell them (Jones 1971). Adoption of the postpositivist approach was a "radical shift" away from objective, value-free, universal knowledge that characterized the rationalist, positivist, and behavioralist approach to research (Locher and Prügl 2001). The idea of research ethics based on human rights and justice that emerged after World War II also influenced a reaction against "value-free" positivist research; it also helped to generate interest in a research methodology that no long simply described what was, but that went beyond the obvious to interpret and explain why things are the way they are. Heppell (2002, 15), an early critic of the positivist focus, identified what he saw as a problem in the political science research of the period: "There is wide agreement today among philosophers of science that scientific hypotheses and theories are not derived from observed facts, but invented to account for them."

While empiricism is the way of learning things that says we can only know what our senses tell us, another way of learning is through a process of *mental reflection*. This is the investigative position that E. Terrence Jones (1971) called "rationalism." To make the jump to this rationalist way of learning, political scientists have increasingly been forced to adopt qualitative approaches for conducting their research; this approach is called "postpositivism"; it reflects a rejection of the positivist tradition. Today, postpositivist political scientists apply rationalist or qualitative methods to study what governments choose to do and what they choose not to do. They are particularly interested in studying the distribution and exercise of power and domination, and the actions of individuals and groups who seek to gain power and hold onto it once they have it. Accordingly, the aim of the behavioralists has been "to apply the scientific method vigorously and rigorously to every nook and cranny" of political science, while on the other hand, the goals of the postpositivists have been to emphasize *ideas* more than constructs that must be observed and measured:

> Empirical scientists have often made a fetish of measuring. Worse still, they have confused efforts to avoid bias caused by unconscious or uncritical values with the avoidance of all evaluation. They too have developed a crude positivism that most philosophers, if they ever held it, have long since abandoned. (Pennock 1966, 46)

A New Beginning for Research

From this small beginning in the early 1970s, research methodology has evolved into more than the one positivist way of approaching scientific inquiry in political science. In addition to the traditional *explanatory* approach taken by the positivists, two additional positions in research today are the *interpretive* and the *critical* approaches (Neuman 2000; White and Adams 1994). Interpretive research has been defined as "the systematic analysis of socially meaningful action through the direct detailed observation of people in natural settings and interpretations of how people create and maintain their social worlds" (Neuman 2000, 71).

Interpretive political scientists often employ the tools of anthropological research, participant observation, and field research. The major research activity followed in all postpositivist/interpretist research approaches is observation. Interpretist observation is unobtrusive, however. Specific data-gathering techniques employed include participant observation, in-depth interviewing, action research case studies, life-history methods, focus groups, and similar qualitative tools (Oakley 2000).

The critical approach to research is sometimes referred to as *emancipative* or *empowering* research. This approach has as its key objective helping research participants to identify and understand the causes of their circumstances, and then empowering them to bring about the change that they feel is required. The approach is "a critical process of inquiry that goes beyond surface illusions to uncover the real structures in the material world in order to help people change conditions and build a better world for themselves" (Neuman 2000, 76). Feminist and Marxist political science research are two of the major directions taken in critical research.

Research Methods in Political Science

Political science is an exceptionally dynamic discipline. Researchers have taken many different approaches to the study of political questions. At times, supporters of one approach or another have made strident claims that theirs is the only way to study politics. However, such chauvinistic attitudes are no longer as common as they once were. Today, political scientists are in general agreement that many different research methods and research topics are valid and appropriate. They are more likely than not to agree with the following conclusions: "there is no one method of acquiring knowledge about politics" (Stoker and Marsh 2002, 15); and "there now exist not only multiple approaches to empirical research, but also multiple agendas for the discipline as a whole" (Farr, Dryzek, and Leonard 1995, 2). According to Denscombe (2002), there is a growing tendency to combine the use of different methods and different research strategies within the same studies. Researchers eclectically select one or the other, drawing on their individual strengths and compensating for their weaknesses. It is an exciting time to be conducting research in political science!

Three Common Positivist Research Approaches

Positivist approaches examined include *institutional analysis*, *behavioralism*, and *rational choice theory.* A slightly disproportionate emphasis has been given to the discussion on behavioralism because it is, as a review of the literature reveals, still the methodology of preference for a large number of political scientists.

Institutionalism

For most of its history as a discipline among the social sciences, the dominant methodological approach in political science was *institutionalism.* The institutional focus remained the direction of choice up until the 1950s, when it was replaced by the *behavioralist* approach. Prior to this change in focus, most political science research dealt with questions relating to the institutions that make up the polity and the rules and conventions that emerged to allow political institutions to function. The chief research topics of political science were concerned with describing—often by the comparative method—such formal institutions as constitutions, legal systems, and government structures, and their changes over time. For more than a hundred years, "Institutionalism *was* political science" (Lowndes 2002, 90; Shepsle 1995, 277). The topic of political science research for that period was the concept of the state and the institutions that made the state possible. The concept of the state was of particular interest to nineteenth-century American political scientists, and to discuss government meant to discuss institutions. Shepsle concluded that, for the most part, government was the "institutional manifestation of the state" and that this political science research agenda carried on into the early decades of the twentieth century.

The institutions that were the focus of institutionalist political science are not the organizations that make up the political world, but rather, such concepts as the formal and informal rules, political standards, norms, and guides for accepted political behavior. The term *political* does not refer exclusively to party politics, but instead to the broader view of governance in general. Political phenomena are social phenomena; the rules that enable society to work are also necessary for government to work. *How* governments work—not how they *should* work—was the question that institutionalists sought to answer. One of the earliest examples of an institutional study is Woodrow Wilson's 1885 investigation of the American Congress. His study (*Congressional Government*) sought to explain the way Congress actually operates, not the way the Constitution says it should work (Shepsle 1995).

Institutionalism appears to be enjoying a renewed popularity among political scientists, although in a format dramatically different from the institutionalism of the past; it no longer focuses only on the task of explaining political organizations by comparison. Instead, new institutionalists are interested in such concepts as the ways that power is gained, held, and exercised in political circumstances, in how values are shared and disseminated among members of political groups, and on the broader issues of organizational design. Institutionalism is still commonly used in some subfields of political science, including public administration and constitutional studies.

According to Lowndes (2002, 91), new institutionalists are no long concerned solely with how political institutions affect individuals, but also with the "interaction between institutions and individuals." Lowndes (97) identified six changes that are helping to make the institutional approach more palatable. Institutionalists have gone from

- An old focus on organizations toward a new focus on rules
- A concentration on formal concepts to informal definitions of institutions
- A view of political institutions as static to a view of them as dynamic
- Submerged (or ignored) values to a position that sees values as critical to understanding institutional relationships
- A holistic view of institutions to one that focuses on their individual parts and components
- A view of institutions as independent entities to one that sees them as embedded in societies and specific contexts

Behavioralism

Beginning in the middle to late 1950s, some political scientists began looking for ways to improve society by enhancing political institutions, increasing public participation, and otherwise addressing politically based social problems. The institutional focus was unable to meet the needs of the new researchers, who felt that the purely descriptive approach of institutional methods was not able to successfully address the important issues of the discipline. A new political science was needed; the rigorous application of scientific principles of other behavioral sciences was seen to meet this need. This new way of studying political phenomena was, in the words of Shepsle (1995, 279), "tremendously important to the study of politics because it emphasized, in its many variations, precise observation, counting and measuring where possible, the clear statement of hypotheses, and unambiguous standards for accepting or rejecting them." Furthermore, it was a radical shift away from the rambling narratives that characterized much of the political science of the period.

Behavioralism took hold in social science research in the 1920s. By the 1940s, it was deeply entrenched in all social science. Social researchers began to move their data-gathering activities out of the laboratory or classroom and into the real world, which made it even easier to apply behavioralist research principles to political science research. For example, experimental social scientist William S. Verplanck (1994, 4) described the lessons he learned while conducting research at the Naval Medical Research Lab during the Second World War:

> If you're really going to learn about behavior, unless you settle for a kind of myopia, you have to do research in the "real" world, that is, the world in which we all live every day, and not solely in the restrictive environment of a laboratory. Neither what is theoretically best nor what works best in the lab is necessarily the best elsewhere.

The behavioralist approach continued to gain acceptance over the next several years until by the 1950s it had become the dominant way of conducting social science research. In the 1960s, the primary focus of political science had shifted from the study of political institutions to the study of the political *behavior* of people in the "real world" described by Verplanck. However, acceptance of the behavioralist approach was not without a great deal of controversy. Somit and Tanenhaus described the acrimonious introduction of behavioralism to political science research this way:

> Political scientists have quarreled over many matters in the contemporary period but the most divisive issue by far has been behavioralism. If the controversy it has elicited is any measure, this latest quest for a more scientific politics is easily the paramount development in the discipline's entire history. (Somit and Tanenhaus 1967, 173)

According to Gunnell (1983, 15), the objectives of behavioral research are to be reached by "the formulation of systematic concepts and hypotheses; the development of explanatory generalizations that would raise inquiry beyond mere factual empiricisms; interdisciplinary borrowing; empirical methods of research; (and) direct observation."

The following eight assumptions and objectives are characteristics of behavioralist concepts and methods in political science research that differentiate the approach from the traditional institutionalist approach (Easton 1962, 7–8; Somit and Tanenhaus 1967, 177–179):

1. *Regularities:* These are discoverable commonalities in political behavior. They are expressed as generalizations or theories. Political science is capable of prediction and should avoid the purely descriptive studies that characterized most of institutionalist research.
2. *Verification:* The validity of the generalizations must be testable and shown to be tied to relevant political behavior. Political science researchers should focus on observable phenomena—what is done, what is said by individuals. These data can then be studied together as "political aggregates." Institutional behavior is the behavior of individuals.
3. *Techniques:* The means for collecting and interpreting data about the generalizations and behavior must exist; they must be examined using rigorous means for observing, recording, measuring, and analyzing behavior. Research must be theory oriented and theory driven.
4. *Quantification:* Precise measuring requires quantification and application of mathematical (statistical) analysis. Data must be quantified; only quantification will make the discovery of precise relationships and regularities possible.
5. *Values:* Ethical evaluations are not empirical explanations, and their use should be kept apart. They require different methods of evaluation and interpretation. Extreme care must be taken not to mistake one for the other. The "truth" of such values as democracy, equality, freedom, and so forth, cannot be proven scientifically, and therefore should not be a part of political science research. Only observable, measurable behavior, not the "great issues" of society, is grist for the political science mill.

6. *Systemization:* Research ought to be systematic. Theory and research are closely associated parts of the orderly development of knowledge. "Research untutored by theory may prove trivial, and theory unsupported by data, futile" (Easton 1962, 7).
7. *Pure Science:* Although recognizing the importance of applied solving of real-life problems of society, political science research should focus on "pure research" that advances our knowledge of the political world. Behavioralists contended that applied research is an "unproductive diversion of energy, resources, and attention" (Somit and Tanenhaus 1967, 178).
8. *Integration:* Political science research must not ignore the other social science disciplines; only by integrating all knowledge about human behavior will political science be brought back to its earlier high status and returned to where it belongs: among the social sciences.

Sanders summarized the position of behavioralism in the new century by pointing out that, for behavioralists and post-behavioralists alike, the main objective for social research is to explain the behavior of individuals and groups of individuals. Their basic research question is, "Why do individuals, institutional actors, and nation states behave the way they do?" He added,

> Embedded in the behavioralist notion of explanation is the idea of causality. Although behavioralists are aware that causality may be as much a reflection of the way we think about the world as it is of "reality," they nonetheless insist that, unless a theory makes some sort of causal statement, it cannot be deemed to explain anything. (Sanders 2002, 63)

Rational Choice Theory

Rational choice theory is a way of explaining human behavior. It is based on the idea that people make decisions for the purpose of providing themselves the greatest possible benefits. In economics—where most of the principles of the theory were developed—this is referred to as the process of "maximizing utility."

Political scientists began to employ rational choice theory during the 1960s and 1970s, partly in reaction to the behavioralist position that human behavior is not a matter of personal choice, but is instead shaped by psychological and social accidents to which humans are exposed, often against their will. In political science, the essential focus of choice theory research that has emerged is the analysis of the ways that groups of individuals respond to challenges in political institutions, public policy, and other political phenomena.

In the form in which it is used today, rational choice theory is probably closer to the institutionalist position than it is to behavioralism. Shepsle described how rational choice theory differs from behavioralism this way:

> In place of responsive, passive, sociological man, the rational choice paradigm substitutes a purpose, a proactive agent, a maximizer of privately held values. A rational agent is one who comes to a social situation with preferences over possible social states, beliefs about the world around oneself, and a capability of employing these data intelligently. Agent behavior takes the form of choices based on either intelligent calculation or internalized rules that reflect optimal adaptation to experience. (Shepsle 1995, 280)

A key concept in rational choice theory is that all human behavior occurs for a purpose. Given a set of options and information about the costs and benefits of their choices, people will act in the way that provides them the greatest payoffs—they make the *rational* decision. Thus, all behavior is centered on the self. One of the underlying assumptions in rational choice theory is that people calculate their actions as though they were playing a game to win. Individuals make political decisions; groups do not. Compromise occurs when it results in greater utility for the collected group than maintaining an individual position. This helps explain why political parties form.

Another key concept in rational choice theory is that all the players know—and generally adhere to—the rules of the game. "Rules" in this sense are similar to the standards and norms that are a focus in the institutionalist approach to political science.

Postpositivist Research Approaches

The many qualitative research approaches now finding their way into use in political science and the other social sciences have been grouped together under the label of *interpretive theory* (Bevir and Rhodes 2002). Interpretive approaches to research involve the use of what is essentially subjective narrative. Narrative methods are believed to produce knowledge that is different from knowledge gained by traditional (positivist) science. To interpretive researchers such as the postmodernists, for example, the things that citizens take for granted, such as the sovereignty of nature, are not "Truth," but rather, simply a concept that has been constructed by humans. Some societies accept the premise that the natural environment is something that should be protected and preserved, while others do not. Neither view is inherently better than the other. This has been pointed out explicitly in research in international cooperation on environmental issues. Before progress can be made, negotiators must take care to ensure that everyone is working from the same basic assumptions (Wapner 2002).

According to Denscombe (2002, 18), some writers use the term *constructionism* to categorize the same approaches that fall under the interpretist label. Constructionism means that the researchers do not hold the idea that the world of reality is "out there," waiting only to be discovered. Rather, they believe that humans construct all social phenomena and that no single construction is better than any other.

Denscombe found that most of the different postpositivist research approaches share a number of common points. First, all reality is considered to be subjective; it is constructed and interpreted by people. Second, humans react to the knowledge that they are being studied. When people become aware of this fact, their behavior changes—often in a subtle but real manner. Hence, the researcher can never identify the "true" behavior.

Third, this approach holds that it simply is not possible to gain objective knowledge about social phenomena. Despite all their efforts, researchers cannot be objective. Fourth, there is little or no prospect of producing grand theories explaining the social world using these research approaches. All reality is subjective, created by individuals, and subject to change; thus, a common theory is impossible.

Several interpretive approaches guiding qualitative research in political science include *critical research,* such as the *feminist* and *emancipatory* (Marxist) approaches, and the *anti-foundationalist* or *postmodern* approaches. A key characteristic of each of these three approaches is their emphasis on narrative. They are typically small-sample studies, often analyzing a single case or a few cases, and placing greater emphasis upon qualitative methods than on mathematical tools.

The Feminist Research Approach

Feminist issues appeared in political theory studies during the 1970s. An initial goal of feminist research was to "document the dreadful history of misogynist statements by one male author or another, statements that have served to justify the exclusion of women from the political realm and confine them to the private world of the family. (Saxonhouse 1993, 15)" The feminist approach took on greater importance in political theory research during the decade of 1980s, a phenomenon chronicled thus:

> [No] story of political theory in the 1980s would be complete without stressing the extraordinary development and vitality of feminist thought. Its explorations ramified into all aspects of politics, society, personality, and inquiry; the constitution and construction of gender differences; the retrieval of neglected writers, agents, and questions, and the corresponding expansion or reconstitution of [what] political theory theorizes about; the exploration of covert gender assumptions in theoretical categories such as the public/private distinction, rights, and justice; the examination of bias and discrimination in practical spheres structured by such categories; and the questioning of entire modes of philosophy and social inquiry . . . as gender-based and partial. (Galston 1993, 31)

The feminist approach to research and to science in general is based on the contention that women see things differently, have different ways of learning, and different ways of describing meaning than men. Because of centuries of women being forced to accept a lesser status in the political sphere, feminist-oriented political science research was developed as a tool to aid women in their emancipatory efforts. Feminist researchers take issue with the gender-based political theory and political writing that is both overtly and covertly gender biased.

Feminist researchers tend to see traditional positivist research as resulting in a science with a gender bias that is potentially misleading at best, and insulting and derogatory at worst. When feminist political science researchers examine such political phenomena as international relations and politics, state formation, war and peace, revolutions, international political economies, and global governance, they include in their analyses discussions about the role of gender in these events. Thus, gender is considered to be inherent in all international politics and other political writing (Locher and Prügl 2001).

Feminist research has been identified as one of four types of action-oriented research (Small 1995). The first of the three other models of action research is the traditional *action research* as proposed by Kurt Lewin in the 1940s. The second model is *participatory research*, which, by breaking down barriers between researchers and the researched, enables people to identify the cause of their problems and to develop their own ways to deal with them. The third approach is *empowerment research*, which has its foundations in community psychology; empowerment research is seen as a tool to help people gain "mastery over their own affairs." Feminist research, according to Small (1995, 5), has as its primary goal "the promotion of the feminist agenda by challenging the male dominance and advocating the social, political, and economic equality of men and women." It has been described as "research for women rather than about women" (Allen and Baber 1992).

The Marxist Approach

What may be the first of the critical approaches to research in the social sciences, classical Marxism, was based on the idea that conflict between the haves and have-nots, workers versus owners, the worker class versus the capitalist ruling class, is at the root of all political behavior. Therefore, Marxist research focuses on ways to highlight disparities, to identify the economic structures that form and restrict development of society, and on studies that foster egalitarian and emancipatory principles (Marsh, Stoker, and Furlong 2002).

Four main principles are associated with classical Marxism: economism, determinism, materialism, and structuralism. Economism refers to the concept that economic forces determine social conditions. The determinism principle says that capitalist production methods determine the role people hold in life; people are not free to choose their lot. Materialism refers to the materialism of the ruling class, the owners and operators of factories and the ruling classes they support. Finally, structuralism refers to Marx's contention that economic and political structures established the actions of men. Modern Marxism is radically different from the classical version, however. Accordingly,

> [W]hile modern Marxism is characterized by diversity, most of it: rejects economism; rejects determinacy, emphasizing contingency; rejects materialism, acknowledging an independent role for ideas; rejects structuralism, accepting a key role for agents; no longer privileges class, acknowledging the crucial role of other causes of structured inequality; and, to an extent, privileges politics. (Marsh, Stoker, and Furlong, 2002)

The Postmodern Approach

Among the postpositivist approaches that have gained some acceptance since they appeared in the last decades of the twentieth century is the *postmodern* position, also known as the *anti-foundationalist* approach. This approach to political science research has its roots in the *critical theory* found in art, music, and literature, which emerged during the 1960s. Several key principles of postmodernism are that no single fundamental political truth exist; there is no one absolutely certain way to gain knowledge; no rules exist to guarantee the rationality of science.

According to Oakley (2002), postmodernism refers to the extensive cultural changes that have taken place in Western societies since the end of World War II. Some of the salient phenomena include the emergence of a global economy, the weakening of radical politics and collapse of the Soviet Union, a lost faith in the power of rationality to bring about freedom, the rapid and pervasive spread of technology, the spread of popular culture, and other events and conditions. Postmodernist critics hold that, since social science is itself a part of the modernist condition, then the changes in the philosophical foundations of political science research that are still evolving make it necessary to adopt a postmodernist approach to research in these disciplines.

The postmodern approach has been adopted by a variety of political scientists and philosophers who, according to Dwight Allman (1995, 69), "dispute the viability of modern civilization." This means, in essence, that the positivist approach of searching for an all-encompassing "true" picture of a social event is a waste of time. Each event must be described individually, taking into consideration the intentions of the actors, the experience of the investigator, and the external environment of the time of the event.

To determine the meaning of a political phenomenon, the postmodernist believes that the time, situation, and intent of the social actor must be considered in addition to the event or behavior itself. Furthermore, there is no one best way to describe or define a social or political event. Equally, for the researcher, there is no one best way to investigate a social or political behavior or event. One of the most important tasks of the researcher is to interpret the phenomenon itself *before* it can be researched. First, the researcher frames the act within a larger context that includes the objectives of the social actors and the specific circumstances existing at the time of the action (Fay 1975).

The postmodern researcher cannot simply progress from a known and accepted foundation of basic assumptions. To the postmodernist, the meaning of the concepts we usually take for granted, such as democracy, the "sovereignty of nature," honesty, ethical behavior, and the like, do not really exist; they are, instead, human *constructs.* As such, the interpretations placed on these constructs represent only one set of possible meanings.

To postmodern researchers, the idea of a concept such as *nature* is not real; rather, it is a construction of the human intellect. For example, Wapner (2002, 167) adopted a postmodern approach in his discussion of the apparent lack of an international consensus in the importance of degradation of the natural environmental, and how that lack limits public environmental policy. Thus, there is no *better* or *best* view of nature. Nature is what society makes of it, and people in different cultures, in different circumstances, have different points of view about nature that are equally legitimate. Wapner concluded that, "Postmodern critics have shown . . . that 'nature' is not simply a given, physical object but a social construction—an entity that assumes meaning within various cultural contexts and is fundamentally unknowable outside of human categories of understanding. This criticism raises significant challenges for global environmental politicians."

Ian Hodder (1989a) identified four strands of postmodern social science that may help to define this evolving approach to political science research. The first is what he describes as "the sense of disillusion" that social scientists and people in general have with the products and progress of scientific research. Second, "modernism" has resulted in detachment, alienation, and cynicism, rather than coming through with its promise of freedom, equality, and an enhanced quality of life for all of society. Third, postmodernism has been shaped by a number of essentially revolutionary changes in society that have occurred since the end of World War II. Some of these have to do with advances in technology; others are founded in changes in the way people look at their world and society, including consumerism, world capitalism, planned obsolescence, very brief periods between alterations in fashion and style. The fourth defining strand of the postmodern approach is the way special interest groups use the global press, fashion, and the arts to manipulate and manage the images of political events, economic issues, or social structure that modern society conceptualizes as social and political phenomena. Together, these four strands provide a framework upon which to conduct research in political science with a postmodern focus (Marsh and Stoker 2002).

Summary

Political science research is approached from a number of different methodological traditions, each framed with different conceptual elements that are found in other social science disciplines. In two different studies on American politics, for example, one researcher may have used a variable-based approach, with heavy emphasis on quantification and statistical analysis (the *positivist* research tradition), while on the other hand, a second researcher may have elected to follow a comparative case study approach, in which the most common themes are qualitatively compared. Typically, qualitative research designs follow what has come to be known as the *postpositivist* research tradition. At one time a heated debate raged in the discipline over which of the approaches was the appropriate one. Traces of that debate still exist today, despite the growing acceptance that there is a correct time and place for both approaches to research in political science (Smith 2001).

The two major philosophies of science traditions are *positivism* and *postpositivism.* Positivist researchers emphasize quantitative data that is gathered and analyzed using experiments, surveys, and statistics. Postpositivism includes several different approaches, including explanatory, critical, feminist, and postmodern research.

Discussion Questions

1. Discuss the differences between the positivist and postpositivist philosophies of science.
2. How does the phrase "value free" relate to research in political science?
3. Why did the postpositivists break away from the positivist tradition in research?
4. What is meant by the term *empiricism* in research?
5. Define the *institutional analysis* research approach and give an example of a political science research project using this approach.
6. Define the *behavioralist* research approach and give an example of a political science research project using this approach.
7. Define the *constructionist* research approach and give an example of a political science research project using this approach.
8. Define the *rational choice theory* research approach and give an example of a political science research project using this approach.
9. Define the *feminist* research approach and give an example of a political science research project using this approach.
10. Describe the *postmodernist* research approach and give an example of a political science research project using this approach.

Additional Reading

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Marsh, David, and Gerry Stoker. 2002. *Theory and Methods in Political Science.* 2nd ed. Houndmills, UK: Palgrave Macmillan.

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3 Understanding the Research Process

All research activity takes place in a logical sequence of steps or stages. McDowell (2002), perhaps taking this concept to the extreme, identified a process for research that involves as many as twenty distinct steps. Regardless of how many steps are identified, most researchers would probably agree that research involves at a minimum the following distinct activities. First, the researcher identifies a problem circumstance, question, event, or situation (this is the *study problem*). Second, the researcher designs a method of collecting information that promises effective resolution of the problem or question (*planning a research strategy*). Third, information about the problem is collected (a *data gathering* activity); sometimes this means collecting quantitative data, at other times, qualitative data. Fourth, once the information is collected, its meaning must be found (*data processing*, *analysis*, and *interpretation*). Finally, all the pieces must be put together in a *report* of the research findings—either written or oral or both—that either helps establish resolution of the problem or identifies a need for additional research.

How these activities are put together is the subject matter of this and the remaining chapters. Together, the parts make up the whole that constitutes *the systematic process of research strategy and methods.* This chapter examines that process by explaining each of the steps in detail. The process has been compressed in order to be relevant for all types of research approaches. Research in political science takes many forms and approaches, and other authors may suggest a different process. However, if all the steps in the process presented here are followed, most researchers will successfully complete their projects.

There are few limits to the variety of choices of study questions, research strategies, data collection methods, data processing, and evaluation approaches. There are also many different ways of interpreting the results. It is possible to put these together in many different combinations, none of which is inherently more correct than another. Today, these different combinations are all seen as valid research strategies. Their selection and application is based upon the nature of the study question, the objectives for the study, the level of skill of the researcher, and his or her comfort with the research methods that are most appropriate for the objectives of the research.

Steps in the Research Process

Today, both quantitative and qualitative research strategies are considered to be legitimate designs for research in public administration and the other social and administrative sciences; the different designs simply serve different purposes. Whichever approach is taken, all research takes place in a series of activities similar to the seven-step process discussed below (see Figure 3.1). This seven-step process has been used to guide research activities in the social, administrative, and

Figure 3.1 A Seven-Step Process for All Research Approaches, with Checklist Questions

Step 1: Identify the Research Problem
(Why should effort be spent on this research topic; what study questions need to be addressed; what is the research hypothesis?)

↓

Step 2: Establish Research Objectives
(What information must be collected to answer the study questions and improve the quality of the final research report?)

↓

Step 3: Select the Research Strategy
(What is the best and most cost-effective way to gather this information; how should the sources be studied?)

↓

Step 4: Prepare a Research Plan
(What specific steps must be taken to gather this information from these sources following the selected strategy?)

↓

Step 5: Gather the Data
(What activities are needed to monitor and manage the process to be sure the right data are collected?)

↓

Step 6: Analyze and Interpret the Data
(What do the data mean, specifically in terms of the problem?)

↓

Step 7: Prepare and Present the Research Findings
(Does the interpreted information address the research problem and answer study questions; what are the implications of the research findings?)

natural sciences. The steps begin with identifying the research problem; they proceed through establishing objectives and strategy, planning and collecting data, and analyzing and reporting the findings. The process is a composite of quantitative and qualitative methodologies.

Frankfort-Nachmias and Nachmias (1996, 20) suggested a model for social science research that more closely follows the traditional plan for quantitative studies. Their model begins with identifying the problem, then goes on to include the writing of hypotheses, research design, measurement, data collection, data analysis, and generalization. Qualitative research process models vary with the methods employed. Among the methods used most often in the social sciences are simple and participant observation, in-depth personal interviews, key informant and focus group interview, and similar designs (Devine 2002). Each of these methods begins with identifying a research problem, and each includes stating a goal for the study and planning the remaining elements, including data collection.

Step 1: Identify the Research Problem

The first step in research is to clearly and succinctly *identify the research problem.* Frankfort-Nachmias and Nachmias (1996, 52) defined the research problem as "an intellectual stimulus calling for a response in the form of scientific inquiry"; they added that the problem is typically described with a set of concepts that have been identified or selected by the researcher. The problem concepts are, in turn, the *variables* evaluated in the study.

The label "study problem" is not always used to describe this initial activity in the research process. In the social sciences, it is often replaced with the phrase *defining the study question.* Other authors refer to it as a process of establishing a *rationale for the study.* The "question" has also been called the *research topic*, the *research situation*, the *information need*, and other things. The labels all mean the same thing: they justify the reason for expending the time and effort required to complete a research project before starting the process. Researchers agree that clearly identifying the study problem is among the most important steps in the entire research process (Berg 1998). If defining the study problem is not done correctly, it is likely that the remaining activities will be a waste of the time and labor of the researcher. Data will have been gathered, but the reason and meaning of that data will be lost. There are usually no simple answers to study questions; instead, each involves many subcomponents and antecedent factors.

The research problem often consists of two key components. It is important to not confuse one with the other. The first is a statement of the problem as it is seen by the researcher; the second is the set of research questions that will be addressed in the study. The following is an example of a problem statement:

> This research examines some reasons why the governments and voter publics of the three Baltic States—Estonia, Latvia, and Lithuania—have different expectations of benefits and costs resulting from possible membership in the European Union (Berg 1998, 23).

The research questions associated with this study problem might include the following:

- What are the cost and benefit expectations to each government?
- How have citizens in each country voted on EU membership in the past?
- What changes have occurred in public opinion about EU membership?
- Which groups in each country support membership and which oppose it?
- What conditions has the European Union made a price of EU membership?

Some of the key activities involved in the process of identifying the study problem include (1) determining the unit of analysis for the study, (2) finding out what other researchers have discovered and reported about the issue, (3) identifying relevant concepts that are functions of the problem, and (4) translating the concepts into variables that can be stated in hypotheses and tested. The unit of analysis refers to the most basic, complete component part of the study concepts that can be investigated. The unit of analysis selected will affect the final research design, the data collection process selected, and the way the data are analyzed.

Key concepts that collectively constitute the study question may be determined by interpretive analysis of exploratory interview data or by conducting a small-sample pilot study—both of which should be augmented by a study of the problem as it has been experienced and examined by other investigators. Exploratory activities include conducting intensive interviews with persons with some knowledge of the problem; these persons are sometimes referred to as *key informants* and the activity is known as *conducting key informant interviews.*

A second way to identify potential concepts that influence the problem is by testing a preliminary data-gathering instrument on a small subsample of participants. Analysis of these findings will often reveal the underlying structure of the problem, including the concepts that frame the issues. Finally, research designs should always include a thorough reading of what other investigators have discovered. In the language of scientific research, this process is called a *literature review.* It is absolutely critical that the literature search be more than a simple spin through items found on the Internet. Certainly, electronic data sources are important, but they must be augmented with other sources. Examples of other sources include archival data, artifacts, symbols, historical narratives, and many other published and unpublished documents.

Conducting a Literature Review

An important part of the early development of a research project is carrying out a comprehensive *review* of the published literature on the topic. This examination of prior research on the topic is important for several fundamental reasons. First, it helps to define and delimit the study problem. Second, a review of the literature may reveal previous research that clearly answers the problem, thereby making further effort superfluous. It typically involves reading and analyzing material in published books, professional and academic journals, and government documents, among other sources.

The focus of the literature review should always be on the key ideas that could function as leads for further investigation. The literature typically builds on the work already done by other investigators, often including the authors of that work in the list of references. These references, in turn, become important contributors to the design of an appropriate research project.

Previous investigators often have already stated and tested some meaningful and enlightening hypotheses about the topic—very little in social science is really “new.” The task of the research is to gather these previously published ideas, to evaluate their usefulness as they related specifically to your research, and to determine whether they suggest new ways of looking at the problem that might have been missed (Selltiz, Wrightsman, and Cook 1976).

Identifying Variables and Writing Hypotheses

The term *variable* is used to identify the characteristics or properties of the concepts that are to be studied. In a quantitative research design, variables must have two or more *values*—also known as *levels.* The characteristic must be able to take on any one of the values, and typically varies from subject to subject. The variation can be in quantity or in quality. For example, political party affiliations may have as many values as there are recognized parties. In U.S. presidential elections, the two traditional values of the variable *party* are Democrat and Republican. Periodically, third parties attempt to gain voter recognition, but as yet have not unseated the traditional two parties, despite millions of dollars in contributions.

Social class is another variable often seen in social science research; traditionally, it has five levels: lower, lower-middle, middle, upper-middle, and upper (Frankfort-Nachmias and Nachmias 1996). The variable *gender* is what is known as a *dichotomous* variable, because it has just two possible classes: male or female. Other kinds of variables include the following:

- *Multichotomous:* A multichotomous variable provides a selection of more than two possible answers from which to choose. Examples include *multiple choice* quiz questions and questions with more than two possible answers from which to choose such as ethnic group, social class, or residence type. A question type that has a similar appearance, but one that is not multichotomous, is a list of items from which respondents may select more than one—these are called "check all that apply" questions. Checking all the publications from a list of magazines to which you subscribe, or all the radio stations you regularly listen to or television stations you watch, are examples. They are dichotomous rather than multichotomous in that the only possible coding for such responses is *checked–not checked.* In this sense, then, each item on the list is an individual variable (or question) with two values.
- *Continuous:* Continuous variables—also called measurement *variables*—are not restricted to specific categories and can take almost any value within an upper and lower limit. Age in years, income in dollars, height in inches and fractions of inches, air pressure in pounds per square inch: these are all examples of continuous variables.
- *Discrete:* Also known as *categorical* variables, discrete variables are restricted to only a set number of possible values; discrete variables also have a minimum-sized unit. An example is the number of family members living in the same household.
- *Control:* Control variables are used in experiments in order to test the possibility that a relationship between two variables might be explained only in the presence of another variable. For example, to test whether gender influences party affiliation, control variables might include social class, education, occupation, or income.
- *Dependent:* Dependent variables are the variables that the researcher is attempting to explain. An example might be voting behavior.
- *Independent:* Independent variables are the variables that "cause" a change in the dependent variable. Causality is very difficult to prove in social and political research, however, so rather than "cause," researchers usually use the word "explain" instead.

Step 2: Establish Research Objectives

Step 2 in the research process is spelling out in advance and in detail what is to be accomplished by the research. These are the *objectives* for the study. This step is closely allied to the first step, identifying the research problem. Both address the reasons for doing the research. At this stage, however, the objectives may still be tentative; a final set of objectives may not emerge until after a review of the literature pertaining to the study question has been completed.

The research problem is a statement of the reason for doing the research; research objectives are statements of what the researcher wants the study to accomplish. Say, for example, that an appointed advisor to the governor manages a statewide program to collect ideas on ways to improve high school students' awareness about the prevention of sexually transmitted diseases. The political advisor believes it is important to begin the study with a research project to identify students' current attitudes and awareness. A study question might be how to determine the best way to accomplish this task. Specific research objectives might include first determining students' current level of awareness of the diseases, their cause and spread, and methods of prevention.

A second objective might be to determine where the students received their information. Another might be to establish their preferred medium of communication and its ability to effectively convey persuasive messages. And another might be to measure local public opinion about the plan in general. Finally, the researcher will also want to know who makes up the population at greatest risk so that in selecting the sample to study, the appropriate subjects are included.

Step 3: Decide on a Research Strategy

Step 3 of the research process is deciding on the research strategy that provides the most cost-effective way of gathering the needed information, and the strategy that produces the best possible answer for the research or study question. A partial list of the positivist and postpositivist strategies followed by political scientists today was discussed in Chapter 2. They included institutionalism, behavioralism, and rational choice theory among the positivist approaches, and the feminist and Marxist and other interpretive designs as postpositivist approaches. Each of these strategies provides the researcher with a wide variety of data-gathering approaches and specific methods and data-processing and analysis techniques from which to choose. Each strategy has its own advocates and critics as well, although the acrimony between the camps has become far less strident than it was in the past.

Peter John (2002, 216) described the irrationality of the disagreement between opposing schools of political science research methodology in the following way: "The current debate between quantitative and qualitative research is shallow and rests on stereotypes of the research process." He went on to add that researchers were correct in choosing a method that satisfies the objectives of their research. All researchers should design research projects capable of testing hypotheses, and that also allow them to apply their skills and knowledge to conduct "exciting and imaginative pieces of work." The selection of approach and method should be based on the first two steps in the research process.

Positivist strategies typically involve sample research, quantified data such as mathematical models and correlation and regression analysis, time-series, and other methods calling for statistical analysis. Postpositivist strategies may employ ethnographic methods common in anthropology, participant observation methods used in sociology, hermeneutic and symbiotic methods used in historical and literary approaches, or in-depth personal and focus group interviews found in psychological investigations. The key, of course, is to match the correct methods with the specified strategy.

Step 4: Prepare a Research Plan

In Step 4 the researcher prepares a *plan* for the subsequent research activity. This means identifying in advance the research subjects or sample, the methods planned for gathering and processing data, and a timeline for completing the project. Thus, designing an effective research plan requires five decisions or choices: (1) the data source; (2) the research approach; (3) the data-gathering instrument; (4) a sampling plan; and (5) the method of contacting study subjects. Each of these steps will be discussed in detail in subsequent chapters. Data sources are diverse and range as far apart as polling individual respondents in election night, voting booth exit interviews, and archival data describing events leading up to the eighteenth-century French and Indian War on the American frontier.

Step 5: Gather the Data

Step 5 is an action step; it involves gathering the data needed for meeting the study objectives and answering the study question. Depending upon the research strategy selected, data may be

Table 3.1

A Classification of Data Sources

- I. Positivist Research Data Sources
  - A. Primary Data Sources
    - 1. Field Surveys
      - a. Questionnaires
      - b. Attitude surveys
      - c. Lifestyle surveys
    - 2. Field Studies
      - a. Observation studies
      - b. Personal interviews
      - c. Focus group interviews
      - d. Videotaping and audio recording
    - 3. Experiments
      - a. Laboratory experiments
      - b. Field experiments
  - B. Secondary Data Sources
      - a. Organization internal reports
      - b. Organization invoice and/or accounts payable records
      - c. Registered voter lists
      - d. Vote records
      - e. Production and service records
      - f. Human resource records
- II. Postpositivist Research Data Sources
  - A. Existing Documents
      - a. Books, periodicals, published reports, films, unpublished literature
      - b. Local, state, and federal government documents
      - c. Professional association papers and reports
      - d. College and university documents
      - e. Consultants' research reports
      - f. Meeting minutes
      - g. Commercial databases
      - h. Other
  - B. Internal Records
      - a. E-mail
      - b. Memoranda
      - c. Policy papers
      - d. Reports and other documents
  - C. External Sources
      - a. Interviews
      - b. Life histories
      - c. Case studies
      - d. Observation and participant observation

gathered by such activities as: (1) participating in a social situation and recording the findings; (2) overtly or covertly observing the behavior of subjects; (3) interviewing subjects one at a time or in groups; (4) administering a questionnaire to survey the attitudes of a sample of voters; or (5) reviewing documents or other information materials.

The researcher may gather primary data, secondary data, or both. These data can come from internal sources, external sources, or both. A classification of data sources is displayed in Table 3.1. *Primary data* are original data that the researcher gathers from original sources. Examples of primary data include responses to a questionnaire, an interview, or some other type of measurement.

Secondary data are data that have been collected by someone else for another purpose. Examples of secondary data include government statistical reports, articles in professional journals, and city or agency records. Neither data type is inherently better than the other, but care must always be taken in the interpretation of secondary data to ensure that it meets the specific research objectives.

Researchers employ various tools in the data collection process. Examples include survey questionnaires, interview discussion guides, tape recorders, video cameras, and other recording devices. When observing the behavior of individuals, simple paper-and-pencil recording is common. In such instances, the data collection process includes applying order and structure to the dataset.

Step 6: Analyze and Interpret the Data

Step 6 is a payoff step; it is also the activity that may be the most difficult for beginning researchers to master. Once the data are in hand, the researcher must establish some order in the data and determine their meaning and/or implications. This interpretation must be carried out so that the findings can be related to the original study question and research objectives.

Researchers are typically interested in knowing the following things about a mass of data: First, they want to know what is "typical" in the sample. This means getting some idea of the central tendency of the responses. In everyday language, they want to know what are the averages. Second, they want to know how widely individuals in the sample vary in their responses. In a community economic development study, for example, the director might want to know whether local citizens have similar or widely diverse attitudes about proposed development of a ten-acre parcel on the city limits.

Third, researchers want to see how subjects are distributed across the study variables. For example, is the number of people who prefer a new park for the ten-acre site the same or greater than the number who prefer a new shopping center? A good way to display this type of information is to use charts or graphs showing the frequency of responses. Fourth, the analyst will want to show how the different variables relate to one another. It may be important to know, for example, that the preferences for different types of uses for the parcel seen related to certain characteristics of the population, such as age, gender, occupation, or annual income.

Finally, the researcher will want to describe any differences among the two or more groups or objects. It might be important to know, for example, whether males in the sample respond differently about their preferences for the site than do females in the sample. This type of understanding is important because much public administration research focuses on the comparisons of groups of citizens (Selltiz, Wrightsman, and Cook 1976).

Tabulating Responses

The first activity in data analysis is to tabulate the responses to all items (questions or categories of phenomena) in the study. In a quantitative study, this could mean counting all the answers to each question or schedule item. This counting of responses is often referred to by the phrase *frequency distributions*, after the statistical software process that counts responses and prepares summary data for the researcher. Frequency distributions and summaries are prepared for one variable at a time, producing *univariate statistics* for each variable. Counts of how many subjects answered yes to a question and how many answered no, and the distribution of males and females in a sample are both examples of univariate frequencies. Univariate statistics include measures of central tendency, variation, and location.

Once univariate statistical tabulations are done, the researcher then begins *bivariate* tabulations. In this process, responses to one variable are tabulated with a second variable. The information

Table 3.2

A Simple Crosstabulation of Bivariate Data

	Response		
Gender	Did Vote	Did Not Vote	Totals
Males	47	81	128
Females	76	53	129
Totals	123	134	257

is usually presented in a table (called *crosstabulations* or "*crosstabs*" for short). For example, responses to a yes-no question are displayed broken down for males and females in the crosstabulation table displayed in Table 3.2.

In addition to simple counts of responses, crosstabulations can also display some summary information for each of the responses. The individual boxes with counts displayed are called *cells*; *rows* run across the page, and *columns* run down the page. Summary statistics include the percentage of the total represented by the number of responses in each cell, the cell's percentage of the row total, and the cell's percentage of the column. Row, column, and total percentage values are provided along the sides of the crosstabulation table. Finally, a wide variety of statistical tests for nominal, ordinal, and interval/rations data can also be produced with crosstabulation software. After analyzing relevant bivariate data, the analyst turns first to either variable correlation or hypothesis tests, then proceeds to any of the many multivariate statistical processes needed to meet the objectives of the study.

For a qualitative study, the researcher often begins the analysis by reviewing the data to establish a structural skeleton that will provide for meaningful interpretation and discussion. In qualitative research, the typical data analysis has been the *narrative text* (Miles and Huberman 1994). This is often a comprehensive rewrite of the researcher's field notes, with the researcher's verbal interpretation and conclusions from the data. There are few agreed-upon styles and formats for the broad scope of qualitative analysis methods. Selection is left up to the researcher. According to Miles and Huberman,

> Valid analysis requires, and is driven by, displays (i.e., narrative text and graphic presentations of qualitative research findings) that are as simultaneous as possible, are focused, and are as systematically arranged as the questions at hand demand. While such displays may sometimes be overloading, they will never be monotonous. Most important, the chances of drawing and verifying valid conclusions are very much greater. . . . The qualitative analyst has to handcraft all such data displays . . . each analyst has to invent his or her own. (Miles and Huberman 1994, 79)

Step 7: Prepare and Present the Findings

Step 7 includes preparing the research report and presenting the findings either orally or visually, or both. It is the final step in the process, but is second in importance only to clearly defining and focusing on a research problem/study question. An outline for the research report follows the same outline developed during the fourth step, preparation of a research plan. Some portions of the report, such as a description of the research problem, delineation of research objectives, the review of the literature, and rationale for selecting the strategy employed, may have been written as the researcher completed the earlier steps in the process.

There are many different ways to gather data, or conduct a research project, and many different ways of communicating the research findings. Ultimately, however, someone must sit down and write out the results of the study. These results must then be passed on to a supervisor, a fellow employee, members of a funding organization, or, if possible, even published in a brochure, report, or professional journal.

Doing good research means more than using good scientific methods to select the sample, gather data, and tabulate the results. It also means interpreting what the data mean in terms of the study objectives and writing a research report that clearly and effectively communicates the findings of the research effort. Using an appropriate *style* is critical in all research writing. Style refers to the words, syntax, and punctuation that are used or not used. It includes the way these components are placed into sentences and paragraphs. It involves the structure and organization of the report, and whether it conforms to the traditions of the discipline. It also refers to the way that the author's sources are cited, identified, and credited.

As a researcher in political science, public administration, or any of the administrative or social sciences—present or future—it is important to remember that there is no one "best" writing style. Your style is your own. One or more styles might be more appropriate for a given discipline, but the choice of style often seems arbitrary. The best style to use in all research reports and organizational papers is one that is *clear*, *concise*, and *readable.*

The processes necessary for producing a research report for the social and administrative sciences are similar to those that are used for research in chemistry, physics, biology, or any other natural science. Slightly different research, analysis, interpretation, and presentation processes are involved, however.

Following an accepted style enhances the readability of the research report, regardless of its discipline. Academicians and managers and administrators are typically pressed for time. If a paper is written in a familiar format (style) it will be easier to read—and take less of the reader's time. This often results in greater acceptance of the research findings—an extremely important point for research that comes up with negative findings. This benefit alone should be a desired outcome.

One issue that makes professional writing difficult for researchers and students is the *lack of conformity* in formats required by different disciplines and their journals. Using the format demanded by the editors of political science association–sponsored journals, for example, will probably result in rejection of the paper by the editors of a business administration, sociology, education, or an economics journal. Researchers must determine which style is required in their field, and which styles are unacceptable. The only thing consistent about writing style is inconsistency!

Summary

The research process can be defined as *the process of systematically acquiring data to answer a question or solve a problem.* Research is done to help managers, administrators, and academics achieve a better understanding of how the world works. Research *methodology* refers to the approach researchers take as they examine their study questions or problems. The research process involves seven steps: (1) identify the research problem; (2) establish research objectives; (3) decide on a research strategy; (4) prepare a research plan; (5) gather the data; (6) analyze and interpret the data; and (7) prepare and present the findings.

Using an appropriate s*tyle* is critical in all research writing. Style refers to the words, syntax, and punctuation that are used or not used. The best style to use in all research reports and organizational papers is one that is *clear*, *concise*, and *readable.*

Discussion Questions

1. Why is it so important to clearly define your research question before designing a research study?
2. Give several examples of what you consider to be good research objectives. How do they relate to the research question?
3. What is a key informant interview?
4. Why is it important to conduct a thorough review of the literature before collecting data?
5. Name some sources for published information about political science research topics.
6. What is a research plan?
7. What is a research strategy?
8. What is the meaning of the phrase "writing style"?

Additional Reading

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Johnson, Janet B., Richard A. Joslyn, and H.T. Reynolds. 2001. *Political Science Research Methods.* Washington, DC: CQ Press.

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4 Selecting a Research Design and Choosing a Research Topic

Researchers must make several decisions when beginning a research study in political science. These include selecting a research approach, choosing a research design, deciding on a research method, and designing a specific study to meet the objectives for the research project. Some of the alternatives available to political science researchers are displayed in Figure 4.1.

The two families of research approaches seen most often in political science research are *quantitative* and *qualitative* designs. Examples of quantitative designs include experiments, longitudinal and cross-sectional studies and surveys, content analysis, and cases analyses. Examples of qualitative designs include case and historical research, ethnography, and grounded theory, among others.

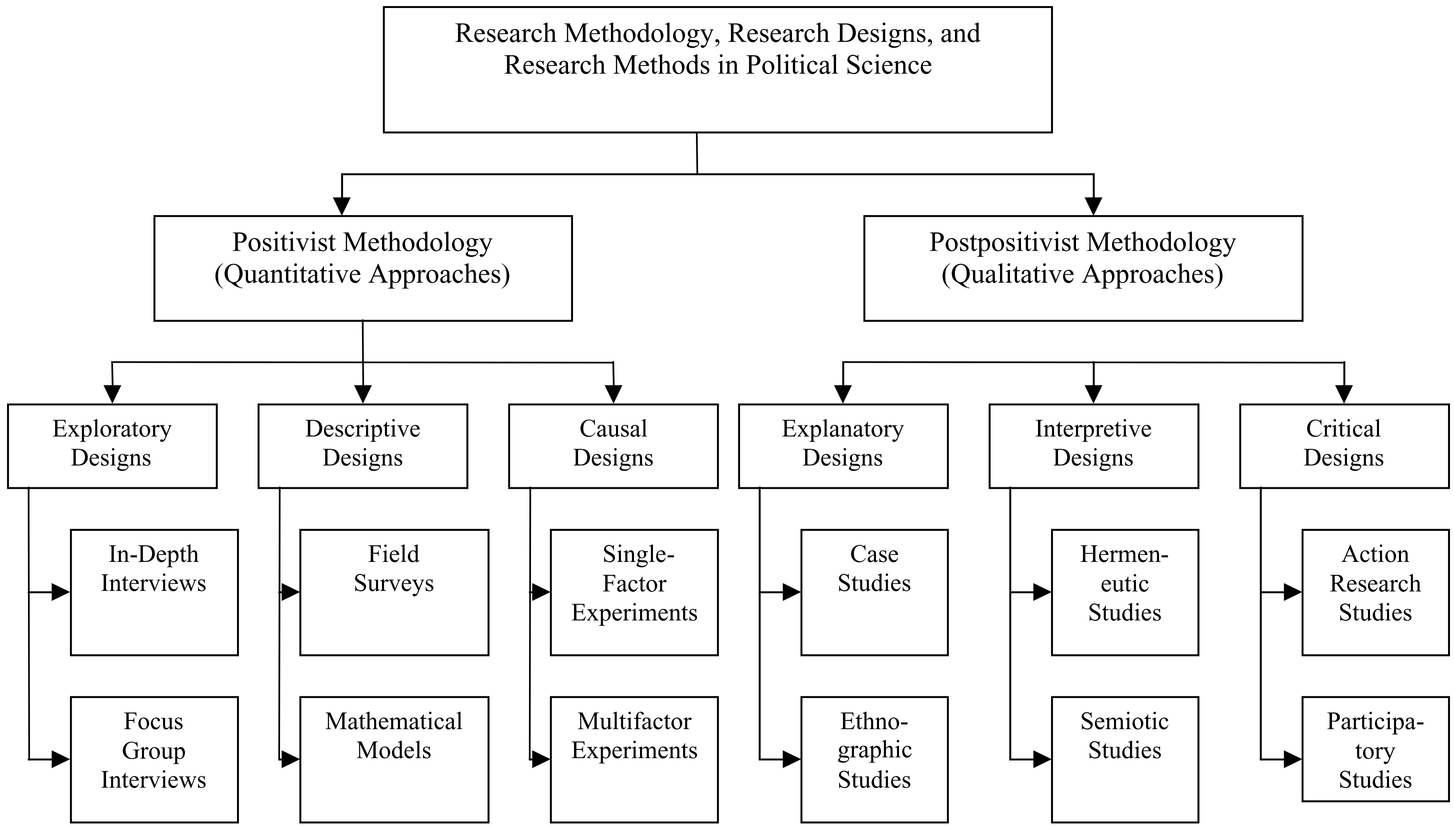
The term *research design* refers to the way an investigator applies a logical structure to his or her research project. The function of this step in the research process is to make sure that the data gathered are sufficient and appropriate for answering the research questions completely and unambiguously (de Vaus 2001). Two terms are often used interchangeably to designate this portion of the research process: *research design* and *research methods.* They are not the same, however.

Researchers can choose from three quantitative research designs: exploratory, descriptive, and causal. Three qualitative designs are also available: explanatory, interpretive, and critical. Several different research methods are available for each research design; examples are shown in Figure 4.1. *Research methods* refers to the ways in which data are collected. Some examples of methods used in quantitative studies include questionnaires, structured or semi-structured interviews, observation, document and artifact analysis, and unobtrusive methods. Examples of methods used in qualitative studies include participant observation, unstructured interviews, and hermeneutic analysis of texts.

Other authors have followed different taxonomies in describing the optional available ways to conduct research. For example, Hakim (2000, 9) identified eight types of study designs: (1) literature reviews, secondary data analysis, and meta-analysis of existing data; (2) qualitative research, including in-depth interviews and focus groups; (3) research based on administrative records and documentary evidence; (4) ad hoc interview surveys; (5) regular or continuous interview surveys; (6) case studies; (7) longitudinal studies; and (8) experimental social research.

An important idea to remember about research design selection is that the researcher is never locked into using any one "best" design. There are many acceptable ways to conduct research; the only selection criterion that ought to make sense is that the method chosen must provide the best possible conclusions. Phillips (1976) described the process of selecting a research design as a *Magna Charta* for the researcher; he added that,

Figure 4.1 A Partial Display of Research Methodologies, Approaches, Designs, and Methods



> [The researcher] is not chained to a set of techniques simply because they have worked adequately in the past, nor must [he or she] defer to the supposedly superior methodological knowledge of other investigators because of their research reputation. It is not necessary for [researchers] to continually look back over [their] shoulder, wondering if others would consider (the) procedure to be "correct" or incorrect. . . . What counts is not what others think of those procedures but how well they work. (Phillips 1976, 5)

What Phillips and others like him mean is that the key to good research results is "doing good science." This simply means selecting a research design that best meets the objectives for the study. It is the research question that drives the selection of a research design (Denscombe 2002).

Quantitative Designs

Quantitative research designs are employed in the sequence of steps shown in Figure 4.2. In deciding what strategy to follow in a quantitative design, political science researchers usually seek answers to these six basic questions (Miller 1991):

1. What characteristics of the people in my sample (such as demographic differences) distinguish them from other groups or subgroups of people whom I might have included in my study?
2. Are there any differences in the subgroups contained in this sample that might influence either the way the questions are answered or the opinions that are offered?
3. Is there a statistically significant difference in the answers of any groups or subgroups in this sample, or did they all answer the questions in roughly the same way?
4. What confidence can I have that any difference that I do find did not occur by chance?
5. Is there any association between any two or more variables in my study? Is it relevant? Is it significant?
6. If there is any relationship between two or more variables, is it possible to measure how strong it is and whether it is a positive or negative relationship?

Types of Quantitative Designs

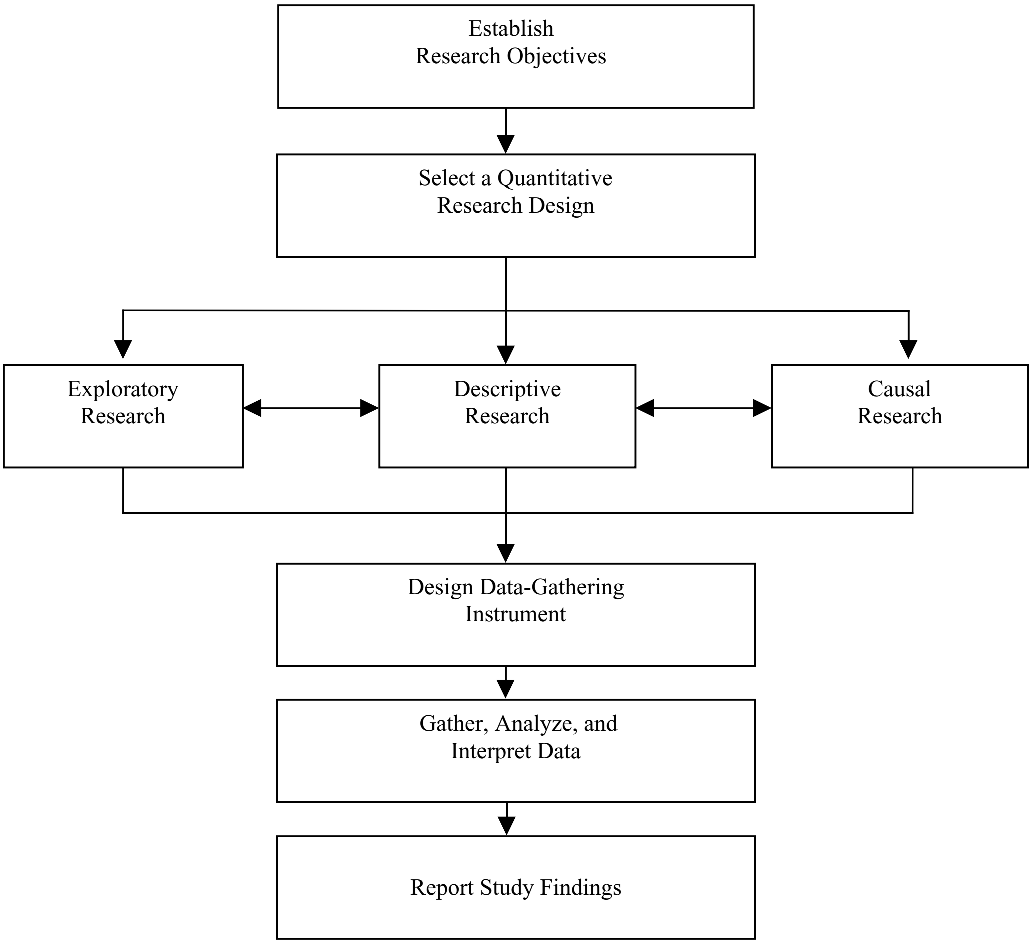
Depending on their research objectives, researchers select from three types of quantitative research designs: *exploratory*, *descriptive*, or *causal.* In each of these approaches, one or more of a variety of statistical tools are used to test ideas or concepts and to communicate research findings.

Exploratory Designs

Exploratory studies are small-sample designs used primarily for gaining insights and ideas about research problems and the variables and issues associated with those problems. These types of studies are sometimes referred to as "pilot studies." Exploratory studies are often employed as the first step in a multi-part research project. Because of their limited scope, however, they seldom exist as stand-alone approaches. Exploratory studies help the researcher gain greater understanding of a problem for which more information is needed. They also help the researcher identify variables that may be only tangentially or only marginally related, and thus should not be included in a more extensive research effort.

Data gathering in exploratory research may involve quantitative, qualitative, or a combination

Figure 4.2 **A Schematic Representation of the Quantitative Research Design Process**



of strategies. The data may come from either primary or secondary sources; that is, it might be gathered directly by the researcher, or it might be data gathered by someone else for a different purpose. Both data types have similar validity in exploratory research.

Descriptive Designs

Descriptive research designs are used to develop a "snapshot" of a particular phenomenon of interest. Descriptive studies typically involve large samples. They provide a description of an event, or help define a set of attitudes, opinions, or behaviors that are observed or measured at a given time and given environment. The focus of descriptive research is on the careful mapping out of a circumstance, situation, or set of events to describe what is happening or what has happened (Rosenthal and Rosnow 1991).

Descriptive studies may be either *cross-sectional* or *longitudinal.* The "snapshot" study is called a *cross-sectional* design. It is a one-time assessment of a sample of respondents. Time is an important consideration because the "picture of the sample" usually varies—sometimes substantially—if the research is repeated at a later date or conducted with another sample taken from the same population.

The purpose of a cross-sectional design is to determine to what extent different categories or classes in the single sample differ on some outcome (independent) variable. Categories could be gender, different age groups, income groups, social class groups, ethnic groups, and the like.

Descriptive research that is repeated with the same sample over two or more time intervals is *longitudinal research.* Studies using panels of the same participants are longitudinal studies. The purpose of a longitudinal study is to identify and measure *change* in subjects' responses. The same elements in a cross-sectional design apply to a longitudinal study, except a follow-on measurement or measurements are taken after passage of a period of time. *Cohort* studies—research projects that follow a sample over time to evaluate attitudes and behaviors—are longitudinal studies. They are popular for measuring changes in voter attitudes as a campaign progresses or as an administration serves its elected period in office.

Researchers use two related-but-different types of descriptive research strategies—*field studies* or *field surveys.* Field studies tend to go into greater depth on a smaller number of issues or items; field surveys evaluate a larger number of issues in lesser depth. Field surveys are the most commonly encountered approach in political science; they make up more than 80 percent of all quantitative research. Surveys are popular because they are relatively easy to design and administer. The wide availability today of powerful desktop computers and statistical software has made them much easier to tabulate and interpret. It is currently possible to use interactive surveying techniques, with the responses immediately entered into a database and tabulated.

Both field studies and field surveys produce data that are presented as numeric *descriptions.* These descriptions may be of a *sample* of subjects or of an entire *population.* Many different types of variables can be used, including but not limited to demographic characteristics, attitudes, opinion, intentions, characteristics of organizations, groups, families, subgroups, and so forth. In essence, almost anything that can be measured can be a descriptive variable.

Causal Designs

Causal research studies are often the last step in a three-part approach to research in the administrative and social sciences. These designs typically involve planning and conducting *experiments.* Causal studies may be either *relational* or *experimental.* The purpose of relational studies is to identify how one or more variables are related to one another. They are sometimes called *correlation* studies. The purpose of an experimental study is to identify the cause or causes of *change* in a variable or event—that is, determining "what leads to what" (Rosenthal and Rosnow 1991).

The classic version of experimental design includes these five key components (de Vaus 2001, 47–50):

1. One pre-test measurement of the dependent (outcome) variable for all subjects
2. Two groups, one that is to be exposed to the treatment (intervention) and the other, the *control group*, which is not exposed
3. Random assignment of subjects to the groups; this occurs prior to the pre-test
4. One treatment (intervention)
5. One post-test of both groups on the dependent (outcome) variable

Designing an experiment is the key activity in a causal research project. Experiments involve subjecting two or more samples or subsamples to different *treatments* or *interventions.* Researchers may manipulate one, two, or more independent variables in the same treatment experiment. Researchers must be careful in the design of experiments and interpretation of the findings so that potential intervening or confounding variables do not muddy the results of the study.

The classic example of the need for careful attention to experimental design, and how experiments are used to provide information about behaviors, is the set of experiments conducted at the Western Electric Hawthorne manufacturing facility near Cicero, Illinois. The studies were begun in 1924 and consisted of four phases (Hodgetts 2002). A random sample of assembly workers was selected, moved to a special location, and subjected to variations in working conditions, including varying the speed of the production line, different levels of lighting, rest periods, group memberships and norms, and so forth. Researchers measured performance under normal conditions, changed a working condition characteristic (a *variable*), and measured performance again. To their surprise, production increased with negative environmental changes just as they did with positive changes. The design did not consider the effect on workers of being singled out for attention. This unplanned change is what is known as an *intervening* or *confounding* variable.

Qualitative Designs

Qualitative research is not based on a single, unified theoretical concept, nor does it follow a single methodological approach. Rather, a variety of theoretical approaches and methods are involved (Flick 1999a). All of these approaches and methods have one common underlying objective: to understand the event, circumstance, or phenomenon under study.

Types of Qualitative Designs

Broadly speaking, qualitative strategies fall into three categories of study techniques. These are *explanatory*, *interpretive*, and *critical* designs (White 1999). Some include *ethnography*, *kinetics* (the study of movement), *atmospherics*, *phenomenology*, and *proxemics* (the study of space in social settings). Additional examples include *using such data-gathering methods as focus groups*, *elite-group interviewing*, and the use of *unobtrusive measures.*

Qualitative data are typically gathered in one of four ways: (1) by observation (usually but not exclusively *participant observation*), (2) during in-depth personal interviews, (2) unobtrusive measures, and (4) a combination of these and other methods in what is known as a *triangulation* approach (Esterberg 2002).

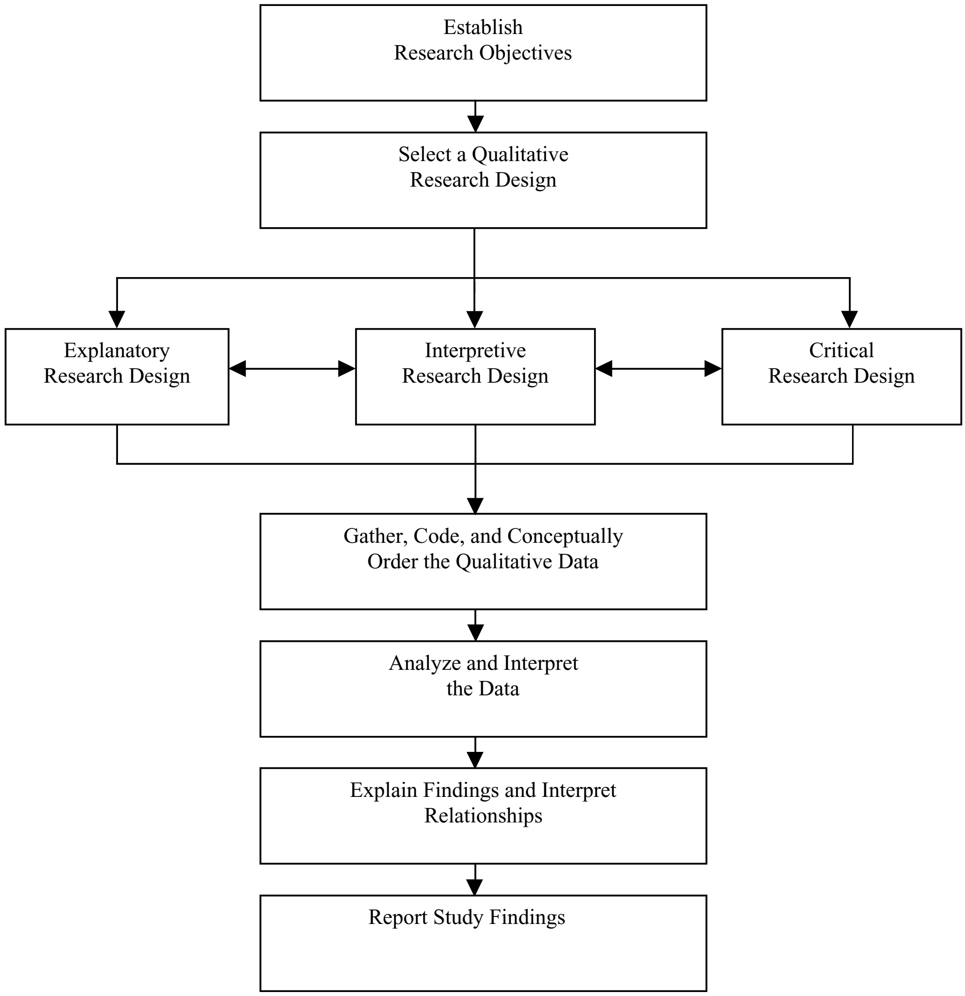
Figure 4.3 displays the interconnected nature of the qualitative process. In all three approaches, several different techniques may be employed for gathering data, including *observation*, *participation*, *interviewing*, and *document analysis.* In each, data are coded, placed in some intelligent order, interpreted, and used for explaining and/or predicting future interrelationships in similar circumstances.

Explanatory Research

Explanatory research is the approach taken in most mainstream qualitative research. Its goal is to go beyond the traditional descriptive designs of the positivist approach to provide meaning as well as description. The purpose of explanatory research is also broader than that of descriptive research; it is conducted to build theories and predict events:

> Explanatory research strives to build theories that explain and predict natural and social events. Theory building requires the development of a collection of related and testable law-like statements that express causal relationships among relevant variables. The ultimate goal of explanatory research is the control of natural and social events. (White 1999, 44)

Figure 4.3 **Steps in the Qualitative Research Process**



Typical objectives for explanatory research include explaining why some phenomenon occurred, interpreting a cause-and-effect relationship between two or more variables, and explaining differences in two or more groups' responses. The design is similar to the traditional positivist approach, and some numerical description and simple statistical analysis may be involved.

Interpretive Research

Interpretive research is characterized by a strong sense of connection between the researcher and the subjects who are a part of an interpretive study. The goal of interpretive research is to build *understanding* between the participants and the researcher. Therefore, interpretive research often focuses on standards, norms, rules, and values held in common, and how these all influence human interactions (White 1999).

The primary objective of interpretive research is to establish the *meaning* of a circumstance, event, or social situation. It goes beyond simple description or explanation in aiming to enhance people's understanding of the symbols, artifacts, beliefs, meanings, feelings, or attitudes of the people in the study situation (White 1999). Interpretive research has much in common with the study of *phenomenology* in philosophy and the phenomenological approach to sociological research. Public administration theorist Camilla Stivers provided this view of interpretive research:

> To me, interpretation entails sense-making: taking a more or less inchoate bundle of events and processes—what might be thought of as a situation or group of situations—and putting a frame around them based on more or less conscious assumptions about what is likely to be important, significant or meaningful. (Stivers 2000, 132)

Critical Research

Critical research is the least-used approach in political science research in general, although it is an increasingly important tool in public administration and sociological research. In addition, a growing number of applications are now seen in education research. The subjective nature of critical analysis makes it difficult for students to adopt in meaningful ways. While it has potential for application in political science, it has not yet been widely adopted. According to White:

> Criticism is the most radical of the three modes of [qualitative] research because it calls into question our most basic assumptions and asks us to evaluate them as a basis for action. Critical research does not always satisfy the critic, nor does it always change beliefs and values, but it has the potential to do so. (White 1999, 57)

The overriding objective of critical research is to change people's beliefs and actions in ways that the investigator believes will better satisfy their needs and wants. The criticism points out inconsistencies that exist between what is true and false and what is good and bad. It aims to bring people to actions that are commensurate with accepted truth and goodness. According to White (1999), the "truth" of critical research is only realized when people (through a process of self-reflection) finally take action to change their situation.

Combined Research Designs

Combined designs entail using *both* qualitative and quantitative methods. The three broad classes of combined studies are *archival*, *media*, and *artifact* studies. Techniques used in these types of studies include content analysis, document analysis, and in situ analysis (also known as *within-site* analysis). Several types of multivariate statistical tools are also used in these designs, including *canonical correlation*, and *cluster* and *factor analysis.* These statistical tools all require some subjective (qualitative) interpretation of the data.

Flick is one of many writers on research and research methods who now report that good research often requires the use of a combination of quantitative and qualitative approaches:

> It is well known that the juxtaposition "qualitative–quantitative" has sometimes led to not very fruitful controversies and is sometimes used as a schematic demarcation. But the combination of approaches is often truthful as well. (Flick 1999a, 634)

Choosing a Research Topic

Beginning researchers often find themselves at the start of the research process struggling for answers to such questions as*: What shall I research? How shall I do it?* And, *once I've gathered my data, how can I make any sense of it? How can I know what it really means?* For some, simply choosing a subject to research and write about can be the most difficult part of the entire project. How political science students determine a topic to research, identify research problems, formulate study questions, and other related concerns are the subjects addressed in this section.

Research in political science is conducted for two very broad purposes: The first type is conducted to solve real problems in everyday political life; this is known as *applied*, *practical*, or *policy research.* Policy research is conducted in all subfields of political science except political theory. These studies are conducted to improve the way that politics works, with the unstated understanding that if we make it work better, we also make it work longer. Applied research is particularly important in the public administration subfield of political science. Much of the research in that subfield is conducted to provide information needed to make better administrative and managerial decisions. According to Hakim (2000, 4), policy research is concerned with "knowledge for action." As a result, it focuses on "actionable factors" or variables. The objective of this type of research can be expressed in the phrase "It is more important to change the world than to understand it."

The second type of research is conducted for the purpose of advancing the body of knowledge about politics and the political world. This research is called *basic* or *pure* research. Hakim (2000) called studies of this type *theoretical research.* The long-term goal of social theoretical research is to build greater social science knowledge; in political science, the purpose is to produce greater knowledge and understanding of politics and the political process.

The methods employed in political science theoretical research are often aimed at identifying causal processes and coming up with explanations for them. Furthermore, policy research has an underlying goal of *prediction.* For this reason, political science researchers conducting policy research employ simulations, mathematical modeling, forecasting, time series studies, and other more advance quantitative tools. The primary audience for theoretical research is other political scientists in the academic community. These fellow researchers have similar disciplinary backgrounds; they speak the same scientific language and are familiar with the same sets of assumptions and operational definitions.

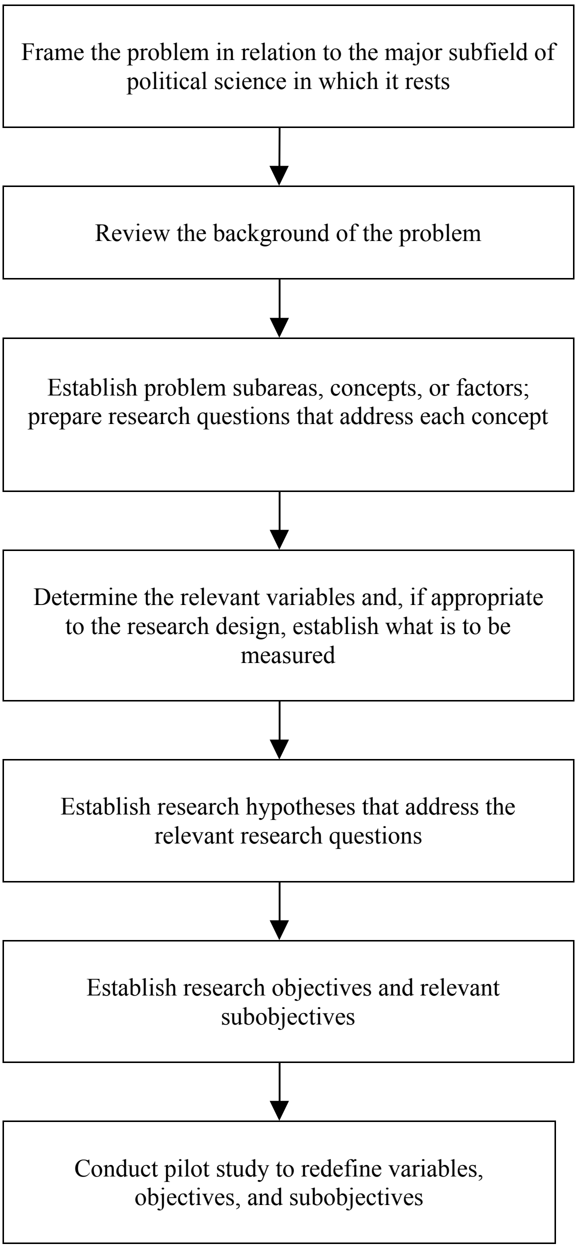
Defining the Research Topic

A key requirement for all research is beginning with a clear, concise, and thorough definition of the topic upon which the research is to be carried out (research topics are also called "study problems"). Defining the topic does not mean that answers are known before the questions are asked. Rather, it means that the researcher has a specific *goal* in mind for the research—before getting started. Having said this, it must also be said that choosing a valid research topic is hardly ever an easy process. The process of topic definition provided in Figure 4.4 may help researchers who face this often difficult task.

Sources of Research Topics

Research topics can come from questions discovered in texts, in the professional literature, from classroom discussions, from reading the newspaper or watching a television news or talk show,

Figure 4.4 **Tasks in the Problem Definition Process**



and other outside interests. Topics can also come from the life experience of the researcher. An example is the study of a hearing-impaired graduate student who learned that Native American children are more likely to have hearing problems than are children of other ethnic groups with similar socioeconomic characteristics. Determining why this is so and what can be done to alleviate the problem became the student's master's degree program research project.

Bernard (2000, 82–83) identified five broad classes of research topics, based upon their relationships with various types of variables:

1. Internal conditions, which include attitudes, beliefs, values, lifestyles, and perceptions of participants in the political arena
2. External conditions: these are primarily past, present, and predicted demographic characteristics of the political actors
3. Behavioral characteristics: these include a wide variety of relevant behaviors, from how people vote or why they do not vote, where they get their information, with whom they communicate, how much they work and play, etc.
4. Artifacts: what Bernard described as the "physical residue" of human behavior
5. Environmental conditions: these include the physical and social environmental characteristics—often referred to as *cultural factors*—that have some impact on the political and social world. They range from such items as the amount of rainfall and other geophysical features of a region to whether the society exists under democratic or authoritarian regimes. Working conditions and gender and race factors are also sources of research topics that fall under this class.

Sylvan Barnet made these statements about choosing a research topic: "No subject is undesirable," and "No subject is too trivial for study" (1993, 177–78). Barnet might have added: *No subject is inherently uninteresting.* It is the way subjects are researched and reported that makes them desirable or undesirable, interesting or uninteresting. Here are a few guidelines to think about when choosing a research project topic:

- Research and write about something that interests you.
- Be sure enough material about the topic is available to do a good job.
- Make sure that the topic is not so large that it is overwhelming.
- Be sure the topic fits your abilities and understanding.
- Make sure you take good notes once you start reading about the topic.
- Ask your reference librarian for guidance on your research topic.
- Run the topic by your instructor for his or her assistance.
- Focus, focus, and focus!

Tasks in Problem Definition

The process displayed in Figure 4.4 has been designed to help researchers identify and define research topics and study problems. There are seven components in the definition process; each is discussed is some detail below.

Task 1: Frame the Study Topic in Its Environment

The first step in the problem definition process is determining whether the proposed research project will produce information that is commensurate with the purpose, goals, and objectives of the organization, program, or agency. To do this, the researcher must frame the research problem within the broader field or subfield of political science in which it rests.

For example, if the research is to be in the area of international relations, the researcher must identify the nations involved, the political history of the diplomatic relations between the nations, past and current political and economic conditions, the point of conflict, if any, and similar important points. Moreover, the research project must be worth the effort, time, and money it will consume. The researcher must be absolutely sure of the relevance of the project; proper framing of the research question helps make this possible.

Task 2: Review the Background of the Topic

Answers to the questions listed above can often be found by conducting a thorough review of the background and published literature on the topic. Another way is to conduct a series of interviews with several key informants; these are people who have a greater than average familiarity with the problem and/or its associated antecedents or consequences.

There are two aspects to a problem's background. The first is the nature of the problem within the actors, institutions, organizations, or other entities involved in the study; this is called the *internal background.* The internal background includes the total body of knowledge on the topic that exists within the relevant topic entities. This knowledge may exist as published reports, operations records, or as accounting data; it may reside in the memories of other participants or organizations. Or it may be stored in historical archives somewhere, such as the Library of Congress. Internal information is often easier to access than external sources or information. Internal data should always be the first place a researcher looks when conducting organizational research.

The second part is the body of research that already exists on the problem, its causes and cures, its extent and impact, and the way that other researchers have approached the issue. This is the *external background.* External information exists in the body of literature on the topic. Accessing this previous work is referred to as a *review of the literature.* It includes all the published and unpublished-but-available material on the question.

Task 3: Establish Topic Components

Once the researcher has settled on a problem or circumstance that requires more information, the next step is to break that broad problem into as many parts or sub-problems as are feasible. Say, for example, the research problem decided upon is: "How can the level of service provided to out-patient disabled veterans be improved without raising hospital operating costs?" A partial list of some relevant subproblems of this question might be:

- The type of organization (e.g., hospital, out-patient clinic, field provider, etc.)
- Type of service patients require
- Staffing levels
- Queuing system in effect or not
- Location of facility (urban, suburban, rural)
- Prescreening system
- Attitudes of provider staff
- Attitudes of service users
- Expectations of service users
- Operating costs, and others

Task 4: Determine Relevant Variables and What Is to Be Measured or Evaluated

Once the topic is identified, the researcher must determine which specific and relevant components should be studied. For example, say a researcher is confronted with citizen distrust of government. Should the researcher collect data on local economic conditions, neighborhoods, schools, ethnic groups, families, peer groups, students who drop out, students who do not drop out, students below a certain age, students above that age, etc.? Each option will come up with very different information.

Related to this question is one of *accessibility.* If the element or subject to be measured is a person, that subject must have the needed information, be willing to share the information with the researcher, speak the researcher's language, and be able to put into words why they behaved in a certain way. The same problems exist for all possible measurement elements.

A variable is anything that changes in value or varies in some way. Thus, variables are phenomena that can be "measured" in some way. Said another way, variables are study questions that have been rephrased into testable statements. For example, the high school dropout phenomenon is a *study question*, whereas the annual rate of dropouts is a *variable* that can be measured. Other variables include the gender of the dropout, the dropout's age, ethnic group, the level of education of the dropout's parents, the location of the dropout's residence, and many more. A listing of some of the types of variables researchers use is displayed in Figure 4.5.

There are several ways to identify variables. One way is to divide them into two categories based on the type of numerical measurements they provide. These are *categorical* and *continuous* variables. Categorical variables identify a limited number of possible categories. Gender is an example, with just two categories possible: female or male. Continuous variables, on the other hand, can have an unlimited number of values. Values for continuous variables can be measured on a continuous scale (such as weights, height in inches, etc.). They are not restricted to specific, discrete categories or values, as are categorical variables. Attitude scales that provide continuous data are used often in public administration research. Researchers are concerned with mean (average) scores on a scale, not the response category (score) of any single subject.

A second way of looking at variables is whether they are *dependent* or *independent.* This dichotomy is important in causal research designs. Dependent variables are variables that are influenced in some way by another variable or variables. Independent variables are the variables that act upon the dependent variables. For example, the dependent variable *voting behavior* can be influenced by many different factors, such as the type of political contest involved, the income, education, occupation, or the age of the voter/nonvoter, etc.

Task 5: Establish Research Hypotheses

The *hypothesis* is the fundamental building block of all scientific research. It defines the research topic and the researcher's ideas about it. Hypotheses can be defined in many different ways. One way is to look at the hypothesis as the researcher's ideas about a relationship between two phenomena (variables). Shaughnessy and Zechmeister (1994) defined hypotheses as nothing more than a "tentative explanation for something."

Figure 4.5 **A Partial Classification of Variables**

Variable:
A characteristic, quantity, or anything of interest that can have different values. Examples include such things as savings account amounts, stock prices, package designs, weight, monthly sales, gender, salaries, etc. The values of variables may be said to be either *continuous* or *categorical*.

Independent Variable:
A variable that functions as the causal element in a hypothesis. A change in the value of an independent variable is said to "cause" a positive or negative change in a dependent variable. An example is the independent variable "poverty" in the hypothesis "Poverty causes crime."

Dependent Variable:
The second part of a causal hypothesis, a change in the value of a dependent variable is hypothesized to have been "caused" by a change in the level of the independent variable. In the hypothesis "Poverty causes crime," the level of crime is the dependent variable.

Intervening Variable:
Sometimes referred to as a *control variable*, an intervening variable lies between an independent and a dependent variable. A change in the intervening variable must be "caused" by the independent variable; this change then "causes" the change in the dependent variable. For example, in the hypothesis "Workplace stress causes physical illness, which causes absenteeism," physical illness is the intervening variable.

Conditional Variable:
This variable establishes the antecedent conditions necessary for change in the dependent variable. The values of a conditional variable influence the level of impact that the independent and intervening variables have on a dependent variable. In the example "Poverty causes substance abuse, causing HIV-positive rates to increase, wherever needle exchange programs are proscribed," existence of needle exchange programs is the conditional variable.

Study Variable:
A variable whose cause or effect status the researcher is trying to discover through research. The study variable can be an independent variable, a dependent variable, an intervening variable, or a conditional variable.

Continuous Variables:
Quantities that can take any value within a range of measurements, such as weight or percentage of increase in the price of a stock, are said to be continuous.

Categorical Variables:
Categorical variables have values that can vary only in specific steps or categories (they are sometimes called *discrete* variables).

Tasks 6 & 7: Establish Objectives, Subobjectives and Do a Pilot Study

Research objectives are statements of what the researcher wants to accomplish by completing the research activity. They are related directly to the study question. For example, the director of a program designed to help single parents receiving public assistance make the move to full-time employment might be concerned that the program participation rate is declining while the numbers of parents receiving assistance is not declining. Why enrollment is declining is a key study question. Identifying ways to reverse the decline might serve as the program director's main research objective. Subobjectives might include the following items, although this is only a partial list of the possible factors the director may wish to include in the study:

- Identify characteristics of clients who participate in the program.
- Determine reasons why they elected to participate.
- Identify characteristics of clients who do not participate in the program.
- Determine reasons why they elected to not participate.
- Identify barriers to participation.
- Identify what incentives might entice more qualified people to participate.
- Determine what successes other programs have had and whether they can be transplanted to the local program.

Choosing a Research Theme or Position

Once the researcher has decided on a topic, there are many options on how to approach the study of the topic. According to Seech (1993), research studies and their reports can follow one of five different approaches or themes:

- Thesis or "position"
- Compare-and-contrast
- Analysis
- Summary
- Basic research

A *thesis* or *position* study is one in which the researcher begins by stating a position, either his or her own or some other person's or group's. This is then followed by arguments for or against the point of view. Various types of evidence are presented to support one viewpoint and/or refute the others. Political candidates regularly produce position papers in which they spell out their support or lack of support for such things as tax increases, school budgets, welfare expenditures, and so forth. The evidence presented in such papers is usually the product of a research project.

Compare-and-contrast studies are used to compare two or more ideas, methods, proposals, or positions. First, each of the approaches to be compared is defined. Research is usually necessary to fully develop each position. Several paragraphs follow, in which key points of the differences are listed. This portion of the study is then followed by a more detailed discussion of the differences. The arguments that can be used to explain the differences are then spelled out. The researcher then selects one argument and, using evidence found in the research to support the argument, explains to readers why that argument is "best."

Analysis studies are closely related to generic research reports and often follow a similar structure. These studies require the researcher to carry out an in-depth analysis of an *idea.* Examples include such political science issues as characteristics of political parties, voting behavior, rules or standards that permit political institutions to continue to function, presidential policies, privatizing services, spending limitations, fiscal policies, foreign policy, and others. The researchers' opinions about the topic and its meanings or ramifications are typically included in analysis reports.

The investigator reviews and summarizes existing literature on a topic, then writes an analytical summary in which he or she interprets the information for the reading audience. For example, a researcher might be assigned to research and write a report about how passage of a people's initiative putting a cap on state automobile excise taxes affects a state highway department's plans to reinforce bridges to comply with federal earthquake damage requirements. The researcher will first go to the published literature to review trends and developments on all the topics. This could be followed by a series of interviews with department and budget administrators to establish their opinions about such things as delaying work on some bridges, finding cheaper ways to do the required work, or identifying other revenue sources.

Summary studies are detailed summaries of a topic or issue. They are much like an expanded version of the review of the literature section of other types of studies. These summary report studies include a brief introduction defining and describing the topic, then move immediately into a summary of what other researchers or practitioners have said about the topic. Unlike analysis studies, summary reports often do not require the author to subjectively interpret the previous research, but only to summarize what others have reported.

Seech's last style or approach to research studies is *basic research.* The form followed in research studies is rooted in the earliest traditions of scientific research. The scientific method approach to research evolved out of this tradition. Because of this, social science and administrative research usually follows a structure similar to research for such disciplines as chemistry or biology, for example.

When conducting a basic research study, the researcher designs and conducts a data-gathering project. To do this, the researcher may elect to follow a qualitative or a quantitative approach. In either approach, the data can be either *primary* or *secondary.* Collecting *primary data* means the researcher gathers "new" information. This might mean conducting a survey with a questionnaire, carrying out a series of personal interviews, employing content analysis to published documents, or conducting an experiment. Afterward, the gathered primary data are processed (often with computers) and interpreted. Researchers can then draw relevant conclusions and make recommendations.

Research to collect s*econdary data* means getting most of one's information from already published sources. These data can be found in libraries, on the Internet, or in internal publications, among other sources. Because this material has already been published, the researcher must use extreme care to report all the sources of material used in the report.

Summary

A variety of research designs are employed by researchers in political science and other social science disciplines. Quantitative research designs are often employed in a sequence: they may begin with a small-sample, exploratory study to provide information for developing a questionnaire, followed by a large-sample descriptive study. The results of a descriptive study may then be used to design an experiment (a *causal design*).

Qualitative research strategies fall into three categories: *explanatory*, *interpretive*, and *critical.*

These approaches can be applied to many different research methods, including ethnography, kinetics, atmospherics, phenomenology, and proxemics, among others.

The principal data collection methods used for gathering qualitative data in political science research are unobtrusive observation, participant observation, personal interviewing, archival analysis, and artifact analysis. Combined designs entail using *both* qualitative and quantitative methods. The three broad classes of combined studies are *archival*, *media*, and *artifact* studies. Techniques used in these types of studies include content analysis, document analysis, and in situ analysis.

A seven-step process can aid the researcher in identifying and defining a research problem or topic: (1) relate the problem to the program mission and objectives; (2) review the background of the problem, usually by conducting a literature review; (3) break the problem down into its subareas, components, or factors. Additional steps include: (4) select the most relevant variables and determine what should be measured; (5) establish testable research hypotheses; (6) establish objectives for the research and establish relevant subobjectives; and (7) conduct a pilot study to check on the validity of the variables, measurements, and hypotheses.

Discussion Questions

1. Describe how the three phases of quantitative research might be used for a study of your choosing.
2. Define the three approaches used in qualitative research.
3. Using a research question of your own choosing, describe how you would apply each of the seven steps in the research problem–defining process.
4. Where might you find topics for a political science research project?
5. Do you agree with the statement that no subject is too trivial for study? Why or why not?
6. What is the purpose of breaking a problem into smaller components or factors?
7. How do you know what to measure in a research project?
8. Must all variables you identify be measured? Why or why not?
9. How do you know what to focus on in a research study?
10. Name and define four different focus approaches to research.

Additional Reading

Anastas, Jeane W., and Marian L. MacDonald. 1994. *Research Design for Social Work and the Human Services.* New York: Lexington Books.

Carlson, James M., and Mark S. Hyde. 2002. *Doing Empirical Political Research.* Boston: Houghton Mifflin.

Corbett, Michael. 1996. *Research Methods in Political Science.* Bellevue, WA: MicroCase.

Schram, Sanford, and Brian Caterino. 2006. *Making Political Science Matter: Debating Knowledge, Research and Method.* New York: New York University Press.

Schwab, Donald P. 2008. *Research Methods for Organizational Studies.* Mahwah, NJ: Lawrence Erlbaum Associates.

Wildavsky, Aaron. 1993. *Craftways: On the Organization of Scholarly Work.* 2nd ed. New Brunswick, NJ: Transaction Publishers.

5 Preparing a Research Proposal

The research proposal is an important first step in the research process. The proposal is a description of what the researcher plans to undertake and why, as well as how the researcher plans to carry out the research project. As such, it serves as a guide that keeps the researcher focused on the tasks that need to be done. It also provides the research sponsor with a rationale for investing in the effort. The purpose of the final report, on the other hand, is to explain what the researcher concluded from his or her analysis. Because it serves as a guide or checklist, preparing a good research proposal in advance makes writing the final report much easier.

Although the proposal is a critical component of the total research process, it has too often been ignored or simply left to the researcher to discover how it should be done. Or it is treated as something that everyone intuitively knows how to write. Nothing could be further from the truth, however. Poorly written proposals have been identified as one of the major causes of failure to receive committee approval or, more importantly, failure to receive funding for the proposed study (Wasby 2002).

After a stint reviewing research proposals at the National Science Foundation (NSF), political science professor Stephen Wasby concluded that many graduate students were apparently receiving little or no instruction in the skills needed to produce effective research proposals. Although many proposals he read contained exciting research ideas, they were too often poorly written or incompletely presented. The good ideas were often “embedded in horrendously constructed proposals.” In many proposals, a clear statement of the research problem and a well-executed literature review would be followed by a thin or nonexistent description of the research design. Or there would not be a transition statement between the literature review and the statistics to be used. Hypotheses, where present, were often not developed from the discussed literature, or from any literature for that matter.

Wasby blamed graduate school curricula for the poor showing of so many research proposals. In his view, graduate work in the social sciences—including political science, public administration, and social services—has not always provided students with enough experience in proposal writing. And what instruction students do receive in this important skill during their research methods courses is too often inadequate or even inappropriate for the proposed task. For example:

> A related aspect of inadequate training is that our methods training seldom focuses on particular methods. For example, elite interviewing and content analysis, and when to use them, are critical components of a well-rounded methods curriculum. That curriculum, however, instead becomes additional training in statistics, with the course in “Methods” becoming “Statistics II or Statistics III,” with little if any attention to problem specification

Figure 5.1

Some Alternate Formats for the Research Proposal

Sample Format 1	Sample Format 2	Sample Format 3	Sample Format 4
Cover/Title	Cover/Title	Cover/Title	Cover/Title
Table of Contents	Table of Contents	Table of Contents	Table of Contents
Executive Summary or Abstract	Executive Summary or Abstract	Executive Summary or Abstract	Executive Summary or Abstract
Introduction	Objectives	Background	Literature Review
• Problem statement	Activities	Literature Review	Objectives
• Literature review	Methodology	Scope of the Study	Research Plan
• Research questions and/or hypotheses	Personnel Involved	Methodology	Methodology
• Significance of proposed study	Facilities Needed	Work Schedule	Work Schedule
Design and Methodology	Other Information	Equipment	Budget
• Subjects	Budget	Estimated Costs	References
• Instrumentation	Appendices	References	
• Procedures	References		
• Data analysis			
• Presentation			
• Limitations			
References			
Appendices			

> or research design. . . . This deficiency helps to explain why proposals often move, without a transition of linkage, from literature review to discussion of the statistical method of choice. (Wasby 2001, 309)

Although they are actually two equally important components of a single systematic activity, the research proposal and the research project are often erroneously treated as entirely separate activities. Instructions on how to prepare a research proposal are likely to be found as an appendix at the end of research methods text, or they are just as likely to be excluded entirely.

In these unfortunate circumstances, beginning researchers given an assignment to prepare a research proposal often do not know how to go about completing the assignment. If they do, their proposals are often incomplete or do not adequately guide the researchers toward completion of the research project that follows. Research Director Paul Wong of Trinity Western University addressed this issue in a set of instructions prepared for graduate students:

> Most students and beginning researchers do not fully understand what a research proposal means, nor do they understand its importance. To put it bluntly, one's research is only as good as one's proposal. An ill-conceived proposal dooms the project even if it somehow gets through the thesis supervisory committee. A high quality proposal, on the other hand, not only promises success for the project, but also impresses [the] thesis committee about your potential as a researcher. (Wong 2002)

Sample Format 5	Sample Format 6	Sample Format 7
Cover/Title Table of Contents Executive Summary or Abstract Introduction Literature Survey Problem Statement Conceptual Framework Specific Objectives Hypotheses (if any) Methodology Bibliography	Cover/Title Table of Contents Executive Summary or Abstract Introduction Research Problem Statement of Need Major Issues and Subproblems Key Independent and Dependent Variables Hypotheses or Theory Delimitations Definitions Literature Review Methods and Design Discussion Bibliography	Cover/Title Table of Contents Executive Summary or Abstract Introduction • Problem statement • Rationale • Objective(s) • Hypotheses • Problem summary Literature Review • Current status of the topic • Relationships between literature and problem Method • Participants • Research design • Definitions • Reliability/validity • Pilot study results • Data analysis plan Implications and Limitations Appendices (instrument, human subjects approval, permission forms, timeline, budget)

Contents of a Typical Research Proposal

A chief purpose of the research proposal is to convince an administrator, a manager, an organization, a professor, or a committee that the proposed project is worthwhile. It is also supposed to show the people involved that you have the ability and knowledge to design a work plan and that you have the competence to complete the work outlined in the proposal. For this to happen, the proposal must contain all the information about the research process that will enable the approving body to evaluate your proposed study.

There are a number of different opinions as to what should be included in a good research proposal. Fortunately, there are many more or less complete outlines and guides to follow; some of these are displayed in Figure 5.1. Elements in the far-left column have been synthesized from McMillan and Schumacher (1997); the list in the far-right column is a simplified version of elements proposed by Salkind (2002). The remaining columns are summaries from a wide variety of recommendations rather than a single source, with terms changed to reflect common concepts.

Components that appear to be common to many of these suggested guides include (1) an executive summary or abstract; (2) an introduction, which includes a statement of objectives, key definitions, and assumptions, a statement of the problem, and a rationale for doing the research; (3) a review of the relevant literature; (4) a description of the research methods to be followed, including a plan for data analysis and limitations; and (5) appendices, which may include a timeline, a budget, and copies of proposed research instruments, discussion guides, and results of pilot studies, if any.

The Abstract or Executive Summary

Although quite different in form, these two early elements serve very similar purposes. Both elements are designed to be brief summaries of the material included in the full proposal. Both should be written with the reader foremost in mind. That is, they are written in such a way that the reader will be able to get a moderately complete overview of what the proposal is about. In length, abstracts range from a low of about 100 words to a high of 300, with most closer to 200 words. Some abstracts have exceeded 500 words, but when this happens, they lose their intended purpose as a *brief* summary. An executive summary, which may be written as either a narrative or in bulleted or numbered form, should not exceed one full page. Both the abstract and the executive summary should outline the proposed research project and present a brief statement of the research objectives and the methods proposed for accomplishing them.

The Introduction

This is where you "sell" your proposed project. It must be written in such a way that readers come to believe in the project and your ability to accomplish it as described. If you are seeking financial support for the research, the reader must be able to come away from the proposal feeling that the money will be well invested and provide a payoff that justifies the investment of time and money.

The purpose of the introduction is to provide the reader with enough background and content to clearly understand what the research project is about. The introduction may include several or all of the following elements:

1. A statement of the research problem;
2. A rationale for the proposed study that clearly indicates why it is worth doing;
3. A brief description of the major issues and (known) problems to be addressed by the research;
4. If a quantitative study, a statement of the hypotheses; if a qualitative study, a statement of theory, if any. Note: these are *not* the statistical null and alternative hypotheses;
5. Limitations you expect and definitions of key concepts;
6. Sometimes, a review of the literature on the topic, although this is more often a separate section of the proposal.

Statement of the Problem

The statement of the research problem is usually the chief component of this section. In much academic research, the problem is derived from the literature; that is, researchers determine what to study from what they read that others have proposed. Often, beginning academic researchers are advised to follow this same path: study the journals of a discipline, pick a recognized investigator or investigators, and then focus on research that closes identified gaps in the published research. However, in fields of inquiry such as political science, research tends to be more *applied* than theoretical. Thus, research problems often emerge from problems encountered in the day-to-day operations of existing organizations, or they arise with proposed modifications to existing organizational processes.

In either case, the problem or problems to be investigated should be framed in the theoretical concepts of the discipline. For example, say that the issue has to do with a health care administration problem. To address this issue effectively, the researcher(s) should have grounding in health care administration. Some of this grounding comes from practical experience in the field. In this way, the research is able to locate the problem within the current thinking found in the literature.

Researchers should keep the following cautionary points in mind as they approach this critical component of the proposal (Paxton and Cox 2000):

- Be sure to take enough time to explore the current research in the field. This has two payoffs: it can help you avoid choosing a topic that has already been thoroughly investigated, and it can help you narrow your study to something that can be done in the allotted time frame, and done well.
- Do not try to be *different* in your choice of topic and/or your methodology just to be different; be able to justify what you plan to do. Choose a research problem that can make a difference. It is acceptable to use new methods on problems that have been studied earlier in different ways.
- Do not choose a topic that is too complicated, but—equally important—do not focus on a problem that can be seen as too trivial. Attempting to study a highly complex problem is one of the main reasons why many graduate students fail to finish their academic programs. Three important rules to remember are: *focus, focus, and focus.*
- Avoid choosing a research problem that you are not truly interested in. Taking the easy way out is often taking no way out.

The Literature Review

A literature review is simply the researcher's detailed summary and interpretation of the published articles, books, and related materials that pertain to the issues that frame the research problem. A thorough analysis and interpretation of the published literature tells the researcher what has or has not been studied and said about the issues, as well as the methods used to study them, and thereby provides clear signals about how to plan and conduct the proposed research project. Demonstrating a direct link to previous research in your proposal is always a good idea. A literature review serves a number of additional functions (Wong 2002):

1. It demonstrates your knowledge of the problem and its larger theoretical foundation.
2. It demonstrates your ability to critically evaluate relevant literature.
3. It shows your knowledge of the issues surrounding the research problem.
4. It indicates your ability to integrate and synthesize information.
5. It provides new insights and new models for the framework of your research.
6. It helps you to avoid "reinventing the wheel."
7. It gives credit to those who have previously studied the problem.
8. It helps convince readers that your research will make a significant contribution to the problem area and discipline.

There is no one best way to organize the literature review. However you choose to structure the narrative of your analysis, remember to follow a logical path of presentation. You must make it easy for the reader to follow. To do so, group related topics together, separated by subheadings such as those used in this guide. Remember to synthesize and integrate your findings during the section and summarize the issues and your conclusions at the end.

Study Objectives

Another important element in the Introduction section is a definitive statement of the study's objectives. Study objectives usually begin with a statement of the problem, a discussion of the need for the project and the questions that the study is designed to answer, and the activities that will take place. The objective (or goal) is a statement of what you expect to determine from the findings. For example, in a research project to determine why a selected minority group exhibits disproportionately low citizen participation in municipal planning sessions, a study objective might be to identify what causal factors influence the group's involvement. The rationale for the researcher might be a need to create activities and programs designed to elicit greater group participation.

Research Design and Methodology

The research design and methods section describes the design or procedures you plan to follow in conducting your research. Methods might be surveys, interviews, library research, lab work, fieldwork, analysis of historical documents, analysis of physical artifacts, and many others. The underlying purpose of the methods section is to inform others how you plan to approach your research project. It must contain enough information to convince the reader that your methodology is sound and appropriate. This section, like the others, will vary with the type of study proposed. Some elements are more important for a quantitative study than they are for a qualitative project. For example, research in the sciences most often follows a quantitative design. Therefore, the proposal requires a detailed description of the proposed experiments, laboratory work, research subjects, data collection methods, and similar details. Such studies also require identification of the population from which the sample or samples will be drawn, sample size, sample elements, and related sample data.

Although much social science research continues to be quantitative, an increasing number of studies are following a qualitative approach. Proposals for qualitative studies also require a description of the sources and types of data to be collected, strategies and processes for data collection, and the techniques, if any, proposed for analysis of the collected data. Data collection tools, interview discussion guides, and other related information should also be described in the proposal. Some discussion of how quantitative and qualitative proposals differ is included in the following section.

References and/or Bibliography

The research proposal must include detailed bibliographic data for every source addressed in preparing for and writing the proposal. In addition, the bibliography may also include a list of all the resources the researcher plans to investigate during the conduct of the subsequent research. Sources are grouped according to whether they are primary or secondary, and in what form they exist. Primary sources are those from which the researcher collects the data firsthand. An example is persons to be interviewed. Secondary sources are those collected originally by others, such as journals, databases, and similar sources.

Public administration and nonprofit organization management disciplines tend to follow the American Psychology Association (APA) style more often than not, although it is a good idea to check with the sponsors of your research to determine which style they prefer. For example, the publisher of this text prefers to follow the current edition of the *Chicago Manual of Style.* Other commonly encountered styles include Harvard University's *A Uniform System of Citations*, a similar volume published by Columbia University, and the style recommended by the Modern Language Association (MLA).

Table 5.1

Differences in Preferences in Quantitative and Qualitative Research Proposals

	Quantitative Preferences	Qualitative Preferences
1.	Precise hypotheses and definitions stated at the outset	Hypotheses and definitions that emerge as the study develops
2.	Data reduced to numerical scores	Data as narrative descriptions
3.	Focus on assessing and improving reliability of scores obtained from instruments	Reliability of inferences is often assumed to be adequate
4.	Assessment of validity with reliance on statistical indices	Validity assessed through cross-checking sources of information (triangulation)
5.	Random selection of samples	Recruitment of expert informants for sample
6.	Precise description of procedures	Narrative/literary description of processes
7.	Statistical control of extraneous variables	Logical analysis in controlling or accounting for extraneous variables
8.	Specific design control for procedural bias (procedural and measurement integrity checks)	Reliance on researcher to deal with procedural bias (integrity checks are still critical)
9.	Statistical summary of results	Narrative summary of results
10.	Breaking down of complex phenomena into specific parts for analysis	Holistic description of complex phenomena
11.	Willingness to manipulate aspects, situations, or conditions in studying complex phenomena	Unwillingness to tamper with naturally occurring phenomena

Source: Kelley, Bennett, and Moore 2002.

The Finished Product

Writing any research proposal involves a number of important steps. How these steps are incorporated into a finished document that clearly communicates what the research intends to accomplish may vary somewhat depending upon the type of study envisioned. There are small but very real differences in the way quantitative research is structured and the format to be followed in qualitative research proposals. Quantitative studies follow a deductive approach, whereas qualitative studies tend to be more open-ended, suggesting a final design that evolves from the research itself. Qualitative studies, therefore, follow an inductive reasoning approach.

Despite the differences in emphasis, some common elements are found in each proposal type. Among these are: a statement of the problem, literature review, rationale for the study, design and methodology, and references or bibliography. Some of the differences in the two types of study proposals are discussed in the following paragraphs. In a presentation on preparing research proposals given at the 2002 Association for Childhood Education International (ACEI) annual conference, a number of points that differentiate between quantitative and qualitative proposals were identified (Table 5.1).

Table 5.2

Common Mistakes in Proposal Writing

1. Failure to provide the background necessary to frame the research question
2. Failure to delimit the boundary conditions for your research (proposing to do too much)
3. Failure to cite landmark research on the topic
4. Failure to accurately present the contributions made by earlier researchers
5. Failure to stay focused on the research question
6. Failure to develop a coherent and persuasive argument for the research
7. Too much detail on minor issues; not enough on major issues
8. Rambling—going on and on without a clear direction
9. Missing too many citations and having incorrect references
10. Proposal is too long or too short
11. Failure to follow APA style
12. Sloppy writing
13. Claiming the study is significant without demonstrating it
14. Claiming prior research was poor or inadequate without providing support
15. Stating the need for the research without substantiating your claims

Preparing a Quantitative Research Proposal

The design and methods section of a quantitative proposal generally includes a description of the subjects, instruments, procedures for collecting the data, data analysis, and design limitations, if any. Quantitative studies may be exploratory, descriptive, or causal. Exploratory projects are usually small-sample studies designed to produce insights and ideas for further research. Descriptive studies provide a descriptive snapshot of a sample at a particular time. Causal projects involve experimentation and are designed to measure relationships between independent and dependent variables.

The data analysis section identifies the statistical techniques to be used in data analysis. In this section, some proposal recommendations add a call for a statement of how the data are to be presented. Statistical tests should be identified for each research question and/or hypothesis, often with a rationale for selecting the particular test(s). Limitations of the design that should be noted include the scope of the study (research projects typically address one small part of a larger issue or problem), the overall design, and/or the methodology.

Preparing a Qualitative Research Proposal

Unlike proposals for quantitative research projects, qualitative research proposals are necessarily more tentative and open-ended. Often they must allow for a design and hypotheses that emerge from the research activity. The actual detail to be included in a qualitative study often depends on the amount of preliminary work done by the researcher prior to preparing the proposal.

The proposal must also identify the data collection methods proposed, with recognition that these might be changed under exigencies of the collection event. The limitations of the design notes the difficulties the research can identify in advance, the scope of the study, methodological limitations, and time/site limitations. Table 5.2 lists some of the common mistakes seen in research proposal writing.

Summary

Research proposals are the critical first step in all research activities. Too often, however, they are treated cavalierly and not given the attention they need to be successful. Research proposals are often rejected because the problem is too trivial or too broad to be meaningful. Another cause of rejection is the researcher's failure to clearly and cogently describe the methodology to be followed.

Proposals serve several different purposes. First, they show that the researcher is competent to carry out the project, that the research is important and should be done, and that it is connected to prior research in its issues and methods. Research proposals should include a statement of the problem, the significance of the study, a review of the relevant literature, and a statement of the research questions and hypotheses. Quantitative proposals usually identify the population, sample selection, subjects, instruments, data gathering and analysis procedures, and references. Qualitative proposals are more tentative, with the design often emerging from the research activity. However, they should also state the selection of the case or cases and how and why they were selected.

Discussion Questions

1. In your own words, explain why a researcher should prepare a research proposal before embarking on a research project.
2. Why did the National Science Foundation conclude that graduate students have received little in the way of instruction in how to write a research proposal?
3. What recommendations would you make to your professors to improve the amount and/or quality of instruction in research method?
4. What are the major topics that should be in all research proposals?
5. What are some of the benefits of doing a comprehensive literature review?
6. Discuss the list of mistakes commonly found in research proposals with a fellow student to be sure you both understand how to make sure they don't happen to you.
7. What is APA style and why should you know how to use it?
8. Why is it important to use a recognized style for citations and references?

Additional Reading

California State University–Sacramento. 2005. *Research and Sponsored Projects: Proposal Development Handbook*. www.csus.edu.rsp/Chapter6.htm.

Kelley, Michael F., Linda Bennett, and Lin Moore. 2002. "Preparing High Quality Research Proposals for ACEI." Paper presented at the 2002 annual conference in San Diego, CA: Association for Childhood Education International.

Ogden, Thomas E., and Israel A. Goldberg. 2002. *Research Proposals: A Guide to Success.* San Diego, CA: Academic Press.

Paxton, Patsy, and Stephen J. Cox. 2000. "Preparing Research Proposals." New Zealand. www.wintec.ac.nz/files/research%20connections/PreparingResearchProposals.doc.

Wasby, Stephen L. 2001. "Proposal Writing. A Remedy for a Missing Part of Graduate Training." *PS: Political Science and Politics* 34 (2) (June), 309–312.

6 The Legal and Ethical Environment of Research

All science, including political science, is increasingly subject to the influence of uncontrollable forces emanating from the political and ethical environments. Government legislators and administrators, the popular press, the general public, and a growing number of crusading social scientists are alike in their increasingly justified calls for moral reform in research, passage of ethics laws and codes, and greater education and training in ethical behavior for scientists working in all disciplines. Calls for ethics reform have been directed at every level of government, from the Office of the President of the United States to the smallest local special service district.

Ethical problems in government run the gamut from sexual harassment to embezzlement of millions of dollars. And when they happen, they are loudly pointed out by the press as examples of the poor quality of public servants in general. Citing a Gallup Poll, *USA Today* reporter Karen Peterson (2001) wrote that, for only the second time in half a century, ethics and morality are near the top of a list of the major problems that people believe are facing the nation. Gallup reported that 78 percent of the public feels that the nation's moral values are somewhat or very weak.

Those are not isolated, seldom-seen instances; nor is the problem a new one. The behavior of researchers in political science has long been affected by ethics as well as politics (Rohr 1998). The problem of unethical behavior by researchers became a particularly important political issue for Congress in the last decades of the 1900s. According to LaFollette (1994, 264), scientists had "forged data, falsified experiments, and plagiarized before that time, but scientists and politicians alike had treated such behavior as isolated, deviant, irrelevant, or unrepresentative of normal science, and the news media only paid temporary attention when new cases were developed."

According to one widely cited author on the topic, Terry Cooper (1998), interest in political ethics appears to have mushroomed. This has resulted in a growing demand for in-service training, publication of many ethics articles, and professional conferences devoted solely to ethics problems in government. In addition, political science undergraduate and graduate education programs are requiring students to successfully complete a course in ethical behavior. This heightened interest in ethics has also included the practice of research. Every aspect of political research and analysis involves ethics (J. Mitchell 1998). Jerry Mitchell included most types of research in his analysis, including "pure" social science, as well as more "applied" studies such as policy analyses, and program evaluations. He considerd ethics to be an issue whether research is conducted to describe problems, predict outcomes, evaluate solutions, or measure agency performance.

The American Political Science Association (APSA) actively works to strengthen regulations dealing with research. For example, in 2001 the Consortium of Social Science Associations, to which APSA belongs, joined with other organizations to form a new research-accrediting group, the

Association for the Accreditation of Human Research Protection Programs (AAHRPP). This group is expected to play a major role in improving the system of protection for human subjects.

But ethics is more than protecting human subjects; there are many ways to define this value-laden term. The next section discusses several of the approaches to defining ethics.

The Meaning of Ethics

Ethics, a branch of philosophy, is the study of the *moral* behavior of humans in society. It has been further defined as the set of principles that govern the conduct of an individual or a group of persons, and briefly as the study of morality or moral behavior (Velasquez 1998). *Morality* refers to the standards that people have about what is right, what is wrong, what is good, and what is evil; these standards are the behavior norms of a society. *Moral behavior* is acting in ways that follow the moral standards that exist in society. *Moral standards* are the rules by which a society functions. Examples of moral standards include the moral commandments: *Do not kill*, *Do not steal*, *Do not lie*, etc. Standards are about what behavior is acceptable, what is "right" and what is "good" in society, and their opposites, of course. While moral standards often differ from time to time, they remain relatively constant for at least a generation or more. When they do change, they tend to do so very slowly.

What is meant by behavior that is *unethical?* In the specific sense of scientific research it refers to the concept of *scientific misconduct.* Misconduct "encompasses acts of deception—alteration of data or materials, false representation of authorship or originality, and misrepresentation to advance oneself or to hurt the career or position of another" (Fox and Braxton 1994, 374). Behavior that is ethical, on the other hand, is behavior that reflects the moral standards of a society.

Scientific research of all types is beset with ethical dilemmas, paradoxes, and ambiguities (de Laine 2000). This is particularly true when research involves potential physical or mental harm to human subjects, and when the research is conducted in social settings, as the following statement suggests:

> Ethical and moral dilemmas are an occupational work hazard of fieldwork that the researcher cannot plan for, but nonetheless must be addressed on the spot, by drawing on the values, ideals, ethical codes, moral and professional standards, intuition and emotions. (de Laine 2000, 6).

Ethicists have identified a number of different theoretical foundations for the values, ideals, ethical codes, and moral standards that researchers draw upon when faced with these dilemmas. Examples of the types of events that trigger ethical conflicts include the following behaviors cited by LaFollette (1994) who considered them to be the cause of the increased oversight activity of Congress over the last two decades:

> The behavior in question ranged from fabrication of data, falsified experiments, or faked specimens and artifacts, to the deliberate misrepresentation or altering of data and theft of ideas from research proposals and published articles. Congressional attention concentrated on unethical or illegal activities that took place during the process of proposing, conducting, or communicating federally funded research in the biological, physical, and behavioral sciences [including political science], mathematics, and engineering. (LaFollette 1994, 270)

The Office of Research Integrity (ORI) is one of the agencies established by Congress to monitor research fraud. The agency came up with a list of fourteen ethical topics with applicability to research. The topics were grouped under three headings: (1) the research community, (2) professional development, and (3) the research process. The five subgroups in the research process category concerned data management, publication of findings, authorship, peer review, and research misconduct specifically. A partial list of the topics under research misconduct includes the following (ORI 2005, 5):

- What factors affect the detection of research misconduct?
- What factors discourage the reporting of research misconduct?
- What factors motivate individuals to commit research misconduct?
- What happens to whistle-blowers?

How Can You Know Which Is the Right Decision?

These principles of ethics may help guide the researcher when preparing, conducting, and reporting the results of research studies. Some of the principles have resulted in laws that define specifically what a researcher can and cannot do. However, it is not enough to simply do what is legal; researchers have a *moral responsibility* that goes far beyond adhering to the letter of the law. Because there is no one comprehensive moral theory that is capable of stating exactly when a utilitarian consideration should take precedent over a right, a standard of justice, or the need for caring, the political science researcher is forced to "follow his or her conscience" when faced with an ethical dilemma.

Ethical dilemmas that cause the most difficulty for researchers in political science are not those associated which what Orlans (1967) described as outright "knavery—lying, bad faith, conscious misrepresentation to get money, or the deliberate breach of the terms on which it was obtained (i.e, research grants)." Those are practical problems of a legal nature rather than problems of ethics. Instead, he considered the following issues to be the most problematic:

> The persistent ethical dilemmas in . . . research are those in which the right course of action is *not* clear, in which honorable [researchers] may differ and no consistent rule obtains; they involve issues in [which] what is reasonable to one [person] is ignoble to another; in which honesty must be reconciled with tact and effectiveness; in which the disinterested pursuit of innocent truth can abet the interested selection of useful knowledge; in which the judgment of the pragmatic [person] of affairs confronts that of the academic moralist. (Orlans 1967, 4)

Five Important Research Problem Areas

Reynolds (1979, 43) identified five problem areas where ethical dilemmas occur most often in research:

1. *Research program effects*—the positive and negative effects of an overall research program
2. *Research project effects*—the positive and negative effects that result from a specific research project
3. *Participation effects*—how participation in the research project will affect each participant
4. *Overall distribution effects*—how the key positive and negative effects of research are distributed evenly among different social groups (stakeholders)

5. *Consideration of participants' rights and welfare*—the features of the research program and project that ensure that the rights and welfare of participants are, or will be respected

Because research projects are carried out for all levels and functions of government, the ethical conduct of research is extremely important. Researchers have dual responsibilities. First, their research must be done in an ethically correct manner, particularly so when working with human subjects. In addition, the sponsoring agency has a moral obligation to be honest and complete, and to support ethical methodological choices. Morality, political science functions, and research ethics are closely interconnected.

Research Ethics

Research ethics refers to the application of moral standards to decisions made in planning, conducting, and reporting the results of research studies. The fundamental moral standards involved are those that focus on what is right and what is wrong. Beyond this, however, Jerry Mitchell (1998) identified the following four practical ethical principles that shape morality in political research: *truthfulness*, *thoroughness*, *objectivity*, and *relevance.*

The *truthfulness principle* means that it is unethical for researchers to purposefully lie, deceive, or in any way employ fraud. Deliberately misrepresenting the purpose of a study, not informing subjects of the dangers of participation, hiding the identity of the sponsor of the study, or inflating or understating the findings of a research project are all examples of research that fails the truthfulness principle.

Despite the belief that truthfulness is a fundamental standard for all human endeavors, it sometimes gets sacrificed to expediency in certain research applications. When it does, a rationale for not telling the truth is usually provided. For example, some researchers believe that certain research could not be conducted without deception of some sort. They believe that disclosing the true sponsor of a study will unnecessarily bias the findings. Researchers who use deception use two arguments to justify their actions: (1) they assume that participants will not suffer any physical or mental harm as a result of the deception, and (2) they take the responsibility of informing the participants about the deception after the research study is completed (Zikmund 1994).

The *thoroughness principle* demands that researchers not cut corners in their designs. This means being methodologically thorough (Jerry Mitchell 1998, 312). It means "doing good science" by following all steps in a study. Researchers are morally obligated to include the following in their study reports:

1. Definitions for all key concepts used in the study
2. Selection of appropriate samples or group participants, including full descriptions
3. Identification of all limitations of the research design
4. A description of the analysis design

Furthermore, remaining methodologically thorough means that all results and findings are reported—good news and bad. It means guaranteeing that participants will be neither physically harmed nor emotionally distressed. Thoroughness is not a simple concept, however, and can cause a great deal of difficulty for a researcher. Jerry Mitchell (1998, 313) summarized this difficulty in the following way: "In short, thoroughness is evidently at the core of methodology; the ethical problem is defining exactly what thoroughness means in the actual conduct of research."

The *objectivity principle* refers to the need for the researcher to remain objective and impartial throughout all aspects of the study. The researcher should never interject his or her own personal feelings or biases into the design of a study, selection of participants, writing and/or asking of questions, or interpreting results. "Doing good science" means that the researcher does not bias the study in any way. This means using probability methods to select a sample, wording questions is such a way as to avoid any hint of leading the subject to give a desired answer, and not allowing one's own values to color the results.

Not all researchers believe that remaining neutral is the proper role for a researcher to take in conducting research for public organizations. Some say that it is impossible to do so. These researchers object to the positivist philosophy of science and instead purposefully place themselves as one with the study participants. These researchers follow a postpositivist approach and employ such qualitative methods as ethnography, case analysis, grounded theory, and action or participatory research methods.

The final ethical research principle discussed by Mitchell is *relevance.* Research should never be frivolous, or done because the researcher "has an axe to grind" and wants the study done to punish the persons or groups involved in the subject organization. According to Mitchell, in a democracy, research has a moral responsibility to be understandable to people and useful. Research that fails this test can be open to ridicule and worse. One example was a $27,000 study to determine why inmates want to escape from prison (TFCS 2001). The phrase, "it if sounds ridiculous, people will think it is" applies to all research. Kumar (1996, 192) has summarized the need for relevance in the following way: "If you cannot justify the relevance of the research you are conducting, you are wasting your respondents' time, which is unethical."

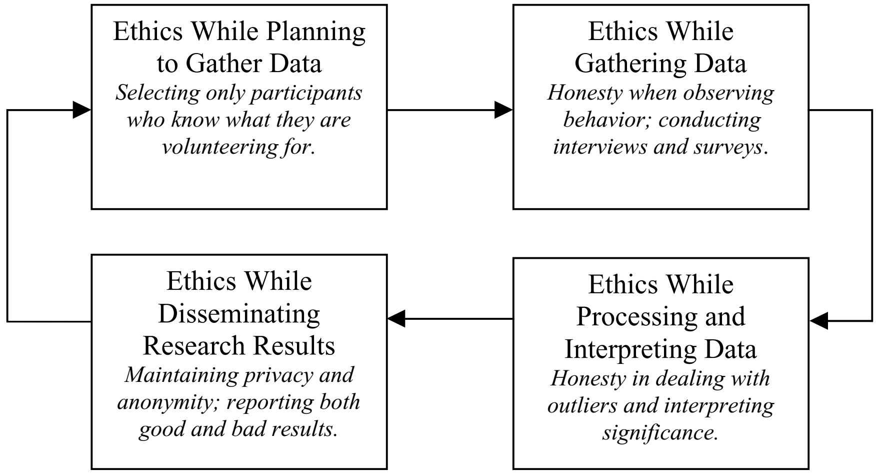
Hardwig (1991) has made the valid point that, today, teams of scientists conduct most research. The body of knowledge in most disciplines has grown so great and is evolving so rapidly that it has become increasingly difficult for any one investigator to have a complete grasp of everything going on in his or her discipline. This fact has contributed to the potential for scientific fraud. Although Hardwig was talking about research in the natural sciences, his warning applies equally to researchers in the social sciences as well:

> [R]esearch is increasingly done by teams because no one knows enough to be able to do the experiment by herself. Increasingly, no one could know enough—sheer limitations of intellect prohibit it. The cooperation of researchers from different specializations and the resulting division of cognitive labor are, consequently, often unavoidable if an experiment is to be done at all. . . . Specialization and teamwork are thus inescapable features of much modern knowledge acquisition. (Hardwig 1991, 695–96)

The Nuremberg Code

The acceptance of ethical standards as a guiding principle for all research with human subjects is based upon decisions made during the Nuremberg Military Tribunal on Nazi war crimes held after the end of World War II. The standards that emerged from those trials resulted in adoption of what is known as the Nuremberg Code (Neuman 2000; Neef, Iwata, and Page 1986). Although originally applied to medical experiments only, the principles in the code are today used in all research involving human subjects, including the social and administrative research employed in political science. Included in the code are the following principles:

Figure 6.1 **The All-Pervasive Nature of Ethics in Research**



1. The requirement for informed, voluntary consent
2. No unnecessary physical or mental suffering
3. No experiments where death or disabling is likely
4. Ending the research if continuation will cause injury or death
5. Experiments should be conducted only by highly qualified researchers
6. Results should be for the good of society and unattainable by any other method

Political science researchers are most concerned with ethics at four times in the research process: (1) when they are planning to gather data, (2) while they are gathering data, (3) when they are processing and interpreting data, and (4) when they are disseminating the results of their research (Figure 6.1).

Ethics When Planning Research

A key activity in planning a research project is deciding who will participate in the study. Use of the proper sampling design is a critical decision factor in planning a design. In all designs, special care must be taken to ensure that participants voluntarily agree to participate, that their privacy is protected, and that they are not physically or mentally harmed in any way.

When researchers follow a positivist (or quantitative) research approach, they often use the information gathered from a representative *sample* drawn from a larger *population* to imply or infer that the results apply to the larger body as well. Samples can be one of two basic types (with many variations): *probability* or *nonprobability.* Both have a place in research, but they are not interchangeable. In a probability sample, all participants have an equal or known chance at being selected for the study. This is not the case with a nonprobability sample, where participants are usually selected for the convenience of the researcher or simply to fill a quota. Therefore, the results of a nonprobability sample study should not be used for inference; it is unethical to do so.

The following six questions must be answered before involving a subject in a study; they must be addressed in the planning stage of the project.

1. Has the participant given his or her *informed consent* to be included in the study?
2. Has the subject *voluntarily agreed* to participate, or has some form of coercion been used to force the subject's participation?
3. Have subjects been *fully informed* of their right not to participate, and of any risks and/or benefits that might accrue from the study?
4. Will the subject be *harmed, either physically or mentally,* in any way as a result of participation in the study?
5. Is it necessary to use *deception*, to disguise the research, or use covert research methods in order to collect the data?
6. Will a jury of external professional peers *validate* the study?

Informed Consent. The idea of "informed consent" is based upon Western society's ideas of individual freedom and self-determination, as spelled out in the body of common law (Neef, Iwata, and Page 1986). A person's right to be free from intrusion by others is supported by a number of court decisions, among them the 1973 *Roe v. Wade* decision. From this and other court actions, the following components of informed consent have been of particular interest:

- The capacity of the person to consent to participation,
- The free and voluntary giving of consent, and
- Consent that is based upon subjects' knowledge of the research and possible outcomes.

Courts have held that the capacity to consent requires that the person giving consent knowingly and rationally understand the nature of the experiment or study, any associated risk, and other relevant information. At the same time, researchers are not permitted to decide whether the subject is competent enough to make the decision; all people retain the right to manage their own affairs.

In research involving children, parents have traditionally been allow to give consent on their behalf, but Neef, Iwata, and Page (1986) note that the courts have not always accepted that as a right. Therefore, researchers are advised to acquire the consent of parents and the child, as well as that of relevant organizations (such as schools).

Voluntary Consent. There are two aspects to the concept of voluntary consent. First, the agreement must be entirely free of any coercion. Second, the subject must understand that the consent can be withdrawn at any time without harmful consequence (Neef, Iwata, and Page 1986). Often, academic researchers use the students in their classes as participants in research studies. Students are not required to participate and must know that their standing in the class will not suffer as a result of their not participating.

Knowledgeable Consent. All potential research participants must be made aware of all aspects of the study. This means that they must be told of their rights to (1) not participate, (2) withdraw at any time, as well as (3) what risks might be involved, and (4) the potential benefits of the study, if any. If the study is a medical experiment, they must also know the risks and benefits of any alternative treatments.

Freedom from Harm. A fundamental ethical principle that must be followed in all research studies is that no harm shall befall the participants as a result of their participation in the research. *Harm* is broadly defined; for example, it can mean physical, cultural, social, or psychological distress as well as physical pain (Neuman 2000; Oppenheim 1992).

Ethics When Gathering Data

Kumar (1996) identified five key points in the research when an ethical concern for respondents is particularly important: (1) when seeking consent from the subject, (2) when providing incentives to participate, if any, (3) when seeking sensitive information or information that might embarrass or otherwise cause discomfort to the subject, (4) when there is a possibility of causing harm, and (5) while maintaining confidentiality for the respondent.

A number of ethical issues come into play when conducting interviews or writing questionnaires. The ethics of data gathering in all forms continue to raise controversial questions among researchers (Oppenheim 1992). The two problems that cause most difficulty are the potential for *bias* on the part of the interviewer or in the wording of the question, and the *response distortion* that such biases can cause. Most researchers concede that it is impossible to eliminate all interviewer bias; conscientious training of interviewers is the only way to reduce it.

Ethics in Processing and Interpreting Data

Researchers are sometimes asked to conduct a research study and analyze the collected data in order provide "scientific credence" to pre-established conclusions—in other words, to perform research to justify decisions or opinions after they are made. Researchers have also been asked to compromise their ethical standards as a condition for receiving a contract to conduct research. Both of these situations present ethical dilemmas. The researcher has three options in these situations (Neuman 2000): One, the researcher may feel that loyalty to an employer or group overrides any ethical considerations and quietly go along with the request. Two, the researcher may publicly oppose the request, making the opposition a part of the public record. This places the researcher in the role of a *whistle-blower*, and could result in loss of credibility in the agency, elimination of future research opportunities, or even loss of a job. Three, he or she can simply refuse to make compromises and walk away from the request, aware that another researcher might be found to do the work.

Making the "right" moral decision in such situations is not an easy choice. Opting for the first path may not only cause the researcher undue personal stress, it could also open the door to criminal prosecution. On the other hand, refusing to go along with the request opens the researcher to accusations of disloyalty to the organization and disregard for the well-being of fellow workers.

Ethicists often encourage selecting the path of the whistle-blower; it is clearly the "most moral" of the three options. However, whistle-blowers are seldom rewarded for their willingness to publicize unethical activity. The whistle-blower must be in a position to prove his or her allegations in a court of law, where deliberations could take years to complete. In the intervening time, the whistle-blower is often ostracized by fellow workers, removed from any meaningful work in the organization, eliminated from potential promotion, and ultimately forced to suffer loss of a job. The popular press has aired many reports of whistle-blowers who have not only lost their job, but their home and other possessions as well. It takes a brave person to adopt this role; thankfully, many still do.

Refusing to do the study may be the easiest way out of the dilemma. If morality can exist on a continuum, this path is less immoral than going along with the request and less moral than publicly disclosing the request. This does not mean to imply that it is an easy solution. Choosing not to do the research may mean loss of income or professional standing. On the other hand, complying with the request because someone else will do it anyway is never an acceptable justification. In discussing the conflict that often arises in such situations, Neuman (2000, 103) concluded:

"Whatever the situation, unethical behavior is never justified by the argument: 'If I didn't do it, someone else would have.'"

Ethics in Disseminating Research Results

Researchers are faced with two broad classes of ethical considerations when communicating their findings. The first includes issues that come into play with the distribution and/or publication of findings. The second centers on obligations to protect the privacy of research participants.

Researchers must consider the following when communicating the results of their research: (1) whether to tell the entire story rather than just a few significant portions; (2) presenting insignificant, adverse, or negative findings; and (3) contributing to the general storehouse of disciplinary knowledge. Telling the entire story relates to the idea of methodological completeness discussed earlier. The obligation to include findings that reflect negatively on the sponsoring agency, the research method, or the researchers themselves is based on the ethical standard of honesty. Telling only part of the truth is little different than not telling the truth at all. Contributing to knowledge in the field refers to researchers' obligation to the ethos of the profession, both as administrators and as researchers.

In addition to the ethical obligation to be truthful when preparing a research report, the researcher must also protect the rights of participants. Three participant ethics issues are of particular importance when disseminating the results of a research study: (1) protecting the privacy of participants, (2) ensuring the anonymity of participants, and (3) respecting the confidentiality of individuals involved in the study.

An integral part of every study is, or should be, a description of the sample participants. This description should always be done in the aggregate, focusing on characteristics of the group, such as measures of central tendency, variation, and the like. The results of any single participant should never be made known, except in interpretive studies, which can focus on a single case. The confidentiality standard means that no one other than the primary researcher should know the names and addresses of sample members. This means making a single list, kept only by the principal researcher.

Researchers also have a moral obligation to avoid reporting incomplete research results, issuing misleading reports, and issuing biased reports (Malhotra 1999). Incomplete reports are more likely to be disseminated when the researcher uncovers adverse or negative information. Misleading results are released to intentionally sway an audience, even if they are not an actual lie.

Summary

The potential for unethical behavior is a universal problem; it affects academic political scientists and those working as administrators at all levels of government and non-governmental organizations. Political scientists, elected officials, public administrators, and the popular press have called for moral reform, passage of ethics laws and codes, and greater education and training in ethical behavior for everyone involved in science and in politics. These have been directed at every level of government, from the Office of the President of the United States to the smallest local special service district.

Ethics, a branch of philosophy, is the study of the *moral* behavior of humans in society. *Morality* refers to the standards that people have about what is right, what is wrong, what is good, or what is evil. *Moral behavior* means acting in ways that follow the moral standards that exist in society. *Moral standards* are the rules by which a society functions.

Research ethics refers to the application of moral standards to decisions made in planning, conducting, and reporting the results of research studies. The fundamental moral standards involved are those that focus on what is right and what is wrong. Four additional practical ethical principles shape morality in political science research: *truthfulness*, *thoroughness*, *objectivity*, and *relevance.*

Principles found in the Nuremberg Code are today used in all research that involves human subjects, including the social and administrative research employed in political science. The key clauses of the code deal with rules for ensuring that participants have the right to not participate, that they are informed of all risks, and that they will not be intentionally physically or mentally harmed.

Political science researchers are particularly concerned with ethics at four times in the research process: (1) when they are planning to gather data, (2) while they are gathering data, (3) when they are processing and interpreting data, and (4) when they are disseminating the results of their research.

Discussion Questions

1. What are ethics? What are research ethics?
2. What are the sources of our moral standards?
3. What are some the reasons for malfeasance in government?
4. Why has a large segment of the population lost faith in the morality of many elected and appointed public officials?
5. What is the cause of the precipitous drop in the public's trust in government?
6. How can you explain the growth in the incidence of lapsed morals among leaders in business, nonprofit organizations, and in government?
7. How would you incorporate protection for human subjects in a research project in which you plan to interview children between the ages of 10 and 13?
8. Does asking people how they voted in the last election constitute a breach of research ethics? Would it be important to include provision for the protection of human subjects in such a study?

Additional Reading

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Part 2

Quantitative Research Approaches and Methods

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7 Introduction to Quantitative Methods

An underlying objective of much research in political science is to uncover information needed to expand and improve the level of awareness and understanding of one or more political phenomena. Although they generally narrow their focus to more specific areas of interest, such as political theory, American government, international relations, or public policy, political scientists employ methods and techniques that are common to all the social sciences.

In designing a research study, political scientists must establish priorities, identify alternatives and choose options, set and manage budgets, and often hire, motivate, and, when necessary, fire research assistants. They receive, give, or pass on instructions, develop and write research plans with objectives and strategies, monitor their staff's performance, and keep higher-level administrators and funding bodies informed about their progress toward achieving their research objectives. In turn, higher-level administrators are often called upon to communicate to internal and external stakeholders the progress of the researcher in their units.

In every one of these tasks, political scientists and administrators make decisions. In doing so, they compare two or more alternatives, weigh the costs and benefits of each, and then select and implement the better alternative. To improve the quality of their decisions, administrators must thoroughly understand the processes involved in conducting research.

To make effective decisions, political scientists and public administrators use quantitative research methods to produce information that has the potential for improving the quality of those decisions. Often, using numbers with words makes communicating easier, faster, and far more effective than the use of words alone.

To understand the use and meaning of statistics and statistical methods, it is necessary to first understand the nature of measurements. Therefore, this chapter begins with a discussion of the four types of measurements. The next several chapters illustrate how these different types of measurements are applied in quantitative research designs. The material focuses on how to *use* statistical methods and *interpret* statistical information, rather than on the theoretical side of statistical analysis. The purpose of this chapter is to help researchers and those involved in approving, funding, monitoring, or evaluating research in political science.

Fundamentals of Measurement

The key to ensuring that everyone who reads a research report understands the measurements lies in the consistent use of the measurement scale appropriate for the task at hand. In the following discussion the term *data* refers to the numbers (i.e., values) that signify some variable measurements. Variables are things that can be counted or measured, and different values of a variable can convey different meanings. Helping to establish and maintain this meaning is the nature of the measurement used to collect the data. Measurements can be one of four types or levels.

The four different types or levels of measurement in political science research are: (1) nominal, (2) ordinal, (3) interval, and (4) ratio. The label *scales* is sometimes used to mean both the measurement tools used to collect data and the data themselves. Statisticians have developed different statistical tests to analyze data of each different data or scale type. In differentiating between the data types, each level or type must meet one or more rules. Moving beyond the lowest or the "least powerful" of the four scales in terms of meaning that can be conveyed toward higher level or more powerful scales, the preceding rules must also apply to each higher-level measurement. Thus, one rule applies to the lowest level, two rules to the next highest, three rules for the next, and four rules for the highest-level data.

Nominal Data

Nominal data, the least powerful of the four types of data, must comply with just one rule. This rule states that *different numbers must mean different things.* Thus, a nominal scale, as the term implies, is simply a *naming* or classification scale. For example, for a question in which voters are asked to name the party they prefer, the number 1 might be used to refer to Democrats; the number 2 used to refer to Republicans; and the number 3 to refer to Independents. With nominal data, the differences in categories to which a number is assigned are qualitative differences; this means the number is subjectively assigned to one category in a class that contains more than one category. Tabulating responses to the party preference question will entail counting how many 1s, how many 2s, and how many 3s occur in the sample.

With nominal-level data, numbers or labels are used only to differentiate between things. The numbers or labels serve no other purpose or function and supply no additional information. Furthermore, once a number has been assigned to a given category in a variable, all other items with the same characteristics in that variable must belong to the same category or group; that number will always mean that attribute and only that attribute. The same numbers can, of course, be used to mean something entirely different when used in a new variable. Examples of nominal or categorical scales include the following:

1. The values of '1' and '2' arbitrarily assigned to the categories of female and male.
2. The values '0' and '1' assigned to service user and nonuser groups.
3. Numbers used to denote different types of occupations, political party membership, class in college (freshman, sophomore, etc.), newspapers, or magazines read.
4. The counts of the number of times a head comes up when a coin is tossed.

Ordinal Data

An *ordinal* scale of measurement supplies more information than a nominal scale; two rules apply as opposed to just one with nominal data. The nominal scale rule, different numbers mean different things, must first be passed. But the second rule—*the things being measured can be ranked or ordered along some dimension*—must also apply. With ordinal data (often simply referred to as *ranked* data), the differences between measures are *quantitative* rather than just qualitative. When things are ordered, they are arranged in some logical sequence—they may have more or less of a particular characteristic than others in the set. The primary limitation that exists with ordinal measurements is that the numbers never state precisely *how much* difference exists in the sets of two or more collections of data; we know only that "more" or " less" of something is communicated by these numbers. We do not *how much* more or less, however.

A typical use for ordinal scales is to measure people's preferences or rankings for services or things. Much of the opinion data collected by political scientists are based upon ordinal scales. Examples include surveys of issue awareness, policy preferences, and preference rankings for political candidates. For example, a survey question in which subjects are asked to state their preference for a policy issue might have five possible answers: Strongly approve, approve, neither approve nor disapprove, do not approve, and strongly do not approve. A value is assigned to each possible answer. The responses of all members of the sample are then counted. The counts are considered ordinal because there is an implied rank order to the possible responses, even though it is impossible to know the extent of the differences between each value.

Interval Data

The third class of measurement data is *equidistant interval*—more commonly referred to simply as *interval.* To qualify as an interval scale, the measurements must now pass three tests. First, the different numbers must mean different things. Second, the things measured can be ranked or ordered on some appropriate dimension. The third—the most important rule—is that *the differences between adjacent levels on the scale are* (or are assumed to be) *equal.*

With interval data, in addition to determining that one scale item falls above or below another, it is now possible to determine "exactly" *how much* one item differs from another. The differences between levels on the scale can be any size. The zero point on the scale can be set anywhere on the scale that the researcher wants it to be. The key requirement is that a single-unit change *always* measures the same amount of change in whatever is being measured. The unit gradations within the scale may be as broad or as fine as need be.

Measuring temperature using the Fahrenheit scale is a good example of interval scale data. Fahrenheit scales have a zero point, but it is no more important that any other number on the scale. Others examples are grade-point averages, dimensions, and IQ scores. Attitude scales using different levels of agreement are assumed to provide interval level data. This makes attitude scales a highly desired measurement tool for all social and administrative science researchers. Interval scales provide more information than either nominal or ordinal scales because of the equal distance between measurement points.

There are, however, still limitations to the information provided by interval data. For example, because the zero point is set arbitrarily, it is not possible to say that one measure is exactly twice as great as or smaller than another. We cannot say that 100 degrees Fahrenheit is exactly twice as warm as 50 degrees; nor that 35 degrees is half as warm as 70 degrees. Nor can we say that "Strongly Agree" is twice as strong a response as its neighbor, "Agree." We can only say that the differences between single points on the scale are equal. We must turn to the fourth level, ratio scales, to make such qualifying statements.

Ratio Data

As with the other three scales or data types, lower-level rules also apply to *ratio* scales. Different numbers must still mean different things; the data can still be ranked or ordered on some dimension; and the intervals between adjacent points are of equal value. The ratio-required fourth rule is that *the measurement scale has an absolute or fixed zero point*—even if it is not used in the specific range of items being measured.

Examples of ratio scales are time, distance, mass, and various combinations of these; units sold; number of purchasers; and temperature according to the Celsius scale. In applications of statistics in political science research, the distinction between interval and ratio is of little practical value. The same statistical tests can be used for either data type; they are also interpreted in the same manner. As a result, statistical software packages like the Statistical Package for the Social Sciences (SPSS) have combined the two into a single category called *scale data*, which includes statistical tests for both interval and ratio data.

Issues of Reliability and Validity

Whenever designing a research study that involves measuring any element or concept, researchers must pay particular attention to ensure that (1) they are measuring what they intended to measure; and (2) that every time they measure the concept, the scale they use produces consistent results. The first of these issues is a matter of *reliability*; the second is one of *validity.* Reliability refers to the concept that a measurement (such as a question in a survey) consistently measures the same thing; this is particularly important when dealing with measures of attitudes, opinions, and values. This stability of the measurement procedure is a major concern in longitudinal research designs.

Validity refers to the degree to which the measurement measures what it is intended to measure. Researchers are concerned with two types of validity: *internal* and *external.* Internal validity refers to the degree to which the measurement instrument (such as a question in a questionnaire) yields the same results for all cases in the study. This does not mean all answers must be the same. Rather, it means that every response relates to a question with the same meaning. External validity relates to the *inferential* quality of the measurement or the study—do the results apply to all similar cases that satisfy the same conditions outlined in the study question and design? Probability measures help answer this question with quantitative studies; careful scale construction, sample selection, and interpretation help provide some assurance of validity in qualitative studies.

Defining Statistics

The term *statistics* is used in a number of different ways. First, it is used to refer to the numerical data in a report. Examples include such things as the number of elections a person votes in over a five-year period, the number of hours worked on political campaigns, or the number of environmental bills supported by a legislator or a group of legislators. It can refer to earnings, costs per unit of municipal refuse trucks, turnover rates among congressional aides, performance ratios, age and gender of citizens in the community, and so forth. The term *statistics* is also used to define the many mathematical techniques and procedures used for collecting, describing, analyzing, and interpreting data.

Statistical processes can include simple counts of events or the determination of the central values of a group of counts. It can include conducting hypothesis tests or determining relationships between two variables. In summary, statistics may be considered as both *numerical data* and the variety of *tools* or techniques that administrators and researchers use to process raw data to make it more meaningful.

Important Terms and Concepts

Like every discipline or management function, a variety of concepts and terms not part of our common language experience are to be found in the study of management statistics. Definitions for some of these concepts are:

- *Descriptive statistics:* Measurements or numbers used to summarize or describe data sets.
- *Inferential statistics:* Statistical techniques used to make estimates or inferences about the characteristics of interest for a population using the data from a sample data set.
- *Sample:* A portion of a population. The sample is chosen as representative of the entire population.
- *Population:* The set of all elements for which measurements are possible. A population can consist of products, workers, customers, firms, prices, etc., about which the decision maker or manager is interested. Another word used to identify a population is *universe.*
- *Statistic:* A number used as a summary measure for a sample. For example, "The mean age for the 20 students in the sample is 20.3 years."
- *Parameter:* A numerical value used as a summary measure for a population or universe. For example, in the statement "The mean age for all entering college or university freshmen is 19.1 years," the age of all entering freshmen is a *parameter.*
- *Variable:* A characteristic or quantity that can have different values. Examples include such things as saving account amounts, stock prices, package designs, weight, monthly sales, gender, salaries, etc. The values of variables may be said to be either *continuous* or *discrete.*
- *Continuous variables:* Quantities that are measured, such as weight or percentage of increase in the price of a stock, are said to be continuous. Values for continuous variables can be measured on a continuous scale, such as weight, and are not restricted to specific, discrete categories or values.
- *Discrete variables:* Discrete variables have values that can vary only in specific steps or categories (they are sometimes called categorical). Assuming that we assign in advance the value of '1' for female and '2' for male, the variable *gender* is an example of a discrete variable.
- *Univariate statistics:* Univariate statistics are the statistics describing a single variable. They include such measures as the valid number of responses (frequencies); the mean, median, and mode; and standard deviation.
- *Bivariate statistics:* These are measurements with which *two* variables are described or compared at the same time. A cross tabulation table is an example of bivariate statistics in use. Counts, percentages, correlations, difference tests, and many other statistical tests can be carried out with bivariate statistics.
- *Multivariate statistics:* Multivariate statistics, such as *multiple regression analysis*, are statistics used when more than one *independent* variable influences one *dependent* variable. For example, votes for a candidate are probably influenced by aesthetics, age, experience, and advertising.

Statistics vs. Measurements

Statistics is the collective term used to denote the numbers used to communicate the *measurements* of something. The measurements of a particular *sample* are typically drawn from a larger body. The larger group is called the *population* or *universe.* As we have seen, only the numerical values that apply to the sample are known as "statistics," whereas the values of the population are known as "parameters." In learning about applying statistics to political science situations, this difference is seldom a problem; managers rarely deal with entire populations.

Measurement is the term used to refer to numbers read from some type of scale. The scale can be numerical or qualitative. The numerical values encountered in statistics are typically based upon some verbal scale or other measuring device, such as measuring the likelihood of a citizen's voting in the next election on a scale with various levels of likelihood. This type of scale can have a set number of possible answers, as with a five-point scale—or it can be a nonfixed point between poles on a continuum. With such measurement or recording devices, the numbers are arranged according to some meaningful scale that has been determined to be appropriate by the person or persons reading the scale.

Categories of Statistics

Statistics can be categorized in several different ways. One way is according to how they are applied. Statistics can be used to describe something or they can be used to infer similar measurements in another, larger group. The first of these applications is called *descriptive statistics*; the second application type is called *inferential statistics. Descriptive statistics* are used to numerically *describe* such things as events, concepts, people, or work.

Another use of descriptive statistics is for *summarizing* a set of data. A *data set* is simply a collection of a distinct set of measurements. A data set can be as large as the combined total of all measurements of all United States residents taken every ten years for the Census of Population. Or, it can be as small as a dozen or so test scores from a mid-term examination.

Inferential statistics describe a class of statistics that are used for one or more of the following three purposes:

1. To make generalizations about a larger group—called a *population*—from which a sample is taken,
2. To estimate or draw conclusions about a population, or
3. To make predictions about some future event or state of affairs.

Note that all of these uses of statistics employ measurements of a smaller group (a *sample*) for making *inferences* about a larger group (a *population*). This is why they are known as "inferential statistics." The term *sample* is used to mean some portion of a population. Samples are usually chosen to be representative of some larger population. A *population*, on the other hand, is the set of all elements for which measurements are possible. A population can consist of products, workers, customers, firms, prices, or anything else about which the decision maker is interested.

A survey of every unit in a population is called a *census.* Individually, each person, item, or thing in the sample, population, or universe is called a *population unit.* Another label sometimes used to identify a population is a *universe.* The labels *population* and *universe* are often used interchangeably to mean a complete set or group of people, items, events, and so forth from which a sample is or can be drawn.

Parameters vs. Statistics

Another way that statisticians categorize measurement data is based on whether they apply it to a sample or to its parent population. Differences in these applications result in two types of statistical: *parametric statistics* and *nonparametric statistics.*

A *parameter* is a numerical value used as a summary measure for a population or a universe. For example, consider the statement, "The mean age for all entering college or university freshmen in California is 18.8 years." Because 18.8 years is the average of all entering freshmen—the population—it is a *parameter.*

A *statistic*, on the other hand, is a number used as a summary measure for a sample. For example, consider the statement, "The mean age for a sample of 30 Benson College freshmen is

20.3 years." The mean for this sample is a *statistic.* In this case, the mean for the sample is larger than it was for the population of all college and university freshmen in the country, and statistical techniques have been developed to determine whether the two mean values are "statistically different" or not.

Parametric Statistics

Parametric statistics require that measurements come from a population in which the distribution of variances is normal. This doesn't mean that all the measurements are the same. Rather, it means that the differences vary in what we call a "normal" way. For example, take the measurements of the incomes of a randomly drawn sample of a thousand households. If each of the measurements were plotted, it would be expected that the distribution of incomes for members of the sample would come close to the same distribution that occurred in the population—and, this distribution would be expected to be "normal."

Plotting this distribution would result in a typical bell-shaped curve. There would be a few values at either end of the curve, but the bulk would fall around the middle value—near what would be the mean for the sample. When discussing measures of central tendency, it would be appropriate to refer to the average or *mean* income of the group with this measurement. Inferential statistical tests could be used as well.

Nonparametric Statistics

Nonparametric statistical procedures must be used when working with nominal and ordinal-level data. No assumptions can be made about the distribution of these measurements; nor can any assumptions be made about the larger population. Rather, with nonparametric statistics, the distribution must be assumed to *not* be normal.

Surveying a sample of new voters in Florida can be used as an example. The voters are examined to see if they declared a party affiliation—often called a "pass or fail" test. Only one of two possible outcomes is possible. There is no way to establish if the distribution of "passes" and "fails" is normal or not. A mean or average score is no longer possible; instead, the researcher can only say something like "3 out of 100 failed," or that "97 out of 100 passed." Both the "3" and the "97" are nonparametric statistics.

Descriptive Statistics

One of the great advantages of using numbers instead of words to describe something is that it often makes it easier for both the sender and receiver to agree on what is being said. For example, one person might be described as being 6 feet tall, and a second person as being 5 feet, 9 inches tall. Clearly, when both people are standing on the same level surface, one is taller than the other. But how great is the difference? It is hard to tell by just looking at the two people.

By *measuring* the differences in height, it becomes possible to know for sure. Because numbers were used instead of just saying, "one is taller," it is now possible to know that one person is precisely three inches taller than the other person. Furthermore, in the English language the word "three" and the symbol "3" refer to the same amount. Three inches or three bananas are the same number as three oranges.

The same communication concept is true for fractions and percentages. Most people will comprehend the idea behind the phrase "one-third" and will know that 33.3 percent is very nearly the same thing as one-third. One-third of a gallon is the same *share* of the whole as is one-third of a liter, or one-third of a pound, even though the absolute quantities are different. One-third of anything is always one-third of whatever is the unit of measurement. Numbers make it possible to communicate these ideas.

The same goes for other percentages. One hundred percent of anything can only mean all of it, a totality. One hundred and ten percent, on the other hand, is all of something plus ten percent more. And every time you use it or say it, it is the same. That's the beauty of using statistics when communicating; little or nothing is lost in translation. Because things can be measured, they can be described.

According to Lang and Heiss (1994), the four basic types of descriptive statistics used in political science research are:

1. *Measures of central tendency.* This includes the mean, the mode, and the median values of a data set.
2. *Measures of variability in the data set.* The three variability values to be discussed are the standard deviation (SD), the range, and the interquartile range.
3. *Measures of relative position in the set.* Included are *percentiles* and *standard scores.* The most commonly used standardized score is the *z score.*
4. *Measures of correlation between two or more variables.* Correlation tests are used to show how strongly and in what direction two variables are related, if at all.

Inferential Statistics

The second major class of statistics is *inferential statistics.* With inferential statistical tests, researchers assume or infer that measurements of some characteristics of a smaller group (the sample) are held in common by some larger group (the population). One example of inferential statistics is in the periodic testing of small portions of a production run (a sample or samples) to *estimate* the failure or error rate of the entire day's production (a population).

Another example of how inferential statistics is used is the now famous experience of administrators who determined statistically that taking one aspirin a day could greatly decrease the likelihood of having a heart attack. In the aspirin experiment, some 10,000 medical doctors were recruited to participate in a ten-year experiment. Half were to take one aspirin a day; the other half, an inert placebo (colored chalk).

Participants were assigned to their group randomly so that no one knew to which group he or she belonged. After just a few years, the incidence of heart attacks among the aspirin takers was found to be so much lower than the placebo group that the experiment was called to a halt and the results announced. Taking one aspirin a day was deemed to be highly likely to reduce one's chance of (that is, lower the probability of) having a heart attack. Thus, the assumption (or inference) was made that the results (measurements) of the sample applied to the overall population as well.

The basic types of inferential statistics (i.e., procedures) used in political science research include, but are not limited to, the following:

1. The *t*-test for significant differences between means of dependent (uncorrelated) groups
2. The *t*-test for significant differences between the means of paired or correlated groups
3. Simple regression analysis for measuring the strength and the direction of relationships between variables

4. Analysis of variance (ANOVA) tests for differences on one variable for two or more groups
5. Analysis of variance (ANOVA) tests for differences on two or more variables between two or more groups, and for any *interaction* that might result from the two variables
6. Analysis of covariance, as used in pre- and post-test experimental applications

Statistics in Political Science Research

Political scientists use both descriptive and inferential statistics in their research. In both applications, the numerical information may be presented in tables, charts, and as graphical illustrations. The most important of these statistics and some of the more commonly encountered uses of descriptive and inferential statistical tests are discussed in the following sections.

A wide variety of inferential statistical tools have been developed for use in these four applications. Naturally, not all of these have application to the majority of decisions that face managers or administrators. The tests included have been selected for their extensive use in organization and organizational management literature, their relative ease of application and clear interpretation characteristics, and their availability in most general statistical software packages.

It is no longer necessary for anyone to memorize confusing statistical formulas or to work complex statistical calculations by hand. Most political science researchers have access to a personal computer. Powerful statistical software has been available almost from the desktop computer's introduction. However, much of the early statistical software was limited in scope because of hardware restrictions that resulted in slow processing speed and limited the number of variables and/or cases that could be contained in a working dataset. Efficient statistical processing of large datasets required far more memory than available on early desktop computers. This is no longer a problem. Throughout the remainder of this book, a variety of statistical software will be referenced, primarily Microsoft's Excel and the Statistical Package for the Social Sciences (SPSS).

Introduction to Sampling

Seldom if ever will researchers find themselves measuring entire populations. Rather, they draw *samples* from populations and measure the elements in that sample. Sample measurements are called *statistics.* These results are then assumed as applying to the entire sample as well; they conclude that similar results would be found if every element in the sample were measured. Population measurements are called *parameters.*

Researchers acquire sample statistics to estimate a larger population's unknown parameters. The process is known as *inference,* and the statistical tests that are used for this purpose are called *inferential statistics.* If all possible information needed to solve a problem could be collected, there would be no need to sample. Decision makers seldom have this luxury; they are typically limited in time and money. Therefore, people making decisions based on research use data gathered from samples, and make their decisions based on *probabilities* that the sample data mirrors what could be expected if it were possible to survey an entire population (Fitz-Gibbon and Morris 1987).

Why We Sample

The main reasons why samples are used in place of a census of a population involve considerations of cost, time, accuracy, and the "destructive" nature of the measurement process. Costs and time are closely related. In planning a statistical study budget, the researcher must address these key concerns:

- How accurate must the final results be in order to make the type of decision required in the particular business situation?
- What is the cost to the organization if the wrong decision is made?
- How much more information must be added to reach that level of accuracy?
- What kinds of data are needed? How much does it cost to acquire it?
- Can we afford the extra cost?

Sampling Precision

Researchers use measurements of the characteristics of a sample for inferring or forecasting similar characteristics about larger samples or populations. In a sense, they use the sample data to *predict* how a population will act or react under the same conditions in some future situation or event. However, researchers can control few if any of the intervening variables that might affect that future event; they are asked to measure the unknowable. The idea of *sampling precision* refers to how confident the researcher feels about using the sample for inferences.

Using sample data this way is based upon the fundamental concepts of *probability.* The researcher's level of confidence is typically stated in terms of probability, and typically stated as either a "0.10, 0.05, or a 0.01 level of confidence." In the language of probability, a value of 1.0 indicates 100 percent confidence in a statistical result; 0.10 indicates that the researcher is 90 percent sure about the results; 0.05 means 95 percent sure, and 0.01 means 99 percent sure.

Achieving a high degree of precision is often difficult—if not impossible—without greatly increasing the size of a sample. This is not the problem that it might seem to be, however. In most research in the social and administrative sciences, it is seldom necessary to achieve very high degrees of precision or reliability. Instead, decision makers can most often deal very well with information that is only *relative.* The cost of acquiring additional information in order to improve the precision of a measurement is often prohibitive. Precision, and hence, reliability, increase at a far slower rate than the corresponding increase in sample size. Reliability grows at the square root of the increase in sample size. Thus, to double reliability requires making the sample four times as large!

Using very large samples can have other drawbacks as well. One is the *destructive nature* of the survey process. Destructive refers to the idea that being asked a question about an issue may influence a subject's attitude toward that issue, thus resulting in what is considered by researchers to be a "tainting" of a previously "clean" response. Subsequent responses to the same question may, therefore, be influenced by the first experience. Simply by being asked questions, subjects begin to think about the subjects of the questions. This can result in changes in their attitudes. Exposure to a survey questionnaire may help the subject verbalize deep-seated attitudes that had lain dormant but were brought to the fore during the study. There are a number of techniques that researchers can use to achieve greater reliability of a sample study. Among the most important of these is the type of *sampling method* employed.

Some Sampling Methods

Sampling method refers to the way the sample units are selected from a parent population. When deciding which combination of sampling characteristics to use, researchers must make decisions in five basic areas. Each of these concerns is discussed in some detail below. When combined, they allow for thirty-two different possible combinations. The five basic decisions are:

- Probability versus nonprobability sample?
- Single unit versus cluster of units?
- Unstratified versus stratified sample?
- Equal unit probability versus unequal probability?
- Single stage versus multistage?

Probability Versus Nonprobability Sample?

This may be the single most important decision in sampling. Probability sampling is one of the fundamental bases upon which all inferential statistics is built. A *probability* sample is one in which the sample units (people, parts, groups, homes, cities, tribes, companies, etc.) are selected at random and all have an equal chance at being selected. Examples include simple random samples (SRS) and systematic samples.

A *nonprobability* sample is one in which chance selection techniques are not used. Examples include convenience samples (selected at the convenience of the manager) and quota samples, where only subjects with specific characteristics are added until some predetermined mix is achieved. A third example of a nonprobability sample often used in the public administration field of political science research is a judgment sample. Judgment sampling entails substituting experience or the judgment of an administrator or researcher for a more scientific approach at randomization. It often means deliberately picking a sample that is nonrepresentative of a population.

The choice between a probability and nonprobability sample is often based on the cost- versus-value principle. The researcher will pick the method that provides the greatest margin of value over cost. A worthwhile rule of thumb to follow in sample selection is that the more diversified the population, the greater the need to guarantee representativeness by following a probability sampling method.

Single Unit or Cluster Sampling?

A *sampling unit* is the basic element of the population—such as a person or a thing—being sampled. When choosing whether to use *single unit* or *cluster sampling* methods, the deciding factor is the nature of the sampling unit. In single unit sampling, each sampling unit is selected independently. In cluster sampling, the units are selected as groups. If sampling units are households, single unit sampling requires that all households in the population of interest be selected without reference to any other characteristic. A cluster sample might change the sampling unit to the random selection of city blocks, with some or all households on each selected block then surveyed.

Cluster sampling usually costs less per sampling unit than single unit sampling. As a rule of thumb, whenever a study involves a low tolerance for error with a high expected cost of errors, and a highly heterogeneous population, single unit sampling is favored over cluster sampling.

Stratified or Unstratified Sampling?

The third consideration is the *stratified* or *unstratified* sample question. A sample *stratum* is a portion of a population that has one or more characteristics of interest to the analyst. Examples include political party membership, income level, age, and many others. The final sample is selected so that it reflects the same percentages of the characteristic that are found in the larger population. A stratified sample may help to ensure representativeness and, thus, reduce potential for sampling error. Finally, to obtain the same level of sampling error, a smaller sample size is needed with a stratified sample than would be needed if a nonstratified sample were used.

Equal or Unequal Unit Probability?

The question of *equal unit* or *unequal unit* probability sampling (that is, a greater or lesser likelihood of a sampling element's being included) is closely associated with strata in the population. The final sample drawn will included a disproportionately larger (or smaller) percentage of the characteristic of interest.

Although a key tenet of probability sampling is the concept of equal probability of being selected, researchers often find themselves in situations where following the equal probability rule will result in biased results. For example, a political campaign manager conducting a survey of local voting patterns will probably include more persons older than 50 years of age and fewer in the 18 to 24 age group in the sample because the older group tends to vote disproportionately more often than younger voters. The researcher's sample is more than likely to be heavily weighted in favor of relevant demographic and ethnic, socioeconomic, and gender groups because they are more likely to have a disproportionate influence on the outcome of the election.

Single-Stage or Multistage Sampling?

The final consideration has to do with *single* or *multistage sampling*. The number of stages included in a sampling process is usually dictated by the nature of the population and the sample frame (source of units). For example, sampling state legislators in a budgeting process is typically a single-stage process; subjects are randomly selected from the list of members. The following type of multistage sampling would involve this three-stage process:

1. The first stage is random selection of census tracts in the various socioeconomic sections of the region.
2. This is followed by the random selection of residential blocks in the selected census tracts.
3. The third stage is the random selection of individual households in each selected block.

In a comprehensive survey of consumer attitudes across a large area, a multistage process will often be used. Multistage sampling is the method of choice for needs analysis studies when sampling large populations and with population elements disbursed over a wide area.

Dealing with Error and Bias in Sampling

The ultimate objective of all sampling is to select a set of elements from a population in such a way that the measurements of that set of elements accurately reflect the same measurements of the population from which they were selected. A number of potential pitfalls exist to make achieving this objective difficult. Among these are bias and several different types of potential error. These are characterized as *sampling error* and *nonsampling error.* Several types of nonsampling error can occur, including sampling frame error, nonresponse error, and data error.

Sampling Error

Sampling error occurs when a sample with characteristics that do not reflect the population is studied. It is almost impossible to specify a sample that exactly matches the parameters of a given population. Nor will the results of a second sample exactly match the first. More samples taken will not increase the likelihood of a perfect match occurring.

Two laws of numbers influence sampling error. First, the *law of large numbers* suggests that increasing sample size will reduce the size of the sampling error encountered. However, the *law of diminishing returns* also applies to this error reduction method. Recall that to reduce error by half requires making the sample *four* times as large. Using a statistically efficient sampling plan is clearly the best way to control sampling error.

Nonsampling Error

Nonsampling error can result from many different sources. Several of these sources include problems with the *sampling frame*, with subjects' *nonresponse*, and errors in the *data* themselves. Each of these sources of error is discussed in greater detail below.

Sampling Frame Error

The *sampling frame* is the source (such as a list or a telephone directory) from which the sample is drawn. If the study is a test of components provided by an outside supplier, the sampling frame is the collected total of all parts provided by the supplier. If the sample is to be drawn from customers who enter a particular facility, the sample frame consists of the actual premises; the population in this example is all persons who enter the facility during the survey period.

For example, a sociologist conducted a study of the attitudes and concerns about terrorism among a group of regional airline passengers. The sampling frame for the study consisted of the list of passengers with reservations to fly on a specific route on a specific day. Individual passengers were randomly selected from those waiting in the boarding lounge before boarding their aircraft. The key to reducing sampling frame error is to start with as complete a sampling frame as possible. If the sampling frame is a list of clients, it should be up-to-date and include everyone. If the sampling frame is a list of voters in a given precinct or legislative district, it should include all citizens who are registered to vote, not just the voters who voted in the last one or two elections.

A way to adjust for potential sampling frame error has been developed by researchers who gather data by telephone. Increasingly, private telephone numbers are not included in printed telephone directories. To deal with this problem, the survey operators modified their telephone book sampling frames to include unknown, nonlisted numbers. In a process that is called *plus-one dialing*, they do this by adding one number to the numbers taken at random from the directory.

Nonresponse Error

Nonresponse error is another problem encountered in survey decision making. When only small proportions of subjects respond, there is a strong probability that the results are not characteristic of the population. This type of error can be reduced through the use of incentives for completing and returning the survey instrument, and through follow-up telephoning, although there is no guarantee that error reduction will occur.

Data Error

Finally, *data error* can occur because of distortions in the data collected or from mistakes in data coding, analysis, or interpretation of statistical analysis. Several different ways to reduce data error in research projects are:

- Ensure that survey instruments (questionnaires) are well prepared, simple to read, and easy to understand.
- Avoid internal bias (such as the use of leading or value-laden words).
- Properly select and train interviewers to control data-gathering bias or error.
- Use sound editing, coding, and tabulating procedures to reduce the possibility of data processing error.

Sample Bias

Bias in sampling refers to the sampling process itself; it is sometimes referred to *systematic bias.* Bias can be intentional or unintentional. Intentional bias is used when a researcher has a particular point to prove and uses statistics to support the pre-established conclusion. For example, an agriculture decision maker might intentionally select a better piece of ground to show more dramatic yield improvements from a new plant seed.

Unintentional bias can occur as a result of a researcher's best efforts to include relevant elements in the final sample. For example, in the decision to determine whether voters might approve a special bond issue for library construction, the researcher might telephone only registered voters. This results in a *double* bias. First, it includes only people with telephones, and second, it ignores the library users who have not voted in the past, but would in order to improve the library system. The best way to avoid or reduce any and all bias is to maintain random selection procedures.

The Meaning of Sample Distributions

When researchers talk about *sample distributions*, they are referring to the way a statistic would be distributed if computed for a series of samples taken from the same population. This concept has several uses: first, it gives the researcher a quick estimate of the validity of the results of the study. Second, it enables the researcher to estimate the values of some variable in a population of interest. Third, it produces a value that is associated with determining sample size.

Sampling distributions represents a fundamental concept in statistics (Zikmund 1994). It is sometimes a difficult concept to grasp, however. This is because it refers to a *hypothetical* distribution of something that will never take place: randomly selecting a very large number of samples (such as 5,000 or more) from a specified population, computing a mean for every sample, then examining the distribution of those means. The mean of all the 5,000 sample means is called the *expected value* of that statistic, and the standard deviation of the sampling distribution is the *standard error of the mean.*

When political science researchers draw two or more random samples of subjects or items from a given population, the statistics computed for each sample will almost always vary. Such variation is natural and expected. Drawing samples from the same population will produce summary measures that are also different from the first sample or samples drawn. Drawing more and more samples will also produce varying measurements. From this point on, assume that the statistic is the mean value on any relevant question, characteristic, or scale item.

If the value of the mean for each of the group of samples were displayed as a frequency distribution, the individual sample measurements is typically distributed in such a way that the distribution of values would present a picture of a normal, symmetrical (bell-shaped) distribution. Most of the values would cluster around the center of the range, with smaller and smaller amounts drifting off toward the edges. This pictorial representation of the frequency distribution would be what is called a *bell-shaped curve.* A key requirement of most inferential statistical tests is that the data be normally distributed.

The Standard Error of the Mean

The *standard error of the mean* provides an indication of how close the sample mean probably is to the mean of the population. This statistic is an estimate of the *sampling variability* in the sample mean. It is important to remember that the standard error of the mean is only an estimated standard deviation of a *hypothetical* series of samples.

For example, in a study of public agency organizational climate, scale items consisted of such statements about the organization as: "Red-tape is kept to a minimum in this organization." The mean score on this seven-point agreement scale was 3.50; the standard deviation for the sample was 1.512. A standard error of .535 indicated that the sample mean was within a little more than half a point of what could be expected as the mean for the population from which the sample was drawn.

Central Limit Theorem

A rule of statistics called the *central limit theorem* states that as the number of samples drawn from a population gets larger, the distribution of the sample statistic will take on a normal distribution. At least thirty samples are necessary for the likelihood of the normal distribution to occur. In a normal distribution, the two sides of the curve are the same, with the *mean* and *median* both falling at the peak of the curve. Distributions that are not symmetrical are said to be *skewed.* Skewed distributions that have fewer values at the high end (right side) of a distribution are said to be *positively skewed*, or *skewed to the right.* When the values taper off toward the left side of the distribution, it is said to be *negatively skewed*, or *skewed to the left*. Distributions can also have more than one peak (in what is called a *bipolar* distribution).

Summary

Political scientists use words and numbers to communicate the results of their research and creative thinking about ideas and topics in the political world. Academic department heads, deans, college presidents, legislators, public administrators, and other organizational managers also use words and numbers to communicate with their staffs and supervisors, as well as with people and groups outside their organization. Statistics are numbers, and the results of tests conducted on sets of numbers. The results can be presented either in tables, graphs, or other illustrations, which help to ensure mutual understanding of the data at hand.

When the term *statistics* is used, it can mean one or more specific measures or values describing some thing, a sample of some type. Or, the word can be used to refer to a body of mathematical tools and techniques invented for analyzing and giving meaning to sets of numbers.

The numerical values in statistics are typically measurements taken with some type of scale or measuring device. These scales provide different levels of information, based upon the type of data they are intended to acquire. The four types or levels of data (the terms apply to the data-gathering scales as well) from the "lowest" in power to the "highest," are nominal, ordinal, interval, and ratio. Each data type has a body of statistical tests that are appropriate for that level; lower-level tests should not be used on higher-level data.

Researchers are concerned with reliability and validity (internal and external) in all their measurements. Reliability refers to the ability to measure what the researcher intends to measure. Validity refers to consistency in measuring across all cases.

Statistics are used in two main ways: (1) as *descriptive statistics*, they are used to summarize a larger set of numbers, called a "data set"; (2) as *inferential statistics*, the measurements of a smaller group—a *sample*—are used for making assumptions about a larger group—the *population* or *universe* of interest.

Statistics may also be *parametric* or *nonparametric.* Parametric statistics require that certain assumptions be made of the host population, such as a normal distribution. With nonparametric statistics, no such assumptions need be made.

Sampling in public administration research is used because it is more efficient than studying a full population. Sampling can lower the cost and improve the efficiency of measurement activities. Studying a sample rather than an entire population saves time and money. It is also thought to be less "destructive" of underlying attitudes (the process of measuring may influence future measurements). Decision makers must take care to avoid introducing bias and sampling or nonsampling errors into the sample design and selection process.

The five fundamental considerations of the sampling process result in many different possible combinations in sample design. Sample design choices are based on the questions of: (1) probability vs. nonprobability, (2) single unit vs. unit clusters, (3) stratified vs. unstratified, (4) equal unit probability vs. weighted probability, and (5) single-stage vs. multistage sampling.

Sampling distributions—the way each individual measurement clusters around some statistic—tend to reflect distinct patterns, with most following what is referred to as the *normal distribution.* In a normal distribution, the bulk of the measurements cluster around the mean value, with a few trailing off above and below the mean. When plotted, they look like the familiar "bell-shaped curve." Most inferential statistics require that the data be from a normal distribution.

According to the *central limit theorem*, as the size of the sample increases, the distribution of the sample measurements tends to take on the shape of normal distribution, whereas small-sample studies may result in data that are not reflective of the parameters of the larger population.

Discussion Questions

1. Define the four levels of measurement and name the rules that apply for each type.
2. In questionnaire construction and statistics, what is the meaning of the term *scales*?
3. Discuss the differences between *reliability* and *validity* in constructing a survey instrument.
4. Define the following terms:
   a. Population
   b. Sample
   c. Parameter
   d. Statistic
   e. Parametric statistics
   f. Descriptive statistics
   g. Inferential statistics
   h. Variable
5. Why do researchers sample?
6. What is a probability sample?
7. What is a simple random sample (SRS)?
8. What is a nonprobability sample?
9. When would it be appropriate to survey a population instead of a sample?

Additional Reading

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8 Exploratory Research: The Probing Approach

Depending on their research objectives, researchers may select from three types of quantitative research designs: *exploratory*, *descriptive*, or *causal.* A research project could involve the use of just one or two designs, or all three. When all the types are used, a researcher begins with an exploratory study for preliminary identification of possible factors or variables, then moves to a descriptive study to define the salient or key variables, and concludes with a causal study such as an experiment to test the variables for strength of association or cause-and-effect relationships. For some reason, exploratory research is not discussed in any great detail in political science research textbooks; however, this important first-step design is important enough to merit greater attention. Therefore, this chapter looks at some of the ways that exploratory designs can be used in all the subfields of political science.

Purposes for Exploratory Research

Most exploratory research is conducted for one of two purposes: (1) a preparatory examination of an issue in order to gain insights and ideas, or (2) information-gathering for immediate application to an administrative problem. In neither case is exploratory research intended to serve as an in-depth look into all the factors related to a political phenomenon.

Because of their limited scope, exploratory studies are seldom used as stand-alone designs. When they are they can provide information for administrative decision making. The typical objective of these exploratory studies may be either to find an answer to a specific organizational question or to provide information upon which to base a decision, such as gathering cost-benefit information for a proposed administrative action. Such studies are often used in the applied public administration subfield of political science.

The great majority of exploratory research is conducted to investigate an issue or topic in order to develop *insight and ideas* about its underlying nature. Topics are often a problem or issue that requires additional research study for problem resolution. Designing and conducting a small-sample exploratory study, therefore, is often the first step in a more comprehensive or complex research project. Usually, the researcher has only a little or no prior knowledge about the issue or its components. As a result, the research itself is often very flexible and unstructured. Because the research has few preconceptions even about how to study the problem, the first research steps usually involve qualitative methods (Aaker, Kumar, and Day 1998).

The objective of a typical exploratory research design is to gain as much information in as short a time as possible, with little expenditure of money and effort. Naturally, the actual wording of the objective will depend on the reason for which the exploratory research is needed. For example, when the information is needed for developing a questionnaire—the *survey instrument*—for a large-sample descriptive study, the objective is to identify the variables and their constructs. In these situations, exploratory studies are sometimes referred to as "pilot studies."

When the exploratory study precedes a social experiment of some type, a typical objective might be to determine which independent variables, treatments, or levels should be used in the experiment. In these applications, the exploratory study is also used to identify the key dependent and independent variables that will be tested in an experiment (a *causal* design). Exploratory studies also help the researcher identify which variables may be only tangentially or only marginally related, thereby telling the researcher what variables should not be included in the more extensive experimental research project.

Methods in Exploratory Data Collection

Data gathering in exploratory research takes place in only a few different ways. Hakim (2000) identified three approaches: (1) prior research reviews, (2) single-subject in-depth or focus group interviews, (3) examination of administrative records and documentary evidence. Aaker, Kumar, and Day (1998) suggested a similar list of approaches: (1) literature reviews, (2) personal interviews, (3) focus group unstructured interviews, and (4) case studies. The four techniques suggested by Aaker, Kumar, and Day, plus a fifth method, the pilot survey, are discussed in greater detail below.

The Literature Review

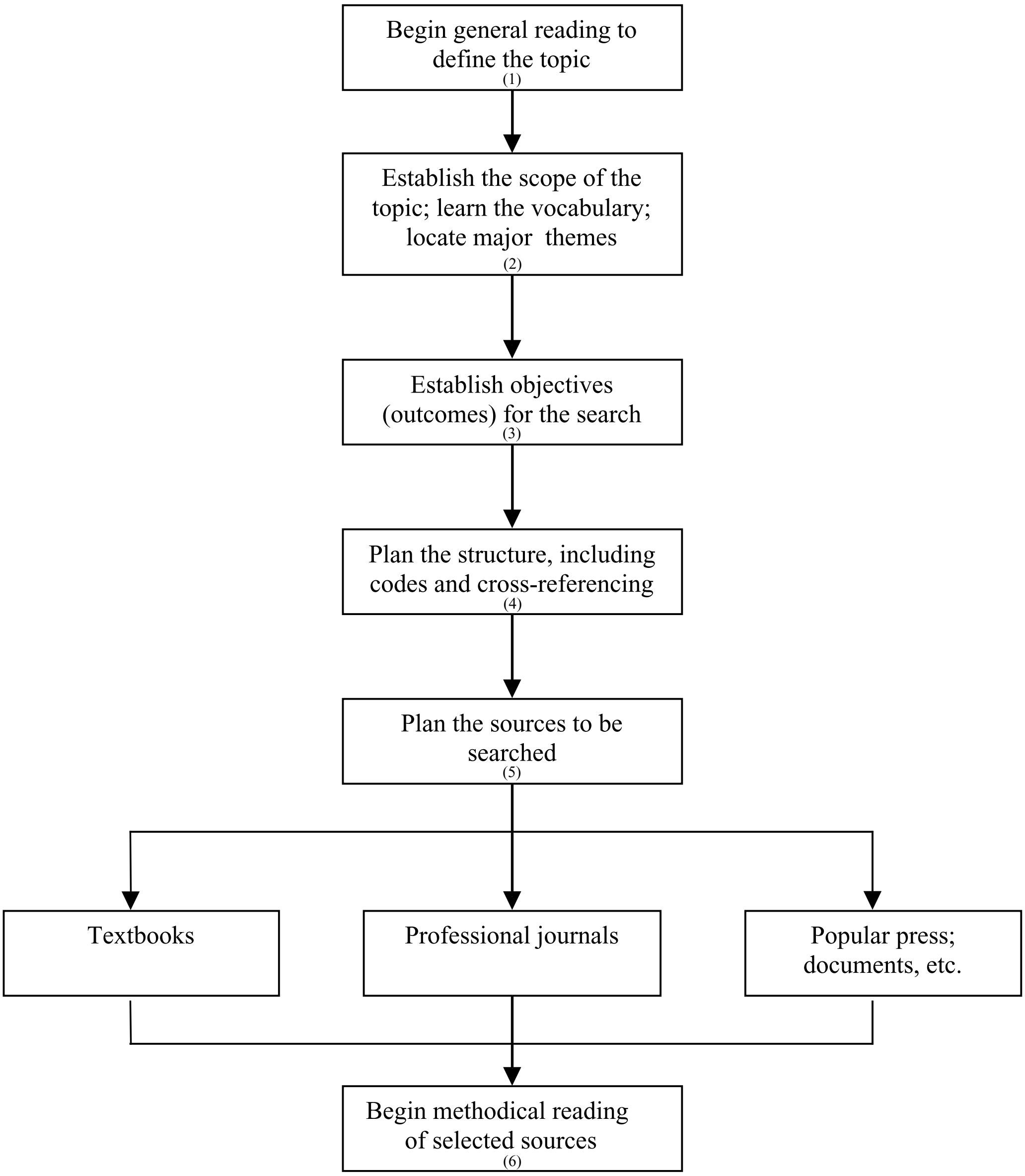
An exploratory research design, like all research, involves examining the reported findings of other researchers. The process is called a *literature review*, and is one of the first steps in any research project. While it is recommended that all research include a review of the literature, the technique is especially applicable as an exploratory research technique. A six-step process for conducting a literature review is presented in Figure 8.1.

Among other reasons, researchers use the literature review to gain knowledge about what they should be looking for in their own data gathering, as well as for weighing the applicability of their proposed research methods. In doing so, they look for major themes in the research, which they may later incorporate into their research questions. According to Knight (2002), some major themes in a review of the literature include: What is the point of concern with this topic? Why is it important, and to whom is it important? On what points do other researchers agree and on what and why do they disagree? Out of all this literature, what research question has been missed or treated too lightly? What research question or questions, then, should I focus on? What research methodology and methods have been used to study this problem?

The next step in the process is to establish objectives for the review. Hart (1998, 27) identified nearly a dozen purposes or objectives for a literature review, including but not limited to the following (these are not in any prioritized order, nor will all apply for any one review):

1. The literature review can inform the researcher what has been done and what needs to be done on the research topic.
2. It provides a means for discovering important variables that are relevant to the topic.
3. It can make it possible to identify relationships between ideas and practices.
4. It provides a means for synthesizing various takes on the topic, often allowing the researcher to gain a new perspective.

Figure 8.1 **A Flowchart of a Six-Step Process for a Review of the Literature**



Source: After material in Hart 1998.

5. The literature review permits framing of the topic or problem by establishing the topic in its context.
6. The extent and quality of existing research can help rationalize the significance of the topic.
7. Gaining a familiarity with what others have discovered can result in enhancing or gaining the vocabulary of the topic.

8. It helps to gain understanding of the structure of the topic.
9. It provides a means for relating the researcher's ideas and theory to actual application of the theory's concepts.
10. The literature review informs the researcher of the main methodologies and research techniques that others have used to study the topic.
11. It describes the historical development of the topic and changes in its significance.

Research activities such as establishing codes, phenomena constructs, cross-referencing and other structural activities, as well as evaluating textual material, follow a standard process for evaluating and interpreting qualitative data. Knight (2002, 182) reduced this process to just two steps: (1) indexing or coding the data, and (2) reflecting upon and interpreting the data.

The exploratory literature review can become an integral part of the research report, or it can simply provide the researcher with background information, only some of which may find its way into the body of the study. Although they are not specifically exploratory studies, the following two examples of how the exploratory literature review can be woven into the final research paper help to illustrate the value of the technique. The first example is an illustration of the way the review is used as a distinct section in the paper; the example can be seen in the summer 2002 issue of *Political Science Quarterly* (*PSQ*) in a paper on Senate scrutiny of federal court nominees (Hartley and Holmes 2002, 259–278). The analysis of the literature was incorporated into the "Background and Review of the Literature" section of the paper. The review was organized into four main themes or constructs: (1) lower court nominees and institutional change, (2) institutional changes in the Senate, (3) a historical review of the current controversy, and (4) Senate scrutiny on nominations.

It is likely that the decision to use these constructs came after a review of the literature. As with the majority of exploratory studies, Hartley and Holmes used the most basic of descriptive statistics in their paper—two bivariate line charts and five simple frequency distribution tables. No measures of central tendency (averages) or of variation or correlation were included with the tables.

A different approach can be seen in the paper "Human Rights and Domestic Violence" (Hawkins and Humes 2002, 231–257), in the same issue of *PSQ*. This paper followed a combined approach, using parts of two of the three qualitative approaches described by Hakim (2000): a research review combined with analysis of administrative records and documentary evidence. Hawkins and Humes examined two competing theories pertaining to differences in the willingness of nations to intervene in domestic violence issues. One theory focused on social movements; the second on international socialization. Their review of the literature was interwoven throughout the paper. The nature of the research design of Hawkins and Humes did not provide for any tables or graphs, or any statistics in their paper.

Personal Interviews

Exploratory research designs often involve conducting personal interviews with knowledgeable individuals. In policy studies, these subjects may come from within and/or outside the organization. In theoretical studies, the subjects are often other professionals in the discipline, including professors and political practitioners. Whatever their source or affiliation, these individuals are collectively referred to as "key informants," and the process is known as *key informant interviews.* Key informant subjects are selected because they are likely to be better informed about the study problem and the issues associated with that problem.

Gaskell (2000, 51) defined the personal interview process in these terms: The depth interview is a conversation between two (or more) friends. It may last as long as two hours or more, but normally lasts for an hour to an hour-and-a-half. The interviewer begins the session with some introductory comments about the research, thanks the subject for agreeing to participate, and asks permission to tape the session. The information-gathering session should start with some straightforward, interesting, and nonthreatening questions. The interviewer must remain attentive and show interest in what the respondent is saying; eye contact is encouraged; proper body language should be used—respond with nods when appropriate, smile when you should, and remain serious and sympathetic when you are expected to be so. Always try to end the session on a positive note.

According to Gaskell, in an exploratory research project, the personal interview is used to collect the basic data for gaining an understanding of the relationships between the people in the study and the larger social group on which the study is focused. An objective for interviews in these situations is to amass the "thick description" that characterizes much qualitative research. The researcher uses the focus group to develop an understanding of the beliefs, opinions, attitudes, values, and motivations for behavior of people in the social group. If it is not used specifically for developing instruments for additional research, the interview is a valuable way of framing the study in its context and developing hypotheses for descriptive or experimental research designs.

In an illustration of how interviews were used in an exploratory study, the author was a member of a team of faculty and students engaged to design and conduct an extensive community needs analysis for a regional general hospital. The team's first step in the study was to conduct a series of in-depth interviews with key local employers, community leaders, hospital administrators, and senior medical staff. These data were then developed into a comprehensive needs-analysis questionnaire administered throughout a three-community region. In its presentation to the hospital district board of directors, the hospital administrative staff used the findings of the exploratory study to justify further research. The exploratory research report provided concrete evidence that a larger, in-depth survey was needed to provide information necessary to complete the district's ten-year development plan.

To be effective, an interviewer must begin an interview session by establishing rapport with the subject (Johnson 2002). This is done by developing and building on a sense of intimate association such as is found between two close friends in a conversation. The goal of the interview is to ferret out "deep" information, knowledge, and feelings. Johnson suggested that interviewers use the following four-step process in a semi- or fully structured interview:

1. Begin with two or three introductory "ice-breakers" to get the ball rolling.
2. Once the subject appears comfortable with the process, employ several transition questions. These may help to explain the purposes of the research. It is also a good time to secure the subject's permission to use a tape recorder, if appropriate.
3. Now start asking the key questions that address the heart of the research question. This may involve as few as four or five questions, but in a typical in-depth interview, there is no set limit to the number of questions that should be used. The goal is to continue asking questions until the desired information objectives are met.
4. The interview session typically ends with the interviewer summarizing some of the main points that were brought up. The interviewer may also take this time to share with the informant some of the points raised by other subjects.

The techniques involved in conducting personal interviews have been honed over many years in such disciplines as anthropology, sociology, and psychology, among others. In their *Handbook on Interview Research*, Gubrium and Holstein (2002) have collected a large body of literature on the various ways to conduct interviews. The three topics in their collection that most apply here are *in-depth interviewing*, *focus group interviewing*, and *interviewing for survey* research. As Knight (2002) noted, "Good [interview] research depends upon researchers and participants developing trust and sympathy, which are necessary if participants are to speak freely and, perhaps, to work with the researcher to tease out fresh understanding and bring some embodied or embedded things into words." Once this rapport is established, the interviewer can proceed with the rest of the process. The researcher can follow this six-step process for conducting personal interviews (Gaskell 2000):

1. *Prepare the conversation guide.* The guide is a list of topics that the researcher wants covered in the interview. It should be followed as a guide, not addressed in any mandated order. Interviews, if conducted correctly, can be freewheeling, open-ended conversations, with important topics that the researcher had not even considered coming to the fore. Certainly, there is a core of items that must be covered, but the key idea in interviews is to maintain your flexibility.
2. *Select the way the interviews are to be conducted.* Three options are possible: individual interviews, group interviews, or a combination of the two.
3. *Determine how you plan to select the respondents.* Will you randomly select subjects, accept anyone willing to participate, or target a specific group of key informants whose opinions you feel are necessary to meet research objectives?
4. *Conduct the interviews.* A large body of literature exists on how to successfully conduct personal interviews. Three of the key points in this literature are (1) be friendly, unthreatening, and empathetic; (2) be a good, attentive listener; and (3) remain flexible and uncritical.
5. *Transcribe the interviews just as they took place.*
6. *Analyze the body of information collected.* Some researchers feel that it is a good idea to wait a week or two after collecting the data before beginning the analysis; others begin right after all data are collected. No method has been proven to be best.

An important point to remember in scheduling and conducting personal interviews is that informants do not always move on the same schedule that drives the researcher. Informants often have topics they want aired and will remain focused on them until they are satisfied. In addition, the interview will often take what Johnson described as "unexpected turns or digressions" toward topics that the informant is interested in or knows about. He also noted that these unexpected shifts in the interview process can be very productive. Therefore, the interviewer should be willing to depart from the planned discussion guide, going along with the informant to see where the discussion leads.

Focus Group Methods

Focus group interview sessions are another often-used exploratory research technique (Kitzinger and Barbour 1999). The focus group is a good way of developing an understanding of key issues before writing questions and can also enable the researcher to gain a sharper focus on the way that questions are worded. Focus groups can also be used to develop story scenarios ("vignettes") to be used in in-depth interviewing designs. Respondents are asked to react to the scenarios, usually responding to a structured question list in a quantitative study, and an unstructured list in qualitative designs. Kitzinger and Barbour also point out that focus groups may be used after completion of a survey in order to help explain response outliers. Outliers can only be identified, not explained, in survey research.

Table 8.1

A Comparison of Focus Groups According to the Level of Structure in the Session

More Structured Sessions	Less Structured Sessions
Objective of the session is to collect answers to the researcher's questions	Objective of the session is to gain an understanding of what participants are thinking
Focused on the interests of the researcher	Focused on the interests of the participants
Question guide keeps discussion focused	Questions are only guides for discussion
Many specific questions asked	Fewer, more general questions asked
Time limits for each question	Flexibility in time allocation
Group leader asks questions of each subject	Leader is moderator, seeking subject interactions
Leader stops off-topic comments	Leader permits exploring new directions
Subjects speak to the moderator	Subjects talk among themselves

Source: Morgan 2002, 147.

A focus group is a discussion group in which six to ten (more or less) subjects explore a specific set of ideas or issues under the guidance of a moderator or session leader. The focus group has been a staple research technique in business for many years; it is particularly useful in marketing and advertising research. However, in the past decade or two it has come to be recognized as a valuable contributor to developing political science—and all social science—knowledge (Knight 2002; Bloor et al. 2001; Wilkinson and Kitzinger 2000; Kitzinger and Barbour 1999). Politicians in both Canada and the United States have long used focus group sessions to provide data for strategy formulation, and, according to Wilkinson and Kitzinger (2000), focus group research is now a common feature in political research in all of North America and Great Britain.

Focus groups can be classified in several different ways. One way is according to the structure of the session. Some sessions are highly structured, whereas others are only lightly structured (Knight 2002). A second way of classifying focus groups is according to whether the session is conceived of as a group interview or as a focus group. In the opinion of David Morgan (2002), rather than the traditional dichotomy of structured-unstructured sessions, all focus group sessions *must* have some structure. Otherwise, they are nothing more than a mob gathering with no reason for being. Instead, Morgan preferred to categorize focus group sessions as either "more structured" or "less structured." A comparison of the distinguishing features of the two structural approaches is displayed in Table 8.1.

A major benefit of group interviews is the potential for interaction among participants. This interaction is impossible to achieve in one-on-one interviews. Focus groups are also more efficient than a series of individual in-depth interviews, in that a group of subjects are interviewed in the same amount of time interviewing one subject would entail. A major disadvantage of focus groups is the fear of public embarrassment, which sometimes makes it difficult if not impossible to bring up sensitive issues.

Interview sessions with groups can also be classified as either *group interviews* or *interactive focus groups* (Bloor et al. 2001). With group interviews, the researcher asks interview subjects to respond to a preestablished sequence of questions, in much the same way as if the researcher were interviewing a single subject. The advantage of the group interview is simply one of convenience and efficiency. With all subjects together in the same location, the researcher can collect large amounts of data in a short period of time.

The second type of group session is the traditional interactive focus group. While the researcher may, indeed, use a structured question guide, the objective for the focus group is not to collect a

Table 8.2

The Role of the Group Leader in Group Interviews and Focus Group Sessions

	Session Type	
Question Guide	Group Interview	Interactive Focus Group
Highly Structured	Leader as Interrogator	Leader as Moderator
Semistructured	Socratic Leader	Leader as Catalyst

Source: After Morgan 2002.

series of individual answers but rather to generate interactive discussion among the group members. When subjects respond and react to the comments of other group members, the resultant discussion can often bring to light the meanings, opinions, and norms that underlie attitudes and behaviors. Table 8.2 illustrates how these different classification schemes affect the role of the researcher.

In the highly structured group interview the researcher is simply an interrogator, asking each subject the same questions. There is little room for creative thinking in this type of session; the researcher does not probe for deeper responses. Typically, the interviewer has little or no knowledge about the reasons and objectives for the study and did not have any role in the development of the question guide.

In the less structured group interview, the researcher takes on a slightly more active role, serving much as a teacher employing the Socratic method. The session leader continues to ask a prescribed set of questions, but allows more flexibility in the responses, often probing for more information when the respondent stumbles or is unable to put a response into words. The leader may rephrase the question or go so far as to state it as a projective sentence-completion statement. The point of the session is, however, to gain answers to every question on the list from every subject. Application of the structure takes place in the editing of the transcript.

Most focus groups are lightly structured sessions. In fact, the structure may be so slight that it is all but invisible. The researcher uses the question list only as a tool to generate discussion and only partially as a list of items that must be answered. In a focus group session with more structure, the leader serves as a moderator, allowing discussion to proceed as it may and encouraging interaction, but eventually bringing the group back to the point in question. The moderator-leader is less concerned with how the group gets to its conversation destination and more concerned that it continues to move in the desired direction.

In a lightly structured focus group, the goal of the session is not to secure answers to questions, but to generate interactive discussion. In this situation, the session leader takes on the role of a conversation catalyst. This is the most difficult of the four roles that a session leader may take. The leader must take great pains to keep the conversation moving, while not allowing any one or two members to dominate the discussion.

Often, researchers experience great difficulty in gaining the participation of the one or two reticent session members who sit quietly taking it all in but refraining from offering their own comments. Sometimes, however, the objective of the session is to investigate the way that the group members interact, who leads and who follows, who forces an issue and who is willing to compromise. In these sessions, the discussion is of less interest than the interaction process.

While focus groups are an ideal way to explore people's opinions, concerns, desires, and experiences, they may be most valuable for examining how these opinions are expressed, influenced, formed, and counter-formed in a social situation (Kitzinger and Barbour 1999). In an effective focus group session, subjects develop their own questions, frames of reference, and ideas. They follow their own priorities and do so on their own terms, using their own vocabulary.

Bloor et al. (2001) discussed how focus groups are used for opinion-gathering purposes. In such applications, the focus group is used to (1) bring out background or contextual information, (2) identify salient issues that appear to be held in common among sample members, (3) discern the everyday language—including slang—that subjects use when talking about the topic, (4) gather respondent opinions about previous research that has been done on the topic.

An example of how focus groups are used along with traditional survey research can be seen in Rosenthal's 2000 study of gender styles among committee chairpersons in state legislatures. Rosenthal conducted a series of three group sessions over the 1994 and 1996 National Conference of State Legislators conferences. Her design also included ethnographic observation of legislative committees in action and concluded with a mailed survey to committee chairpersons. More than 300 usable instruments were returned, for response rates of 39 percent for women legislators and 30.5 percent for males.

Convenience sample methods were used to form the focus groups. One group was made up exclusively of female committee chairs; a second group consisted of only male committee chairs; and the third group contained a mix of males and females. Respondents were from twenty-four different U.S. state legislatures. During the sessions, participants were asked to define "consensus" and to describe the functioning of committee business during their tenure as committee chair. Rosenthal coded and combined the responses into two broad sets of characteristics. Comments were coded as either *destructive* or *integrative.* Variables in the destructive classification included comments pertaining to winning and losing, interest group competition, bargaining, and majority votes. Variables coded as integrative included comments pertaining to deliberation, discussion, and overall participant satisfaction in the outcome.

The Case Study

The case study is the least-used exploratory research technique; instead, case study designs tend to be complete as they stand. However, the case study is not the most appropriate tool for exploratory studies. Rather, good case studies typically to go into too much depth for the objectives of an exploratory design.

Before beginning a discussion of the case study as an exploratory research tool, one point must be made: the case study in these applications ought not be looked upon as a research methods choice; rather, it is simply a choice of how to get information to help determine what should be studied in a more comprehensive study. By whatever method of data collection is used, the researcher elects to study the case or cases in an exploratory way because of what can be learned for additional research (Stake 2000). However, because the case study is increasingly accepted as an appropriate qualitative research design, it will be discussed in detail in Chapter 17.

According to Knight (2002), a case study is the study of one of something. (Although case studies might involve more than one item, they are investigated individually.) In political science, the case can be a party, a candidate, a state legislature, a political office, a domestic or foreign policy decision—the list includes, essentially, any single event, person, organizational unit, site, or whatever else is applicable to the world of politics. The case study can be simple or complex. This great applicability of the case is also one of its greatest detractions.

A problem that researchers often face with case studies is the difficulty of defining the boundaries of the case. Despite this difficulty, case studies do have a number of advantages. First, they tend to bring out information that might be ignored, forgotten, or not even brought to mind in a different study method. Second, because they are usually descriptions of what the research sees in the case, they are not artificial constructs such as what a survey or an experiment might produce. No variables are controlled in a case; what you see is what you get.

Third, by their very nature, case studies push the researcher to work in depth, to go beyond the surface indications to get at reasons why things happen as they do. The fourth advantage is closely related to the third—case studies force researchers to look for meanings, not simply descriptions. The goal with a case study is to establish understanding. Its purpose is to define and describe the case, not to use the case as a representation of the world (Stake 2000).

The fifth advantage associated with the case study approach is that it helps the researcher remember that the political world is as complex and variable as any social institution. Political phenomena are not usually simple, single-faceted events; they are as complex as the people who exist and function in this world. A survey, no matter how complex or sophisticated, provides only a snapshot of the phenomena; a case study can be like a master's oil painting, deep, with many nuances and a variety of meanings. The sixth advantage naturally follows the fifth. Because of its complexity, case research can be what Knight termed "a powerful antidote to determinism and over generalization." Finally, case studies tend to be person-centered, a fact that further adds to their informative underpinning.

The case study, like all research designs, is constructed around a distinct structure (Stake 2000, 440). While the case may be built upon only a few research questions, the issues in the case tend to focus on complex relationships. Stake identified six major conceptual issues that are typically addressed in a case study:

1. Framing the case: setting its boundaries and identifying the object of the case study.
2. Selecting the issues to address: the phenomena, themes, constructs, or issues that result in formation of research questions.
3. Close analysis of the case material in order to identify the relevant data patterns that frame the issues.
4. If appropriate, triangulating key observations and interpretations through the use of other research methods.
5. Examining the data and relevant literature in order to identify interpretations that differ from the one adopted by the researcher.
6. Developing the conclusions that can be drawn from the case, including what generalizations may be applied in similar situations.

For example, Bryant (2002) studied the indigenous population of a group of islands in the Philippines. He followed an ethnographic data-gathering approach, using the case study to illustrate the conflicting influences of nongovernmental organizations (NGOs) on development and conservation. The objective of the case was to reveal that, despite their different agendas, the NGOs shared a common objective: to help local residents internalize state control over their environment through self-regulation.

The Pilot Survey

Another approach used in exploratory research is the survey of a small random sample drawn from the same population of interest as the larger study planned. This is what is called a *pilot survey* or *pilot study.* A common purpose of a pilot study is to pretest an early draft of a survey questionnaire. Results of the exploratory study are used only to test the validity and reliability of the study design and the instrument questions. Problem words, phrases, and entire questions may be edited, deleted, or replaced. Results of such pilot studies should never be included with the findings of the final study.

Pilot studies are nothing more than small-sample applications of a standard questionnaire survey. The questions included in the pilot study instrument are usually generated through the use of one or more of the other exploratory methods: literature reviews, interviews, focus groups, or case studies. Pilot studies are extremely important in survey research. They are used to pretest the proposed questionnaire, check the wording, and ensure that the researcher and respondents have the same definitions of key words, phrases, and, if used, acronyms. Beginning researchers often ask two questions in one, believing they are being more efficient in the use of time and space. But double-barreled questions are not only difficult for subjects to answer, they are next to impossible to code and tabulate. The researcher is never sure which half of the question was answered.

Consider this example of a poorly written demographic question: “How many children do you have and what are their ages?” This is really a series of questions. First, it asks, “Do you have any children?” (This says nothing about the gender of the children). Second, it asks, “How many children do you have?” (It says nothing about whether they live with you or elsewhere). If you have children, “What is the age of the first child?” “What is the age of the second child?” and so on. The pilot survey is also a good opportunity to test whether the respondents have the knowledge necessary to answer the question. People will often answer questions simply because they think that they must, whether they really know the answer or not.

Pilot studies can be conducted with a small sample drawn from the same population from which the final sample will be drawn, or if this is not possible for some reason, pilot studies can also be carried out on a sample of persons with some knowledge of the subject, the study objectives, and methods, and a willingness to contribute their time and effort. In academic situations, professors often use a sample of their students to pretest the instrument designed for use in the outside social environment—a nonprobability convenience sample. Care must be taken in using students in the pilot study, however, particularly undergraduates. Not only are younger students likely to have little knowledge of the situation under study, they may not grasp the relevance of certain items in the instrument. They often use very different terms for phenomena from those that researchers and eventual study subjects employ. About the only justification for using students to pretest a survey instrument designed for nonstudents is that conducting some type of pretest is better than not pretesting at all.

Analyzing Exploratory Data

Data in exploratory research may be quantitative, qualitative, or a combination of forms. The data might come from either primary or secondary sources—that is, either gathered directly by the researcher or previously gathered by someone else for a different purpose. Both data types have similar validity in exploratory research. Their analysis occurs in different ways, however.

Analysis of Quantitative Data

In general, only descriptive statistics and graphic presentations of data are employed in the analysis of exploratory research data. This statement is qualified because some researchers may employ inferential statistical tests on the data in something like a “dry run,” in which the methods are tested for applicability, not the data itself. The most commonly used descriptive statistics include measures of central tendency and measures of variability, although measures of correlation are also used.

Little credence should be given to associations found in small-sample data, however. Small-sample correlations should only be used as indicators of variables that might be included in follow-on descriptive or experimental research designs. Nonparametric tests, such as the Chi-square test of independence, are often used to analyze exploratory research data, but they, too, have sample-size minimum limits. The general rule is that in a crosstabulation of two (or more) variables, each cell in the crosstabulation table must have at least five responses. Often, this rule cannot be met in exploratory studies, where samples are small and random selection of subjects cannot always be guaranteed.

Tables, charts, and graphs are also considered to fall under the category of descriptive statistics. A first analytical step the researcher takes when establishing order and meaning from raw, unprocessed data is to construct either a *frequency distribution table*, a *stem-and-leaf diagram*, a *histogram,* or any combination of these graphic devices. Stem-and-leaf diagrams can often be more informative than simple frequency tables in that none of the underlying data are lost in the analysis; all values are displayed in the diagram. Histograms also present summary data, but they do not display individual values for a class in the same way that a stem-and-leaf diagram does.

Analysis of Qualitative Data

Probably the single greatest advantage of employing qualitative research methods in exploratory studies—and possibly the greatest disadvantage as well—is the richness of the information gained. *Richness* refers to the large number of topics that may surface in an interview, for example. As Gaskell (2000, 53) has pointed out, "The broad aim of [all qualitative data] analysis is to look for meanings and understanding of what is said in the data, but the researcher must interpret this."

Summary

The purpose of exploratory research studies is to provide the researcher with greater insight into the study problem and ideas about the variables that should be included in a larger or more comprehensive study to follow. In addition, the findings of an exploratory study can often be used to train data-gatherers and help the researcher design and test a data-processing plan. Equally important, the findings of an exploratory study can often provide guidance to the researcher in rephrasing the study question. It can also require the imposition of totally new variables into the study.

Among other reasons, researchers use the literature review to gain knowledge about what they should be looking for in their own data gathering, as well as for weighing the applicability of their proposed research methods. They look for major themes in the database, which they may later incorporate into their research questions.

A major advantage of employing qualitative research methods in exploratory studies—and possibly the greatest disadvantage as well—is the richness of the information gained. It is an advantage because it often goes beyond simple description or numeration to also include some level of deeper understanding of the underlying motivations, attitudes, justifications for interactions and behaviors, for example.

Data gathering in exploratory research generally takes place in one of three different ways: (1) prior research reviews, (2) in-depth interviews and focus group, and (3) administrative records and documentary evidence. Sources of exploratory data include: (1) literature reviews, (2) individual in-depth interviews, (3) focus group unstructured interviews, and (4) case studies. These four techniques plus a fifth method, the pilot survey, were discussed in this chapter.

Discussion Questions

1. What is the main reason for conducting an exploratory study?
2. What role does a literature review take in an exploratory research design?
3. How and when would you use personal interviews in an exploratory research project?
4. How do structured and unstructured interviews differ?
5. What is a focus group? Name the different classifications of focus groups.
6. What role does the researcher take during a focus group session?
7. Name the different types of case studies.
8. What is a *pilot study*, and what is its major purpose?
9. Describe how you would analyze quantitative data collected in an exploratory study.

Additional Reading

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9 Descriptive Research: The Survey Approach

Researchers use two different approaches when gathering data in descriptive quantitative research studies; they may collect data by *observing* and *counting* overt acts of behavior, or they may use a *questionnaire* to generate responses to specific questions, including questions about attitudes, opinions, motivations, knowledge, demographics, and many more categories of data.

Questionnaires are the most popular way to gather primary data. It has been estimated that questionnaires are used in 85 percent or more of all quantitative research projects. They are particularly appropriate when the research problem calls for a *descriptive* design. This chapter discusses the process of descriptive research design and the steps involved in questionnaire preparation, including the nature, limitations, and wide variety of ways to write survey questions.

Questionnaires can be used to gather information about large numbers of respondents (populations) or small groups (samples). Most of the time, political science research is conducted with *samples.* The sample method used most often is the *probability* or random *sample.* Samples that are representative of the population are surveyed; the researcher then makes inferences about the population from the sample data. Within some known margin of error, the sample *statistics* are assumed to be a reflection of the population's *parameters.* Careful planning and construction of the questionnaire is, therefore, a critical step in research.

Advantages of Using Questionnaires

Questionnaires have many advantages. The greatest of these is the considerable *flexibility* of the questionnaire. Questionnaires can be custom designed to meet the objectives of almost any type of research project. Researchers can also purchase the rights to employ many different types of pre-prepared questionnaires that have been developed by other researchers. They have been thoroughly tested with a variety of different samples. The purpose of testing the survey in this way is to establish confidence (reliability) in the ability of the questions to effectively measure some phenomenon of interest.

These purchased pre-prepared questionnaires—called *standardized instruments*—are considered highly reliable and can be ordered from a wide variety of test catalogs. Their biggest drawback is that their use involves a compromise; they were developed for some different purpose, time, and sample than the researcher's study. At one time, they were used extensively in human resources applications, but their popularity has waned in recent years.

Some Characteristics of Questionnaires

Questionnaires can be designed to gather information from any group of respondents. Questionnaires can be short or long, simple or complex, straightforward or branched. They can be rigidly structured or be a loosely organized list of topics to discuss. They can be administered face-to-face, over the telephone, by mail, and over computer networks. Usually, respondents' answers are relatively easy to code and tabulate. This can reduce turnaround time and lower project costs.

Questionnaires can be designed to determine what people know, what they think, or how they act or plan to act. They can measure subjects' factual knowledge about a thing or an idea, or they can be used to measure people's opinions, attitudes, or motives for behaving in certain ways. They can be used to measure the frequency of past behaviors or to predict future actions. When subjects are children or persons from different cultures, response alternatives in the form of pictures or symbols may be substituted for words.

Because of the flexibility of the questionnaire, there are very few rules to follow in development of the instrument. However, constructing an effective questionnaire does demand a high degree of skill. Questions must be arranged in a logical order; they must be worded in such a way that their meaning is clear to people of all backgrounds, ages, and educational levels. Particular care must be taken when asking questions of a potentially controversial or personal nature so as not to embarrass or offend respondents. Folz (1996, 79–80) has summarized the concerns associated with questionnaire construction in this way:

> Know what you want to ask and why you want to ask it; compose clear, unambiguous questions; keep the survey (questionnaire) as brief as possible; and have a plan for analyzing the result before the instrument is administered.

How to Prepare Your Own Questionnaire

When preparing a questionnaire, follow a systematic procedure to ensure that it will fulfill the three key questionnaire objectives (Malhotra 1999). A questionnaire must: (1) successfully gather information that answers each study question; (2) motivate respondents to answer all questions to the best of their ability; and (3) keep all potential error to a minimum. Following these steps helps to make sure the questionnaire does what it should.

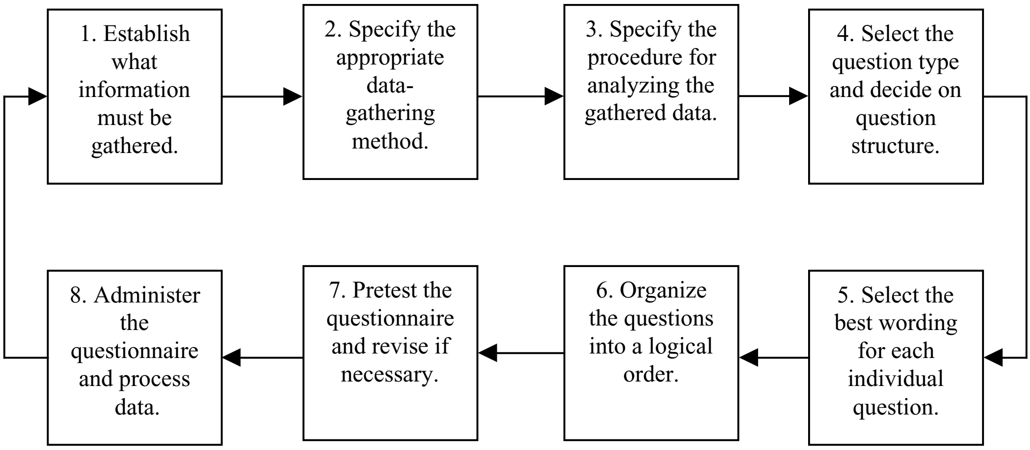
Steps in Developing a Questionnaire

The eight-step procedure displayed in Figure 9.1 has been shown to help in the preparation of effective questionnaires and questions. Because questionnaire construction is as much an art as it is a science, the list should be considered as a guide, rather than a checklist of steps that must be followed in the order presented.

Step 1: Determine What Information Is Needed

Before any questions are written, the researcher must be absolutely certain that the objectives for the research are clearly spelled out. It is never enough for a researcher to just "think" that he or she has an idea of what it would be nice to know. Rather, only questions that contribute to the overall research objective should be asked. This begins with an understanding of the scope of the proposed

Figure 9.1 **The Eight-Step Questionnaire Construction Procedure**



research: Is the research being done to solve a particular problem in a public administration or nonprofit organization, or is it "pure" research designed to identify or test some theory? This is the applied-theoretical research dichotomy question that appears periodically in the literature on public administration research.

Step 2: Specify Data-Gathering Method

The three primary ways to collect data with questionnaires are: (1) in-person or *face-to-face* interviews, (2) telephone interviews (also called *voice-to-voice* interviews), and (3) mailed survey instruments that are *self-administered.* In what is the latest method of data collection, today data can also be gathered over computer networks. Self-administered questionnaires may be mailed to respondents, handed out in public locations such as shopping malls, or dropped off at homes or offices. Each of these approaches has its own advantages and disadvantages.

Face-to-Face Interviews

The primary advantage of conducting in-person survey interviews is that they usually make it possible to gather large amounts of information in a relatively short period of time. Also, people who might not otherwise participate in the survey can often be encouraged to do so by a persuasive interviewer or researcher. Another advantage of the personal administration approach is that the data gatherer can often help respondents who might not understand a word or a question.

In-person administration is particularly helpful when branching questions are used in the questionnaire. This involves asking people questions that only they should answer, based on their response to one or more screening questions. Other respondents are instructed to move to a different section or set of questions. There are four major disadvantages associated with the use of in-person interviews. These are:

1. They can take longer to administer than other methods.
2. They tend to be the most costly method of collecting survey data.

3. The changing demographic makeup of the country means that fewer adults of working age will be at home during the day.
4. Interviewers are subjected to potential personal harm when interviewing takes place in some urban areas.

One way that researchers get around these problems is by conducting interviews in public places, such as shopping malls or recreational facilities. While this tends to eliminate the poor and older citizens from the sample, it does allow a large number of completed questionnaires to be gathered in a very short time.

Telephone Interviews

The major advantages of telephone surveys are (1) the relative speed with which the data can be gathered, (2) their lower cost, and (3) the opportunity for the researcher to ask questions that might not be answered in a face-to-face situation. To reach people at home, most interviews are conducted on weekday evenings or on Saturdays; this allows public administration researchers to use public agency or office telephones after the working day, further cutting the costs of data gathering. Telephone interviews are usually conducted from a central location, thus reducing researcher travel time and its related cost.

The major disadvantages of telephone interviewing are the inability to make eye contact with respondents and to know that people with the desired demographic profiles are answering the questions. Another disadvantage is the limited length of time that the respondent is willing to give to the interview. Also, many respondents are leery of providing personal information to strangers over the telephone. They may assume that the caller is a telemarketer rather than someone who is conducting legitimate research. Or they fear that the caller has sinister motives.

Finally, no one is as yet aware of the effect the wide use of cellular telephones will have on response rates for telephone interviewing. Researchers do know that it is becoming increasingly difficult to acquire the desired number of completed instruments in the time allowed for data gathering.

Mailed Questionnaires

Mailing questionnaires is often the least expensive of all data-gathering processes. On the other hand, this method often results in the lowest return rates of all data-gathering methods. *Return rates* are referred to as *response rates* when applied to face-to-face and voice-to-voice interviewing. They all mean the number of completed questionnaires received by the researcher. It is important to plan for return rates when planning the sample size. For example, it is not uncommon to achieve return rates of 10 percent or less in a mailed questionnaire, although the typical rate is closer to 25 to 40 percent. This means that for a sample of 100, the researcher might have to mail out from 400 to 1,000 survey instruments!

Step 3: Determine Analysis Procedure

The way that the gathered data will be coded, tabulated, analyzed, and interpreted plays a big role in the way the questionnaire and individual questions are developed. Today, computers using readily available, easy-to-use statistical software tabulate almost all survey results. For this reason, most questionnaires are *pre-coded* (classification numbers appear beside each question

Table 9.1

A Classification of Question Types by Content

Cognitive Awareness Stage	Type of Question	Information Acquired
Cognitive Stage:	Factual	The facts about people or things.
	Knowledge	What people know about things.
Affective Stage:	Opinions	What people say about things.
	Attitudes	What people believe about things.
	Motives	Why people act the way they do.
Action Stage:	Behavior	How people act, what they do; how they will respond to certain stimuli.

Source: Folz 1996.

and each possible response), making data entry simple and less error prone. The increasing use of machine-readable answer forms further improves the data entry process. Responses to open-ended questions are grouped into categories, and classes are then translated into numerical form for counting and additional statistical analysis.

Step 4: Select Question Type and Structure

There are many different ways to classify questions. The most common way is by the type of measurements they produce: *nominal*, *ordinal*, *interval*, or *ratio* data. Another is by the character of the measurement values; that is, are the values *discrete* (as in 'yes' or 'no' answers) or are they *continuous* (such as incomes, weights, attitude scale data, etc.). A third classification system is based on the form of the responses; that is, are the answers *open-ended* or *close-ended.*

A fourth way to classify question types is based on the *objective* of the generated response; that is, on the cognitive level of the information produced. Folz (1996) has identified these six broad categories of objective-based questions: *factual*, *opinion*, *attitude*, *motive*, *knowledge*, and *action* or *behavior* questions. Each question type delivers a different type of information and must be worded in such a way that this objective is achieved.

Table 9.1 displays the question types alongside respondents' level of cognitive activity addressed by each type. These three stages are (1) the *cognitive* (knowledge) stage, (2) the *affective* (attitudinal) stage, and (3) the *action* (or behavioral) stage. Examples of the information each type of question produces are also shown.

Step 5: Select Best Wording for Each Question

Very great differences in responses can occur with small variations in the wording of a question. As a result, extreme care must be taken in developing questions. The key things to look for when writing questions are *clarity*, *brevity*, *simplicity*, *precision*, *bias*, and *appropriateness.*

Clarity. Questions must be worded so that everyone completing the questionnaire understands what is being asked. Each question should address a single topic. Trying to include too much in a question often results in what is called *a double-barreled* question. Double-barreled questions result when two or more answers are required in the same question. They are not only confusing to the respondent, but also to the researcher; it can be difficult if not impossible for the researcher to know what part of the question generated the response.

Brevity. Questions should always be as short and as to-the-point as possible. Never ask two questions in one—avoid the use of "and" in a question. Somewhat longer questions can be included with in-person interviews and mail surveys, but shorter questions—less than 20 words—should be used in telephone interviews (Folz 1996).

Also, be sure that the questionnaire itself is not too long. A rule of thumb to follow is that interviews should take no longer than an hour or so to complete. Phone surveys should be kept to less than twenty minutes. Mailed, self-administered instruments should be kept to four standard pages or less.

Simplicity. Never ask complex or difficult-to-answer questions. Make sure the question is one that subjects can answer knowledgeably. Use short words and simple sentences. This is not to say that respondents should be given the impression that they are being looked down upon. Rather, focus on words that are in common everyday use.

Precision. The wording of every question must be as precise as possible (focus, focus, focus!). Never use ambiguous words in the body of the question. Examples of words with ambiguous meanings include "sometimes," "possibly," "maybe," and so on. And always make sure that each question asks just one thing.

Freedom from bias. Avoid asking questions that arouse strong emotions, generate resistance, or result in a refusal to answer. If you must ask these questions, place them at or near the end of the questionnaire, so that they do not result in only partially completed instruments. Such questions will often cause respondents to simply stop answering all questions, resulting in an incomplete instrument.

Do not ask "leading" questions—that is, questions that direct or influence the response toward one point of view. These, too, will often cause subjects to not respond to the survey. Large numbers of refusals to answer can greatly influence the results of a survey by introducing what is known as *nonresponse error* or *bias.* Often, subjects who do not complete the questionnaire would respond far differently than those who do respond.

Appropriateness. As has been said, be sure that each question is one that needs to be asked. Avoid "fishing expeditions." Relate each and every question to the study objectives. This point is related to the bias issue, as well.

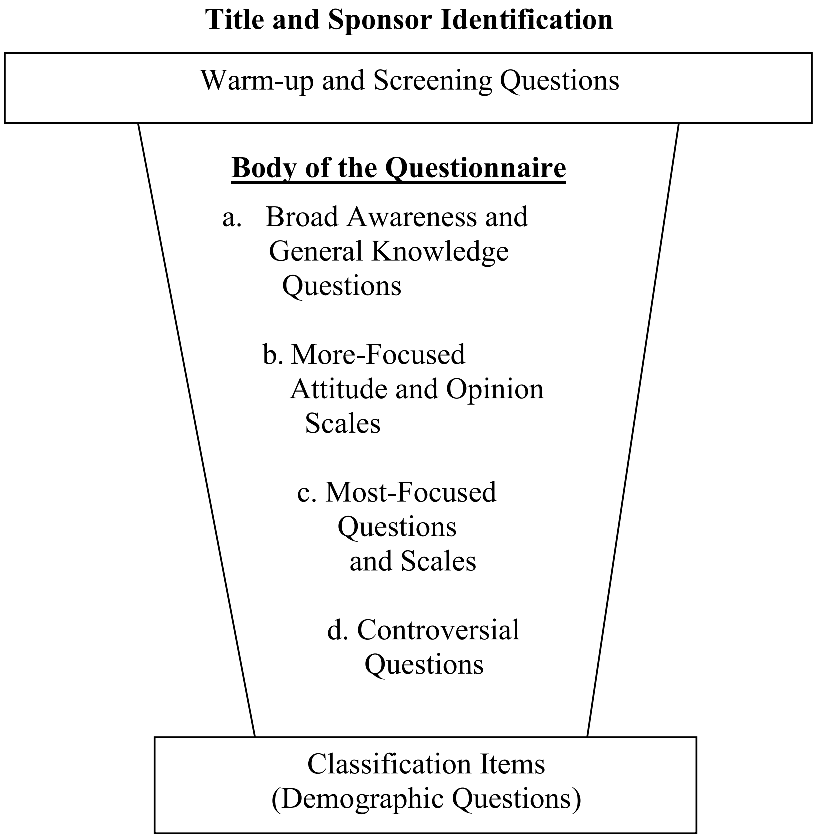
Today, many people have very strong opinions about what should be asked and what should not. Federal privacy laws also confound this issue. This is particularly true with classification or demographic questions. Gender, marital status, ethnicity, income, and the like are potential stumbling blocks in any questionnaire. It is important to ask such questions only if they are critical to the study. It they are not absolutely needed, they are inappropriate and should be left out of the questionnaire.

Step 6: Organize Questions into a Logical Order

The sequence of items in a questionnaire can also unintentionally influence or bias answers to questions that occur later in the instrument (an *item* is just another word for a *question*). Therefore, the researcher needs to carefully organize the questionnaire in such a way that subjects are encouraged to follow through with answers to all questions.

Questions are usually arranged in an order that begins with the broad and easy-to-answer questions placed before the more focused in-depth questions. The latter often require a significant effort on the part of the subject to answer. If the task is too difficult, respondents will often

Figure 9.2 **The Funnel Approach to Questionnaire Construction**



skip the question. A suggested format to follow is called the *funnel sequence* of questionnaire construction (Oskamp 1977).

Funnel questionnaires are composed of four distinct parts: (1) the title and identification of the survey's sponsors, (2) warm-up questions, (3) the most important, body of the survey, and (4) a section containing classification questions (see Figure 9.2).

Title, purpose, and sponsor identification. Questionnaires should have a title; they should indicate the purpose of the survey, including how the information will be used. The public likes to know who is sponsoring the survey and to know that individual anonymity is guaranteed. These items should all be included at the top of the first page of the questionnaire, although in mail surveys it is also acceptable to include some of this information in a cover letter attached to the questionnaire.

Instructions. Instructions are particularly important for self-administered questionnaires. They should be clear and easy to follow. Care must be taken to clearly spell out what is expected of the respondent. It is also a good idea to introduce early in the questionnaire information about potential points of confusion that might appear later, such as who is expected to answer sections of questions after a screening or branching point in the questionnaire. These instructions should be repeated right before the branching occurs.

Warm-up questions. These are simple, easy-to-answer questions that subjects can answer quickly and with a minimum of effort. They are often dichotomous or, at most, simple multiple-choice questions. These are usually questions designed to discern factual or knowledge information; they seldom dive right into gathering attitudinal data. Items in this section of the questionnaire are often *screening questions*—that is, questions to determine whether the respondent qualifies as a primary target subject. Examples of screening questions include the following three items.

1.	Do you consider yourself to be a Democrat or a Republican voter?	Democrat ☐
		Republican ☐
2.	Do you drive your personal car to work more than three times a week?	Yes ☐
		No ☐
3.	Do you own a bicycle?	Yes ☐
		No ☐

The objective of this section is to ease respondents into the questionnaire and to bring them to a level of comfort with the questions and the question-answering process. Therefore, questions that are potentially contentious, controversial, or personal in nature should never be included early in the instrument. The best place for potentially controversial questions is right after the most important body of the questionnaire and just before the classification questions.

In the past, some researchers have tried to use warm-up questions that have no connection whatsoever to the study, but that were asked only in an attempt to capture subjects' interest in the survey process. There have not been any convincing reports in the literature on the effectiveness of this ploy, however. Because of the already existing difficulty of gaining subjects' willingness to participate in yet another survey, it is probably a good idea not to waste a question this way. Researchers are encouraged to stick to the point and focus all their attention on gaining only meaningful data.

Body of the questionnaire. This is where the most important questions should be placed. Again, the easiest of these questions should appear before the more difficult or complex questions. The questions should be placed in a logical order that does not require the respondent to leap from one idea to another. When changes in direction are necessary, a line or two of additional instructions or words calling the shift to the respondent's attention should be considered.

The first part of this section is sometimes used as a transition section between the introduction and ultimate core section of the questionnaire. Researchers use this section of the questionnaire to ask questions to determine subjects' awareness of the survey issue. Other questions can serve to test their knowledge of component factors, indicators, and possible causal factors. These are usually broad questions that help build an overall view of the study for the researcher.

In the second part of the instrument, researchers often employ more focused attitude, opinion, or other types of scales—*if* scales are included in the design. Because they often require the subject to *think* about the question before answering, this is often where nonresponse error creeps into the survey. Another type of question that is sometimes included in either the second or last third of the body of the instrument is for gathering what is called *lifestyle* information. These data are often grouped together into a category of information called *psychographics.* Lifestyle information is used to develop a more in-depth profile of the respondents, adding *attitude*, *opinion*, *value*, and *activity* information to the traditional demographic profile.

The third part of the body of the questionnaire is where the most focused questions should be placed, as should all potentially controversial or personally embarrassing questions. The reason for this is that while subjects might skip a threatening question because it appears near the end of the questionnaire, they will have already provided answers for the bulk of the instrument. Questionnaires that are *mostly* completed are almost as valuable as those that are completely answered.

Classification items. Classification items are questions that enable the researcher to describe the sample in some detail and to compare the responses of one or more subgroups of subjects with responses of other subgroups. Classification information is sometimes referred to as *demographic data* because it usually consists of demographic statistics about the subjects themselves.

These data are, indeed, important to the research results, but not as critical as the information contained in the body of the questionnaire. This occurs because researchers are seldom interested in any one subject's responses, but instead they want to know the mean (average) scores for the entire group. Thus, missing some classification data does not render the instrument completely useless.

Step 7: Pretest and Revise the Questionnaire

Every questionnaire should be pretested on a group of subjects that as closely as possible reflects the same characteristics as the study sample. This is the critical "de-bugging" phase of questionnaire construction. No matter how many times the researcher or members of the research team go over the instrument, some problems are almost sure to surface. Typographical errors and misspellings are the least of these potential problems.

People in a career path will often share a particular sense of meanings for words and phrases that are not likely to be shared by everyone else. Thus, subjects who share the experience and characteristics of the study sample, not the research team, must look at question wording. The best way to do this is to administer the questionnaire to a random sample of subjects from the population of interest. The results from questionnaire pretests should not be included with the findings of the final study sample.

Step 8: Rewrite the Questions and Administer the Survey

The final step in the questionnaire construction process is producing the questionnaire in its final form. This may involve making a number of adjustments to the questionnaire that were brought to light during the pretest. Adjustments may mean changes in wording, reordering the flow of questions, and even deleting some questions. Particular care must be given to questions for which potentially embarrassing answers will ensue.

The final instrument is usually printed if it is to be distributed by mail or if subjects are asked to complete the instrument alone and on their own time. In such circumstances any branching instructions in the instrument must be clear and easy to follow. If the survey is to be administered in a personal interview procedure, the final form may be a discussion guide that the subjects do not see. In that case, the instrument may be less formal and include remarks and comments for the administrator's reminders while asking or recording answer. Finally, great care must be taken in administering the questionnaire so that subjects remain comfortable during the process and remain willing to cooperate with the research team.

Developing and Wording Questions

Responses to questions produce what is called *raw data.* Only when coded, tabulated, and interpreted, does raw data become information. The way in which questions are formed influences the way they are coded, tabulated, and interpreted. Questions may be written in many different ways; they can include a limited set of responses from which the respondent must choose (closed-ended) or they can allow respondents to provide answers freely and in their own words (open-ended).

Most survey questions used in descriptive research designs are close-ended. These questions force respondents to choose from only those alternatives provided by the researcher. While this results in survey instruments that tend to be more objective than open-ended questions, it can also work as a disadvantage. Closed-ended questions force subjects into using the same ideas, terms, and alternatives that the researcher uses—thus following the potential bias of the researcher (Oskamp 1977).

Open-ended questions are far more difficult to code and tabulate than are closed-ended questions. Therefore, open-ended questions are used most often in a small-sample, exploratory research design or as a component in an otherwise completely qualitative design.

Closed-Ended Questions

Closed-ended questions can be organized into two broad classes: *structured answer* (dichotomous and multiple-choice) and *scales.* Structured answer questions are used for warm-up, introductory, and classification portions of the questionnaire, while scales are more commonly found in the body of the instrument. The types of scales used most often in public administration and social science research are: (1) attitude scales, (2) importance scales, (3) rating scales, and (4) readiness-to-act scales.

Structured answer questions. Structured answer questions are the easiest type to write and the easiest for respondents to answer. There are two types of structured answer questions: *dichotomous* and *multichotomous.* For both types, the data provided are *discrete* (also known as *categorical data*).

The examples of dichotomous and multichotomous questions displayed in Figure 9.3 were used in a public safety agency survey of organizational climate and culture. Dichotomous questions require respondents to select from just two alternative answers. Examples include gender (female/male), behavior (do/don't), intentions (will/will not), status (employed/unemployed), and any number of such two-alternative answer forms. Multichotomous questions allow for more than two possible answers (they are also called *multiple-choice* questions).

Open-Ended Questions

Open-ended questions can also be divided into two broad types: *completely unstructured response* and *projective techniques.* Unstructured response questions elicit responses that are entirely the subject's own. The researcher provides no clues or direction for the response, although subsequent questions might probe for more information.

The subject may answer the question in any way desired, with a short or a long answer, and with or without qualifying statements. Projective techniques also allow subjects to respond to some stimuli in their words. The stimulus can be words, pictures, or symbols. The questions are structured in such a way that the respondent unconsciously *projects* hidden feelings or attitudes into the response. It is believed that in this way projective questions can produce answers that might not otherwise surface.

Figure 9.3 **Example of Dichotomous and Multichotomous Questions**

63.	Where do you work most of the time?	Field [2]	Jail [1]				
64.	Your gender:	Male [2]	Female [1]				
65.	Years with the department:	1–5 [5]	6–10 [4]	11–15 [3]	16–20 [2]	20+ [1]	
66.	Highest level of education you have attained:	Graduate work or degree [6]	4-year college degree [5]	2-year college degree [4]	Some college [3]	High school graduate [2]	Not an HS graduate [1]
67.	Do you have supervisory responsibility?	Yes [2]	No [1]				

Source: McNabb, Sepic, and Barnowe 1999.

Projective Techniques

Five different types of projective techniques are used in social and administrative science research. They are: (1) association, (2) construction, (3) completion, (4) ordering, and (5) expressive techniques. Each is discussed in more detail below.

Association techniques. With association techniques, subjects are asked to react to a particular stimulus, such as a word, an inkblot, or another symbol, with the first thoughts or ideas that come to mind. The technique is believed to be a good way to discern the underlying values that certain words or symbols convey.

Construction techniques. With construction techniques, subjects are asked to create a story, either about themselves or others, or to draw a self-portrait. The idea is that even though subjects are not told that the story is about them, their underlying values and attitudes will be reflected in the general sense of their stories.

Completion techniques. These techniques require the subject to finish an already started stimulus, such as a sentence or a picture. In the sentence completion version, subjects are asked to finish the sentence with any statement that they wish. The rationale for this approach is that the subjects' responses will not emerge from a vacuum; rather, the words chosen for the sentence completion will reflect the subjects' subconscious attitudes.

In the picture version of this process, a photograph or a drawing of two characters is shown to the subject. One of the characters is portrayed making a statement. Subjects are asked to put themselves in the other character's shoes and respond in the way that the second character or characters would. Again, the belief is that without consciously doing so, the subject will interject his or her own feelings or opinions into the created response.

Ordering techniques. Also called *classifying* or *choice* techniques, these require the subject to arrange a group of stimuli into some order or to choose one or more items from a group of items. The item(s) selected is supposed to be most representative of the idea or thought involved.

This method can also measure what is known as *salience*, which is another way of indicating the importance that a respondent places on each of the items.

Expressive techniques. In these techniques, subjects are asked to creatively express themselves in some way, such as by drawing a picture, a cartoon, finger painting, and so on. The method is often used in conjunction with the construction technique. The two are considered to reinforce each other. The picture will reveal an underlying attitude, with the subject's description of the events or components of the picture often indicating salience.

It is important to recognize that projective techniques require skilled and empathetic interpretation that goes far beyond the abilities of most students of political science. On the other hand, in the use of a trained professional, they can and do provide valuable information that might not otherwise surface in a traditional, scale-driven attitudinal research study.

Developing and Using Scales

As noted earlier, the types of scales that are used most often in public administration research are: (1) attitude scales, (2) importance scales, and (3) rating scales. Each is discussed in more detail in the following pages.

Attitude Scales

Attitude scales are the scales used most often in political science research. An attitude can be defined as a *relatively enduring*, *learned disposition that provides motivation to respond in a consistent way toward a given object* (Oskamp 1977). Researchers are interested in people's attitudes for any number of reasons. Just a few of these reasons are:

- Voters' attitudes toward candidates and issues directly influence the outcome of elections.
- Citizens' attitudes influence the formation and adoption of public policies.
- Peoples' attitudes influence their behavior and the consistency of that behavior.
- Attitudes determine group support for issues and programs.

Many different types of scales for measuring attitudes have been developed. The types of attitude scale that are used most often today include: (1) Likert scales, (2) semantic differential rating scales, and (3) a related semantic differential approach, the Stapel scale. Each is discussed below.

Likert Scales

By far the most favored attitude-measuring tool in use today is the Likert scale, developed in the early 1930s. Likert scales do not require a panel of judges to rate the scale items. The researcher prepares a pool of items that express an opinion about a subject or one of its contributing aspects. Items are individual statements. While the resulting data are most appropriately considered to be *ordinal level data*, some researchers treat them as *interval level* and process Likert data with interval-scale statistics. The argument has been summarized this way:

> The level of measurement of a Likert-type index is ordinal. The items do not really measure the quantity of a characteristic, but we can use the items to rank the cases. However, by adding together the numbers assigned to the response categories for each item, we are treating the measurement as if it were interval. This practice allows us to use more statistical techniques for

> analysis. Many analysts feel that treating Likert-type scales as if they were interval measures provides more advantages than disadvantages. (O'Sullivan and Rassel 1995, 274)

Objective of Likert Scales

The objective of the Likert scale is to measure the extent of subjects' agreement with each item. The extent is measured on a five-point scale: *strongly agree*, *agree*, *undecided*, *disagree*, and *strongly disagree.* The items are assigned values running from '1' through '5' respectively. Depending on how the statements are worded (positively or negatively, approving or disapproving, etc.), the researcher can use low mean scores to equate with either positive or negative attitudes, while using high mean scores to reflect the opposite attitude.

Researchers are typically not concerned with subjects' responses to any one item on the scale. Rather, an attitude score is established by summing all ratings of items in that scale. Reverse scoring must be used when items stated in positive and negative terms are used together in the same Likert scale. An example of a Likert-type scale designed to measure subjects' attitudes or opinions about one aspect of an organization's climate is displayed in Figure 9.4. Responses are coded in reverse order for the first two questions in that scale. Because low scores are assigned to negative attitudes, agreeing with the statement in question 18 is coded with low values. Question 19 is assumed to register a positive attitude toward the company. Positive attitudes are assigned with high values. Hence, agreeing with the statement is coded with high values.

Individual attitude statements to be used as statements or items in the Likert scale are often generated by an exploratory study that uses series of in-depth interviews with key informants in the organization or sample.

Semantic Differential and Stapel Scales

Two additional scales are often used to measure attitudes and opinions. These are the *semantic differential* and its close relative, the *Stapel scale.* The Stapel scale is almost identical to the semantic differential, except that only *one* of the polar adjectives is used instead of both; they are *unipolar* rather than *bipolar.*

Semantic differential scales are *pairs* of opposing adjectives, with spaces between each for subjects to mark their opinion. A seven-point scale typically separates the adjectives. Subjects are asked to make a personal judgment about a characteristic or a complete concept. For example, they can be used to help researchers build a picture of how subjects rate the service they receive at a particular agency. Or the adjective pairs could pertain to the agency as a whole.

In the following example, subjects are asked to rate the overall effectiveness of a brochure describing any program or agency. Subjects are first asked to read the brochure, then asked to rate it on the following five-point scale. Subjects are to check the box that most closely matches their perceptions of the document. Figure 9.5 includes adjectives that could be used to describe a public service announcement proposed for an AIDS prevention campaign.

In practice, many researchers consider the points on both the semantic differential and Stapel scales to be equidistant, thus providing interval-level data. However, because the assigned differences are arbitrarily assigned, other researchers feel that the scale only provides ordinal data. This conflicting interpretation has resulted in a reduction in the use of the scales in social and administrative science research.

Figure 9.4 **Statements to Measure Attitudes Toward Risk in an Organization**

		Very Definitely Describes ⇓						Does Not Describe ⇓
18.	The philosophy of our management is that in the long run we get ahead fastest by playing it slow, safe, and sure.	[1]	[2]	[3]	[4]	[5]	[6]	[7]
19.	You get rewarded for taking risks in this organization.	[7]	[6]	[5]	[4]	[3]	[2]	[1]
20.	Decision making in this organization is too cautious for maximum effectiveness.	[1]	[2]	[3]	[4]	[5]	[6]	[7]
21.	You won't get ahead in this organization unless you stick your neck out and take a chance now and then.	[7]	[6]	[5]	[4]	[3]	[2]	[1]
22.	We do things by the book around here; taking risks is strongly discouraged.	[1]	[2]	[3]	[4]	[5]	[6]	[7]
23.	We have to take some pretty big risks occasionally to make sure the organization meets its objectives.	[7]	[6]	[5]	[4]	[3]	[2]	[1]

Source: Sepic, Barnowe, Simpson, and McNabb 1998.
Notes: Low values = negative attitudes; High values = positive attitudes. Positive statements are reverse-scored.

Figure 9.5 **An Example of a Semantic Differential Scale**

Clear	[ ]	[ ]	[ ]	[ ]	[ ]	Confusing
Simple	[ ]	[ ]	[ ]	[ ]	[ ]	Difficult
Quick	[ ]	[ ]	[ ]	[ ]	[ ]	Slow
Complete	[ ]	[ ]	[ ]	[ ]	[ ]	Incomplete
Realistic	[ ]	[ ]	[ ]	[ ]	[ ]	Phony
Valuable	[ ]	[ ]	[ ]	[ ]	[ ]	Worthless

Other Types of Scales

Other types of scales include *ordinal* (ranked) *importance scales*, *comparative and noncomparative rating scales*, and *ratio scales.* Example questions are included to illustrate these several types of scales.

1. Ordinal Scale Importance Scales

a. Please rank each of the following public transportation methods in terms of how important it is to reducing traffic congestion in this region. (Use a '1' for most important, '2' for next in importance, etc. Do not give any two items the same value.)

____ Freeway buses
____ Light-rail system
____ Vehicle ferryboats
____ Passenger-only ferryboats
____ Heavy rail commuter trains
____ Commuter pool vans

b. In your opinion, would you say that patient waiting time at the Veterans' Hospital during your last visit was:
____ Shorter than most
____ About the same as most
____ Longer than most
____ The longest I have ever encountered

2. Comparative Rating Scale (Single Attribute)

Compared with Microsoft Excel, how do you rate SPSS in ease of use? (Circle the appropriate number)

	Much Easier			About the Same			Much Harder	
1	2	3	4	5	6	7	8	9

3. Noncomparative Rating Scale

How would you rate this brochure on its ability to inform you of the disadvantages of using tobacco products? (Circle the appropriate number)

	Very Good			About Average			Very Poor	
1	2	3	4	5	6	7	8	9

Summary

Researchers use two different approaches when gathering primary data in quantitative research studies; they may collect data by *observing* and counting overt acts of behavior, or they may use a *questionnaire* to generate responses to specific questions. Questionnaires are the most popular way to gather primary data. They are particularly appropriate when the research problem calls for a *descriptive* design. Questionnaires have many advantages. The greatest of these is their *flexibility*. Questionnaires can be custom designed to meet the objectives of almost any type of research project.

Eight steps are followed in questionnaire construction: (1) establish what information is needed; (2) specify the data-gathering method; (3) specify procedures for analyzing the data; (4) select question type and structure; (5) select the best wording for each question; (6) organize the question in a logical order; (7) pretest and revise the questionnaire, if necessary; and (8) administer the questionnaire and collect the data.

Questions may be written as a limited set of responses from which the respondent must choose (closed-ended), or they may allow respondents to provide answers in their own words (open-ended). There are two types of closed-end questions: *structured answer* (dichotomous and multiple choice) and *scales*. Structured answer questions are used for warm-up, introductory, and classification portions of the questionnaire; scales are usually found in the body of the questionnaire. The types of scales used most often in public administration research are: (1) attitude scales, (2) importance scales, and (3) rating scales.

Open-ended questions can also be divided into two broad types: *completely unstructured response* and *projective techniques*. Unstructured response questions are entirely the subject's own responses to a question. Projective techniques also allow subjects to respond to some stimuli in his or her words. The stimulus can be words, pictures, or symbols. The questions are structured in such a way that the respondent unconsciously *projects* hidden feelings or attitudes into the response. Five different types of projective techniques are used in public administration research: (1) association, (2) construction, (3) completion, (4) ordering, and (5) expressive techniques.

Many different types of scales have been developed for measuring attitudes. The attitude scale methods that are used most often today are: (1) Likert scales, (2) the semantic differential rating scale, and its related approach, (3) the Stapel scale. Several other scales were illustrated in the chapter as well.

Discussion Questions

1. Why are questionnaires such a popular way of collecting research data?
2. Name the three objectives for questionnaires described by Malhotra.
3. List the six steps to follow in preparing a questionnaire.
4. What is the relevance of *brevity* and *clarity* in questionnaires?
5. What are *classification items*? Why are they important? Give some examples.
6. What are some of the problems associated with classification items?
7. Discuss the pros and cons of using Likert scales for measuring attitudes.
8. What are *bipolar adjectives*, and how would you use them in a research project?
9. What are *projective techniques*, and how might they be used in political science *research*?

Additional Reading

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10 Causal Research: The Experimental Approach

Experimental design (ED) is the term used in the social, behavioral, and natural sciences to identify the processes involved in designing, conducting, and evaluating the results of all types of experiments. Researchers conduct experiments when they want to determine whether a *causal relationship* exists between two or more variables. ED also enables researchers to measure the strength—and sometimes the direction—of the possible relationship.

Experiments are characterized by three distinguishing components (Greeno 2001). First, at least two groups of similar subjects are selected; one group is administered a "treatment" of some kind. The second group—usually referred to as the *control group*—either gets no treatment or an alternative treatment. This treatment is referred to as the *independent variable.* Second, the researcher determines what activity, behavior, or result to measure after application of the treatment(s). The variable that is altered as a result of the experiment is the *dependent variable.* The measured change in the dependent variable is the *outcome of the experiment.* The researcher observes the dependent variable to discern the amount of shift, if any, that might have occurred after application of the treatment. In one of the earliest examples of experimental design, independent variable treatment was application or no application of fertilizer; the dependent variable measured outcome was variation in crop yields on plots with and without the treatment (Cochran 1977).

The third distinguishing characteristic of experiments is the requirement that subjects be *randomly assigned* to all test groups. Randomization ensures that the researcher does not influence who receives the treatment and who does not. It is a method for controlling for the possible effects of extraneous, or *confounding*, factors that might influence the outcome.

Key Concepts in Experimental Design

Quantitative research can have as its fundamental focus either (1) the illumination of concepts and themes, (2) the description of events or phenomena, or (3) the determination of causal effects that the manipulation of one or more factors may have on some variable of interest. These three different approaches are called *exploratory*, *descriptive*, and *causal.* Causal research is called experimental research because it follows an experimental design. In exploratory and descriptive designs, the researcher is a collector of data that already exist. In an experiment, however, the researcher becomes an active participant in the data-generating process by manipulating different treatments to examine their effects on a variable of interest.

A number of important concepts play a role in experimental design. Some of the key concerns involved in the design, conduct, and interpretation of experiments and the statistical tests employed in experimental design are probability and confidence levels, sample factors, and inference; these and other factors are discussed below.

Probability. Probability is the level of confidence a researcher holds in implying that a causal relationship exists; it is also a numerical indication of the researcher's belief in the reliability of a prediction that X is a cause of Y, or that the occurrence of X makes Y more likely.

Confidence levels. Confidence levels are related to the concept of probability. Before widespread acceptance of the p-value approach to hypothesis testing, managers were required to compute acceptance and rejection levels and to look up decision values in tables. Today, most statistical packages, such as SPSS and Excel, compute critical p-values along with t-test, z-test, and F-test values. The decision whether to retain or reject the null hypothesis can now be made by comparing the computed p-value with the confidence level or *alpha.* Confidence levels used most often in all social science include the .01, the .05, and the .10 probability values.

Statistical significance. This is the term used to describe the point or value beyond which analysts accept or reject a null hypothesis; decisions are made in accordance with preselected levels of confidence. Hypothesis tests are themselves sometimes called *significance tests.* In the past, the critical values of a statistic had to be read from a table of values found at the end of most statistics texts. These were then compared with a value that was found by following steps in a formula for calculating the statistical test. Today, the value at which the decision can to be made appears as a *probability* value in the results of most, if not all, inferential statistical tests. This is called the *p-value approach.*

Alpha levels. Alpha is the Greek symbol used for the probability value. Most researchers make hypothesis acceptance decisions at the .05 level of confidence. However, the nature of the study and required level of confidence in the results often require that an alpha of .10 or of .01 be employed. In statistical notation, the lowercase Greek letter alpha (α) is used to represent the confidence value. P-values the same or greater than the selected alpha result in retaining (or accepting) the null hypothesis; p-values less than the significance value require that the null hypothesis be rejected.

The confidence coefficient. When analysts use the .05 level of confidence, they are in fact saying they are 95 percent sure about a hypothesis decision. This "95 percent" is what is known as the confidence coefficient and is the probability that a null hypothesis is retained when it should be retained.

Experimental validity. Experimental validity means that the experiment and statistical analysis measure what the researcher wants to measure. There are two types of validity: internal and external. Internal validity refers to the effectiveness of the design at limiting possible explanations for the outcome to the treatment applied. This means controlling external or confounding factors. External validity refers to the degree to which the researcher can make inferences to larger populations from the results of the sample experiment. Over time, field experiments have been shown to provide a greater level of external validity and a lower level of internal validity than laboratory experiments (McDaniel and Gates 1993).

Independent variable. Also called the explanatory or experimental variable, this is the changed or manipulated factor in an experiment. It can be anything that the researcher believes might influence a change in something else.

Dependent variable. The phenomenon that the researcher observes in order to check for a change as a result of the application of treatment. The observed and measured change is called the *outcome.*

Treatment. Treatment refers to the changes the researcher makes in the independent variable or variables. Different instructional methods, communications methods, prices, models, designs, and issues are examples of variables that are manipulated in the experiment.

Randomness. The random assignment of subjects to treatment and control groups is a fundamental assumption of experimental design.

Degrees of freedom. Degrees of freedom (abbreviated as df) refers to the number of observations in an experiment that are free to vary. The degrees of freedom must be known when using a statistical table, such as the t-table or F-table, to determine a critical value in hypothesis testing. Modern statistical software eliminates the need for using statistical tables, but df are still reported when making hypothesis decisions using the *p-value approach.* Degrees of freedom are reported either for columns (variables) or rows (cases) or both, depending on the test in question. When a statistics calculation is concerned only with description, the degree of freedom is n, the full sample size (Phillips 1977). However, when the statistical calculation is concerned with inference, the df is always smaller than n (e.g., $n - 1$, $n - 2$, etc.). Degrees of freedom are discussed in greater detail on page 137.

Inference. Researchers can never prove beyond all doubt that for a given population, X is a cause of Y. Rather, they can only *infer* from the observation of sample results that a causal relationship exists for the population from which the sample was drawn. In all science, causality is always inferred; it is never proven conclusively.

Approaches to Experimental Design

Experiments can take any one of three different approaches. The first is a group of approaches known as *pre-experimental designs.* A second type is one that is used often in political science research, the *quasi-experimental* design. The third group consists of two types of true experiments, laboratory *experiments* and *field experiments.*

Pre-experimental designs are the least scientifically rigorous of all experimental designs. They provide little or no control over confounding variables. As a result, they are considered to be only slightly better than simple descriptive studies when the results are used to make inferences. The advantages that make them so desirable in political research is that they are far less costly to administer than classical experiments, and they typically take far less time to administer. A pre-experimental design may produce results in a week or less—a fact that makes them popular with campaign managers in the midst of a heated political race. Three of the most commonly used pre-experimental designs are the *one-time*, *single case study*, the *one-group pretest*, *post-test design*, and the *base-group comparison design* (McDaniel and Gates 1993).

In a quasi-experimental design, researchers follow most of the requirements of true experiments. They employ treatments, outcomes, and sample units, but do not use random sampling methods to assign subjects to sample groups (Cook and Campbell 1979). The groups usually already exist, and are chosen because of this existing structure or cohesiveness. Examples might be the registered voters of two different communities, groups of lobbyists supporting a controversial issue and groups of lobbyists who support an opposite point of view, or elected government officials in two different nations.

Laboratory experiments are one of the two main types of classical experimental designs. They take place in controlled environments, such as classrooms, university laboratories, research centers, and similar locations. In this type of experiment, the researcher creates a situation that mirrors external conditions as much as possible; the researcher then manipulates the independent variable(s) and measures changes in the dependent variable. In political science research, most studies tend to be empirical. Therefore, laboratory experiments are seldom seen outside of academic settings.

In field experiments, the research is conducted in a realistic situation—often in one or more communities. Although the researcher attempts to control conditions as much as possible, the potential for bias from intervening or confounding variables is always present in these situations. Both laboratory and field experiments involve two principal components: (1) the actual process of designing the experiment, and (2) determination of the statistical tests to use in evaluating the results of the experiment. These two principal components of ED incorporate a number of connected activities (Kirk 1995, 1). As in all research, these begin with establishing a valid research question and end with interpreting the results of the research. Activities involved in experimental design include the following:

1. Selecting a valid research question and forming a hypothesis or hypotheses that can be scientifically tested using proven ED methods.
2. Identifying the treatments (i.e., the independent variable or variables), establishing what changes in the dependent variable will be measured as a result of the changes in treatment, and identifying the variables and conditions that might confound or bias the results.
3. Identifying the population from which a sample will be drawn, the characteristics or constraints that limit the sample alternatives, and determining the sample size needed for validity in the experiment.
4. Determining the approach for assigning units to test and control groups. This involves selecting from several experimental designs. Although more than fourteen designs have been developed, the four basic designs used most often are the *one-sample*, *two-sample*, *factorial*, and *Latin square designs.*
5. Planning the appropriate statistical analysis processes to be used for analyzing and interpreting results of the experiment.

Step 1: Determine the Research Question

Research questions are the concepts the researcher wants to study. The question selected dictates which research design, data collection method, and analysis approach satisfies the objectives spelled out for the selected study question. Political scientists typically examine questions that fall under the categories of either political theory, the philosophy and/or history of politics and political institutions, American politics, comparative politics, elections and voting behavior, all levels of the judiciary, public policy, public administration, program evaluation, international relations, research methodology, and other related topics. Researchers in other nations substitute their own nation or region for American politics, but generally follow a similar set of topic areas.

Step 2: Select Research Treatments

The concept of treatments originated with the founder of experimental design and methods, agricultural researcher Sir Ronald A. Fisher. Fisher developed ED techniques in order to test the influences of such factors as water, fertilizer, soil type, and other variables on improving yields of farm crops (Antony 1998). Classical experimental design follows the procedures set forth by Sir Ronald Fisher and William D. Gosset, who published his statistics research under the pen name of "Student" (Cochran 1977). The design involves the random assignment of subjects or units to experimental and control groups, pretesting to establish benchmarks, variations in treatments, and post-testing after treatment application.

Selection of a treatment variable also involves identifying as many potentially confounding variables as well. Confounding or extraneous variables threaten internal validity. They range from the effects of being tested, history, changes that subjects may undergo over the time from pretest to post-test (called *maturation*), and any variations that might creep into the measuring instrument (such as leading questions and unintentional bias).

In political science research, treatments have included such examples as different types of messages and different types of communication media (such as television versus newspaper), testing of different issues or appeals to voters, comparisons of different policy scenarios with various groups, and similar variables that may be manipulated in experimental situations.

Examples of how treatments employed in political science research include two papers published in the July 2000 edition of the *American Journal of Political Science.* In the first paper, Bottom and co-authors (2000) described a laboratory experiment on the institutional effect on majority rule instability. Subjects were assigned to forty six-person groups. Groups were assigned to one of four different treatments, which involved different meeting arrangements to represent bicameral or unicameral formats for policy decisions.

In the second paper, Gilliam and Iyengar (2000) used as their treatment different versions of a hypothetical television news script. In one version, a crime was described as violent and the perpetrators as nonwhite males; in other versions, these descriptions were changed. The hypothesis tested was that inflammatory news stories influence citizens' attitudes toward minorities.

Step 3: Identify the Population and Select a Sample

Researchers must be certain that the population they are studying is one that is appropriate for the research question and study hypotheses. Samples are smaller groups or research subjects that are drawn from larger populations. The sample selection process begins with identifying the appropriate subjects for the study. This decision is based upon the research question selected by the investigator. The researcher must take care to ensure that the sample is representative of the population of interest and is large enough to enable the researcher to apply the level of precision necessary in measuring the effects of the independent variable(s).

Sample size has an influence on the level of Type I and Type II errors acceptable to the researcher (Wyner 1997). "Error" refers to making right or wrong decisions based on the evidence established in the analysis of the data. A Type I error means deciding that the null hypothesis is false when, in reality, it is true. A Type II error is the opposite: concluding that a null hypothesis is true when it is actually false. While neither can be eliminated entirely, Type I error can be controlled by establishing more rigid confidence levels and random selection of subjects. Type II error can be controlled by increasing the sample size. A rule of thumb often followed in establishing sample size for empirical research is that the sample must consist of at least thirty subjects or 10 percent of the total population size; they typically do not exceed 100. When researching with larger populations, such as the entire population of a state or of the nation, most sample sizes seldom exceed 1,000 subjects. Nearly any statistical textbook will have a formula for rigorous-sample size determination.

Randomness in Sample Selection

Randomness refers to the way subjects are assigned to experimental and control groups. The principle of random selection and assignment of cases was introduced in 1925 by Sir Ronald Fisher. The principal gains from random assignment are that it allows the researcher to control for any bias that might originate from treatment effects or from confounding variables because applications are averaged across all possible groupings (Yates 1977).

The most common approach to selecting a random sample is called a *simple random sample* (SRS). The key characteristic of this type of sample is that every potential sample member has an equal chance at being selected. Often, subjects are numbered sequentially, then either a table of random numbers or a computer-generated random table is used to select individual subject numbers from the list. The total list is called the *sample frame.* Randomly generated telephone numbers (called *random digit dialing*) are another method used in random sample selection. When the sample frame is large, as with a telephone directory, the researcher often simply opens the directory at random, arbitrarily decides on a starting point on the page and a number of pages to turn each time, then continues through the directory from either front to back or the reverse, following the same selection system.

Step 4: Select Experimental Design and Assign Units to Test and Control Groups

The three major categories of experimental design used most often by political science researchers today include *pre-experimental designs*, *quasi-experimental designs*, and *true experimental designs.* Of a wide number of applications of these three basic approaches, the most commonly used designs include one-sample pre-experimental designs, quasi-experimental designs, randomized two-sample designs, randomized block designs, factorial designs, and Latin square designs. Each of these is discussed in greater detail below, beginning with the three types of pre-experimental designs.

Pre-Experimental Designs

Pre-experimental designs are used primarily because of their ease of application and speedy turnaround. Pre-experimental designs are little better than standard descriptive studies in their use for inferences to larger populations. They typically take any one of three different approaches, ranging from the least scientifically rigorous to the nearly so.

One-time single case study. In this design, the researcher selects a convenience sample that he or she expects is similar to the population of interest. This could be a group of students, a neighborhood, a group of House or Senate employees, or any other convenient group. The researcher administers a treatment of some kind and then measures the previously identified dependent variable. No pretests are taken, so the researcher never knows if the treatment induced any change. The design does not control for confounding variables, nor is a control group included in the research.

The single group, pretest and post-test design. This design adds the validity safeguard of establishing a benchmark to measure against after the treatment. This is a very common design, used extensively in tests of public acceptance of political strategies and other types of attitude and opinion research, for example. However, the research does not include a control group. Elimination of a control group makes the results of the experiment potentially suspect. There is no way of controlling for maturation or other confounding variables.

Base-group comparison design. In this type of pre-experimental design, the researcher uses two groups—an experimental and a control group—but does not use random assignment of subjects to either group. Treatments are applied to the entire sample, so it is not possible to randomly assign treatment to sample subjects. No pretests are used, thus making it possible only to infer causality from the results of the treatment.

Quasi-Experimental Designs

Quasi-experimental designs are similar to true experiments. The major difference is that the researcher randomly assigns subjects to groups, but does not use random application of treatments to the groups. They are often used in large-scale studies and in circumstances where it might be impossible to make random applications. Kirk (1995, 6–7) described an example quasi-experimental study in which whole communities were selected to receive different levels of fluoride in the water supply. The measured outcomes were levels of tooth decay in children. The results were compared with tooth decay rates in a community with high levels of fluoride naturally occurring in the water supply.

True Experimental Designs

In all true experimental designs the researcher randomly assigns treatments to randomly selected sample subjects. The use of randomization in subject selection and treatment application has the benefit of controlling for the effects of many intervening variables. They are particularly appropriate for inferences. The four types of experiments discussed below include *randomized two-sample designs*, *randomized block designs*, *factorial designs*, and *Latin square designs.*

Randomized two-sample designs. The most typical of a number of two-sample designs is the *experimental/control groups*, *before and after tests.* Because subjects are randomly assigned to both groups, they are considered to be equivalent. Of the several different variations of this design, the simplest to use and the best known is the *t-test for independent samples design* (Kirk 1995). The *t*-test is used to test for differences in the mean values for both the experimental and control groups after the application of the treatment. The hypothesis often stated is that the difference between the two statistics is equal to some value, which is usually zero. This approach is also known as the *before and after with control group* design (McDaniel and Gates 1993).

Randomized block designs. This design is similar to the randomized two-sample design, except that it can be used to test for the effects of two variables at the same time—it is a two-factor experiment with a one-factor focus (Hildebrand and Ott 1998, 458). The two factors are *treatments* and *blocks.* The term *block* refers to the environment in which the treatment is administered. In this design, the researcher is concerned with measuring treatment effects, but controls extraneous or "nuisance" block factors. The following example will help to clarify the design:

A political strategist wants to determine the best message to use to influence voter attitudes in her state. She has three different strategies that might be effective. She decides to test the messages on three types of voters—Democrats, Republicans, and Independents—in each of three legislative districts.

The legislative districts are the blocks in her experiment, whereas the different messages are the treatments. She is not concerned in which legislative district the voter resides, but rather, with assuring that all voter-groups are exposed to all different messages (treatments). The strategist might simply randomly assign the messages to each district. The problem with that approach is that the random assignment by itself could result in a design where all Democrats receive only the first message, all Republicans receive only the second message, and all Independents receive only the third. That type of assignment might look like the display in Table 10.1. Note that each column receives the same treatment (message). Clearly, this would defeat the purpose of her randomized experiment.

To control for the block variable, the researcher requires that every message be used in every legislative district. In each district, voter-groups are randomly assigned one of the three messages, until each of the three messages is represented by each category. The appropriate randomized block

Table 10.1

Example of a Random Design Affected by the Nuisance Variable "Block"

	Party Affiliation		
Legislative District	Democrat Voters	Republican Voters	Independent Voters
First District	Message 1	Message 2	Message 3
Second District	Message 1	Message 2	Message 3
Third District	Message 1	Message 2	Message 3

Table 10.2

Example of a Random Design with a Nuisance Variable (Block) Controlled

	Party Affiliation		
Legislative District	Democrat Voters	Republican Voters	Independent Voters
First District	Message 1	Message 2	Message 3
Second District	Message 2	Message 3	Message 1
Third District	Message 3	Message 2	Message 1

design will look like the distribution in Table 10.2. In this design, each of the nine experimental groups receives one block assignment and one treatment assignment, thus improving validity by ensuring greater randomization to the study.

Factorial designs. In a factorial design, two or more independent variables are studied simultaneously in the same experiment. All possible combinations of each level of treatment are tested together in this design. In this way, they also allow the researcher to test for any *interaction* that a combination of factors might have.

According to Kirk (1995), they are the most widely used designs in the behavioral sciences. They are also very popular in political science research, and are the principal experimental design employed in marketing and advertising research.

In the following example of how a factorial experiment might be designed, suppose that the managing director of an environmental lobby in Washington, D.C., wants to know what messages might best to use for influencing members of Congress to vote for legislation to protect Arctic wildlife habitat. The director wants to test whether to use an appeal based on reason, an appeal based on emotion, or an appeal based on economic considerations. In persuasive communications, these are called *head*, *heart*, and *pocketbook* appeals, respectively.

In addition, the director wants to test which communications method will have the greatest impact on recipients of the message—a four-color brochure produced and distributed by the organization's home office or a letter-writing campaign by the organization's members directly to members of Congress. Together, these allow for six possible combinations, as displayed in Table 10.3. In one approach, the researcher could plan a number of independent experiments of a single variable, such as one concerned only with which appeal to use. In any one such experiment, all other relevant variables would be held constant. However, a much better procedure would be to vary all factors in a single experiment. This would permit the manager not only to accomplish the purposes of single-variable experiments, but also to test for possible interactions among the factors.

To conduct the experiment, the lobbyist might test the combinations on members of several

Table 10.3

Example of a Two-Factor Factorial Experimental Design

Communication Method	Type of Appeal and Treatments: Head Appeal (A_1)	Heart Appeal (A_2)	Pocketbook Appeal (A_3)
Home Office Brochure (C_1)	A_1 C_1	A_2 C_1	A_3 C_1
Membership Letter-Writing Campaign (C_2)	A_1 C_2	A_2 C_2	A_3 C_2

state legislatures, randomly assigning legislators to each of the six groups. Referring to the diagramed experiment in Table 10.3, the design allows the researcher to test for the following in one statistical operation:

1. The main effects of the communications *appeal* altogether,
2. The simple effects of each *appeal* separately,
3. The main effects of communications *method* together,
4. The simple effects of each communications *method* separately, and
5. The interaction effects of *appeal* times *method*.

In this example, a simple analysis of variance (ANOVA) procedure would test the significance of each of the four main and simple effects, while also providing a bonus test for interaction. Analysis of variance procedures are discussed in the next section.

Latin square design. The Latin square design is similar to the randomized block design in that it allows the researcher to control for the effects of nuisance factors. However, this design lets the researcher control for two or more nuisance variables at the same time. The key characteristic of the Latin square design is the assignment of each level of treatment to every combination of nuisance variables. If rows and columns are levels of the nuisance factors, each level of treatment appears once in each row of the design and once in each column.

For example, in the following Latin square design scenario, the Tribal Council of a Native American tribe is interested in expanding income enhancement opportunities for tribal members. The funding for the program would come from development of a gambling center and/or resort on tribal lands.

Three types of opportunities have been identified as levels for the treatment variable (*treatment*): promises of service jobs now (T_1), technical job training with low monthly stipends (T_2), and transportation to nearby colleges for academic education with stipends replaced by tuition grants (T_3). A layout of the experiment is displayed in Table 10.4. The Tribal Council is running the experiment to see if enough support for gambling exists to proceed with planning the development.

Three groups of tribal members have been identified: modernists, traditionalists, and externally focused (*status*). Modernists (S_1) want to bring gambling to the reservation; traditionalists (S_2) will accept a resort but do not want gambling; and externally focused members (S_3) live off the reservation and consider themselves integrated into the larger, nontribal community.

Three levels of development (*develop*) are identified: no change (D_1), gambling center only (D_2), or gambling center and resort (D_3). The three test hypotheses for this Latin square are (1) there is no difference in the means of the treatment groups, (2) there is no difference in the means

Table 10.4

Example of a Two-Factor, Three-Treatments, Latin Square Experimental Design

	Development Type Supported and Treatments		
Status	No Development (D_1)	Gambling Only (D_2)	Gambling and Resort (D_3)
Modernists (S_1)	T_1	T_2	T_3
Traditionalists (S_2)	T_2	T_3	T_1
Externally Orienteds (S_3)	T_3	T_1	T_2

of the social orientation groups (rows), and (3) there is no difference in the means of the development preference groups (columns).

Step 5: Plan the Appropriate Statistical Analysis

The underlying concepts of one-sample hypothesis testing also apply to a body of statistical techniques designed to test hypotheses with two or more samples. These tools permit managers to test whether the different values found in two or more samples are statistically significant or whether they could have occurred by chance.

Another way to look at a hypothesis test is to consider it a *significance test*, the results of which help the researcher evaluate certain characteristics in measurements. *Differences* are one class of characteristics; *relationships* are another. In experiments, the researcher is almost always testing for differences in the outcomes of a set of treatments.

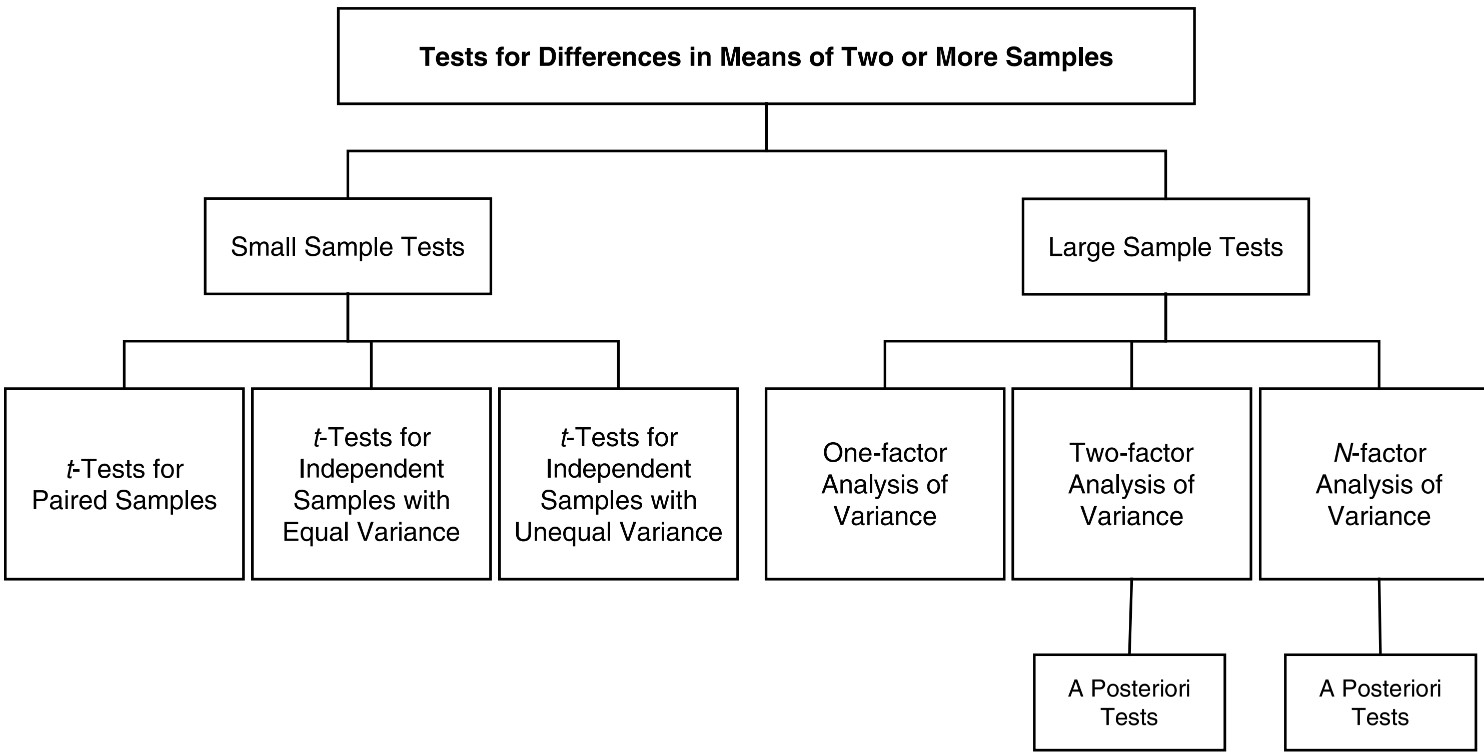
Researchers want to know if the differences seen in test measurements are "real" or if they are simply chance-related variations that are seen every time a new measurement is made and which would fall within the range of a normal distribution of the statistic. They are looking for differences that are *statistically significant.* A difference that is statistically significant is one with a high probability that the differences did not occur through chance alone. It is important to remember that the analyst never knows if the differences are, indeed, "real." Rather, within a predetermined acceptable *level of confidence*, such as 90, 95, or 99 percent, the procedure only entails rejecting or accepting a hypothesis or hypotheses about a difference.

Many statistical techniques exist to test for differences with all levels of measurements. Managers will most likely find themselves using several tests for comparing differences in means, a statistic that requires interval or ratio data. However, other data types can also be tested for differences. The choice of a particular statistical test for differences between measures depends upon the nature of the measurements themselves. A statistic based on two groups' categorical measurement (nominal data) should not be measured with the same statistic used for a continuous (nominal or ratio level data) variable, for example.

As can be seen in Figure 10.1, an extensive body of statistical tools has been developed for testing hypotheses about statistics for two or more groups. Various tests exist for use with *parametric* and *nonparametric* statistics. Parametric statistical tests can be used only with data at the equidistant-interval or ratio level. When the data are ordinal (ranked) or nominal (categorical), a body of tests known as *nonparametric* statistics must be used.

In addition, parametric statistics require that the data be from random samples, with a normal distribution. When these assumptions cannot be met, nonparametric tests must be used

Figure 10.1 **Commonly Used Two-Sample Differences Tests**



in place of parametric tests. Some parametric tests require that the samples be independent from one another, while other tests have been developed for use with dependent or paired samples. Separate-but-related statistical tests have been developed to meet either independence requirement.

Two of the statistical tests often used when comparing the mean values for independent samples are the student's *t*-test for independent samples, and the one-way, two-way, and *n*-way *analysis of variance* tests (ANOVA). When the decision maker has any doubt about the independence of the samples, testing a null hypothesis for dependence with the *Levene test for independence* can be done before selecting either of the difference tests.

Once the researcher is assured the samples are independent, the next step is to decide whether the *t*-test or analysis of variance is appropriate. The *t*-test has more limitations than ANOVA, and is usually used for comparisons between the means of two (and only two) relatively small samples, with each sample having about the same number of observations or cases.

Testing Differences with Student's *t*-Test

The *t*-test is used to compare the means of two groups with approximately equal variances. This could be the test scores of two groups of employment applicants. Scores from a group of trainees gathered prior to a training program might be compared with scores for the same group after completion of the training. Another might be comparing different sample means in production line situations, such as filling boxes or bottles. Many similar such uses are possible. Minimum required assumptions for using the *t*-test include the following: (1) the measurements are of at least interval-level data, (2) the samples are randomly selected, and (3) the scores are randomly distributed.

Only two sets of means can be compared at any one time using the *t*-test. The data analysis tool in Microsoft Excel contains four different types of *t*-tests: The *t*-tests in Excel programs are to be used only when the manager has all the raw data (individual measurements) available. When this is not the case, when the manager has only the means at hand, it is possible to make a similar comparison using just summary data and the Excel mathematical formula capability. ANOVA, which compares variances between samples, also requires that the raw data be available.

As in one-sample hypothesis testing, the first step must be to prepare the null and alternate hypotheses. It is possible to perform both a one-tailed test and a two-tailed test with the pooled variance *t*-test in Excel. A typical two-tailed test hypothesis pair, to determine where the means are different in any way, would be:

$$H_0\text{: } \mu_1 \neq \mu_2$$
$$H_A\text{: } \mu_1 = \mu_2$$

If a one-tailed test is desired, either a greater or lesser hypothesis pair must be written as follows:

μ_1 *Greater than* μ_2	μ_1 *Lesser than* μ_2
H_0: $\mu_1 \geq \mu_2$	H_0: $\mu_1 \leq \mu_2$
H_A: $\mu_1 < \mu_2$	H_A: $\mu_1 > \mu_2$

The difference between *one-tailed* and *two-tailed* tests is that in one-tailed tests the researcher specifies the direction of the difference: it is either greater or lesser. The probabilities calculated with the *t*-test on a one-tailed test are half of the probabilities for a two-tailed test. It should be noted that deciding whether to select either the one- or two-tailed tests cannot be done arbitrarily. If the manager has no specific reason to expect a difference in one direction, it follows that no prediction can be made in advance. The manager is obligated to use the two-tailed test.

Different Approaches for the *t*-Test

Several different approaches to difference tests are possible with the *t*-test. The major differentiating characteristic between these tests is the nature of the samples for which measurements are available: are they paired or independent? This question must be answered before selecting one of the several different *t*-test computational methods. At the heart of this issue is what is known as *degrees of freedom.* As was introduced on page 127, degrees of freedom refers to the limits to which a set of measurements may vary. The concept is rooted in physics, where an object that can move on a flat plane is said to have *two degrees of freedom.* If it can move in only a straight line, it has just one degree of freedom.

In statistics, this idea is used to mean the number of independent comparisons that can be taken between sets of data. For example, if we have two observations, we are limited to just one independent comparison. Two observations means two independent measurements, such as would be taken from a sample of just two individuals. If there are three observations, then we have two independent comparisons, and so on. In statistical notation, we write this as "$n - 1$" degrees of freedom, with n meaning the total number of observations.

Degrees of freedom are computed differently depending upon whether the data are collected from the same individuals, as in a pre-test and a post-test situation, or whether they are collected from different sets of individuals (two independent samples). Data collected from the same individuals at different times are called *correlated data.* Data collected from separate samples are called *uncorrelated data.*

To determine the degrees of freedom for *correlated* data, one is subtracted from the total number of cases. To compute the degrees of freedom for *uncorrelated* data, one is subtracted from each sample. In statistical notations, this is shown as: $df = n_1 + n_2$. The various *t*-tests contained in Excel include these different values in their computations; all the manager needs to do is to select the correct option.

Both the Excel *Function Wizard* and *Data Analysis Tool* include three different *t*-test options: a test for paired samples and two tests for independent samples. The two independent sample tests vary in that one assumes the samples were taken from populations with equal variance, while the second test assumes two populations in which the variance is unequal. In practice, this means the manager should select the equal variance option when comparing the means of two samples, both of which were randomly selected from the same larger population. The unequal variance option is to be used when the populations are different. An example would be comparing the means of samples taken from two separate production lines or processing machines.

All two-sample *t*-tests compare sample (or group) means by computing a student's *t*-value and comparing the significance of whatever difference is found between the means. Considered to be

Table 10.5

Subjects' Scores Before and After Computer-Assisted Training

(Variable 1) Pretest Scores	(Variable 2) Post-test Scores
20.7	19.3
21.7	23.9
17.2	19.9
18.0	24.0
15.1	17.7
21.1	21.5
24.5	25.9
17.8	19.1
23.6	24.0
19.0	19.5

only slightly less "robust" than the *F*-test statistic used in ANOVA procedures, it can be used to test the means for either different (independent) samples or paired samples. "Different samples" refers most often to different groups within a larger sample.

For example, the attitudes of nonsupervisory personnel might be compared with attitudes of agency management; the responses of females in a sample might be compared with those of males, and so forth. Paired sample testing refers to testing for differences between two separate variables. Examples include comparing the mean scores on a pretest given before a training activity variable with the mean of a second test given after the training session. Table 10.5 displays data from a paired-sample, pre- and post-test example.

To summarize *t*-test applications, the paired-sample *t* -tests in Microsoft Excel will compare the means for the two variables (pretest and post-test), report the difference in the means, and calculate a *p*-value for the *t* statistic. The samples may be paired or independent; independent samples may be from one population with equal variance, or from different samples with unequal variance.

Comparing Scores of More Than Two Groups

ANOVA is a powerful tool for comparing the differences in means between any number of groups, and of doing so at more than one level. With ANOVA, it is possible to test the role of each of several variables independently, and then to determine whether two or more variables *interact* to influence differences between groups' scores.

A classical example often cited is that of testing the influence of farm plot location (or any other variable, such as amount of water applied) and the amount of fertilizer on crop yields. Each variable can be tested by itself. The two are then tested for interactive influence on the yield result. Analysis of variance is also regularly used in market research studies to compare mean attitude scores of potential customer groups.

In all applications, analysis of variance uses the *F*-ratio to calculate *variances* of the mean scores and compares this variance to the overall variance found in the total sample. Decisions about the null hypothesis are based on these comparisons.

To make its comparisons, analysis of variance compares the means of two samples or two groups within a sample. Furthermore, ANOVA statistical program results include summary statistics for each sample or group, an F-ratio, and a probability value. This makes interpretation simple. The means are "statistically different" if the p-value is less (smaller) than the analyst-selected confidence level. The p-value of the F-ratio will indicate whether the null hypothesis is to be rejected, but it will not indicate where the differences lie. Another test, called an *a posteriori* or *post-hoc* test, is required. When one of these is selected, actual differences will be highlighted, while those that are statistically "the same" will be so marked. The three versions of ANOVA are discussed in detail in Chapter 12.

Summary

This chapter has looked at a number of ways researchers design experiments and test for differences in the results of different levels of a treatment. Two broad classes of tests were discussed. The first class included the various types of two-sample t-tests. Minor variations in portions of the computation formulas are necessary for paired or independent samples—correlated or uncorrelated data. Microsoft Excel's analysis programs (Function Wizard and Data Analysis Tools) both take these differences into consideration, enabling the analysts to specify which computation procedure to follow. Typically, t-tests should be used for smaller sample sizes (around a total of 30 cases), and preferably with groups that are equal in size. The t-test can only be used to compare the means of two groups at a time.

The second major category of differences tests discussed in this chapter was analysis of variance (ANOVA) procedures. These all use the F-ratio to compare variances across two or more samples or groups. Analysis of variance procedures do not limit the number of groups being compared. Thus, three, four, and more levels or groups' scores can be compared at the same time. Equally, analysis of variance can test for differences with more than one factor at a time. These tests are discussed in more detail in Chapter 12.

Discussion Questions

1. Name and discuss the key concepts in experimental design.
2. How do quasi-experimental designs differ from true experimental designs?
3. Name the five steps to follow when designing and conducting political science experiments.
4. Distinguish between *association* and *causality.*
5. When should Student's t-test be used to test for statistically significant differences?
6. Name the several different t-test models researchers used to compare group means.
7. What is *analysis of variance* (ANOVA), and what is it used for?
8. Describe a situation in which a political science researcher might want to use a causal (experimental) research design.

Additional Reading

Collier, Raymond O., Jr., and Thomas J. Hummel, eds. 1977. *Experimental Design and Interpretation.* Berkeley, CA: McCutchan.

Cook, Thomas D., and Donald T. Campbell. 1979. *Quasi-Experimentation: Design and Analysis Issues for Field Settings.* Chicago: Rand McNally.

Kirk, Roger E. 1995. *Experimental Design: Procedures for the Behavioral Sciences.* Pacific Grove, CA: Brooks/Cole.

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11 Interpreting Exploratory and Descriptive Statistics

Researchers use *exploratory* and *descriptive* statistics for such tasks as describing a sample, providing a quantitative summary of a variable, summarizing a dataset, and similar purposes. Of all the various statistics available for these purposes, four classes of descriptive statistics are used in almost every political science research study:

1. Measures of central tendency (or measures of location)
2. Measures of variability
3. Measures of relative position
4. Measures of correlation

These four types of measurements make it possible to reduce a large dataset to a smaller amount of meaningful numbers that everyone can understand. They provide essential information about the internal structure of the raw data (Lang and Heiss 1994).

The main purpose for measurements of location (also called *measures of central tendency*) is to identify the value in the dataset that is "most typical" of the full set. This "typical" value may then be used as a summary value. Several different numbers can be used as measures of location. These include the *mean* (arithmetic, geometric, and trimmed mean), the *median*, and the *mode.*

Measurements of variability (sometimes referred to as *measures of dispersion*) tell how the individual measurements vary within the dataset. Variability measures include the *range*, the *variance*, and the *standard deviation* in a set of measurements. Scatterplots are also used to visually illustrate how each measurement falls in comparison to all others.

Percentiles and distributions in general are used to indicate *position* and variation within a range of data, while measures of *correlation* help to describe relationships between two or more variables. Each of these descriptive measures is discussed in some detail below.

Measures of Central Tendency

The easiest way to quickly summarize a set of measurements is to identify the most typical value in the set. This value is sometimes called "the most representative score." Most people refer to this most typical value as the *average value.* Five types of averages can be used to show central tendency. They are:

- *The Arithmetic Mean.* Also known as the "average of all scores," the *mean* is the number arrived at by adding up all the values of a variable and then dividing by the number of items or cases in the set. It is used when the distribution of scores is fairly symmetrical about the center value. When plotted, a symmetrical distribution produces the typical bell-shaped curve.

- *The Median.* This quantitative measure is the halfway point in a dataset. Exactly one-half of the values lie above the median value and one-half fall below that point. The median should be used when the scores are not symmetrical, such as when they are closely grouped but with a few very high or very low scores. These very high values might have a disproportionate influence on the arithmetic mean.
- *The Mode.* The mode is simply the value for a variable that appears most often. It is the value with the greatest frequency of occurrence. The mode can be used for a quick estimate of the typical or representative score.
- *The Geometric Mean.* This is the root of the product of all items in the dataset. It is particularly appropriate when computing an average of changes in percentages.
- *The Trimmed Mean.* This average value is used when the dataset includes one or more outliers. It is trims the top and bottom values of the sample by some percentage. A new arithmetic mean is then calculated from the truncated dataset.

The Arithmetic Mean

The term "central tendency" refers to a point in a dataset that corresponds to a typical, representative, or central value. The measurement used most often for this is the *arithmetic mean.* Means are only valid for use with ratio or equidistant interval (i.e., continuous) data; a mean cannot be computed for categorical data. Average scores for attitude and opinion scales are typical examples of the appropriate use of means. In attitude and opinion scales, a mean (or "average") score for the total sample conveys far more information than the exact response for any one subject in the sample. For example, assume that 100 voters are asked their opinions about a proposed national health insurance plan. An individual subject might respond with any value from 1 to 5 on a five-point attitude scale. The researcher used low scores for negative attitudes and high scores for positive attitudes. While any one subject's score might be interesting to know, by itself it doesn't tell the research much. However, a *sample mean* of 1.2 on the scale clearly suggests a negative attitude interpretation of the attitude held by members of this sample.

Arithmetic means are calculated for both populations and samples. Their computation is similar, but separate notation or symbols differentiate them. Below are symbols used to signify sample sizes and means for samples and populations:

N = the total number of cases in a population
n = the total number of cases in a sample
μ = the mean of a population (pronounced "mew")
$\bar{X}$ = the mean for a sample (pronounced "X-bar")

Mean scores or values are generally not valid for use with qualitative measurements such as rankings or numbers assigned to categories (ordinal and nominal data). For example, political polling firms might ask citizens to rank a number of different gubernatorial candidates in their order of preference. The research firm wants to know which candidate is the one most preferred, which is second, etc. A mean rank value has no meaning in this case. In the following example, say that voters are asked to note their occupation from a list of eight or nine categories. In this case, the total number for each category is informative; determining the mean or average occupational category is nonsense. Despite this limitation, it must be noted that computing mean ranks is often done with certain nonparametric statistical tests and may be encountered on some statistical program printouts.

The Median

The *median* is the halfway point in a set of numbers. Half of the values are above the median value, half are below. The median is appropriate for all data types, but is particularly useful with ranking (ordinal) data, or when the dataset contains outliers, which would disproportionately influence the mean. Because the median deals with structure or order in the dataset, it can be used with ordinal and interval/ratio data, but it is meaningless with nominal (categorical) data.

For a small-sample example of how the median is computed, say that during the first half-hour of a fund-raising event, a public broadcast radio station received donations in the following amounts:

$25, $18, $20, $22, and $100

The mean donation value is $185 divided by 5 ($185/5), and equals $37. However, a mean of $37 is misleading, since the $100 *outlier* unduly disproportionately influences the result. A more meaningful measure of location in this case would be the median. This is achieved by rearranging the data in ascending order ($18, $20, $22, $25, and $100) and then selecting the value that falls in the center. The median for the five values is $22. For larger datasets, the median can be located in the list of values by subtracting one from the total number of cases and then dividing by 2. A formula for finding the median is:

$$\text{Median} = (n - 1)/2$$

The Mode

The *mode* is the only measurement that makes sense when dealing with nominal-level variables. It is defined as the value that appears most often in a collection of all counts for a variable. The example below was obtained in a focus-group study conducted for a marketer of sports shoes. Subjects were asked which of four shoe styles they preferred. Individual styles were assigned identifying code numbers ranging from 1 to 4. The final tally of subjects' preferences was:

3, 2, 1, 1, 3, 4, 2, 3, 1, 2, 1, 1, 1

The category value "1" appears most often in the dataset: six times. This gives the researcher the maximum amount of information. Since the numbers represent specific styles and are not quantitative, both the mean and the median clearly are inappropriate measures of location in this example. Political campaign finance managers are often interested in the modal distribution, the distribution of donation amounts within a total range of amounts.

The Geometric Mean

Not all statistics texts include a discussion of the *geometric mean.* This is a mistake, for there are many instances where a geometric mean is far more appropriate than an arithmetic mean. A

Table 11.1

Annual Candidate Pluralities in the 35th District, 1996–2002 (in thousands)

	Election			
	1996	1998	2000	2002
Gross votes	4,000	4,800	4,940	4,890
% Change	—	12%	7%	2%

commonly encountered use is when a campaign manager wants to know the average of a series of percentage changes, such as voter approval rate changes. The changes are measured by the number of votes over her closest opponent the candidate has received over the past four biannual elections. Vote plurality is converted to percentages and reported as the relative change from the previous total. The manager has the gross percentages for a four-year period and wants to know the overall average percentage change. The data are displayed in Table 11.1.

Either the arithmetic or geometric mean can be used to summarize the changes over time. The arithmetic mean for the 1996–2002 period is 7 percent— (12 + 7 + 2)/3 = 21/3 = 7. Computing the geometric mean, however, arrives at a more appropriate measure. This mean is computed by multiplying each percentage change in sequence, then calculating the root of the sum. Note that each change is the new change plus the base 100 percent (which is the previous value). The number of measurements in the sequence determines which root is appropriate. In this example, three periods of change are measured; therefore, the cube root must be used:

$$G = X_1 * X_2 * X_3 \ldots * X_n$$
$$G = 112 \times 107 \times 102$$
$$G = \sqrt[3]{1{,}234{,}352}$$
$$G = 106.9221 \text{ or } 6.92 \text{ percent}$$

Thus, a more accurate average rate of plurality increase over the four-election period is 6.92 percent (106.9221), not the 7 percent of the arithmetic mean.

Excel example. Computing the geometric mean is a quick and simple process with Microsoft Excel. The data are arranged in a column array, as displayed in Table 11.2; the GEOMEAN option is then selected from the Function Wizard. All computations are conducted in the Wizard, which computes a geometric mean to four decimal points. Use the following Excel seven-step process:

1. Insert all labels and values into a new worksheet. Cell A1 contains the label for column 1, "Variable."
2. In Cells B1 through E1, insert the years 1993 through 1996. Type the label "Gmean" in Cell F1.
3. Insert the labels and data. Percentage changes must be written as hundreds; e.g., a 7 percent increase must be inserted as "107."
4. In Cell F4, insert an equals sign (=).
5. Select the Function Wizard (fx). Scroll down to GEOMEAN. "=GEOMEAN" will appear in the worksheet formula bar for that cell.

Table 11.2

Excel Worksheet Setup for the Geometric Mean

	Election Year				
Variable	1996	1998	2000	2002	Gmean
Sales	4,000	4,800	4,940	4,890	
%Change		112	107	102	106.9221

6. Hit *Return* to begin the calculation.
7. The value for the geometric mean will appear in Cell F4, alongside the last inserted percentage change value.

Note: Roots of different power may also be used, thus allowing extension to the time series data. Excel GEOMEAN automatically computes the root that is appropriate for the dataset.

Trimmed Mean

The trimmed mean is a mean computed from a truncated set of values rather than the entire set of measurements. It is particularly useful when one or more extreme measurements have the potential to produce misleading summary statistics. It is calculated by deleting some percentage of responses at both ends of the distribution before calculating the mean for the remaining values. For example, to establish a 30 percent trimmed mean, remove the bottom 15 percent and top 15 percent and calculate the mean for the remaining 70 percent. The *TRIMMEAN* function in the Excel Function Wizard makes it simple to make this calculation.

Measures of Variability

Once the researcher has determined the appropriate measure of location, the next concern is to determine how the distribution of numbers in the data varies around the central value. The researcher asks how and to what extent the scores or values differ from one another, and how this variability can be summarized. The three most common ways to express variability—the range, variance, and standard deviation—all provide information about the distribution of responses within the range.

The Range

The range is the easiest statistic to compute. It is determined by subtracting the lowest value from the highest value in a distribution. It can be misleading, however, and is not used very often by itself. By itself, the range does not take into consideration the variability within a distribution; it is only a crude approximation of variability. For example, consider the following two sets of data:

Dataset A: 65, 80, 81, 82, 83, 84, 98
Dataset B: 65, 69, 74, 78, 87, 89, 98

Both sets have the same range: 98 – 65 = 33. However, a closer look at the two sets reveals that Set B clearly has more internal variability than Set A. Also limiting the uses for the range is that it uses only two values in the set of measurements: the highest and lowest. As a result, percentiles (or *fractiles*) are often used with the range to give more meaning to this measurement. Percentiles are values below which some proportion of the total scores or observations fall. The most commonly used percentiles divide the data into quartiles. These divide the data into roughly 25-percent segments. A quarter of the values fall below the first (or 25 percent) quartile; half are below the second (or 50 percent) quartile; and, three-fourths are below the third quartile. The second quartile value is the same value as the median.

One important application of quartiles used in political science is the interquartile range. This includes all values above the first quartile and below the third quartile, which is the same as the range for the central 50 percent of all cases.

The Variance

The variance is an index of how scores or values in a dataset vary from their mean or average value. Because it is only an index of variation, interpreting the variance is more art than science. Statistically, the variance is defined as the average of the squared deviation of all values in the range, divided by the number of cases in the dataset (minus 1). Larger variance values indicate the data are more spread out, whereas smaller variances mean the values are more concentrated around the mean.

Many comprehensive statistics texts distinguish between the variance of a set of scores for a sample (S^2) and the variance of a set of values for a population. The formulas for computing each are slightly different: for a population, the divisor is $N - 1$; for a sample, the divisor is $n - 1$. Similar differences occur with the standard deviation of populations and samples. Because researchers are most often dealing with samples rather than total populations, researchers almost always work with the variance for a sample.

The Standard Deviation

Because the variance is only an index or rough indicator of variation and, thus, somewhat abstract, it is far more common to find variability stated in terms of the standard deviation rather than as the variance. The standard deviation is nothing more than the square root of the variance. Rather than a squared value, which suggests or implies variation, the standard deviation is a more exact measurement, stated in exactly the same units as the original data.

Because the standard deviation focuses on variation from the true mean, it is probably the most reliable of all the measures of variability. It is certainly the one used most often. As with the variance, standard deviations for samples and for populations vary slightly in their computation formulas. The divisor for the standard deviation of a population is the total number of cases (N); for a sample, it is $n - 1$.

Excel example. Excel's procedure for obtaining the variance or standard deviation for samples and populations is included under the statistics function found in the Function Wizard (fx on the main toolbar). The subcommand for the sample variance is VAR; for the variance of a population, it is VARP. To obtain the standard deviation for a sample, the function command is STDEV; for the standard deviation of a population, it is STDEVP.

SPSS example. Instructions for determining the variance and standard deviation in a variable or dataset are found in two *Analysis* processes under the *Descriptive Statistics* subprogram. These subprograms are *Frequencies* and *Descriptives.*

Table 11.3 displays the amounts that lobbyists for companies, labor unions, and other organizations spent on lobbying activities in Washington, D.C., from 1997 to 2000. The expenditure information was reported on their Web pages by the Center for Responsive Politics, May 5, 2002. Table 11.4 contains summary descriptive statistics produced by the SPSS *Frequencies* program.

Table 11.3

Total Lobbyist Spending, 1997–2000 ($ millions)

	Year			
Sector	1997	1998	1999	2000
Agribusiness	86	119	83	77
Commun/Electronics	154	186	193	200
Construction	17	22	24	23
Defense	49	49	53	60
Energy/NatResources	143	149	158	159
Financ/Insur/REstate	177	203	214	227
Health	136	165	197	209
Lawyers/Lobbyists	13	19	18	16
Misc. Business	15	169	193	223
Transportation	112	115	117	138
Ideol/Single Issue	73	76	76	85
Labor	21	24	24	27
Other	66	69	87	102

Source: Lobbyists Database. *Influence Inc.* 2000. Center for Responsive Politics. www.opensecrets.org/lobbyists.

Table 11.4

Summary Descriptive Statistics of Lobbyist Data Produced by SPSS *Frequencies*

	Statistics YR2000	
N	Valid	13
	Missing	0
Mean		118.92
Median		102.00
Mode[a]		16
Std. Deviation		78.57
Variance		6173.41
Range		211
Minimum		16
Maximum		227
Percentiles	25	43.50
	50	102.00
	75	204.50

[a]Multiple modes exist. The smallest value is shown.

Measures of Relative Position

Measures of relative position are used to compare one measurement against other measurements in the dataset. Two types of statistical processes can be used for this: *percentiles* and *standard scores*; standard scores are also called *z-scores.*

Percentiles

Percentiles are points or values used to indicate the percentage of subjects or measurements with scores below that point. Percentiles are not often found in political science statistics, but can be very useful in selected situations. A well-known example of the use of percentiles is students' scores on the Scholastic Aptitude Test (SAT). SAT results include an indication of how the set of scores for one student compares with all other scores for that test set. Similar applications exist for the Graduate Record Examination (GRE), the Law School Aptitude Test (LAST), and the General Management Aptitude Test (GMAT).

Say, for example, a graduate business school applicant scores 580 on the GMAT. This might be reported as falling in the 85th percentile (P_{85}) of all scores for persons taking the test at that time. This means that 85 percent of all applicants had scores lower than the applicant's 580. If the applicant had scored, say, 450, this might have fallen in the 65th percentile (P_{65}), and so on. The 50th percentile (P_{50}) is always the median value for that set of scores.

Excel example. Microsoft Excel includes procedures for obtaining any-level percentiles as well as standard quartiles. These functions are incorporated into the Statistics toolbox of the Function Wizard (fx*).* When the Function Wizard is selected, two lists appear in the window. The left-hand list shows categories of functions, one of which is Statistics. Within the Statistics master-category function are a variety of specific functions. These appear in the right-hand window. Scroll bars must be used to display all the choices included.

The commands for Excel's percentile function are slightly different from most applications. In Excel, a value between 0 and 1 must be entered. For example, to arrive at the 90 percent percentile value, the user must enter '9' (without the quotation marks, of course). In most other applications, the values to be entered are a number between 0 and 99. Thus, to have a statistics program compute the 90th percentile value, the user enters '90' (again, without the quotation marks).

With the Excel *quartile* function, the user may set the "Quart" value from 0 to 4. Setting it to 1, 2, or 3 will return the corresponding quartile values. Setting it to 0 or 4 will return either the minimum or maximum values in the dataset range. Excel uses the median value for the second quartile.

Standard Scores

Standard scores are the scores of the dataset that have been *transformed* in some way. When the scores are all transformed in the same way, it becomes possible to compare any two or more scores against one another on an equal basis. They are often used to compare the scores on one study against the scores on another study, as in a pre- and post-text research design. The standard-score transformation process used most often is the *z-score. Z*-scores are raw scores that have been converted into standard deviation units. The *z*-score indicates how many standard deviation units any one score is from the mean score for the total group.

Z-scores also make it possible to compare a single subject's scores on two different scales. For example, the SAT includes a communications skills and a mathematics skills component. The mean score for each of these components serves as the common reference point for the test population; standard deviations are the common unit used to measure variability, thus providing a clear picture of how each score compares with the total group's scores.

Excel example. Standardized scores (*z*-values) are easy and quick to compute with Microsoft Excel. All that is required is to highlight the dataset. Data from a hypothetical set of scores on a

Table 11.5

Weights of Sample Units, AM Dataset

	Awareness Scores					
Ward	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6
1	18.4	17.9	18.6	19.0	17.8	18.7
2	18.2	18.0	18.5	19.1	17.4	19.0
3	18.0	18.1	18.4	19.2	16.9	18.8
4	17.9	18.2	18.6	19.1	17.6	18.5

Source: Example data.

political awareness survey taken in six separate samples drawn from the population in four different wards of the city appear in Table 11.5. To calculate *z*-scores with Microsoft Excel, follow these simple steps:

1. Arrange the raw data into a one-column data array.
2. Calculate the mean and standard deviation for the total sample using the Excel Function Wizard. *Note:* To calculate the mean, use the *Average* option in the set of statistical applications. To find the standard deviation for the sample, use the Function Wizard's STDDEV option in the same set of applications. The formula for standardization requires three numbers:
   a. The value to be standardized
   b. The mean for the sample
   c. The standard deviation (SD) for the sample
3. Using the Standardize option in the Function Wizard applications, insert the three appropriate values.
4. For a shortcut, type the mean in the cell below the cell where it was calculated using an Excel Wizard formula. Do the same thing for the standard deviation value.
5. Now, click and hold on the small fill capability box in the lower right-hand corner of only the cell in which you copied the mean. Drag down to the bottom of the data array. The repeated formula calculates the appropriate value in each cell. Do the same for the standard deviation column. *Note:* If you include the cell that contains the formula for the mean and/or the SD in this click and fill, Excel will calculate a new mean and a new SD formula for each raw score, but using one less raw value each time. All the subsequent means and SDs will be wrong.
6. Now, click on the second, empty *z*-score cell, click and hold the drag button, and drag to the bottom of the array. Correct *z*-scores will be calculated for each raw data value.
7. Now go back and use the Format → Cells → Numbers selections and format for the number of places after the decimal point desired.
8. Add lines, boldface, or other options as desired.

The results of a standardization of the measurements in Table 11.5 can be seen in Table 11.6. The left-hand column contains the recorded raw measurements. The right-hand column displays the standardized *z*-score conversions for each raw score.

Table 11.6

Standardized Values for Political Awareness Scores in Four City Wards
(sample mean = 18.3; sample standard deviation = 0.583)

Raw Score	*Z*-score
18.4	0.1216
18.2	–0.2164
18.0	–0.5694
17.9	–0.7682
17.9	–0.7365
18.0	–0.5148
18.1	–0.3432
18.2	–0.1716
18.6	0.5148
18.5	0.3432
18.4	0.1716
18.6	0.5148
19.0	1.2013
19.1	1.3729
19.2	1.5445
19.1	1.3729
17.8	–0.8581
17.4	–1.5445
16.9	–2.4026
17.6	–1.2013
18.7	0.6865
19.0	1.2013
18.8	0.8581
18.5	0.3432

Measures of Correlation

Measures of correlation are used to reveal the relationships or associations between two or more variables or subjects. In many statistics texts, correlation is discussed under the umbrella of inferential statistics. However, since measures of correlation are commonly included in the preliminary section of reports, together with other descriptive statistics, it is not inappropriate to include them as descriptive statistics as well. Different correlation measures are used with different types of data, as indicated in Table 11.7.

The data in Table 11.7 can also be grouped into just two categories, depending upon the type of measurements they represent—*discrete* (sometimes referred to as *categorical*) and *continuous* data. Nominal and ordinal data are discrete or categorical measurements. Interval and ratio data can vary within a set of ranges; thus, they are considered to be continuous. However, it is more appropriate to apply the correct statistical test as indicated.

The *chi-square test for independence* should be used to determine whether two nominal level variables are related or independent. The null hypothesis for the test is that the two variables are independent. Table 11.8 displays the results of a crosstabulation (crosstabs) table for two variables in a hypothetical survey of political behaviors and attitudes of a sample of 60 registered voters. In this hypothetical sample, 20 subjects reported they considered themselves to be affiliated with the Republican Party, 29 said they were affiliated with the Democrat Party, and 11 indicated they were Independents. The researcher wants to know whether there is any association between party affiliation and voting behavior.

Table 11.7

Data Types and Their Appropriate Correlation Statistics

Data Type	Measurement Statistic
Nominal	Chi-square (χ^2)
Ordinal	Spearman's rank order coefficient (*rho)*
Interval/Ratio	Pearson's correlation coefficient (*r*)

Table 11.8

SPSS-Produced Crosstabulations Table for Sample Data, *n* = 60

	Voted in Presidential Election		
Political Party Affiliation[a]	Did Vote	Did Not Vote	Totals
Republican	14	6	20
Democrat	10	19	29
Independent	4	7	11
Totals	28	32	60

Note: [a]Political party affiliation, voted in presidential election crosstabulation count.

Table 11.9

Chi-Square Test for Independence on Party Affiliation and Voting Behavior, *n* = 60

	Chi-Square Tests		
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.574	2	.037
Likelihood Ratio	6.693	2	.035
Linear-by-Linear Association	4.483	1	.034
N of Valid Cases	60		

0 cells (0.0%) have expected count less than 5. The minimum expected count is 5.13.

Because both variables are nominal-level measurements, the chi-square test in the Descriptive Statistics Crosstabs option is the appropriate test. The results of that test are displayed in Table 11.9. The chi-square test for independence produces a Pearson chi-square value, the degrees of freedom for the dataset, and a "two-sided" (more often referred to as "two-tailed") significance value. Two-sided tests mean that the researcher looks at the correlations for both variables, from either direction—that is, regardless of which variable is dependent and which is independent. The easiest way to interpret the results of the test is to compare the significance value with the level of confidence established by the researcher; the .05 level of confidence is used most often in all social science research.

In Table 11.9, the calculated significance level of .037 (the Pearson chi-square value) is less than the researcher-set .05 level of confidence. The null hypothesis is that these two variables are not related; or said another way, the two variables are independent. The alternate hypothesis is that

Table 11.10

Spearman's Correlation Coefficients for Variables in Hypothetical Travel Survey

		Spearman's rho (*r*) Correlations					
		Toward travel in U.S.	Toward travel abroad	Toward travel this year	Toward cruise travel	Toward rail travel	Toward tour group travel
Toward travel in U.S.	Correlation Coefficient	1.000					
Toward travel abroad	Correlation Coefficient	–.168	1.000				
	Sig. (2-tail)	.198	.				
Toward travel this year	Correlation Coefficient	–.096	.060	1.000			
	Sig. (2-tail)	.466	.650	.			
Toward cruise travel	Correlation Coefficient	.150	–.164	.212	1.000		
	Sig. (2-tail)	.252	.210	.104	.		
Toward rail travel	Correlation Coefficient	.154	.345	.039	.061	1.000	
	Sig. (2-tail)	.239	.007	.769	.646	.	
Toward tour group travel	Correlation Coefficient	.011	.363	.010	–.089	–.131	1.000
	Sig. (2-tail)	.931	.004	.940	.500	.317	.

Source: Example data.

the two variables—party affiliation and voting behavior—for this sample are related. Therefore, the null hypothesis must be rejected and the alternate hypothesis accepted. The two variables are not independent.

Note that only the lower half of the correlation matrix is displayed in Table 11.10. The upper half simply duplicates the same information. SPSS Correlations/Bivariate with the ordinal test (Spearman's) option selected, produces both the upper and lower part of the matrix as a default; the duplicated information was deleted by the author. Excel produces a lower-half matrix as its default output.

Only two of the correlation coefficients in this example were significant at the .05 level of confidence: the relationship between attitudes toward rail travel and travel abroad (r = .345, sig. = .007), and the attitude of the sample toward tour-group travel and travel abroad (r = .363, sig. = .004). Thus, the research can assume that there is a low to moderate relationship between the two variables. The Pearson's scale-level data correlation matrix in both SPSS and Excel are identical to the ordinal-level Spearman's tests. It is only necessary to request the appropriate test option.

Understanding Frequency Distributions

Understanding the information contained in a given set of scores or values requires looking at the ways frequency distributions of scores can be distributed around their mean value. We are most familiar with what are called "normal distributions." These are the typical bell-shaped curves that enclose what we call a "normal distribution." Normal distributions tend to be symmetric, with the mean and median falling near one another at the mid or high point on the curve. This is often the *modal value* as well.

Table 11.11

Empirical Rules for Normal Distributions

Approximately 68% of all the items will be within one standard deviation of the mean.
Approximately 95% of the items will be within two standard deviations of the mean.
Almost all items will be within three standard deviations of the mean.

Most distributions encountered in decision making are more or less *normal.* That is, the bulk of the responses or scores cluster around the mean, with the rest trailing off toward the ends. The above information about *normal distributions* has been found to be true so often that it is now accepted as a "rule" (Table 11.11). Sometimes, the distribution of scores does not cluster around the mean. Instead, it may be grouped at either end of the scale or even have more than one mode. These distributions are known as "skewed" or *asymmetrical*, and somewhat different distribution rules prevail.

In normal distributions, one standard deviation above the mean will include some 34 percent of all the cases in the dataset. Similarly, one standard deviation below the mean will include another 34 percent of the sample, for a total of 68 percent falling within a range of plus or minus one standard deviation. Another 27 percent of the cases will be included if one more standard deviation above and below the mean is included. Together, some 95 percent of all cases will fall within two standard deviations above or below the mean. Finally, when three standard deviations are included, 99.7 percent of all cases will be included under the curve (this makes the normal distribution *six standard deviations wide*).

Not all distributions are normal. Some have a majority of the values gathered at either the low or high end of the scale. Other distributions have the great majority gathered at the center, whereas others may bunch up in two or more points or modes. The three most commonly encountered non-normal distributions are *positively skewed*, *negatively skewed*, and *bimodal* distributions.

Positively skewed distributions have their peak nearer the *left-hand* end of the graph, with the line stretched out toward the lower right-hand corner. Negatively skewed distributions have greater concentrations at the *right-hand* side, with the left line stretched toward the lower left-hand corner. Bimodal distributions have two concentrations of scores and have curves resembling a two-humped camel's back. Multimodal distributions have three or more concentrations or peaks.

Calculating Descriptive Statistics with Excel

The Microsoft Excel *Data Analysis* package contained in the *Tools* subprogram will produce a complete set of summary statistics with very little effort. To begin, the first step is to establish a "data array"—a spreadsheet table in which all data are arranged in columns and rows. The data array shown in Table 11.12 is public information published in 2002 by the Center for Responsive Politics. Table 11.13 displays Excel-produced descriptive statistics for donations by individuals, PACs, and soft money.

Steps for Excel. Follow these steps with Microsoft Excel to produce Descriptive Statistics:

1. Arrange the data in a spreadsheet data array.
2. Highlight the data only.
3. Select the *Tools* option, followed by the *Data Analysis* option.
4. In the *Data Analysis* option, select *Descriptive Statistics.*

Table 11.12

Political Donations by the Communications/Electronics Industry, 1990–2002 ($ millions)

Election Cycle	Total Contribs	From Individuals	From PACs	Soft Money	To Democrats	To Republicans	% to Dems	% to Reps
2002	35.9	8.6	6.4	20.9	18.5	17.0	51	47
2000	132.7	50.1	14.7	67.8	71.0	60.3	54	45
1998	52.7	19.5	11.6	21.7	26.0	26.3	49	50
1996	58.2	22.3	10.8	25.1	29.1	28.3	50	49
1994	28.5	12.5	8.7	7.3	16.5	12.0	58	42
1992	36.5	18.6	10.2	7.7	21.7	14.6	59	40
1990	16.1	6.8	9.2	0.0	9.1	6.9	57	43
Totals	360.6	138.4	71.6	150.5	191.9	165.4	53	46

Source: OpenSecret.org (Center for Responsive Politics). *Communications/Electronics: Long-Term Contribution Trends.* From data released by the Federal Election Commission on May 11, 2002; donations are of $200 or more.

Table 11.13

Descriptive Statistics Produced by Microsoft Excel, 1990–2002

From Individuals		From PACs		Soft Money	
Mean	19.7714	Mean	10.2286	Mean	21.5000
Standard Error	5.5067	Standard Error	0.9790	Standard Error	8.4676
Median	18.6000	Median	10.2000	Median	20.9000
Mode	N/A	Mode	N/A	Mode	N/A
Std Deviation	14.5693	Std Deviation	2.5902	Std Deviation	22.4031
Sample Variance	212.2657	Sample Variance	6.7090	Sample Variance	501.8967
Kurtosis	3.8470	Kurtosis	1.0780	Kurtosis	3.6521
Skewness	1.8070	Skewness	0.4214	Skewness	1.7404
Range	43.3000	Range	8.3000	Range	67.8000
Minimum	6.8000	Minimum	6.4000	Minimum	0.0000
Maximum	50.1000	Maximum	14.7000	Maximum	67.8000
Sum	138.4000	Sum	71.6000	Sum	150.5000
Count	7	Count	7	Count	7

Source: OpenSecret.org (Center for Responsive Politics). *Communications/Electronics: Long-Term Contribution Trends.* From data released by the Federal Election Commission on May 11, 2002.

Table 11.13 displays the Excel-produced descriptive statistics for the categories of political donations (Individuals, PACs, and soft money) shown in Table 11.12.

Similar summary statistics are produced by SPSS. The variables for analysis must be moved into the proper analysis box, with desired statistical options selected. The information supplied by the Center for Responsive Politics was accessed on the Internet.

Summary

Descriptive statistics are used to summarize data and describe samples. Four categories of descriptive information can be used for these purposes: measures of central tendency, measures of variability, measures of relative position, and measures of correlation. All of these statistics can be quickly calculated with Microsoft Excel or SPSS.

The main purpose for measurements of location (also called *measures of central tendency*) is to identify the value in the dataset that is “most typical” of the full set. This “typical” value may then be used as a summary value. Five measures of central tendency are used at different times. They include the mean (sometimes called the *average*), the median, the mode, the geometric mean, and the trimmed mean.

Measurements of variability (sometimes referred to as *measures of dispersion*) tell how the individual measurements vary within the dataset. The three measures of variability include the range, the variance, and the standard deviation. The range is the distribution of scores from the highest value to the lowest. The variance is an index of how scores or values in a dataset vary from their mean or average value. Larger variance values indicate the data are more spread out, whereas smaller variances mean the values are more concentrated around the mean. The standard deviation is simply the square root of the variance. Because the variance is a squared value, it is more convenient to work with the standard deviation, which is a more exact measurement than the variance; it is stated in exactly the same units as the original data.

Two measures of relative position make it possible to compare one score against any other in the dataset. They are percentiles and standard scores. Percentiles are values below which some proportion of the total scores or observations fall. The most commonly used percentiles divide the data into quartiles—segments containing 25 percent of the cases. One-quarter of the values are below the first quartile, half are below the second quartile, and three-fourths are below the third quartile. The most commonly used standard score is the z-statistic; z-scores are expressions of variation stated in values of standard deviations from the mean. For most datasets, almost all scores fall within plus or minus three standard deviations of the group mean.

Measures of correlation are used to numerically identify the level of relationships between variables. Care must be taken to avoid unsubstantiated cause-and-effect relationships from correlation values. The chi-square test for independence should be used to determine whether two nominal-level variables are related or independent. The Pearson’s r correlation should be used with interval and ratio data (scale data in SPSS); the Spearman’s *rho* statistic is used with ordinal-level data. Both programs produce a correlation matrix for ordinal and scale data.

Discussion Questions

1. Name and give examples of the four measures of central tendency discussed in the text.
2. Why are researchers concerned with measures of variability in a dataset?
3. Define *range*, *variance*, and *standard deviation.*
4. What are measures of relative position and what do they tell the researcher?
5. What are *percentiles*? What are *quartiles*?
6. What are standard scores? How and why are they used?
7. Measures of correlation are used for what purpose(s)?
8. Frequency distributions are often the first step in a statistical analysis design. What are they and what purpose do they serve?

Additional Reading

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Mallery, Paul, and Darren George. 2008. *SPSS for Windows Step by Step.* Boston: Allyn & Bacon.

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12 Testing Research Hypotheses

Before data are gathered, processed, and interpreted, someone must have established a purpose, or reason for the study. All subsequent analysis follows from this purpose. In scientific research, the reason is typically expressed as a *hypothesis* or a *set of hypotheses*. A hypothesis is a statement that describes some assumption of the researcher. Hypotheses also explain or suggest a researcher's conclusions about some phenomenon of interest. For example, the statement, "People over 50 years of age vote more often than do people 30 years of age and younger," is a testable hypothesis about the behavior of two defined groups of people. The testable research assumption is that age influences voting behavior.

In addition to setting the stage for a research project, hypotheses guide further research action, and they dictate the appropriate research design to follow. For example, hypotheses written about the mean score for a group on an attitude scale dictate the type of data-gathering methods to be followed: subjects must answer questions that reveal their attitudes. This usually means development of a questionnaire that the researcher administers in a survey research design.

The voting age hypothesis above calls for collecting data that can be analyzed with correlation statistics. Equally, a hypothesis that calls for comparing the responses of one subgroup with that of another group drawn from the same population dictates analysis that allows the researcher to compare group responses.

Finally, the type of research hypothesis largely influences selection of the appropriate statistical method or methods for a research project and the way that the alternative explanation is formed. This chapter addresses the fundamentals of hypothesis testing and techniques for one-sample hypothesis tests; it concludes with an introduction to the ideas behind using p-values to make decisions about hypotheses.

Fundamentals of Hypothesis Testing

Hypotheses can be written in many different ways and for many different purposes. For example, they can be formed to address *relationships* between variables or *differences* between values. They can be stated as facts or as the way responses are distributed. They can be written as predictions and as comparisons. They can refer to a sample statistic, a population parameter, or a proportion. In all approaches, they are usually written as pairs, a null hypothesis and its obverse, the alternate. In political science, researchers typically form one or more of these three main types of hypotheses:

1. *Predictive hypotheses.* These are predictions about the future value of a measurement. Examples include predictions about legislator's votes over the next several quarters, predictions about the movements of stock prices, and the government's predictions of annual growth in the deficit, productivity, or unemployment.

2. *Comparative hypotheses.* These make comparisons between groups of people, companies, countries, products, and the like. These are often used in hypotheses about differences between scores of one group compared with another. Examples include differences in mean product preference scores between two samples of beer drinkers, and production-rate differences encountered after a change in environmental conditions (sometimes called a *treatment*).
3. *Association hypotheses.* These deal with the levels of relationship or association between two or more variables. Examples include measuring whether new advertising, a shift in policy announced at a series of press briefings, or modifications in issue focus influence attitudes among voters.

It is important to remember that hypotheses are statements about events or things that researchers *believe* are true or not true. They are assumptions, not facts. Statistical tests are carried out to verify the statement or assumption. Hypotheses are usually employed in pairs. The first of the pair is typically stated in status quo terms; that is, a predicted change in attitudes will not take place; variables are not related; groups' scores on political awareness surveys after a public opinion campaign will not differ from scores gathered before the campaign. This is called the *null hypothesis*, and is represented by the symbol H_0. Null hypotheses are also said to exist as "negative statements." Examples include: "There is no association between the age of a machine and its production-error rate." "There is no difference in a sample of voters' preferences for candidates seeking office in the 35th legislative district." "There is no disproportionate distribution in the frequencies of responses among different age groups to a question on political issues." An alternate hypothesis is always paired with the null hypothesis. Alternate hypotheses are stated in terms exactly opposite from null hypotheses. They are represented by the symbol H_A.

Statistical processes exist to test hypotheses about all types of measurements: categorical (nominal), ordered (ordinal), and continuous (interval and ratio) data. Hypothesis tests exist for a single case, a single sample, for two or more groups, differences in a statistic or parameter, about a single proportion, and for differences between two or more proportions. A commonly encountered use of hypothesis tests is for testing for differences between sample statistics that are known by the researcher and of parameters that are unknown (inferred).

In statistical notation, hypotheses stated as recognizing no difference or change are signified by the notation: $H_0 = H_A$. The alternate hypothesis to this null hypothesis is that the two are not equal, and is signified by the notation $H_0 \neq H_A$. Change in one direction only is indicated by the notations: $H_0 < H_A$, or $H_0 > H_A$. This type of hypothesis is also stated as one is "equal to or less than" the other, or that one is "greater than or equal to" the other; these statements are signified by the notations $H_0 \leq H_A$ and $H_0 \geq H_A$, respectively.

One-direction changes (either greater or less than) are called a *one-tailed test*. When the test involves difference in any direction, it is called a *two-tailed test*. Statistical processing programs often print out test statistics for both one- and two-tailed tests for the same data. The choice of which result to use, either a one-tailed, two-tailed, or both tests, is dictated by the pre-established null hypothesis.

Classes of Hypothesis Tests

Researchers must deal with three different classes of hypothesis tests: (1) tests concerning a single subject, (2) tests for a single group or sample, and (3) tests of hypotheses about two or more groups. A variety of different hypothesis tests have been developed for use with each of these three classes of hypotheses. Among the most commonly used in political science research are *Z*-tests, *t*-tests, and analysis of variance (ANOVA) tests.

Probability and Hypothesis Testing

Research decisions based on inferential statistics are made on the basis of what is *probably* true, not on what is actually true. Probabilities are, in fact, the basis of all statistical inference. Researchers seldom if ever have perfect information before them when they are required to make a decision. To gain information and reduce uncertainty, researchers typically use the results of a sample as an *approximation* of what is or what might be true of a population. They make *inferences* about the population from the sample data

However, a major limitation of sample research is that a study based on another sample taken from the same population will almost always produce results that are entirely different from the results of the first sample data. One way that researchers lower the risk of this happening is by increasing the size of their sample; larger samples lower the influence of extreme values—what we call *outliers*—in a data set. However, collecting data costs money and takes time, both of which are limited resources; increasing the sample size is often simply not possible. What researchers do instead is to change the acceptable level of confidence they have in the results of the hypothesis test.

Hypotheses are simply statements or *predictions* by someone that explain or suggest some conclusion, event, or thing. Hypotheses are suggestions or beliefs about something; they are not "true" statements. Researchers can have varying amounts of confidence in the veracity of their predictions. They can be 100 percent sure, 95 percent sure, 90 percent sure—or any other amount. This degree of faith in the truth of the hypothesis statement is the *level of confidence*; confidence levels are typically stated as *probabilities*, and abbreviated as *p-values*. Probabilities and *p*-values are typically stated as decimals; they range from 0.0 to 1.0. For example, when a researcher is 99 percent sure that a statement is true, the probability of truth is .01. A probability of 1.0 refers to a perfect level of confidence; it means that the researcher is 100 percent sure about the statement.

Confidence Intervals and p*-Values*

A *confidence interval* is the researcher's estimate of the probability of all possible random samples drawn from the same population falling within a range of values that contains the mean of the population. The Greek lowercase letter for m (μ) is the symbol used to signify this parameter. The decision to accept or reject a null hypothesis is based upon a level of probability that is acceptable.

The researcher-established probability is called the *confidence level*; it is the degree of confidence the researcher has that the decision to accept or reject the null hypothesis will not be in error. Confidence levels are also considered to be the probabilities that the results of the test could not have occurred by chance. For example, a confidence level of .05 means that the statistic values for 95 out of 100 samples will fall within the range that contains the population parameter. This range is also referred to as the *sample space*.

No two samples drawn from the same population can be expected to have the same mean or variation. With normal distributions, roughly half of the possible values of a sample statistic will fall above the mean, and half below. Thus, sample space refers to a range of statistics that fall to either side of the population mean and are considered to be statistically the same. Acceptable ranges refer to the proportion of possible values of the statistic that fall between the mean and a cut-off point some distance from the mean. The range includes values greater and less than the central mean. Values falling outside of this acceptable range are those that call for rejection of the null hypothesis.

The entire set of possible values within this range is called the *confidence interval*. The confidence interval is the range of values within which the "true" value of the population (mean) parameter is expected to fall. The researcher's expectation is stated as some chosen level of probability that the statistic falls in the accepted range. The values delineating the confidence range are known as the *upper* and *lower confidence limits*; together they form the bounds of the confidence interval. That is, with a 95 percent confidence value and a normal distribution, 2.5 percent of the values are expected to be above (outside) the upper confidence value and 2.5 percent are expected to fall in the lowest portion or *tail* of the normal curve.

The Concept of Error in Hypothesis Testing

Regardless of what confidence level is selected or computed, several errors of analysis may confound the results of a study (Mattson 1986). The two types of errors associated with hypothesis tests are *Type I* and *Type II* errors. Both error types and indications of when they occur are illustrated in Figure 12.1.

Figure 12.1 **Type I and Type II Error in Hypothesis Testing**

		DECISION	
		Reject the Null	**Accept (Retain) the Null**
REALITY:	Null is False:	Correct Decision	**Type II Error**
	Null is True:	**Type I Error**	Correct Decision

Political science researchers are more concerned about making Type I errors than Type II errors. Type I errors occur when a null hypothesis that is actually true is rejected. This is called *falsely rejecting the null hypothesis*. Type I errors are related to the confidence level adopted for a decision. Thus, with a 90 percent level of confidence, the researcher can falsely reject the null hypothesis 10 percent of the time. Raising the confidence level to 95 percent (an alpha of .05) means the researcher can expect to be wrong only 5 percent of the time. Thus, tightening confidence levels lowers the likelihood of Type I errors occurring. Remember: rejecting a null hypothesis does not mean that something is "true;" it only means this hypothesis must be rejected and the alternate hypothesis retained.

Type II errors occur when a researcher does not reject the null hypothesis when it is, in fact, false. Type II errors occur less often than Type I errors; procedures for computing their possible occurrence are usually found in comprehensive mathematical statistics texts and will not be covered here. In general, researchers reduce the likelihood of Type II errors occurring by increasing the size of the sample.

One-Sample Hypothesis Tests

One-sample hypothesis test applications are tests of a sample statistic, usually the mean or a proportion, in order to establish that the sample measurement is representative of the population from which it is drawn. One-sample tests are also available to determine whether the test statistics have a normal distribution. These tests for normality are important because two key assumptions in most interval and ratio data hypothesis tests are random samples and a normal distribution; they are available in SPSS, but not in Excel.

Inferential statistics involves using measurements of a sample to draw conclusions about the characteristics of a population. Researchers never know with complete certainty that the sample statistics match the population parameters. On the other hand, researchers do know that drawing another random sample or samples from the same population will usually produce similar but different values for their statistics. It will not happen every time, however. The researcher wants to know how likely it is that (with what degree of probability) the sample statistic will fall within an *acceptable range* of possible values. This acceptable range is called the *confidence interval*.

A Single-Case Hypothesis Test

In a single-case hypothesis test, a researcher is typically interested in knowing if the case statistic, such as a mean score on a test of issue awareness, falls within a defined range of values for a population. The range of possible values is known as the *confidence interval*. The null hypothesis for this example is that the case statistic is the same as that of the sample from which it is taken. The alternate hypothesis is that the statistic for the case is not in the acceptable sample space. The one-sample z-test is used to test this hypothesis. The following steps explain how to use Microsoft Excel for the procedure.

1. Using the Standardize procedure from the Excel Function Wizard, convert the single-subject statistic to a z-score. *Note:* the terms z-score and z-value are often used interchangeably.
2. Select a confidence level for deciding whether the score falls within the acceptable range. The .05 level of confidence has long been the level used in most social science research, including political science. The normal distribution table found in most statistics texts refers to the proportion of area under the bell-shaped curve of a normal distribution that corresponds to the z-value. A check of the table reveals that the .05 level of confidence coincides with a z-score of 1.96. This value represents the number of standard deviations from the population parameter. The larger the z, the farther it falls from the center of the curve; the smaller the z, the closer it is to the center of the sample space.
3. Determine whether the standardized (z-score) single-case test statistic value is greater or less than the 1.95 confidence value. If it is the same or smaller than 1.96, retain the null—the case does belong to the group. If it is greater—that is, if the z-value is larger than 1.96—reject the null and accept the alternate hypothesis; the case does not belong to the group.

The Excel Confidence Test

Researchers often want to know what percentage of all possible samples would include the parameter for the population somewhere within the interval (range) of their statistic values. Since the *actual* parameter value is seldom known, an estimate for this number must be made. The sample statistic is substituted for the unknown parameter. The sample statistic usually used for this purpose is the sample mean.

Microsoft Excel's Confidence test function can quickly establish an estimate for the range of values above and below the hypothesized population mean. Three values are needed to complete the Confidence test:

1. *Alpha* (the researcher-determined significance level to be used to compute the confidence level; a number greater than 0 and less than 1)
2. The standard deviation of the population (since this is seldom known, the SD for the sample is substituted)
3. The total of sample items involved (n)

Normal Distribution Tests

A key condition of many statistical tests is the requirement that the samples be drawn from a population with a normal distribution and normal variance. Therefore, one of the first tests carried out on a sample dataset is often a test for *normality*—that is, a test to see if the population parameter has a normal distribution. It is important to remember that this test should only be done with a probability sample—that is, one that meets requirements for random selection.

Researchers are often required to compute the area under a normal curve and/or to establish probabilities associated with the normal distribution. Microsoft Excel's statistical analysis capabilities under the Function Wizard (fx) includes five functions that pertain to normal distributions. An illustration of the five tests and the purpose for each is displayed in Table 12.1.

Table 12.1

Five Functions of Normal-Distribution Tests in Microsoft Excel 2000

Excel Test	Purpose
STANDARDIZE	Computes standardized z-values for given raw scores
NORMSDIST	Computes the probability that an area under the curve is less than a given z-value
NORMSINV (Opposite of the NORMSDIST test)	Computes a z-value that corresponds to a given total area under the normal curve
NORMDIST	Computes the probability that an area under the normal curve is less than a given measurement value ($\bar{X}$)
NORMINV	Computes the measurement value ($\bar{X}$) that corresponds to a given area under the normal curve

Source: Excel 2000 HELP function.

The first of the five tests is the Standardize function, which computes standardized z-values for given raw scores. The second function related to the normal distribution is the NORMSDIST test. This function computes the area under the curve (probability) that is less than a given z-value. The third function, NORMSINV, computes a z-value that corresponds to a given total area under the normal curve. This function is the opposite of the NORMSDIST function.

The fourth Excel normal distribution function, NORMDIST, computes the area probability that is less than a given measurement value ($\bar{X}$). The last function in this family of tools is the NORMINV function. This function—the obverse of the NORMDIST function—computes the measurement value of $\bar{X}$ that corresponds to a given area under the normal curve.

In addition to these five specific normal distribution-related tests, Excel also conducts one-tailed and two-tailed tests, one-sample t-tests, a two-tailed (only) z-test, and a confidence interval test.

Two or More Sample Hypothesis Tests

In addition to the one-sample tests, social scientists and statisticians have developed a body of statistical techniques designed to test hypotheses about two or more samples. Techniques for testing for differences permit political science researchers to apply experimental design methods in which they test whether the differences in mean scores for two or more samples are statistically significant or whether they could have occurred by chance.

Statistical procedures for two types of research situations are discussed here: small-sample tests for two groups, and large-sample tests for two or more than two groups. The two-group tests include several versions of t-tests; tests for large samples or for more than two groups are the *analysis of variance* (ANOVA) procedures. Two-group tests are based upon the *t-distribution*, a special distribution that is shaped by the degrees of freedom with the dataset.

These procedures are most appropriate with small samples—that is, when the total number of cases is 30 or less (Anderson, Sweeney, and Williams 2002, 295, 394). However, because the difference between the t-distribution and a normal distribution is made nearly insignificant as the number of degrees of freedom increase, this size limitation is typically ignored, and t-tests are used for comparing the means of any size samples.

The three situations in which the t-test is applied include (1) when the samples are paired, (2) when the samples come from a population or populations with equal variances, and (3) when the samples come from populations with unequal variances.

Political science researchers are highly likely to find themselves using one or more two-sample procedures very early in their research careers. The several tests for comparing differences are among the most commonly reported statistical results found in research literature. Techniques exist to test for differences with all levels of data.

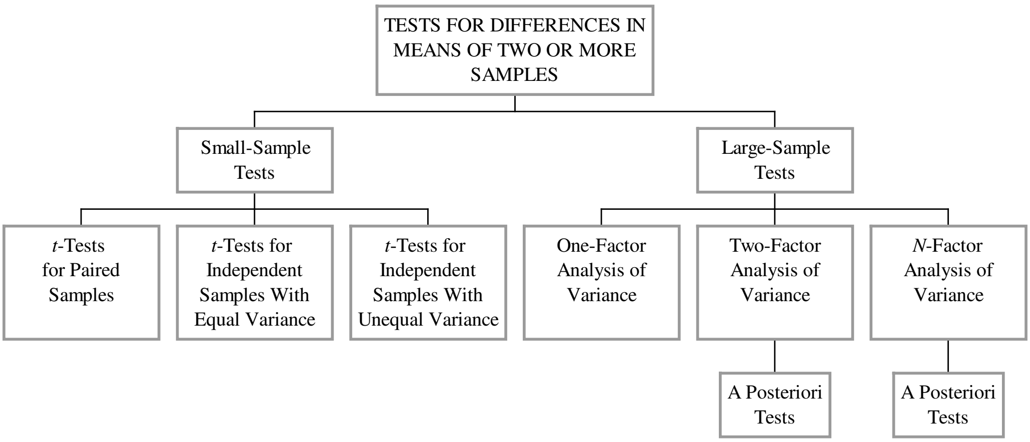
Two-Group Hypothesis Tests

As can be seen in Figure 12.2, an extensive body of statistical tools has been developed for testing hypotheses about statistics for two or more groups. These procedures are to be used with *parametric* statistics. Parametric statistical tests require the measurements to be at the equidistant-interval or ratio level. Parametric statistics also require that the data be from random samples and have a normal distribution.

When these assumptions cannot be met, nonparametric tests must be used in place of parametric tests. In addition, some parametric tests require that the samples be independent from one another, while other tests have been developed for use with dependent or paired samples. Separate-but-related statistical tests have been developed to meet each independence requirement. Whether the samples are independent (as most are) or are dependent (as with samples that are paired), some minor differences will be found in the computational formulas, although their interpretation is identical. Finally, the t-tests and ANOVA procedures discussed here should be used only when the researcher has all the raw data (individual measurements) available; the tests should never be used with data that are already summarized.

Two of the statistical tests often used when comparing the mean values for independent samples are the *Student's t-test* for two samples, and the one-way, two-way, and n-way *analysis of variance* tests (ANOVA). Although the t-test has more limitations than the F-test, it is well suited for comparisons between the means of two, but only two, relatively small samples (typically around thirty cases), and with each sample having the same or nearly the same number of observations or cases. Analysis of variance, on the other hand, is considered to be very robust. It can be used

Figure 12.2 **The Funnel Approach to Questionnaire Structure**



with two or more samples, large or small samples, and samples of unequal sizes.

Whenever three or more samples are to be compared, a body of post-hoc or after-the-fact tests may also be employed to pinpoint the differences. Post-hoc tests have not been included in the basic set of procedures in Excel. Instead, they must be calculated using mathematical procedures. Therefore, they are not discussed in this text. More powerful statistical software, such as SPSS, includes a wide variety of post-hoc tests.

Comparing Two-Group Differences with the t-Test

The *t*-test is used to compare the means of two groups; variations of the test exist for use with paired samples, samples with unequal variances, and samples with approximately equal variances. The test might, for example, be used to compare scores from a group of voters tested prior to a political campaign information program. These scores might then be compared with scores for the same group after completion of the information program.

In another use, the mean scores on political attitudes for two groups of voters, with the groups determined by gender, age, income, political party, or ethnic group—provided that only two groups are compared during each *t*-test application. Another application might be comparing attitudes about political parties held by university sophomores with the attitudes of juniors at the same university.

Minimum required assumptions for all applications of the *t*-test are: (1) the measurements are of at least interval-level data, (2) the samples are randomly selected, and (3) the scores are randomly distributed. Only two sets of means can be compared at any one time using the *t*-test. As in one-sample hypothesis testing, the first step must always be to establish a null and alternate hypothesis for testing.

Several different approaches to difference tests are possible with the *t*-test. The major differentiating characteristic is the nature of the two samples for which measurements are available: are they paired or independent? This question must be answered before selecting one of the several different *t*-test computational methods. The Tools → Data Analysis feature in Excel includes three different *t*-test options: a test for paired samples and two tests for independent samples. The two independent sample tests vary in that one assumes the samples were taken from two separate populations, while the second test assumes two populations in which the variance is known to be either equal or unequal. Because researchers seldom if ever know the variance of a population, this usually means the researcher selects the unequal variance option.

Regardless of which option is used, both samples should always be randomly selected from the population or populations. The unequal variance option should be used when the samples are drawn from different populations. An example would be comparing the means of samples taken from two separate cities or different states.

All two-sample *t*-tests compare sample means by computing a Student's *t*-value, and comparing the significance of whatever difference is found between the calculate *t*-statistic and a critical *t*-statistic for the number of degrees of freedom in the dataset. Considered to be only slightly less "robust" than the *F*-test, the *t*-test is very easy to use and interpret and is, therefore, a popular tool for comparing the mean scores of two samples or groups.

A Paired-Sample Example

A typical example of a paired two-sample hypothesis test application is the standard pre- and post-test research design used in education, training, and public opinion measurements. Researchers use this design when they want to know if the differences between the first and second measurements are "real," or if they are simply chance-related variations encountered every time a new measurement is made. This type of design is often used during an experimental test of a "treatment," such as different instructional methods or different communications media.

In all these applications, the researchers are looking for differences that are *statistically significant*. A difference that is statistically significant is one with an acceptable level of probability that the differences did not occur through chance alone. It is important to remember that the analyst never knows if the differences are, indeed, "real." The procedure calls for accepting or rejecting a hypothesis with the possibility of making the wrong decision held to a level within some acceptable *level of confidence*. This means that the research accepts the possibility that a correct decision was made—that is, avoiding making a Type I error—90, 95, or 99 percent of the time.

Table 12.2 displays data from a paired-sample, pre- and post-test example. In this example, a political science researcher wanted to know if a white paper prepared by the staff of a state senator changed a sample of voters' attitudes toward a proposed change in funding for the state's portion of elementary school teachers' salaries. A group of community leaders completed a 25-item opinion questionnaire and then were asked to read the white paper. The group was administered the same opinion survey one week later. Scores for the pre- and post-test survey are displayed in Table 12.2. Table 12.3 displays the results of a Microsoft Excel paired-sample *t*-test.

The researcher's null hypothesis for this study was that the mean of the group before reading the white paper was the same as the mean for the group after reading the white paper. An alpha of .05 was selected as the test confidence level. In statistical notation, the null and alternate hypotheses for this example are:

$$H_0\text{: } \mu_{\text{pre}} = \mu_{\text{post}}$$
$$H_A\text{: } \mu_{\text{pre}} \neq \mu_{\text{post}}$$

Table 12.2

Subject Attitude Scores Before and After Reading an Issue White Paper

Pretest Scores (Variable 1)	Post-test Scores (Variable 2)
20.7	19.3
21.7	23.9
17.2	19.9
18.0	24.0
15.1	17.7
21.1	21.5
24.5	25.9
17.8	19.1
23.6	24.4
19.0	19.9

Table 12.3

Excel Output of a Paired Two-Sample *t*-Test

t-Test: Paired Two-Sample for Means

	Variable 1	Variable 2
Mean	19.87	21.56
Variance	8.8134	7.7671
Observations	10	10
Pearson Correlation	0.776726572	
Hypothesized Mean Difference	0	
df	9	
t Stat	–2.768013281	
p (T<=*t*) one-tail	0.010912144	
t Critical one-tail	1.833113856	
p (T<=*t*) two-tail	0.021824288	
t Critical two-tail	2.262158887	

Because no direction—neither greater nor lesser—in the change was specified, this was a two-tailed test. The important information in the Excel procedure results includes the information in Table 12.4. Interpretations of the information in the above output include the following:

- The mean for the pre-sample was 19.87; after reading the white paper, the score increased to 21.56 for the post-sample.
- The calculated *t*-statistic was –2.77, with 9 degrees of freedom.
- The critical *t*-statistic for 9 degrees of freedom was 2.26, which is less than the critical *t* of –2.77.
- Using this information alone, the null would be rejected and the alternate hypothesis accepted.
- The calculated *p*-value for the data was .022, which is less than the alpha of .05.
- Using the *p*-value approach, the null would also be rejected and the alternate hypothesis accepted.

Table 12.4

Selected Information in Excel *t*-Test Output

	Pretest	Post test
Mean	19.87	21.56
df	9	
t Stat	–2.768013281	
p (T<=*t*) two-tail	0.021824288	
t Critical two-tail	2.262158887	

One-tailed and Two-tailed Tests

The difference between *one-tailed* and *two-tailed* tests is that in one-tailed tests the researcher specifies the direction of the difference: the mean is either larger or smaller than the mean of the second group. The probabilities calculated with the *t*-test on a one-tailed test are half of the probabilities for a two-tailed test. It should be noted that deciding whether to select either the one- or two-tailed tests can not be done arbitrarily. If the researcher has no specific reason to expect a difference in one direction, it follows that no prediction can be made in advance. The analyst is then obligated to use the two-tailed test. A typical two-tailed test hypothesis pair, to determine where the means are different in any way, would be:

$$H_0\colon \mu_1 = \mu_2$$
$$H_A\colon \mu_1 \neq \mu_2$$

If a one-tailed test is desired, either a greater or lesser hypothesis pair must be written; these would appear as follows:

	μ_1 greater than μ_2		μ_1 lesser than μ_2
H_0:	$\mu_1 \geq \mu_2$	H_0:	$\mu_1 \leq \mu_2$
H_A:	$\mu_1 < \mu_2$	H_A:	$\mu_1 > \mu_2$

A Two-Sample, Unequal Variance Example

In the following example, a political scientist was interested in the percentages of voters who said they supported a bill to limit increases in property taxes to no more than 5 percent per year. Data were collected in 28 counties; 15 counties were considered to be predominately urban, while 13 counties were predominately rural. The results of the telephone survey are displayed in Table 12.5.

A one-tailed *t*-test was conducted using Microsoft Excel on the data to test the hypothesis that voters in rural counties were more likely to support a bill to limit increases in property taxes than were voters in urban counties. The results of that test procedure are displayed in Table 12.6. The null and alternate hypotheses for this study problem can be written as follows:

$$H_0\colon \mu_1 \geq \mu_2$$
$$H_A\colon \mu_1 < \mu_2$$

Table 12.5

Percentages of Voters Supporting a Tax-Limit Bill

Urban Counties	Rural Counties
22.20	33.30
19.90	29.89
42.09	59.76
26.12	35.22
41.11	51.98
46.44	54.66
63.67	69.09
44.12	45.24
44.22	47.93
44.23	53.22
60.56	61.12
33.12	42.90
51.07	58.43
43.07	
43.55	

Table 12.6

Excel Results of a *t*-Test on Urban/Rural Support of a Proposed Tax-Limit Bill

t-Test: Two-Sample Assuming Unequal Variances

	Urban Voters	Rural Voters
Mean	41.698	49.44153846
Variance	153.2067886	138.7881641
Observations	15	13
Hypothesized Mean Difference	0	
df	26	
t-Stat	–1.694229869	
p (T<=*t*) one-tail	0.051084648	
t Critical one-tail	1.705616341	
p (T<=*t*) two-tail	0.102169296	
t Critical two-tail	2.055530786	

The null hypothesis for this study was that rural voters are no more likely to support the tax-limit bill than are urban voters. The alternate or test statistic was the opposite of the null: rural voters are more likely to support limits on property taxes than are urban voters. Because this was a one-tailed test, the *p*-value for the one-tailed test is used for decisions on the hypotheses. The decision rule is: reject the null and accept the alternate hypothesis if the *p*-value for the one-tailed test is equal to or less than .05. The critical one-tailed *p*-value calculated by the procedure is .05, with a .05 level of confidence. Therefore, there is enough information to conclude with a 95 percent level of confidence that a statistically significant difference in the preferences will be reported in the survey. Therefore, the null hypothesis must be rejected and the alternate accepted.

Comparing Two Group Scores with ANOVA

The second set of tests for differences is based on differences in the variances in group means—*analysis of variance tests*, or ANOVA for short. The two most commonly encountered versions of the test are *one-way analysis of variance*, and *n-way analysis of variance*. The first version involves testing differences in a single factor; these differences can be tested with any number of groups during the same procedure. The second version tests differences in two or more factors across any number of groups. *Factors* are what are known in experimental design as *treatments*. Both versions of ANOVA involve analysis based on what is referred to as the *F-test.* The F-test is a ratio developed from calculating the value computed for the variances in means for each group and the value calculated as an estimate of the variation caused by the measurements for individuals in the group.

ANOVA is a powerful tool for comparing the differences in the variation between means of any number of groups, and of doing so at more than one factor level. With ANOVA, it is also possible to test the role of each of several variables independently, and then to determine whether two or more variables *interact* to influence any differences in groups' mean scores. In all applications, analysis of variance uses the F-statistic to compare the variances in each group's mean scores. The process compares the variance of each mean to the overall variance found in the sample. In statistical notation, the overall variance is referred to as "error," and relates to the distance from the mean for each individual case. A large "error" score infers that the scores are widely disbursed; a small "error" score means little variation in the set of scores.

Analysis of variance compares variances in the means of two samples or groups. The procedure produces summary statistics for each sample or group, an F-ratio (also called an F-statistic), and a probability value (called a *significance value* in some software's printed output). Interpretation of the results is a one-step process: the means are "statistically different" if the p-value is the same or less than the analyst-selected confidence level.

Interpretation becomes a little more complicated when more than two groups or levels are compared. The p-value of the F-ratio will indicate whether the null hypothesis is to be rejected, but it will not indicate where the differences lie; an a posteriori test is required. When one of these is selected, actual differences will be identified, while those that are statistically "the same" will be so indicated. None of these after-the-fact tests is available in Microsoft Excel, but they are available in more powerful statistical packages such as SPSS.

Three Versions of ANOVA

There are three different models of ANOVA: a one-way or one-factor model, a two-factor model, and an "n-way" or three or more factor version. One-way analysis of variance is the basic procedure; it is used when two or more group means are being compared across a single factor. For example, a political campaign manager might want to know if married female voters and unmarried female voters respond differently to an advertisement for a presidential candidate. The response variable must be at least interval level; the grouping variable can be any level data.

One-Way Analysis of Variance

One-way ANOVA compares the mean scores on a scale variable across two or more categories of a single categorical variable. The category variable is called a grouping variable. Grouping variables are often demographic characteristics, such as gender, marital status, ethnic group, education level, occupation, or some similar social characteristic.

Three different ways of estimating variance are possible: (1) a total estimate of the variance of all cases; (2) a between-group estimate based on the variation of the subgroups' means around a "grand mean," which is nothing more than a mean of the means; and (3) a within-group estimate that is based on the variation of subgroup cases around their subgroup mean. ANOVA simply divides the between-group variance by the within-group variance to come up with a value that is called the F-ratio, or F-statistic. The total group variance model is not used in ANOVA.

The following example represents the method used for testing differences in the scores of two groups. A new office administrator was hired to manage the office of a U.S. Congresswoman. Under the leadership of the former manager, staff morale had declined dramatically, the overall quality and quantity of the staff's work had dropped, customer service was ranked very poor by the visitors to the congresswoman's office, and staff absenteeism was becoming a major problem. Before making sweeping changes in the office, the new manager wanted to determine if supervisors, staff workers, and visitors to the congresswoman's office perceived the office climate in the same way. A seven-point composite organizational climate scale was administered to a random selection of twelve supervisors, twenty-five members of the staff, and twenty regular visitors to the office. Individual scores on the scale are shown in Table 12.7.

The manager's null hypothesis was: "There is no difference in the way staff employees, office supervisors, and outside visitors rate the organization's climate." The alternate hypothesis was: "Supervisors, staff, and visitors have different interpretations about the climate at this organization." To test this hypothesis, a one-way analysis of variance procedure and a 95 percent confidence level were used to analyze the survey data. The results of that procedure are presented in Figure 12.3.

To interpret these results, refer to the p-value of 0.00094 printed along with the F-ratio of 7.9530. The large F-value alone would indicate that the difference in the three groups' means is statistically significant. This is supported by the very small p-value. In this case, the null hypothesis is rejected and the alternate hypothesis accepted; the groups do view the office climate differently. The F-test is always multidirectional, testing for differences in either direction; therefore, it is always a two-tailed test.

Two-Way ANOVA

Two-way analysis of variance designs are the simplest example of a class of statistical tests developed for what are called "factorial experiments" or "factorial designs." In all such cases, the goal of ANOVA is to test the means of two or more groups on two or more variables or factors at the same time. In addition, the procedure tests to see if two or more of the variables working together may have had an impact on the differences, in what is known at the *interaction effect.*

In this example of a two-factor analysis of variance procedure, the advertising manager for the State Lottery wants to establish which is the best day to advertise in a newspaper and in which section of the paper the ad should appear. The two factors are *day of the week* and *position.* Four days are selected: Wednesday, Thursday, Friday, and Saturday. Three positions are tested: general news (the first two sections of the paper), the sports section, and the family section (which includes the entertainment pages). Outcomes to be compared are daily sales totals.

In setting up the experiment, *position* is to be the manager's grouping variable. The two factors being tested are *position* and *day of the week*. Four levels of the *position* variable are included in order to match the four *days* of the levels, making it necessary to record 48 total observations. Analysis of variance will compare the mean of the four levels of each of the three positions with each of the four days in each position.

This analysis of variance procedure will compute an F-ratio with p-values and critical F-values

Table 12.7

Organizational Climate Scales Scores for Supervisors, Staff, and Visitors

Supervisors	Staff	Visitors
2.9	3.2	3.8
4.8	5.6	4.1
4.0	3.0	3.0
2.8	5.7	2.5
3.3	3.1	2.1
2.6	5.0	5.6
3.7	6.0	1.8
4.2	3.3	1.6
4.8	4.4	2.3
4.4	5.4	3.1
2.9	3.4	2.0
1.9	4.9	9.0
	4.1	1.9
	5.3	3.3
	6.0	2.3
	4.1	1.3
	5.0	4.1
	6.4	2.1
	6.7	3.2
	4.7	2.0
	5.0	
	3.5	
	3.9	
	2.9	
	5.1	

Figure 12.3 **Results of an Excel One-Factor ANOVA Test** (***p***-value emphasis added)

ANOVA: Single Factor

SUMMARY

Groups	Count	Sum	Mean	Variance
Supervisors	12	42.3	3.525	.8711
Staff	25	115.7	4.628	1.2813
Visitors	20	61.1	3.055	3.0658

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	***p-value***	*F crit*
Between Groups	29.03795088	2	14.51897544	7.9530	**.00094**	3.1682
Within Groups	98.5824	54	1.8256			
Total	127.6203509	56				

for each of the three positions, the four days (labeled as "columns" in the ANOVA summary table), and a measurement of the effect of any interaction between *position* and *day.* Table 12.8 on page 173 displays the two factors and sales totals; Figure 12.4 on page 172 displays the results of an Excel two-factor analysis of variance procedure.

There are three results to interpret in the ANOVA results produced in this Excel application

Figure 12.4 **Two-Factor ANOVA Results for Sales/Advertising and Media/Day**

ANOVA: Two-Factor With Replication

SUMMARY	WED'DAY	THURSDAY	FRIDAY	SAT'DAY	Total
GENERAL NEWS (1)					
Count	4	4	4	4	16
Sum	3849	4074	5114	5533	18570
Average	962.25	1018.5	1278.5	1383.25	1160.625
Variance	1244.916667	4008.333333	3548.333333	198328.9167	74228.38333
SPORTS (2)					
Count	4	4	4	4	16
Sum	4796	4238	5281	7591	21906
Average	1199	1059.5	1320.25	1897.75	1369.125
Variance	836.6666667	5713.666667	11287.58333	3912.916667	112788.3833
FAMILY (3)					
Count	4	4	4	4	16
Sum	4072	6923	7628	6686	25309
Average	1018	1730.75	1907	1671.5	1581.8125
Variance	358.6666667	10224.25	1124.666667	20045.66667	127379.3625
Total					
Count	12	12	12	12	
Sum	12717	15235	18023	19810	
Average	1059.75	1269.583333	1501.916667	1650.833333	
Variance	11807.29545	121749.9015	94174.81061	108985.9697	

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*p-value*	*F crit*
Sample	1419238.042	2	709619.0208	32.67190463	0.000000008	3.25944427
Columns	2431282.229	3	810427.4097	37.31327129	0.000000000	2.866265447
Interaction	1502755.958	6	250459.3264	11.53151619	0.000000360	2.363748308
Within	781903.75	36	21719.54861			
Total	6135179.979	47				

Table 12.8

Daily Sales by *Position* and *Day of Week*

	Sales by Day of the Week			
Position	Wednesday	Thursday	Friday	Saturday
1	$ 933	$ 979	$1,240	$1,610
1	1,004	1,112	1,299	1,020
1	933	1,003	1,353	1,003
1	979	980	1,222	1,900
2	1,217	1,172	1,175	1,945
2	1,171	1,034	1,371	1,837
2	1,178	1,011	1,421	1,958
2	1,230	1,021	1,314	1,851
3	1,021	1,871	1,889	1,835
3	1,015	1,735	1,948	1,631
3	1,041	1,642	1,872	1,500
3	995	1,675	1,919	1,720

of this test: The first null hypothesis was that there is no difference in the position factor. These are the groups in the table; each includes four iterations of sales results. The second null hypothesis is that there is no difference in the days of the week the advertisement is placed. The final null hypothesis is that there is no interaction between the two factors as they relate to the differences, if any. These results can be interpreted in two ways. First is the traditional p-value approach. Since these are less than the .05 level of confidence, all three of the null hypotheses are rejected.

Another way is to compare the F-ratio with the critical value of F. In the past, analysts had to look this up in a table of values for various degrees of freedom and values for the .05 and .01 levels of confidence. This is no longer necessary. The critical value for the data and degrees of freedom is presented alongside the p-value. If the F statistic is smaller than the critical value from the F table, the null hypothesis is retained. In this example, the F statistic is larger than the critical F for all three hypotheses. Hence, all three null hypotheses must be rejected. The samples (newspaper locations) are statistically different from one another.

Three-Way ANOVA and More

This design is very much like two-way ANOVA. The principal effects of each factor are examined to see if it makes a difference between groups. This is followed by tests for interactions among the variables. However, now these interactions are expanded; two-way interactions, three-way interactions, and more are evaluated. The results are interpreted in the same way as one- and two-way analyses.

Designs have been developed to test the impact on differences for more than two sets of groups at the same time. These tests compare all factors against each grouping variable at time, then test for interaction, and then test for combinations of groups. These are known as *multivariate analysis of variance* (MANOVA). Finally, a technique has been designed that combines regression analysis with ANOVA. Known as ANCOVA, it makes analyzing a data set a rich experience. Neither MANOVA nor ANCOVA is discussed here.

Summary

Researchers deal with three main types of hypotheses: predictive hypotheses, comparative hypotheses, and association hypotheses. Hypotheses are usually stated as pairs: a hypothesis that is to be tested, and an alternative hypothesis, which is the obverse of the test hypothesis. In practice, most test hypotheses are stated in "null" form. That is, they refer to a status quo situation. The alternative hypothesis is stated in terms opposite from null hypotheses. When interpreting hypothesis tests, they are said to be either *retained* or *accepted* if they are true, and *rejected* or *not accepted* if they are found to be false.

Two types of errors are associated with hypothesis tests—*Type I Error* and *Type II Error*. Type I errors occur when a null hypothesis that is actually true is rejected. Type II errors occur when a null hypothesis that is false is not rejected. In practice, hypothesis tests are often associated with confidence intervals for sample statistics. Normal distribution tests in Excel compute the area under a normal curve that falls below a test statistic. SPSS for Windows includes several tests for normality; Excel does not.

Researchers often want to know what percentage of all possible samples would include the parameter for the population somewhere within the interval (range) of their statistic values. Since the *actual* parameter value is seldom known, an estimate for this number must be made. The sample statistic is substituted for the unknown parameter. The sample statistic usually used for this purpose is the sample mean. Microsoft Excel's Confidence test function can quickly establish an estimate for the range of values above and below the hypothesized population mean.

Researchers are often required to compute the area under a normal curve and/or to establish probabilities associated with the normal distribution. Excel includes five functions that pertain to normal distributions. The social science statistical package SPSS provides additional possibilities for dealing with questions about distributions. For example, the *Explore* procedure in the descriptive statistics set of processes also includes normal distribution-associated tests among its capabilities.

Differences tests are among the statistical tools used most often by political science researchers, along with correlation and regression analysis procedures. Two sets of procedures for testing differences between the means of groups were discussed in this chapter: First, t-test applications for two-sample tests were explained. Then, analysis of variance procedures for testing differences with two or more groups were examined.

The paired-sample t-tests in Microsoft Excel compares the means for two related groups, as in a pretest and post-test research design. The procedure then reports both the calculated and critical t-statistic for the means, and calculates a p-value for the t-statistic. Results for both a one-tailed and a two-tailed test are produced. In addition to the procedure for comparing paired samples, Excel includes a similar procedure for testing independent samples; independent samples may be from one population with equal variance or from different samples with unequal variance.

Analysis of variance (ANOVA) is used for samples of any size and with any number of groups or subgroups. Three different levels of analysis of variance tests were also discussed: one-factor, two-factor, and three or more factor designs. All ANOVA procedures produce a calculated and a critical F-statistic and a p-value that can be used for quick interpretation of the test results.

Discussion Questions

1. Name and define the three major types of research hypotheses.
2. What is the difference between a null hypothesis and an alternate hypothesis? Which one do you test, and why?

3. What role does probability play in hypothesis testing?
4. What is a confidence interval and what is it used for?
5. Discuss the concepts of Type I and Type II error in hypothesis testing.
6. What are some of the ways researchers use one-sample hypothesis tests?
7. What are some of the ways researchers use two or more sample hypothesis tests?
8. What is an *F*-ratio and in what hypothesis test is it used?
9. What is a *degree of freedom*?

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13 Introduction to Nonparametric Statistics

Quantitative research results are often grouped into two broad classes of measurements: *parametric* and *nonparametric* statistics. Parametric statistics are measurements about samples and populations. Sample measurements are called *statistics*; population measurements are called *parameters.* Most quantitative political researchers work with parametric statistics. Parametric statistics are also called *inferential* statistics because the statistical results are *inferred* to apply to a population from which the sample or samples were drawn.

Measurement data can be either *continuous* or *discrete.* The measurements in inferential statistics are almost always from variables that produce *continuous* measurements. Continuous variables can have many different possible values; they are not restricted to a specific number of categories as are categorical variables. An example of a continuous variable is a test score. An example of a categorical variable is the answer to a Yes or No question. Because only two answers are possible, this type of categorical variable is also called a *dichotomous* variable. Another common form of a categorical variable is the multiple-choice question. Multiple-choice questions usually have from three to five possible answers, but are not limited to any number of categories. Multiple-choice questions are also known as *multichotomous* variables. Because categorical statistics cannot be used for inferential purposes, they are known collectively as *nonparametric statistics.* Categorical data may be either *nominal- or ordinal-level* measurements (Lehmkuhl 1996).

A large collection of nonparametric statistical tests has been developed for use with *categorical* variables. In fact, Lapin (1993, 605) considered the many choices to be one of the major disadvantages of the body of nonparametric test: there are almost too many from which to choose. It is hard to be sure that exactly the best tests has been chosen for the dataset being investigated.

Parametric statistics must meet several basic assumptions. These are: (1) the samples must be randomly selected, (2) the data are assumed to come from samples with equal variances, (3) the distribution of responses must be normally distributed, and (4) the samples are assumed to be independent from one another. Another assumption often cited is that researchers must be able to replicate the results with other studies. Except for a few examples, in parametric statistics the measurements must be *interval-* or *ratio-level* data; they use *mean* scores in their computations. Nonparametric statistics, on the other hand, use *rank* and *frequency* distribution information (Lehmkuhl 1996). Means are not appropriate for these data. Instead, measures of central tendency are likely to be either the median or the mode.

These required assumptions cannot always be met. Distributions are often not normal; they may be all gathered around one value or the other, becoming what is known as "positively or negatively skewed." They may be bipolar, or evenly distributed across all possible scores. When only two answers are possible, it is meaningless to talk about a "normal distribution" or a "bell-shaped curve." In addition, researchers often draw samples from two or more very different populations.

Therefore, no assumptions can be made about the population parameters. When this happens, there is no way of assuring that the samples have equal variances. In all these cases, nonparametric statistics may be more appropriate for analyzing research results.

Parametric statistics are typically used for making inferences about some population parameter or parameters. With nonparametric statistics, however, the assumption of a normal distribution does not apply; that is, nonparametric statistics are those that are considered to be "distribution free." In a dichotomous variable, for example, the distribution can only be binomial (only two answers); this is the same type of data developed by flipping a coin.

Because nonparametric statistics do not require the assumptions necessary for parametric statistics, one might wonder why they are not always used. In fact, nonparametric statistical tests *can* be used with all levels of data. This is not done because they typically provide less information than parametric statistics. They are sometimes described as being "less powerful," or "not as robust" as parametric tests. However, these accusations are not really relevant; there are times when nonparametric statistics are the only appropriate choice. Lehmkuhl summarized the position of when parametric statistics should and should not be used in the following way:

> Nonparametric tests should not be substituted for parametric tests when parametric tests are more appropriate. Nonparametric tests should be used when the assumptions of parametric tests cannot be met, when very small numbers of data are used, and when no basis exists for assuming certain types of shapes of distributions. (Lehmkuhl 1996, 106)

Thus, nonparametric statistics are entirely appropriate for use when the researcher cannot make any assumptions about distributions, when the sample size is small (less than 100), and measurements are nominal or ordinal level. Such applications occur when the data are categorical (nominal level) or ranked or ordered (ordinal level).

An illustration of a manifestly appropriate application of a nonparametric statistical test is the chi-square-based *Cramer's V* test for relationships between nominal-level variables. This statistic, with its table-shape variant the *phi*-statistic, provides an index of the strength of a relationship, although it does not tell the direction of that relationship. Although nonparametric tests for differences will provide information about differences in measurements between two or more groups, they are unable to include information about possible *interaction* between two or more influencing variables.

Nonparametric Analogs of Parametric Tests

At least one nonparametric equivalent test exists for each type of basic parametric statistical test (StatSoft 2002). This chapter discusses some of the most commonly used nonparametric statistical tests in each of four general categories of statistical analysis:

- Tests for location (i.e., central tendency)
- Tests for statistically significant differences between groups (independent samples)
- Tests for differences between variables (dependent samples)
- Tests for associations between all types of variables

The statistical tests used most often when dealing with parametric statistics and interval and/or ratio-scale data include (1) the single-sample t- or z-tests; (2) the two-sample t-test for independent samples and the analysis of variance (ANOVA) test for two or more samples; (3) the two-sample

Table 13.1

Selected Nonparametric Analogs to Parametric Statistical Tests

Test Type	Nonparametric Analog	Parametric Tests
Tests for location	Chi-square one-sample tests Kolmogorov-Smirnov one-sample test	*t*-test for small samples *z*-test for samples of 30 or more
Differences tests with independent samples	Mann-Whitney *U*-test	*t*-test for independent samples
	Kolmogorov-Smirnov two-sample test Kruskal-Wallis *H*-test Kruskal-Wallis ANOVA	*F*-test of variance (ANOVA)
Differences tests with dependent samples	Friedman's two-way analysis of variance test McNemar's chi-square test	*t*-test for dependent [paired] samples ANOVA
Tests for association between two or more variables	Spearman's *rho*, χ^2, *phi*, and Cramer's *V*	Pearson's correlation coefficient

t-test for differences in the means of dependent samples, such as with pre-and post-same-group testing and paired-sample testing; and (4) the Pearson's correlation coefficient statistic for associations. Table 13.1 displays a variety of the available nonparametric tests.

Not all of these nonparametric tests are included in the Excel statistical package. However, provision for the majority of the nonparametric relationship and differences tests are included in the more comprehensive and powerful statistical software package, SPSS. For additional information, a standard statistical methods textbook should be consulted. One or more nonparametric procedures for tests of *location*, for *differences*, and for *association* are discussed in the following pages.

Nonparametric Tests for Location

Tests of location are designed to determine whether a sample or samples could have come from a known population (Siegel 1956). The procedure is to compare a sample's measurement of central tendency with a known or hypothesized parameter. When the researcher is dealing with parametric data, the one-sample *t*-test or *z*-test are the preferred procedures.

The *t*-test is used compare a sample mean with a hypothesized population mean; the *z*-test is used with large samples, and the unknown population standard is replaced by the sample standard deviation. In both these applications the scores are assumed to have come from a population where the distribution is normal. Because both tests compare means, the data must be either interval or ratio. When these assumptions cannot be met, the nonparametric chi-square test of location may be substituted for the *t*-test or the *z*-test.

In general, nonparametric tests of location are very similar to the chi-square goodness-of-fit procedure. Both one-sample and two-sample models compare actual distributions with expected distributions. In the one-sample test, the researcher draws a sample, then attempts to determine if there is any significant difference in the location (central tendency) between the sample and the population. Because the data are nominal or ordinal, the central tendency measurement in these tests is usually the median. In a two- (or more) sample test, the researcher wants to know if there is a statistically significant difference between the actual (observed) distribution of responses and an expected distribution. Modified versions of the chi-square test are appropriate for one, two, and three or more sample situations.

Tests based on the chi-square statistic (χ^2) are extremely versatile statistical tools. (Greek letters are used throughout statistics and mathematics; in English, the Greek letter χ is written as "chi," and pronounced "ki." Because the final statistic is squared, the test and distribution are called *chi-square*, and written as χ^2.) Chi-square has important applications with both parametric and nonparametric statistical tests. The statistic is based on the χ^2 distribution, which was originally developed for use with small samples where the assumptions of normality could not be upheld.

Small-sample results, simply because of the limited number of responses available, seldom resemble a normal distribution, for example. The one-sample location test is just one of many tests based on the χ^2 distribution. Several other χ^2-based nonparametric tests are discussed below. This simple-to-use and easy to understand test has become a popular one-sample test for making decisions about the distribution of responses in one-sample situations.

The inclusion of this test in the majority of statistical software packages has increased its popularity such that it has replaced many other tests, such as the *one-sample sign test*, in many empirical research applications. Although it is used with all types of measurements, the test is particularly at home with all types of categorical measurements.

One-Sample Nonparametric Tests

Of the many statistical tests that are available for testing hypotheses about a single sample, two of the most popular are the chi-square test for use with nominal data and the Kolmogorov-Smirnov one-sample test for ordinal data. One-sample tests are conducted to test hypotheses that the sample in question could come from an identified population. One-sample tests use a goodness-of-fit model, in which they test for a disproportionate or unexpected distribution of scores across the various categories of a variable.

The One-Sample Chi-Square Test

The X^2 one-sample test should be used when a researcher has questions about the distribution of responses in data taken from a sample. Specifically, the researcher has questions about the distribution of responses that fall into the spread of possible responses.

For example, say that the County Clerk of a rural county in a western state has reported that for the past decade, the number of registered voters in the county has remained stable. County records reveal that 45 percent are registered Democrats, 38 percent are Republicans, 12 percent are Independents, and 5 percent are members of the Socialist Labor Party (Table 13.2).

In these types of applications, the one-sample test is similar to the *goodness-of-fit test* because it compares the set of *observed* cases against an *expected* distribution. The null hypothesis for this test is that the proportion of cases that make up a sample of county voters will not differ from the known distribution. The alternate hypothesis is that the distribution does not mirror the expected distribution of responses.

The chi-square test (CHITEST) in the Excel Function Wizard looks at differences within the sample, computes a chi-square distribution, and compares the actual distribution of responses with the expected distribution. The only required assumptions for the χ^2 test are (1) that the sample is randomly selected, and (2) each observation must fit into one and only one class. CHITEST only returns the two-tailed *probability* for a χ^2 statistic with the appropriate degrees of freedom (number of rows minus 1); it does not return a calculated chi-square value. The syntax for this simple test is: CHITEST = (actual range, expected range).

Table 13.2

Distribution of Registered Voters in a Population and a Sample

Party Affiliation:	Number of Registered Voters (n = 131,687)	Expected Percentage	Number in Sample (n = 250)	Observed Percentage
Democrat	59,260	45	128	51
Republican	50,041	38	80	32
Independent	15,802	12	37	15
Socialist Labor	6,584	5	5	2
Totals:	131,687	100.0	250	100.0

Source: Example data.

For the data in Table 13.2, the test returned the probability of 0.2311 that the actual proportion of voters in the four categories is representative of the known population parameter distribution. Decisions regarding nonparametric hypotheses are made based on the size of the p-value. If the researcher elects to use a 0.05 confidence level for the test, the null hypothesis cannot be rejected; the computed p-value of 0.2311 is greater than 0.05. The researcher must conclude that the sample is not representative of the population.

The Logic Behind the Chi-Square Test of Location

In the following one-sample example, a media buyer planning a political advertising campaign in a given state or community wants to know which Wednesday and Thursday evening prime time television programs are preferred by a target audience of adult registered voters. The media buyer will use this information to place advertisements for her candidate. Data are gathered from a sample of 200 subjects. Local advertising can be purchased on eight programs over the two evenings. The variable of interests is *preferred television program.* The null hypothesis is that the distribution of preferred programs is equal; no one program is preferred above any other program.

The data are *categorical* (preferred, not-preferred), and are presented in Table 13.3. The number

Table 13.3

Frequencies for Wednesday–Thursday Preferred Television Programs

Program Type	Program Code	Observed Cases	Expected Percent	Expected Cases
Situation Comedy	1	22	12.5	25
Medical Drama	2	28	12.5	25
News Magazine	3	14	12.5	25
Sports Show	4	30	12.5	25
Variety Musical	5	22	12.5	25
Slice-of-Life	6	30	12.5	25
Ethnic Comedy	7	26	12.5	25
Children's Omnibus	8	28	12.5	25
Totals		200	100.0	200

Table 13.4

Calculations for Determination of a Chi-Square Test

Code	Actual Count (A)	Actual Percent	Expected Count (B)	Expected Percent	Actual minus Expected (A–B)	(A–B)/25
1	22	0.110	25	0.125	–3	0.36
2	35	0.175	25	0.125	10	4
3	28	0.140	25	0.125	3	0.36
4	18	0.090	25	0.125	–7	1.96
5	32	0.160	25	0.125	7	1.96
6	25	0.125	25	0.125	0	0
7	21	0.105	25	0.125	–4	0.64
8	19	0.095	25	0.125	–6	1.44
	200	1.00	200	1.00	0	10.72
					χ^2 (table)	14.067

Source: Sample data from Table 13.3.
Computed chi-square = 10.72
Degrees of freedom (r – 1) = 7
Table χ^2 value = 14.067

of *expected* cases was determined by dividing the total number of cases by the number of classes or categories (100/8 = 12.5); degrees of freedom refers to the number of categories (rows) minus 1; in this case, 8 – 1 = 7 df. Table 13.4 displays the information and steps needed to calculate a chi-square value.

Using the chi-square distribution (CHIDIST) capability in the Excel Function Wizard, a one-tailed p-value of 0.0853 is found for the distribution of 12.5 observed cases per cell and 7 (n – 1) degrees of freedom. Since this is a two-tailed test, the one-tailed probability of 0.0853 must be doubled, for a final value of 0.1706. The null hypothesis cannot be rejected; the distribution of responses is statistically disproportionate. The null hypothesis for both a one-tailed and a two-tailed test would be rejected at the 0.05 level of confidence. The alternate hypothesis is retained for both (or accepted).

The K-S One-Sample Test for Ordinal Data

The Kolmogorov-Smirnov (K-S) one-sample test for ordinal-level data is different in concept than the nominal-data test for location. Instead of comparing a sample median with a population median, it compares the distribution of a sample dataset with a theoretical *expected distribution.* The K-S test is used when the researcher wants to determine whether the sample rankings can be assumed to be from a population with those theoretical rankings.

The K-S one-sample test is an efficient statistical procedure for testing for differences among the rankings of classes within one sample. The only two assumptions that must be met are the requirement that the data are at least ordinal level (rankings), and that they are from a randomly selected sample. A null hypothesis for this test is that there is no difference in the way groups in the sample have ranked a given set of objects. Therefore, the K-S one-sample test may be said to be a test that follows the *goodness-of-fit* model.

The K-S test is included in the SPSS *Nonparametric Tests* group, listed as "1-sample K-S."

(It is not available in Excel.) The test computes a mean rank for each group, a *z*-score, and a two-tailed probability. It requires selection of a test distribution (normal, uniform, or Poisson). In almost all cases (unless the manager knows specifically that another distribution is present), the normal distribution option is selected even though this is a distribution-free test. The test results are interpreted by comparing the two-tailed probability value with the desired confidence level; *p*-values equal to or greater than the chosen alpha result in retaining the null hypotheses.

Nonparametric Tests for Differences

A number of nonparametric statistical tests have been developed to measure the significance of differences in variables that are measured in either nominal- or ordinal-level data. Table 13.5 displays a small sample of the better-known nonparametric differences tests, including the one-sample tests. The table lists dependent and independent group nonparametric tests that have been developed for one, two, and more-than-two-samples comparisons.

Not all of the differences tests identified in Table 13.5 are regularly used in standard political science research situations. The following discussion looks at only those tests that might be seen in political science, administrative science, and public administration journals, and which are easy to employ and interpret. The following two-sample tests are discussed first: the Kolmogorov-Smirnov *z*-test for nominal data, and the Mann-Whitney *U*-test for ordinal data. For three or more samples, the following procedures are discussed: the Kruskal-Wallis *H*-test for nominal data and the Kruskal-Wallis one-way ANOVA procedure for ordinal data.

Table 13.5

A Partial List of Nonparametric Tests for Statistically Significant Differences

	Independent Samples		Related Samples	
	2-Sample Tests	3+-Sample Tests	2-Sample Tests	3+-Sample Tests
NOMINAL DATA:	Kolmogorov-Smirnov Test	χ^2 Test for Independent Samples	McNemar Test	Cochran's *Q*-Test
ORDINAL DATA:	Mann-Whitney *U*-Test	Kruskal-Wallis One-Way ANOVA	Wilcoxon Rank Sum Test	Friedman Analysis-of-Variance Test

Source: After Siegel 1956.

Two Independent-Sample Tests

SPSS includes four two-independent-sample test procedures in its powerful *Nonparametric Tests* sub-program. Two of these independent-sample tests are often used in organizational research, including studies in political science and public administration. They are the *Kolmogorov-Smirnov z-test* (K-S), which is used with categorical (nominal-level) data, and the *Mann-Whitney U-test* (M-W), which should be used with ordinal-level data.

The nominal-data K-S *z*-test compares the observed distributions counts of numeric variables across categories for two samples or groups. A *z*-value and a two-tailed probability value are produced. The test results are interpreted by comparing the *p*-value with the

Table 13.6

Time (in seconds) and Rank Order for Two Voting Procedures

	Control Group		Experimental Group	
Sample No.	Time (in seconds)	Rank Order	Time (in seconds)	Rank Order
1	217	20	239	22
2	256	24	198	12
3	285	27	201	14
4	192	10	204	15
5	191	9	187	7
6	175	2	162	1
7	268	26	211	18
8	261	25	213	19
9	380	30	183	6
10	292	28	176	3
11	189	8	207	16
12	210	17	182	5
13	244	23	177	4
14	220	21	200	13
15	360	29	195	11

desired confidence level (.01, .05, or .10). The only required assumption is that the samples are randomly selected.

The Mann-Whitney *U*-test ranks all responses to an ordinal-level variable and computes a *U*-score and its significance level, which is used for interpreting the results of this test. It tests the hypothesis that two independent samples come from populations having the same distribution. The Mann-Whitney *U*-test requires that the samples are randomly selected and that data are ordinal-level. The *U*-test converts the observed data to ranks and compares the differences.

In the following example, suppose that a state elections board is evaluating the effectiveness of two different vote-recording systems. One, the existing system, is a manual process that requires voters to use a small metal stylus to punch out partially perforated windows in card-like ballots. The finished ballots are then counted at the end of the day by equipment resembling old IBM punch-card readers.

The second system is an electronic touch-screen that allows voters to record their votes, erase or change any mistakes, and electronically counts all ballots as they are completed. A random sample of 30 voters is selected to test both systems, with the time to complete the voting in seconds recorded for each voter. Half of the sample is randomly assigned to the existing system (the *control group*), and half is randomly assigned to the new electronic system (the *experimental group*). The time (in seconds) for each sample member to complete the voting process is displayed in Table 13.6.

Two Related-Sample Tests

In political science research, nearly all of the applications of differences tests involve independent samples. Tests with related samples are used primarily in laboratory-based experimental research. The setups and test results for dependent sample tests are nearly identical to those of independent tests. In the SPSS Nonparametric Tests statistical program, for example, four types of related-sample tests are grouped under the "two-related-samples tests" set of procedures.

Two of these tests for related samples are the McNemar Test for dichotomous (nominal) data, and the Wilcoxon Rank Sum Test for ordinal data. McNemar's test is designed to test hypotheses about pairs of variables, such as spouses or in before-and-after designs. Norušis (2000, 344) defined the McNemar procedure as one that tests whether the possible combinations of values for the variables are likely. In a before-and-after experiment, subjects are tested before a treatment, such as being exposed to a communication, and again after the treatment.

The Wilcoxon Rank Sum test performs a similar function for data at the ordinal level, but data that do not have to be dichotomous. The test computes differences between pairs of variables, ranks the differences, and computes a *z* statistic and a significance level for interpretation. The null hypothesis for this test is there is no difference in the way the related samples ranked the variables. It is interpreted using the *p*-value approach.

Three or More Independent Sample Tests

Nonparametric tests are also available to test for differences in more than two independent samples. When three or more independent samples are involved and the data are categorical, a choice of three-sample tests is included in the SPSS tests for several independent samples capability (called *K Independent Samples* in the dialog box menu).

The χ^2 K-Independent Samples Test

The K-sample χ^2 test for three or more independent samples compares the medians of three or more independent samples, and computes a chi-square and a significance value (*p*-value). This test is included in the *SPSS Crosstabs* procedure in the *Descriptives Statistics* section. Accordingly,

> When frequencies in discrete categories constitute the data of research, the χ^2 test may be used to determine the significance of the differences among (3 or more) independent groups. The χ^2 test for *k* independent samples is a straightforward extension of the χ^2 test for two independent samples. . . . In general, the test is the same for both two and *k* independent samples. (Siegel 1956, 175)

In the following example, a researcher is interested in determining whether Cuban-Americans of different ages support or do not support normalizing relations with Cuba. The researcher identified four age-group categories, 15 to 29 years, 30 to 44 years, 45 to 59 years, and 60 years and older. Subjects were asked to answer either Yes or No to the question "Should the U.S. normalize diplomatic relations with Cuba as long as Castro still leads the country?" Subjects were surveyed at random on a street in a Cuban-American community in Miami, Florida. The data from a small-sample attitude survey are displayed in Table 13.7.

Table 13.8 is a crosstabulation table produced by the SPSS descriptive statistics procedure. Table 13.9 displays a table of the results of the chi-square test. Two results of interest are presented in Table 13.9. One is the result of the χ^2 test. The calculated χ^2 value is 7.897, with 3 degrees of freedom (rows – 1). A two-tailed probability of 0.048 indicates that at the .05 level of confidence the hypothesis that the age groups are not from the same population must be accepted.

Table 13.7

Data Distribution for a Survey of Attitudes Regarding Cuba

Subject	15–29 years of age	30–44 years of age	45–59 years of age	60 years of age or older
1	1	1	2	2
2	1	2	2	1
3	2	1	2	1
4	2	1	2	2
5	1	2	1	2
6	1	1	2	2
7	1	1	2	2
8	2	2	2	2
9	1	1		2
10		2		

Key: 1 = Yes; 2 = No

Table 13.8

Age-Group Membership: Should the United States Normalize Relations with Cuba?

		Yes	No	Total
Age group:	15–29	6	3	9
	30–44	6	4	10
	45–59	1	7	8
	60 or older	2	7	9
Total		15	21	36

Table 13.9

Chi-Square Test Results, Age Group Membership: Should the United States Normalize Relations with Cuba?

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.897	3	.048
Likelihood Ratio	8.421	3	.038
Linear-by-Linear Association	5.812	1	.016
N of Valid Cases	36		

Note: 5 cells (62.5%) have expected count less than 5. The minimum expected count is 3.33.

Kruskal-Wallis Analysis of Variance Test

The Kruskal-Wallis analysis of variance test is used to test differences in the way that three or more groups respond to one or more ordinal-level variables, such as the way subjects rank a set of statements or other items in terms of their perceived importance. The test computes an *H*-statistic similar to a chi-square distribution (a chi-square value is also printed as the default). This test also provides a significance value that can be used in the same way as a p-value for interpreting the results. If there are a large number of ties in raw data, a second chi-square and significance value corrected for ties is also computed.

The Kruskal-Wallis procedure tests for differences in the way that three or more independent groups or samples rank a variable in order to establish whether three or more independent samples are from the same population (Siegel 1956). In much the same way as the Kruskal-Wallis H-test, it computes a chi-square and a significance value, and repeats these results corrected for ties in the data. This test is also included in SPSS Nonparametric Tests.

In the following example, a researcher is interested in determining the best appeal to use in order to influence citizens' attitudes about constructing a new wastewater treatment facility in the community. The city and county must float a bond issue in order to pay for the facility; property taxes are expected to increase if the bond issue passes. Table 13.10 displays the data for the hypothetical test of three independent groups exposed to different advertising appeals and a control group that does not get the treatment. All subjects were asked to rank the importance of a proposed community bond issue by awarding up to 100 points; the more points awarded, the greater the importance.

To prepare the data for an SPSS K-W analysis of variance test procedure, the data in Table 13.10 must be rearranged into three columns, as displayed in Table 13.11. Column 1 is the subject number variable, with subjects numbered sequentially from 1 to 29. Column 2 is the grouping variable. Groups are numbered from 1 to 4, with 1 assigned to the control group, 2 to the reason group, 3 to the emotion group, and 4 to the financial appeal group. The third column is the rank value given by each subject. The SPSS procedure requires entry of the rank variable as the test variable and the group assignment variable as the grouping variable. The default selection for the test is the K-W H-test, so this box should already be checked. Table 13.12 shows mean rank calculations for this test.

The SPSS procedure produces a summary table in which the calculated mean rankings for each group are displayed, and a test statistics result for the test (Table 13.13). In this example, the computed chi-square is 12.602, with 3 degrees of freedom, and a significance of .006. There are only six chances in 1,000 that a Type I error will occur. The null—the distribution of rankings is not the same in all groups—must be rejected and the alternate hypothesis, the distribution is similar in all groups, accepted.

The Cochran Q*-Test for Differences*

The nonparametric test for differences in three or more related samples is the Cochran Q-test for nominal data. For differences between three or more related samples where the data are ordinal, the Friedman analysis of variance test for ordinal-level data may be used. Neither of these tests is included in the standard edition of SPSS for Windows, version 10.0 and below. Readers are encouraged to consult a standard nonparametric statistics text for instruction on the manual methods for conducting these two tests. The tests are included in more powerful editions of earlier desktop and mainframe versions of the software.

Nonparametric Relationship Tests

In the previous chapter on parametric statistical tests for relationships, it was brought out that two different statistical techniques are needed to determine whether a significant relationship existed, and to provide information about both the strength and the direction of a relationship.

Table 13.10

Data for a Kruskal-Wallis ANOVA Test

	Importance		Rankings	
Subject	Group 1	Group 2	Group 3	Group 4
1	20	25	65	30
2	25	10	40	70
3	60	40	15	70
4	80	30	25	40
5	50	90	35	95
6	40	20	75	100
7	45	50		20
8		50		15

Table 13.11

Importance Data Reformatted into Column Form

Subject	Group	Importance Score
1	1	20
2	1	25
3	1	60
4	1	80
5	1	50
6	1	40
7	1	45
8	2	25
9	2	10
10	2	40
11	2	30
12	2	90
13	2	20
14	2	50
15	2	50
16	3	65
17	3	40
18	3	15
19	3	25
20	3	35
21	3	75
22	4	30
23	4	70
24	4	70
25	4	40
26	4	95
27	4	100
28	4	20
29	4	15

Table 13.12

Mean Rank Calculations for SPSS Kruskal-Wallis *H*-Test

Ranks

	Group	*N*	Mean Rank
IMPRANK	Control Group	7	7.93
	Appeal to Reason	8	13.38
	Appeal to Emotion	6	14.50
	Financial Appeal	8	23.19
	Total	29	

Table 13.13

Calculated Chi-Square Value, Degrees of Freedom, and *p*-Value for K-W *H*-Test

Test Statistics

	IMPRANK
Chi-Square	12.602
df	3
Asymp. Sig.	.006

Kruskal-Wallis test.
Grouping variable: group

Table 13.14

A Summary of Some Nonparametric Relationship Tests

Nominal Data Tests	Ordinal Data Tests
χ^2 Test for Independence	Spearman's Rank Order Coefficient *R* (*rho*)
Cramer's *V*-Test (for square tables)	Kendall's *tau-b* (for square tables)
Phi-Statistic (for rectangular tables)	Kendall's *tau-c* (for rectangular tables)

Regression analysis measured the way in which variables might be related; correlation analysis provided a numerical measure or index of the strength of the relationship. These tests are displayed in Table 13.14.

Tests for Nominal-level Data

The first step often used to test for associations between nominal-level data is to employ the chi-square test for independence. This test provides a coarse measurement of association in that it allows the manager to test a null hypothesis that the two categorical variables are independent (that is, they are not related). The chi-square test is included in two separate categories of statistical tests in SPSS for Windows: *Crosstabulations* and *Nonparametric Tests.*

Crosstabulations, which are two-way frequency distribution tables, include a number of other relationship or association tests for categorical data. Among the two most useful of these are tests for the *phi*-statistic and for Cramer's *V.* Both of these tests compute a nonparametric correlation coefficient index number that ranges from 0 (no relationship) to 1.0 (a perfect relationship). This means they can only provide a non-directional measure of relationship; it is impossible to determine whether the relationship is positive or negative. The samples can be of any size with either of these tests.

The only difference between these two tests is the way they are structured for comparing responses to different numbers of categories. The *phi*-statistic is used with tables that are "square," that is, a table with the same number of categories in both rows and columns. For example, a "two-by-two table" is one with just two possible classes for each variable. Examples include such dichotomous variables as gender, yes or no, read or don't read, member or nonmember, use or don't use. The Cramer's *V* tests, on the other hand, measures association for all tables that are rectangular in shape; rows and columns do not have the same number of categories. They may be 2 by 3, 2 by 4, 3 by 4, 4 by 6, etc. Both tests are included under the same statistics option in the SPSS Crosstabs procedure.

The Crosstabs procedure is designed to prepare tables and measures of association for two or more nonscale-level variables. Although the procedure may be prepared with any level of data, it is particularly appropriate for use with categorical data. The association measures are grouped in three categories: for nominal data, for ordinal data, and for tables where one variable is nominal and the other is interval level.

Among the options for inclusion in the table are row percentages, column percentages, and the percentages of the total represented by each cell count. Counts (or "observed" frequencies) for each category are always printed. It also possible to have the expected frequencies counted for goodness-of-fit applications.

The data will dictate which of the two tests is carried out by the statistical software (they are included in the same selection option). Interpretation of both of these chi-square-based tests is identical. Each produces a relationship value (correlation coefficient) ranging from 0 to 1.0. This can be interpreted in the same way as the parametric coefficient of determination's percentage of association.

Ordinal Data Association Tests

Ordinal-level measurements, like nominal data, are considered to be measures of *category* rather than quantity. With nominal data, the numbers mean how many cases fall into each specific and discrete category, such as "male" or "female" in the variable "gender." With ordinal data, the numbers also refer to how many observations fall into each of the descriptive categories. But now they also mean that the various categories may be placed in some kind of order.

Examples included voters' preferred presidential candidates, the perceived importance of a set of factors that influence determination of public policy, or the possession of more or less of a characteristic, such as a "liberal attitude." Each level in ordinal measurement is a statement of order for the category. It is not possible to tell from the rankings how far apart the levels are, but simply that one level is higher (or lower) than others.

Researchers often want to know how ordinal-level variables are related to one another, if at all. For example, a public administrator might want to know if there is any relationship between the importance ranking that citizens give a civic service with the way the public ranks the perceived quality of the service.

When at least one of the variables in a crosstabulation test is ordinal level, the SPSS Crosstabs procedure allows a choice of several different tests. These include the *Spearman correlation coefficient* (Spearman's *rho*), *Zero-order Gammas*, *Somer's d tests*, and *Kendall's tau-b* and *tau-c* *tests.* Spearman's *rho* is perhaps the most used measure of correlation between two ordinal-level variables. It is the nonparametric analog of the parametric *product moment correlation coefficient* (Pearson's *r*) and is interpreted in the same way as the interval-level test. It also identifies whether the relationship is positive or negative. Spearman's *rho* can be used with samples of any size, with equal or unequal size groups, and with any table shape.

The Kendall tests are also simple to use and interpret; each is appropriate for slightly different situations. *Tau-b* should be used for square tables (when the number of columns equals the number of rows in the Crosstabs table); a *tau-b* corrected for ties tests is also computed. *Tau-c* is to be used when the tables are rectangular rather than square.

Summary

A number of nonparametric statistics procedures were discussed in this chapter. A few are included in Microsoft Excel, and all are included in SPSS and SPSS for Windows software. Nonparametric tests, which are also known as *distribution-free* tests, are appropriate when a researcher must deal with categorical or ranked data. Nonparametric statistics are to be used when the researcher cannot make any assumptions about distributions, when the sample size is small (less than 100), and measurements are nominal or ordinal level. Such applications occur when the data are categorical (nominal level) or ranked or ordered (ordinal level).

There are many different uses for nonparametric tests. They begin with several different versions of chi-square tests, and extend across a variety of independent- and paired-sample applications for one, two, and three or more samples or groups. They include tests for differences and tests for relationships.

At least one nonparametric equivalent test exists for each type of basic parametric statistical test. Nonparametric statistical tests have been developed for these categories of statistical analysis: tests for location, tests for statistically significant differences between independent and related samples, and tests for associations between variables.

Two of the most popular one-sample nonparametric tests are the chi-square test for use with nominal data and the Kolmogorov-Smirnov one-sample test for ordinal data. One-sample tests are conducted to test hypotheses that the sample in question could come from an identified population.

Two of the independent sample tests in SPSS are often used in political science and public administration. They are the *Kolmogorov-Smirnov z-test* (K-S), which is used with nominal-level data, and the *Mann-Whitney U-test* (M-W), which should be used with ordinal-level data. For two related-samples tests, the McNemar Test for dichotomous (nominal) data, and the Wilcoxon Rank Sum Test for ordinal data should be used. When three or more independent samples are involved and the data are categorical, the χ^2 K-independent Samples Test, the Kruskal-Wallis Analysis of Variance Test, and the Cochran *Q*-Test for Differences should be used.

The SPSS Crosstabs procedure prepares tables and measures of association for two or more nonscale-level variables. When at least one of the variables in a crosstabulation test is ordinal level, Spearman's *rho* is the most appropriate measure of correlation between two ordinal level variables.

Discussion Questions

1. What is meant by the term *distribution-free statistics?*
2. When and how do political science researchers use nonparametric tests for location?
3. When should the χ^2 (chi-square) one-sample test be used? Why?
4. What is the appropriate test to use when comparing two related samples with *nominal* data?

5. What is the appropriate test to use when comparing two related samples with *ordinal* data?
6. Name at least one nonparametric relationship test for *nominal* data and describe how to interpret the test results.
7. Name at least one nonparametric relationship test for *ordinal* data and describe how to interpret the test results.
8. Is it ever appropriate to use a parametric test on nonparametric data? Why or why not?

Additional Reading

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14 Correlation and Regression Analysis in Political Science

There are many instances when researchers are interested in determining either (1) how two or more variables are associated or related to one another, or (2) how a change in one variable or variables influences or moves with a change in another variable or variables. The statistical test used most often in these circumstances is *regression analysis*. Identifying and measuring the strength of relationships is, in fact, one of the most fundamental tasks of data analysis in political science research.

Measuring relationships also influences the type of research design selected by the researcher. For example, a researcher might have a "feeling" that the public's use of a state park is directly related to the price charged for access to the facilities. Or a highway maintenance researcher might believe that maintaining consistent quality on patchwork paving is to be related to gaining citizens' approval on city bond issue proposals. Another researcher might want to know whether the level of service provided to citizens by her agency is related to staff workload or if the productivity of staff members is related to the amount or type of training they receive.

Other elected officials and public managers might look at these same problems and have other questions. For example, another researcher might want to know whether park use is related to amount and type of advertising about park availability. Another highway department researcher might want to know if paving quality is affected by the age of the equipment used or training of employees in the use of the equipment. The public agency researcher might have an idea that the level of service provided by public workers is affected by the announcement of a deferred pay increase. And another researcher might want to determine whether employee productivity varies with changes in the weather. In every one of these examples, regression analysis can be an appropriate statistical design in a research project.

It is important to note that the relationships described in these examples have alternative conclusions. The point is that a variable relationship is not always what it appears to be. Variables may only seem to be associated, or they may be only a "confounding" factor in the issue. Researchers test many different variables before selecting what seems to be the most probable answer.

Obviously, it would be irresponsible on the part of a researcher to make major economic decisions based on how the researcher's estimates about a relationship between two or more variables. Before making the decision, the researcher would propose a hypothesis about a relationship, write an alternate hypothesis, and then test the hypotheses statistically.

The correct procedure is to assume that associations do not exist until they are "proven" statistically. Fortunately, an extensive body of easy-to-use statistical tools exists to help managers identify and weigh evidence about relationships. This process is often described as proving that the relationship is statistically significant. The phrase *statistically significant* means that the identified relationship did not occur because of chance alone and that there is some measured degree of probability that it does, indeed, exist.

The logic behind a relationship test is found in all research; it is based on establishing and testing a hypothesis. For example, researchers want to know, first, are the variables related, second, in what way are they related, and, third, how strong is the relationship. The null hypothesis for this procedure is that the variables are independent; they are not related. The alternate hypothesis is that they are not independent; they are related.

It is possible to carry out statistical tests for associations with all levels of data. Because each test employs different assumptions, measures, and calculations, it is particularly important that the appropriate test statistic be selected for the type of data collected. Tests for nominal and ordinal-level data were covered in the chapter on nonparametric statistics. Tests for interval and ratio data are covered here.

Measures of relationship between two interval- or ratio-level variables involve two closely related measurement concepts: regression analysis and correlation analysis. Regression analysis measures the way in which two or more variables are related to one another, whereas correlation analysis provides a measure of the strength of the relationship. Together, these constitute what may be the most heavily used statistical tests in political science, public administration, and economics.

Relationship Test Applications

Relationship tests have two broad applications. They can be used to examine the way in which variables vary together (a *covariational* relationship), or they may be used to test whether a *causal* relationship exists. An example of a covariational relationship is expressed in the statement, "Wisdom increases with age." The hypothesis is that as people get older, they get smarter. An example of a causal relationship is a prediction that if advertising expenditures are increased, the number of votes received by a political candidate will also increase. The hypothesis is that advertising "causes" votes. Of course, this assertion ignores all other potentially intervening variables, such as the quality of the advertising, the amount and quality of an opponent's advertising, and even the weather on Election Day.

In political science and other social science organization research, covariational relationships are seldom studied. Rather, researchers tend to focus on identifying cause-and-effect relationships. Thus, only causal relationships are discussed here.

All causal relationships have three key characteristics in common. First, the variables always vary together (either positively or negatively). Second, a time factor is always involved. One variable must change in order to "cause" a commensurate change in the other. The *independent* variable always changes first, followed by the *dependent* variable. In the advertising and votes example above, advertising expenditures was the independent variable; votes was the dependent variable.

And finally, the relationship is statistically significant; it did not appear through chance alone. In other words, it is not a "fake" relationship. An example of a fake or "spurious" relationship existed some sixty or more years ago when it was reported that more families were using pots and pans made of aluminum. It was also reported that more people were being diagnosed with cancer. Reporters assumed a cause-and-effect relationship between these two independent social factors, and reported their conclusions—causing aluminum cookware sales to plummet. Knowledgeable scientists quickly debunked this spurious relationship, however, and sales of aluminum cookware continued their climb.

The analytical techniques used to test relationships fall into two closely related families of tests: correlation analysis and regression analysis. Correlation analysis and regression are concerned with providing a mathematical measurement of the *strength* of any relationship between variables; both will also indicate strength of the relationship and the *direction* in which the variables are related to one another.

Correlation analysis and regression analysis are most appropriate for use with interval- and ratio-level measurements. When dealing with categorical or ranked data, other, somewhat less powerful, tests must be used. However, it is possible to create what are called *dummy variables* from nominal and ranked data in order to test relationships with similar regression analysis reliability.

Correlation Analysis

Correlation analysis is the interval and ratio-data test for association. As the last chapter indicated, similar tests exist for nonparametric data. Correlation analysis enables the researcher to measure the degree to which the two variables are related, measure the strength of the relationship, and, with data above the nominal level, identify the direction of that association (i.e., whether it is positive or negative).

The concept of correlation analysis is closely linked to regression analysis in several ways. Regression analysis provides a way of estimating the value of one variable from the value of another, and of determining the way in which two or more variables are associated. As a result, it is often used for predictive purposes.

Correlation analysis can also indicate how well the regression line explains any relationship between variables. And the easier correlation analysis test can be used instead of regression when the only question the manager asks is, “How strongly are the two variables related?”

This numerical value for correlation analysis serves as a mathematical summary measure of the degree of correlation between two variables, x and y. The summary number is called the *correlation coefficient*; it is expressed in statistical notation as the lower-case Greek letter r (rho). The value of any “r” falls between –1.0 and +1.0. This enables the researcher to indicate both positive and negative relationships.

In both correlation and regression analysis, measurements for the two (or more) variables can be plotted on a graph with an x- and y-axis. If all the paired points of x and y lie on a straight 45 degree line, then the correlation between the variables would be “perfect”; the value of the correlation coefficient would be 1.0. Therefore, the value 1.0 always represents a perfect positive correlation, while the value –1.0 always represents a perfect negative correlation and the 45 degree line is reversed. A negative correlation means that as the x-axis values *increase*, y-values would *decrease*, and in reverse, as x-axis values decrease, y-values would increase. The value 0.0 refers to no association whatsoever between the two variables.

Correlation Statistics

The Coefficient of Determination

The coefficient of determination is the square of the correlation coefficient value; it is probably the most useful measurement in correlation analysis. It provides a clear, easy-to-understand measurement of the explanatory power of a correlation coefficient. In addition, r^2 (r-squared) can help show how closely the computed r describes a relationship between two variables.

For example, say that a correlation coefficient (r) of 0.667 is found to exist between the variables Votes Received (VR) and Advertising Expenditures (AE). The square of this value is an r^2 *coefficient of determination* of 0.44. The coefficient of determination now provides an interpretation that everyone can understand: *44 percent of the variation in votes received is explained by variation in spending on advertising, while 56 percent is unexplained, or due to other, unidentified, factors.*

An important caveat to keep in mind when making such interpretations of the results of correlation analysis is that it is never possible to say for certain that a dependent variable or variables actually *cause* a change in the independent variable (that x causes y). Instead, it is only possible to report the direction and strength of a *statistical* relationship.

The Standard Error of the Estimate

One of the key concepts of statistics is measurement of the variability in a dataset; a number of tools have been developed to measure this variability. Three of the most commonly encountered variability measurements include the *range*, the *variance*, and the *standard deviation.* The point of these measurements is that data seldom fit neatly into values or categories that researchers would like to see. Instead, most often the data vary, either positively or negatively, from some middle point of a range of data. The central point used most often in analysis is the average score.

A similar variability concept applies in regression analysis, although in regression, the central point is not an average, but is instead the computed *best line of regression.* Because the observed data points do not all fall on the regression line, the regression equation is not a perfect indicator of association; rather, it is an estimate. How close it comes to estimating can be judged by computing one additional value, the *standard error of the estimate.* In statistical notation, the standard error of the estimate is indicated by the symbol S_{yx}. When calculated, the standard error of the estimate provides a measure of the variation around the fitted line of regression. It is measured in the same units as the dependent variable (y) in much the same way that the standard deviation measures variability around the mean.

In application, the standard error of the estimate is used to make inferences about the predicted value of y. For example, a small standard error suggests that the data points cluster relatively closely to the plotted regression line; in a word, the data are homogeneous. A large standard error means suggests that data points are widely disbursed on either side of the regression line and that a high degree of variability exists.

A second inference statistic is produced with the standard error of the estimate, the p-value. The p-value is a confidence measure, in that it suggests with what degree of probability the regression equation can be relied upon. In this way, it is used to make decisions about the statistical significance of the relationship between the two variables.

Three quick steps can provide most of the information a manager needs to have about the potential relationship between a set of values. In Excel, these are the *XY Scatterplot* in the Chart Wizard, and the *CORREL* and *RSQ* calculations in the Function Wizard.

Interpreting Correlation Values

Researchers have developed many different ways of interpreting correlation values in order to describe relationships in terms that have meaning for everyone. The following defining model is a purely subjective suggestion. Many other models can be found in the research literature. In this model, values range from 0 to 1 in units of ten percentage points for each level. Since the coefficients of determination are the squares of the *r*-values, it is not necessary to use positive or negative values. The labels and their respective values are:

0.0	= No relationship
0.01 to 0.19	= Weak relationship
0.20 to 0.39	= Low but definite relationship
0.40 to 0.59	= Moderate relationship
0.60 to 0.79	= Strong relationship
0.80 to 0.99	= Very strong relationship
± 1.0	= Perfect relationship (positive or negative)

Interpretations of the correlation coefficient (r) and the coefficient of determination (r^2) are slightly different. For example in the two test-score data, the *r*-value could be interpreted as: "The more than .99 correlation coefficient suggests that the relationship between the two test scores is nearly perfectly linear." To interpret the r^2, use the above table of interpretation labels. For example: "The r^2 of 0.95 suggests that there is a very strong relationship between the two tests."

Simple Regression Analysis

Regression analysis is a statistical procedure developed to determine whether two or more interval- or ratio-level variables are related. To put it another way, regression analysis allows the manager to determine how different values of one variable (called the *dependent variable*) might or might not help to *explain* variation in another variable, which is called an *independent variable.* This is the methodology underlying experiments, which are often specifically designed to determine whether changes in one variable will influence changes in another variable.

Testing versions of a homeland *s*ecurity bill is an example of an experiment. In such an experiment, legislators might take the versions to three or more similar regions. In each, one or several variables will be changed, with all other variables kept as constant as possible. Different costs for the bill might be published in each test market, while restrictions and jurisdictions remain unchanged. At the end of the test period, survey results in each test market might be compared to see if overall cost of the legislation had any impact on citizen acceptance. In this way, legislators are able to get a handle on citizen willingness to support potential legislation.

In addition to measuring the way in which variables are related, regression analysis also enables managers to predict responses or reactions to changes in independent variables. Such predictions are often needed before making expenditure decisions. From the above example, a marketer will be able to predict with some level of certainty consumers' purchases of the product at different price levels.

This, in turn, will enable production to predict how many machines and how much raw material will be needed, the finance staff to predict how much money to borrow to build the factories needed to make the product, sales managers to predict how large a sales staff will be needed, and the distribution manager to predict how many trucks and drivers will be needed to get the product to market. Prediction is one of the most important uses of regression analysis results, if not the most important.

The Regression Procedure

The regression analysis procedure begins with collecting a dataset that includes pairs of observed values or measurements. One set of measurements is needed for each variable to be included in the analysis. The idea of *pairs of measurements* may be somewhat misleading. It does not mean regression analysis is restricted to analyzing just two variables at a time. With multiple regression analysis, many variables can be included. The term *pair* refers instead to measurements for a dependent variable and one or more independent variables.

The next step in the procedure is to produce a scatter plot of all measurements. Value pairs should be plotted as points on a *scatter diagram* (also called a *scatter plot*). A scatter diagram has two axes: a vertical line (the y-axis) and a horizontal line (the x-axis). The vertical line represents values on the dependent (or changed) variable. The horizontal line identifies increments of the independent variable or variables.

Regression analysis evaluates all recorded data points and computes a regression equation. A *regression function* or numerical value is produced. When multiplied with independent variable values, this function enables the researcher to predict the value of a corresponding measurement of the dependent variable(y), given any value of x. The final step in the regression analysis procedure is interpretation of the findings.

The Regression Equation

Interpretation of the findings of a regression analysis procedure begins with fitting the sample data into a best-fit line. The regression analysis statistical procedure in statistics software packages does this through a process called the *method of least squares.* This process measures the amount each point varies from a proposed line, squares each deviation, and then sums the squares.

After computing these values, the minimum squared value of all differences establishes the *slope* of the regression line. At the same time, the regression process determines the point at which the y-axis (the vertical line in the scatter diagram) and the computed regression line would meet. This point is called the *intercept.* Once this point is known, the regression equation is used to predict additional points along the line, given a value for the x-axis. In statistical notation, the regression equation is expressed thus:

$$y = a + bx$$

where

y = the value of y calculated from the estimated regression equation
a = the point on y where the regression line intercepts on y
b = the amount of change in x required for a corresponding change in y which, when plotted, represents the slope of the line
x = a measured value for independent variable (x)

In some statistics texts, the statistical symbol for the y intercept point is given as b_o, and the symbol for the regression slope value as b_1. The regression equation for straight-line regression (linear), then is depicted as:

$$y_i = b_o + b_1 x_i$$

where

y_i = the predicted value of y for measurement i
x_i = the value of x for measurement i

In general terms, we would interpret the $y = a + bx$ equation in this way: "As x changes, y also changes by b times the change in x." Once the regression equation has been obtained, predictions or estimates of the dependent variable can be made. For example, say that we have computed the following regression equation:

$$y = 4.0199 + .00896 * x$$

This is interpreted to mean that the regression line begins at that point on the vertical axis that coincides with the value of 4.0199. Then, any subsequent increase in a value on the x-axis, multiplied by 0.00896, will equal a corresponding change in y. Moving along the x-axis and periodically plotting the increases to both x and y, connecting each point, produces a graphic impression of the regression line.

The shape of the regression line is an indication of how much of the change in the independent variable is explained by the dependent variable. The regression equation indicates how steep the line must be, whether it slopes to the right or left, or is curvilinear. When very little or no relationship exists, the scatter plot will show the data points distributed haphazardly around the space, with no connection visible.

Researchers usually look for a *linear* relationship, one that shows a definite relationship between the variables. However, not all relationships will be linear. Some will be curvilinear, some will be more or less flat, showing no relationship whatsoever, some may be U-shaped, and others may take on S-like patterns. Techniques are available for dealing with nonlinear relationships, but are not part of most introductory management statistics texts and are not discussed here.

A Simple Regression Example

The caucus secretary of the legislature wanted to know the relationship between the number of bills introduced per week and the number that made it out of committee. Data were collected for the 20 weeks that the legislature was in session. She decided to use Microsoft Excel to (1) see if a relationship existed, (2) find out the strength and direction of the relationship, and (3) determine whether it would be possible to predict committee productivity at future legislative sessions. A regression analysis was conducted on the data. The data are shown in Table 14.1.

In this simple example, three Excel Wizard applications were applied to the data. First, the Chart Wizard's *XY Scatterplot* program is used to graphically display the type of relationship between the two variables. Next, using the *Add a Trend Line* option from the *Tools* menu, a linear trend was fitted to the scatter plot. Because the scatter diagram revealed a linear relationship, the next step is to call up the *CORREL* (Correlations) program in the Function Wizard. The value produced is the correlation coefficient (also referred to as the *Pearson Product Moment Correlation Coefficient* after the statistician who first reported its application).

The third step is to interpret the relationship findings using the *RSQ* (r-square) capability in the Function Wizard, which makes it much easier to make an interpretation. The r^2 value produced is the coefficient of determination, and used to express the relationship as a *percentage.*

The results of the Excel correlation procedure are displayed in Figure 14.1. The Excel result for the CORREL test was 0.61. The result for the RSQ test was 0.3761, which, rounded to 0.38, can be interpreted as "38 percent of the change in the dependent variable, *Bills Passed by Committee*, is explained by the independent variable, the *Number of Bills Introduced* each week."

Table 14.1

Bills Introduced and Passed Out of Committee, 20-Week Legislative Session

Week	Bills Introduced	Out of Committee
1	53	2
2	91	8
3	59	6
4	72	10
5	45	11
6	44	16
7	31	22
8	55	37
9	68	92
10	71	66
11	88	58
12	90	73
13	79	64
14	67	52
15	44	24
16	31	15
17	22	16
18	14	7
19	4	2
20	1	0

Source: Hypothetical data.

Figure 14.1 **Excel Regression Procedure Output for Table 14.1 Data**

SUMMARY OUTPUT

Regression Statistics	
Multiple *r*	0.6132
r^2	0.3761
Adjusted r^2	0.3414
Std. Error	22.7864
Cases	20

ANOVA

	df	*SS*	*MS*	*F*	Sig. of F
Regression	1	5633.01655	5633.02	10.8490	0.0040
Residual	18	9345.93345	519.219		
Total	19	14978.95			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	–2.91571	10.96107	–0.26601	0.79326	–25.9440	20.1126	–25.94408	20.11266
Introduced	0.62130	0.18863	3.29379	0.00404	0.2250	1.01759	0.22501	1.01759

Multiple Regression Analysis

When carrying out a regression analysis procedure, two approaches are possible. They differ only on the number of variables used in the regression equation. The first is called *simple regression* and includes just one independent variable to explain one dependent variable. An example of simple regression analysis already discussed is the use of levels of advertising expenditure to predict future votes of legislators. The second approach is known as multiple regression analysis (MRA) and, as its name implies, involves more than one independent variable in the regression equation.

Both simple and multiple regression analyses (MRA) produce a regression equation that helps explain the shape and direction of the relationship between variables. Multiple regression is nothing more than expanding simple regression to consider two or more independent variables at the same time. Adding more variables to simple regression in order to conduct a multiple regression analysis is often far more efficient and effective.

Too often, much of the variation in *y* cannot be explained by any *x* alone when measuring association one variable at a time with simple regression analysis. Doing two, three, or more simple regression analyses may still not explain the source of a majority of the variation. However, when two or more variables are tested *together* in a multiple regression procedure, an *interaction*-like effect may come into play. Thus, more information becomes available for the analysis, often resulting in more effective and informative results.

Correlation analysis, when extended for use with multiple *x* variables, calculates a multiple correlation coefficient. As in simple regression, the direction of the association may be either positive or negative. This makes it possible to judge both the strength and direction of the association explained by the set of *x* variables.

The test statistic for interval and ratio data for both simple and multiple regression analysis is Pearson's *r.* This *r*-value can range from –1.0 (a perfect negative relationship) to +1.0 (a perfect positive relationship).

The square of Pearson's r (r^2) is called the *coefficient of determination.* This value represents the *proportion* of the variation in the *y* variable that can be explained by linear regression in the *x* variable. The coefficient of determination in simple regression becomes the *coefficient of multiple determination* in multiple regression analysis. This last value is used as an index of association for the combined set of independent variables, in exactly the same manner as r^2 in simple regression.

The Excel *Regression* procedure in the Data Analysis option in the Tools menu produces a set of summary statistics for both simple and multiple regression analysis. The information in Figure 14.1 was produced in this way from the data in Table 14.1.

Uses for Multiple Regression Analysis

Multiple regression analysis, a popular multivariate statistical method, has wide application in political, economic, social, and educational research (Kerlinger and Pedhazur 1973). An extremely robust procedure, it can be used with either continuous (interval and ratio) measurements or categorical (nominal and ordinal) data. In addition, theoretically there is no limit to the number of independent variables it can handle.

Multiple regression analysis is a method of analyzing the contribution that more than one independent variable makes to the relative change in a dependent variable. It is used to explain and predict future events from measurements of a variety of independent variables. For example, political science researchers use multiple regression analysis to study how such phenomena as gender, age, education, party affiliation, ethnic status, income level and occupation, place and type of residence, and similar characteristics influence such behaviors as registering and voting. University admissions personnel use multiple regression to predict successful completion of advanced degree programs from such independent variables as graduate aptitude tests and college grade-point averages, among other factors. Medical personnel

Table 14.2

Variables with Potential Impact on Gross Revenue

ROWS	COLUMNS				
Job Number	*N* of Copies	Time (minutes)	Cost (dollars)	Errors	Gross Revenue
1	150	4.0	1.75	2	1.50
2	310	15.5	1.35	5	1.00
3	450	11.0	1.10	6	0.90
4	1,150	19.5	0.80	9	1.20
5	800	16.0	0.99	3	0.80
6	200	6.0	1.30	2	1.00
7	300	8.5	1.35	4	1.10
8	250	6.0	1.30	2	0.80
9	910	14.5	1.05	3	1.20
10	100	14.0	2.00	5	1.10
11	500	14.0	0.95	2	0.20
12	225	10.0	1.30	1	0.50
13	50	4.0	1.75	0	0.60
14	920	17.0	0.90	5	1.50
15	5,000	49.0	0.70	10	1.25
16	600	13.0	1.10	2	1.50
17	1,400	22.5	0.95	6	1.00
18	2,750	28.0	0.90	2	1.25
19	410	12.5	1.25	1	1.00
20	2,500	29.0	0.95	2	1.50

Source: Personal data, 2002.

use multiple regression to predict the likelihood of contracting a disease from such factors as weight, exercise, and diet.

In an example of a typical use of the method, say that the manager of the copy center in a government agency is interested in determining whether existing cost controls are effective at lowering costs and improving productivity. She elects to measure productivity by the gross revenue earned per individual copy made. Records are kept of each copying order, including the time to produce each copy in seconds, the labor cost per sheet, the number of bad copies in each order, and a measure of gross profit per sheet in cents per sheet. The manager randomly selects a sample of twenty jobs and comes up with the data presented in Table 14.2.

The independent variables in this example include: the *number of copies, time to produce, cost per copy,* and the *number of errors.* The number of errors is particularly important because the manager has just completed a training program designed to improve productivity by eliminating waste caused by errors in copying. A simple regression analysis procedure can be conducted on each independent variable in order to establish what impact on each variable gross revenue has. However, the more appropriate statistical test to use for evaluating the relationships between these values is *multiple regression analysis.*

The multiple regression programs in SPSS and Microsoft Excel allow the researcher to conduct

Table 14.3

Descriptive Statistics for the Variables in Table 14.2

	Descriptive Statistics		
	Mean	Std. Dev.	*n*
Gross Revenue	1.05	.350	20
N of Copies	948.75	1208.779	20
Time in Minutes	15.70	10.495	20
Cost in Dollars	1.19	.339	20
N of Errors	3.60	2.644	20

Table 14.4

A Correlation Matrix for the Independent Variables in Table 14.2

	Copies	Time	Cost	Errors	Revenue
Copies	1				
Time	0.96058259	1			
Cost	–0.63637334	–0.650999	1		
Errors	0.50486879	0.600563	–0.41956	1	
Revenue	0.35267705	0.320736	–0.12931	0.276613	1

both linear and curvilinear regression analyses, and to produce several different statistical-test results for the data in Table 14.2. Options in SPSS include a table of descriptive statistics for all variables in the analysis (Table 14.3).

Both programs produce a correlation table for the variables included in the equation. Table 14.4 is a *correlation matrix* produced by Excel. The most relevant information is the moderate and low correlations for each of the independent variables and the dependent variable, gross revenue: .35 for copies, .32 for time, –.13 for cost, and .27 for errors.

Correlations measure the strength and direction of the relationship between any x value and its corresponding value on the y axis of interval or ratio-scale variables. Other relationship tests, such as Spearman's rank order correlation, are available for ordinal- and nominal-level data. Excel produces a lower-half correlation table, not repeating the same table on the upper half. The values printed in a correlation table are correlation coefficients, which indicate the strength and direction of the relationship between variable pairs. For example, the coefficient for the variables *errors* and *time* is 0.60, and the variables are positively related. *Errors* and *cost* display a negative correlation of –0.42. The strongest relationship in the table is the nearly perfect positive (0.96) between the variables *time* and *number of copies.*

Excel regression program results are displayed in Figure 14.2. They include a summary output for the regression analysis procedure and significance tests for the full regression equation individual variables in the equation.

The regression analysis procedure produces summary regression statistics, an analysis of variance (ANOVA) table with the results of an F-test, and a t-test for each independent variable. Summary regression statistics include a solution for the regression equation, and both a regression coefficient (r) and a regression coefficient of determination (r^2) and an adjusted r^2.

Figure 14.2 **Regression Analysis Output Produced by Microsoft Excel**

SUMMARY OUTPUT

Regression Statistics	
Multiple *r*	0.41
r^2	0.17
Adjusted r^2	–0.05
Standard Error	0.36
Observations	20

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4	0.399141	0.09978	0.777402	0.55692
Residual	15	1.925359	0.12835		
Total	19	2.3245			

	Coefficients	*Standard Error*	*t Stat*	*p-value*	*Lower 95%*	*Upper 95%*	*Lower 95%*	*Upper 95%*
Intercept	0.7675	0.5336	1.4381	0.1709	–0.36998	1.90492	–0.36998	1.90492
Copies	0.0002	0.0003	0.9102	0.3771	–0.00032	0.00079	–0.00032	0.00079
Time	–0.0164	0.0324	–0.5072	0.6194	–0.08557	0.05267	–0.08557	0.05267
Cost	0.1703	0.3206	0.5311	0.6031	–0.51308	0.85362	–0.51308	0.85362
Errors	0.0305	0.0412	0.7406	0.4703	–0.05729	0.11831	–0.05729	0.11831

Source: Excel output from data in Table 14.2.

Displayed Statistics for Interpretation

The three sets of statistics displayed in Figure 14.2 are (1) the set of regression statistics, (2) an ANOVA table, and (3) the coefficients for the standard error, *t*-statistic and its *p*-value, and the confidence intervals for the coefficients. The coefficients are the calculated values that, with the computed *y*-axis intercept value, are included in the computed regression correlation. These values are the data needed to calculate a future value for *y* given new values for the independent variables.

The Model Summary produced by SPSS is displayed in Table 14.5. It includes (1) the regression coefficient (*r*), (2) a regression coefficient of determination (r^2), (3) an adjusted r^2, and (4) the standard error value. The strength of the computed r^2 tells the researcher how effective the set of independent variables are at "explaining" the variation in the dependent variable *Y.* In the copy center example data, the r^2 of 0.17 suggests that the model is only marginally successful at explaining the variation in gross revenue.

The adjusted r^2 is an estimate of how well the model would fit a different dataset from the same population; the adjusted r^2 is always less than the r^2. The standard error of the estimate is a measure of the variability of the distribution of values of the dependent variable. The smaller this value is in real terms, the less variability in the *Y* values. Normally, close to 95 percent of all *Y* values will fall within two standard errors of the estimate.

The ANOVA table is a hypothesis test on the regression equation. The purpose of the test is to determine whether a linear relationship exists between the set of independent variables and the dependent variable. The null hypothesis for this test is that a set of independent variables cannot predict *Y*. Table 14.6 shows results of an ANOVA test on the data in Table 14.2. The large significance (0.557) and the small *F* (0.777) indicate that this regression model is clearly not a good predictor. There is a probability of more than 55 percent that the variables cannot predict changes in *Y* any better than could random prediction.

Table 14.5

Model Summary Produced by the SPSS Regression Procedure, Table 14.2 Data

Model Summary

Model	R	R^2	Adjusted R^2	Std. Error of the Estimate
1	.414	172	–.049	.358

Predictors: (constant), n of errors, cost in dollars, n of copies, time in minutes.

Table 14.6

ANOVA Table for SPSS Regression Analysis

ANOVA

Model		Sum of Squares	df	Mean Square	F	$Sig.$
1	Regression	.399	4	.100	.777	.557
	Residual	1.925	15	.128		
	Total	2.325	19			

Predictors: (constant), n of errors, cost in dollars, n of copies, time in minutes.
Dependent variable: gross revenue.

Table 14.7

Regression Coefficients Produced by the SPSS Regression Procedure

		Coefficients				
Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	.767	.534	1.438	.171	
	n of copies	2.359E-04	.000	.815	.910	.377
	time in minutes	–1.645E-02	.032	–.494	–.507	.619
	cost in dollars	.170	.321	.165	.531	.603
						.470
	n of errors	3.051E-02	.041	.231	.741	

Dependent variable: gross revenue.

Table 14.7 displays the individual coefficients for each of the independent variables in the regression equations. In the equation, the value for the slope (α) plus the measurements for each of the x variables multiplied by their corresponding coefficients is necessary in order to compute future values of y. Results of the corresponding t-tests are significant tests for each of the independent variables.

Since all significance values are greater than the normal cut off of .05, none of the variables is significant. The overall conclusion that must be drawn from this regression equation is that the four independent variables of number of copies, cost, time, and number of errors are not good predictors of gross revenue.

Multiple Regression with Dummy Variables

Multiple regression is generally employed with continuous dependent and independent variables. However, it is also possible to use categorical data for either the dependent or independent variable, or both. This requires creating what is called an *indicator*, or *dummy*, variable out of the categorical variable (Siegel 2002). For example, say that the variable gender—with two categories, female and male—is an important factor in a regression equation. To create a dummy variable, the researcher simply assigns a value of zero to the first category of gender and a value of one to the other category. The multiple regression equation uses one category as the baseline against which to compare the presence of the second category. Dummy variables can be used by themselves in a regression equation or in conjunction with continuous variables.

Values for dummy variables are assigned according to the number of alternative categories that are named for a variable. The general rule is to assign one category fewer than the total number of values. Thus, for a two-category variable such as gender, dummy variables of 0 and 1 are assigned. For a three-category variable, dummy variables are 0, 1, and 2.

Multiple regression models have also been developed for those times when the researcher wants to use a categorical variable for the dependent or *y*-axis variable. If the categorical dependent variable has only two categories, either a *multiple logit* regression or a *probit* regression model can be used. If the dependent variable has more than two values—as in *yes*, *no*, and *maybe*—then the *multinomial logit* or *multinomial probit* model should be used. None of these four models is available in the standard Excel or SPSS software packages, but can be found in extensions of these two commonly used software programs.

The probit model is used extensively in political science research. According to Norušis (2000), probit analysis is used when the researcher wants to estimate the strength of a stimulus variable or set of variables that are needed to produce a certain proportion of dichotomous responses. Examples of a set of stimulus variables are television advertising, newspaper advertising, voters' perceptions of a candidate's performance during a televised debate, and political party affiliation; an example of a response that these stimuli might influence is the proportion of voters who are likely to vote for a particular candidate.

In a logit analysis procedure, the dependent variables are always categorical, while the independent variables can be factor scores. Factors are composite variables that are composed of one or more individual items or variables. The program allows the researcher to use from one to ten dependent and factor variables combined.

Summary

When researchers are interested in determining either (1) how two or more variables are associated or related to one another, or (2) how a change in one variable or variables affects another variable, they carry out what are called *association tests*. These tests include correlation and regression analyses. Identifying and measuring the strength of relationships is one of the most fundamental tasks of data analysis.

Variable relationships have alternative conclusions; they are not always what they appear to be.

Statistical tests may indicate that variables are associated, whereas in truth, they may be only a "confounding" factor in the behavior of a variable of interest. Researchers test many different variables before selecting what seems to be the most probable answer, and even then they may not have a true measurement.

It is possible to carry out statistical tests for associations with all levels of data. Because each test employs different assumptions, measures, and calculations, it is particularly important that the appropriate test statistic be selected for the type of data collected.

Relationship tests have two broad applications. They can be used to examine the way in which variables vary together (a *covariational* relationship) or they may be used to test whether a *causal* relationship exists. The analytical techniques used to test relationships fall into two families of tests: regression analysis and correlation analysis. Regression analysis identifies the *way* in which two or more variables are related to one another. Correlation analysis, on the other hand, is concerned with providing a mathematical measurement of the *strength* of any relationship between variables.

Regression analysis and correlation analysis are most appropriate for use with interval- and ratio-level measurements. When dealing with categorical or ranked data, other, somewhat less powerful, nonparametric tests must be used. However, it is possible to create what are called *dummy variables* from nominal and ranked data in order to test relationships using the more powerful parametric techniques.

Discussion Questions

1. What are the two broad applications for relationship tests?
2. What does correlation analysis tell the researcher about two variables?
3. What is the *coefficient of determination*?
4. Describe how correlation values are subjectively interpreted.
5. What is simple regression analysis and what does it tell the researcher?
6. What is the difference between dependent and independent variables?
7. What is a multiple regression analysis?
8. Describe the multiple regression procedure.
9. What is the meaning of *slope*?
10. What is the meaning of *intercept*?
11. What is a dummy variable?

Additional Reading

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Miles, Jeremy, and Mark Shevlin. 2000. *Applying Regression and Correlation: A Guide for Students and Researchers.* Thousand Oaks, CA: Sage.

Norušis, Marija J. 2008. *SPSS® 16.0 Guide to Data Analysis.* Upper Saddle River, NJ: Prentice Hall.

15 Exploring Multivariate Statistics

This chapter explores several additional multivariate statistical analysis techniques. A common goal of multivariate statistical analysis is to determine and explain how groups of variables are related and ultimately to develop theories of causation that can be traced to those relationships (Bernard 2000). Among the many multivariate procedures developed for data analysis are multiple regression analysis, partial regression, path analysis, multiple dimensional scaling, multiple analyses of variance and covariance, multiple discriminant analysis, principal component and factor analysis, cluster analysis, and more. This chapter will explore three major families of multivariate statistics: (1) multiple discriminant analysis (MDA), a group-membership prediction and classification tool; (2) factor analysis; and (3) cluster analysis. Both factor analysis and cluster analysis can be use for reduction of large data sets and statistically summarizing data sets. Multiple analysis of variance (MANOVA) and multiple analysis of covariance (MANCOVA) are mentioned, but not discussed in any detail. Multiple regression analysis (MRA), an extension of the simple regression procedure, was discussed in Chapter 14.

Predicting with Discriminant Analysis

Discriminant analysis and multiple discriminant analysis are among a series of statistical techniques designed to analyze relationships among two or more variables (Bennett and Bowers 1976; Maxwell 1977; Klecka 1980). Discriminant analysis has been defined as *a mathematical technique that weighs and combines a set of measurements in such a way that their ability to discriminate between two or more groups is maximized* (Cooper 1987). When more than two grouping variables are used in the design, the discriminant process is considered to be *multiple discriminant analysis* (MDA).

Classifying groups with cluster analysis is based upon a set of *classification correlations* that are mathematically generated between each scale item and the composite functions. Contribution is measured by the size of correlation value; higher correlation coefficients mean greater contribution (Dalgleish and Chant 1995). The functions are then interpreted by the strength of the individual items that contribute most to the function.

While several authors have examined mathematical rules for determining cutoff points for including an item in the interpretation (see, for example, Glorfeld 1995), most analysts resort to rules of thumb to set their cutoff values. Coefficients of less than 0.40 or 0.50 are often left out of the analysis, but this is only a subjective decision. Too many retained items greatly increase the difficulty of the required subjective interpretation of functions; too few and the function often lacks intuitive sense.

The underlying research problem in discriminant analysis is how to establish a decision rule that enables assigning (or predicting) a subject whose group membership is not known to only one of the categories that make up a complete group. Although assigning is done on the basis of measurements on sets of descriptor variables, selection of these loading items is the province of the researcher. Thus, it is difficult if not impossible to know if the selected items constitute the best combination of items.

A *set of measurements* can be any number of different types of descriptive variables, including such descriptors as demographics, attitude scales, lifestyle characteristics, behavioral measurements, preferences, and others. Group assignment or prediction is made upon the basis of subjects' scores on these characteristics. A group can be any two or more distinct sets in a sample. Examples of two-group sets include Republican/Democrat, committed/noncommitted voters; legislators who, regardless of their party affiliation, traditionally vote for legislation on social issues and those who vote against such legislation; nonprofit organizations that either support or ignore environmental issues; patients with one or more symptoms who are likely to develop or not develop a disease.

Regardless of the application, discriminant analysis requires that several important assumptions be met. First, the distribution of measurements for the descriptive (independent) variables must be approximately normal. Second, the sample must be relatively large; samples in the range of 250 to 300 are considered to be of minimum size, although the process works with even smaller samples. Third, independent variable measurements must be at least nominal level (or transformed into dummy variables). Fourth, it must be possible to distinguish between two or more known categories among the sample. And fifth, there should be no missing values on either the dependent or independent variables for any subject included in the analysis; most statistical packages provide for elimination of cases with missing data with a simple instruction.

Purposes for Discriminant Analysis

In practice, discriminant analysis can be used in at least five different types of applications. First, the technique may be used a way of *classifying* and *describing* subjects in two or more respective relevant groups at the same time. Second, political researchers use discriminant analysis as a tool for improving the quality of their *predictions* about which subject is most likely to belong with which citizen group and why. Third, researchers often use the technique to determine which descriptive variables have the greatest *power to discriminate* between two or more groups of people. Fourth, the method may be used as a *post hoc* test, in which it serves as a check for diagnoses or predictions made on the bases of other types of evaluations. And fifth, discriminant analysis may be used to gauge how far apart groups are located on a set of descriptive characteristics. In this application, which is somewhat similar to the discrimination test, the distance between groups is based upon the location of the central tendency values (called *centroids*) for each group in two-dimensional space established by computer-generated functions.

The Descriptive Discriminant Analysis Model

In their review of the capacity of discriminant analysis procedures contained in three different statistical software packages, Huberty and Lowman (1997) distinguished between two fundamental types of discriminant analysis: descriptive discriminant analysis (DDA) and predictive discriminant analysis (PDA). In the DDA model, the *grouping variable* serves as the predictor variable, with the responses on the descriptive characteristics variables taking on the role of the outcome variables.

The research question in descriptive designs is centered, not on the differences themselves, but instead on *how* the groups differ on some set of descriptors. For example, discriminant analysis may be used to test whether voters and nonvoters are the same or different on a set of lifestyle characteristics. The same model could be used to develop descriptive profiles of several candidates for political office, or between adults who are politically active or politically inactive, for example. The DDA method tests the power of the grouping variable to differentiate among the characteristics of group members.

DDA was used in a study conducted to test methodology for segmenting students' preferences for various types of post-secondary education (McNabb 1980). This study compared different scales of measurement on the basis of their power to discriminate between pre-identified segments. The study first grouped a sample of 195 secondary school students into different groups according their stated intent to attend one of five different types of post-secondary institutions. A sixth group that did not plan to continue their education immediately after high school was also tested. This enabled the researcher to determine which of the demographic, social, economic, and attitudinal scales had the greatest power to classify subjects into their pre-identified choice-groups.

The Predictive Discriminant Analysis Model

Most applications of discriminant analysis in political science research use the predictive approach. In predictive applications the grouping variable is simply the categorical variable that signifies group membership; in these circumstances, the set of characteristics variables serves as the predictor variables. The predictive model is discussed in greater detail below.

In an example of the predictive (PDA) application, Cooper (1987) first used cluster analysis to group nations according to the type and size of their debt to foreign banks. After developing a profile of nations that had failed in the past, he then used discriminant analysis to predict which debtor nations were most likely to fail in their repayments of the debt.

Roberts (1992) used the PDA model in a voter prediction study. She employed panel information gathered in three waves leading up to the 1990 Texas gubernatorial elections. The data consisted of measurements of subjects' attitude changes over time. Her sample of 283 subjects was 52.5 percent male, 47.5 percent female; 49.6 percent registered Republicans, and 50.4 percent Democrats.

The dependent variable in the study was exit interviews in which subjects reported which candidate they had voted for. Independent variables—the descriptive scales—consisted of multi-item variables measuring partisanship, gender, degree of media reliance, and closeness of their attention in following the race. After editing for missing data, Roberts had a database of 160 valid cases. Using the set of independent variable demographic measurements, predictive discriminant analysis revealed that they correctly grouped 84 percent of the male voters and 91 percent of the female voters.

In another example of a predictive application, Kim (1995) conducted a comparative study in which he tested the power of selected scales to predict the voting behavior of uncommitted voters in 1992 presidential elections. He tested his model on samples in North Carolina and in the Republic of South Korea (Table 15.1). Kim then used the same scales to predict how voter behavior would change if a third or minority party dropped from the race late in the campaign period. Kim found that in political polls, analysts are often uncertain as to how to treat uncommitted voters in the findings. That uncertainty has resulted in at least four different ways of looking at uncommitted voter data:

Table 15.1

An Example of Discriminant Results for a Prediction Application

Country Sample	Prediction Power with 3rd-Party Candidate in the Race	Prediction Power, 3rd-Party Candidate out of the Race
United States	73.0% of grouped cases correctly classified	87.0% of grouped cases correctly classified
Korea	82.9% of grouped cases correctly classified	87.2% of grouped cases correctly classified

1. Eliminate the group from the analysis entirely.
2. Assign the uncommitted group on the basis of another discrete descriptive variable, such as the party affiliation of the respondent.
3. Predict the group assignments on the basis of an attitudinal variable, such as the respondent's attitude toward candidates, parties, and/or their position of key political issues in the campaign.
4. Use qualitative information gathered from intensive personal interviews with a small sample of respondents, then classify the uncommitted group according to how similar they are to the interviewed sample.

Kim was convinced that none of the four approaches used took full advantage of the collected information. Also, they often resulted in grossly inadequate prediction results—a fact that could have serious effects on a political campaign strategy. Instead, Kim proposed using a discriminant analysis design upon which to base the uncommitted voter classifications.

At the conclusion of his analysis, Kim concluded that discriminant analysis is particularly useful for the following purposes: (1) to identify the election issues and the demographic variables with the greatest power to discriminate between groups, (2) to predict how many of the uncommitted voters would vote for each of the candidates, and (3) to judge the effect that one candidate's withdrawing from a race with more than two candidates will have on the distribution of votes for the remaining candidates.

Kim's comparison of possible Korean voter reaction with third-party candidates in a race, and their reaction when the third-party candidate withdraws, was particularly insightful. The results of his analysis with 17 predictor variables are displayed in Table 15.1; the data were collected from nationwide polls.

Group-Classification Applications

The group-classification process can be worked in much the same way that Kim used the PDA model to test the power of scales to predict the voting behavior of uncommitted voters in Korean presidential elections. Consider the following example: Suppose that a researcher is working with two equal-size groups of politically aware people, of which 160 consider themselves to be liberals at heart and 160 conservatives. Each of the 320 subjects is measured on several describing characteristics.

The researcher wants to know whether the variables can be used as a tool for distinguishing between the two political groups. Discrimination analysis, by comparing known with predicted group membership, will give the analyst a numeric measure of the prediction effectiveness of the scale. Using MDA can give the researcher indispensable evidence for supporting a conclusion.

Post Hoc Validation of Other Diagnosis Methods

Runyon, Faust, and Orvaschel (2002) used discriminant analysis to determine whether two scales developed to diagnose children with post-traumatic stress disorder (PTSD) were effective in distinguishing between children who were or were not suffering current depression. The researchers tested the Children's Schedule of Affective Disorders and Schizophrenia (K-SDAS) and the Children's Depression Inventory (CDI) on a sample of 96 children, ranging in age from 5 to 17 years. Their discriminant analysis found that, overall, the items they selected after analysis of variance for statistically significant differences were able to successfully classify children with both disorders 81.8 percent of the time.

Discriminant Analysis Software

The Statistical Package for the Social Sciences (SPSS) contains a discriminant analysis capability. Discriminant analysis is possibly best known in political science as a tool for predicting which individuals will fall into two or more separate groups based upon the measurements taken from a similar sample of subjects. This method is used for situations where the researcher wants to build a predictive model of group membership based on observed characteristics of each case. The procedure generates a discriminant function—or for more than two groups, a set of discriminant functions—based on the combinations of the predictor variables that result in the best distinction between the groups.

Factor and Cluster Analysis Methods

Many multivariate analysis techniques or methods have been developed to assist in the management and analysis of large databases. Large databases are those datasets that consist of measurements in the neighborhood of 300 or more subjects and/or 100 or more variables. Among these techniques are principal component analysis, standard factor analysis, and cluster analysis.

Principal component analysis (PCA) is similar to standard factor analysis (SFA) in concept and application. In fact, it is just one of the seven different ways that the SPSS statistical software package provides for extracting the factors that underlie a set of measurements. However, the principal components model does not result in a direct reduction in the number of variables. Instead, the model lists components in the order of the amount of variation they explain in all the variables (Cattell 1978; Goddard and Kirby 1976; Dunteman 1994). Principal component analysis transforms an original dataset of variables into a set of uncorrelated variables.

Factor analysis serves many different purposes, the most important of which are the reduction in the number of variables and testing of hypotheses. The standard factor analysis (SFA) model, which is also known as *common factor analysis*, is used more often than principal component analysis. With SFA, the observed variables are considered to be causal influences on the underlying factors as well as influences on factors that are unique to each observed variable (Lance and Vandenberg 2002).

Cluster analysis also results in a reduction in the amount of data with which the researcher must work, but involves more subjective decision making than factor analysis. However, cluster analysis is a popular tool for grouping people into similar categories or classifications; it has become an important statistical tool for identifying and describing voter segments in political campaigning, and even more important as a tool in business for segmenting markets for products and services.

Factor Analysis

Factor analysis is one of a family of statistical techniques for summarizing interrelationships among a set of variable measurements, identifying underlying structure in a dataset, and reducing the number of variables with which the researcher must work. The techniques all produce a smaller number of artificial variables, called *factors* or *components.* Factors are artificial constructs generated by the statistical program that are based on measures of inter-correlations; they represent what is common among the original variables (Babbie 2001; Cattell 1978; Lance and Vandenberg 2002).

Bernard (2000) called these underlying constructs "super variables" because they are made up of more than one initial variable. The initial variables make up the factors on the basis of the strength of their *similarity correlation* with the factor. The variables included in the factor, in turn, help the researcher find meaning in and subjectively explain the composition of each factor.

A *factor* is a new variable that is a composite of other variables. By examining the commonality of the initial variables and the strength of their factor correlations (called *factor loadings*), factor analysis helps make it possible to explain portions of the variance in a dependent variable. An arbitrary number of important variables (importance is determined by the size of the factor loadings) are determined to make up the composite factor. Interpretation of the factor is a subjective determination of the researcher.

The cutoff point in the number of variables loading on a factor is at the discretion of the researcher. Traditionally, only variables with correlation values of 0.60 or greater are always included, and loadings of 0.30 to 0.59 are considered as possible contributors. According to Bernard, however, some researchers use 0.50 as the cutoff point in factor loadings, with values from 0.30 to 0.49 considered as possibly worth including.

Many researchers feel that the subjective interpretation of factors is one of the greatest advantages of factor analysis. Subjective interpretation makes it possible to interject an aspect of reality to the process; it is an attempt to decipher meaning from simple numerical description. However, Babbie (2001) saw this subjectivity as the root cause of several disadvantages of the technique, including the following:

- The factors themselves are generated mathematically, with no meaningful assistance of the researcher; interpretation occurs *after* establishment of the factors and factor loadings of the individual variables.
- Factor analysis does not provide a means for disproving a hypothesis; therefore, it is more a qualitative analysis technique than a scientific, positivist research approach.
- No matter what data the researcher includes in the analysis matrix, factor analysis will generate a factor solution. The algorithm ignores the form and content of the initial variables. Therefore, the factor result may be nonsense.

Factor analysis requires that the data meet a few simple assumptions: a normal distribution, a large sample size (an *n* of at least 300, although some researchers reduce this to a minimum of 150 cases), at least nominal-level (or standardized) data, a linear relationship, and outliers screened and omitted.

Applications of Standard Factor Analysis

Factor analysis is used in two major applications. One, *exploratory factor analysis* (EFA), identifies relationships among variables. The relationships are not always obvious in the data, but show up as a pattern of correlations with artificial factors. The purpose of EFA is to summarize, group, and explain the data. The research interprets the meaning of the factor according to its correlated items. The second chief application for factor analysis is called *confirmatory factor analysis* (CFA). CFA is the newer of the two uses and is rapidly gaining acceptance by researchers.

Exploratory Factor Analysis

In exploratory factor analysis, the researcher uses the method to determine the minimum number of hypothetical factors or components that account for the variance between the variables; it is also used to *explore* the data for ways to reduce the number of active variables. Well into the 1990s, exploratory models remained the chief factor analysis application in the social sciences (Kim and Mueller 1994). The following steps are presented to guide the researcher through the EFA process:

1. Collect the data from a representative sample.
2. Determine which of the observed variables should be included in the analysis.
3. Determine which method of extraction to use in the analysis.
4. Specify how many factors should be included in the solution.
5. Interpret the patterns of factor loadings, variances, and covariances.
6. Rotate the matrix to test for alternative factor structures.
7. Interpret the final EFA solution.

In an example of an exploratory factor analysis, data acquired by Lee, Barnowe, and McNabb (1999) were subjected to an EFA to identify the underlying structure of an international environmental awareness database. The study assessed awareness and perceived importance of risk associated with a number of environmental and social concerns among a sample of 295 university students in the United States and Taiwan.

The researchers combined portions of several instruments available in the research literature to produce a topical and comprehensive instrument. The final instrument was pretested in several undergraduate and graduate classes in private and public universities. The major change to the instrument resulting from pretesting was a revision to the response scales: a sixth response, *"Not familiar with this issue,"* was added for all items.

The instrument contained a list of forty-five issues that the researchers believed were naturally classified into three broad groups: items pertaining to the natural, social, and technological environments.

The natural environment scale consisted of twenty-four items often cited as pressing environmental problems. These ranged from ozone depletion and acid rain to Ebola and dioxins. The scale was developed from items loading on what was subjectively interpreted as five broad categories of environmental issues: air pollution (5 items); water pollution (3 items); solid and toxic waste (3 items); climate and nature, including species loss (6 items); and disease and illnesses concerns (7 items).

The social environment issues scale contained thirteen items associated with the quality of life and health and welfare in modern society. Example items range from tobacco and drug use to AIDS and crime and violence. The scale was constructed from six items loading on each of two subscale categories: social issues (6 items), and health-related issues (7 items).

The third scale, the technological environment, consisted of eight items that ranged from nuclear waste to cloning and irradiation of food. These items were loaded most highly on the technology scale. The scale was constructed from four items each in of two subscale categories: technological dangers (4 items), and science and energy (4 items).

The instrument was administered to a sample of 192 undergraduate and graduate-school students at three U.S. universities, with a translated version administered to 103 students at the National University of Taiwan. Responses were made using five-point scales ranging from Not-at-All-Important to Absolutely Critical. A set of demographic classification items was also included.

Confirmatory Factor Analysis

The purpose of the confirmatory factor analysis model is to test hypotheses, either about the number of underlying factors or the variables or items that load on any single factor or component. Having made the assertion in advance which items belong to which factor, the researcher can test his assertion (hypothesis) by examining factor loadings. While describing the difference between the two approaches is relatively simple, Kim and Mueller (1994) point out that, in practice, the distinction is not always this clear; some of both models is found in many studies.

Factor analysis methods have been traced back to the initial development of the principal components model developed by Charles Spearman in 1904. Nearly all of the factor analysis literature from that date, and especially through the 1970s, was concerned with exploratory applications. However, from the 1980s onward, there has been significantly more interest in the CFA model. The objective of confirmatory factor analysis is related to hypothesis testing. The researcher hypothesizes that a number of items or variables are collectively related. He or she can run a factor analysis on the data to test whether the relationships exist as they were hypothesized.

In his monograph on confirmatory factor analysis, Long (1983) identified a number hypotheses that may be established for a CFA analysis. These include specifying the number of factors to be included in the solution, deciding what variables to include, what variances and covariances to expect among both common and unique factors, and what relationships between variables and underlying factors and/or between unique factors and initial variables to expect.

Lance and Vandenberg (2002, 223) developed the data in Table 15.2 to illustrate the major differences between the EFA and CFA approaches. They added that that CFA should be considered a tool for testing the *validity* of an underlying structure using prior-identified variables, whereas EFA should be used as a technique for identifying which variables are related with which other variables. The following seven steps were proposed by Lance and Vandenberg to lead the researcher through the process of conducting a confirmatory factor analysis.

1. Collect the data from a representative sample.
2. Determine which of the observed variables should be included in the analysis.
3. Determine which method of extraction to use in the analysis.
4. Specify how many factors to include in the solution.
5. Interpret the patterns of factor loadings, variances, and covariances.
6. Rotate the matrix to test for alternative factor structures.
7. Interpret the final EFA solution.

Conducting a Factor Analysis with SPSS

The SPSS factor analysis program procedure is highly flexible: it provides seven methods of factor extraction and five methods of rotation. Three methods of computing factor scores are included,

Table 15.2

A Comparison of EFA and CFA Factor Analysis Approaches

Issue	EFA	CFA
Mathematical Model	Either standard factor or principal components	Standard-factor model
Selection of Measures	Wide variation	Determined by hypothesized factor format
Number of Factors	Determine from the data	Specified before the analysis
Interpretation of Factors	Interpreted from items loading on each factor	Specified before the analysis
Factor Pattern Matrix	Fully free; no constraints	Constrained; a fixed set of elements
Factor Correlations	Established after rotation	Estimated before the analysis
Goodness of Fit	Not an issue	A key, controversial issue

Source: After material in Lance and Vandenberg 2002.

and factor scores can be saved as variables for additional analysis. The following example is contained in the Help file of SPSS for Windows Factor Analysis.

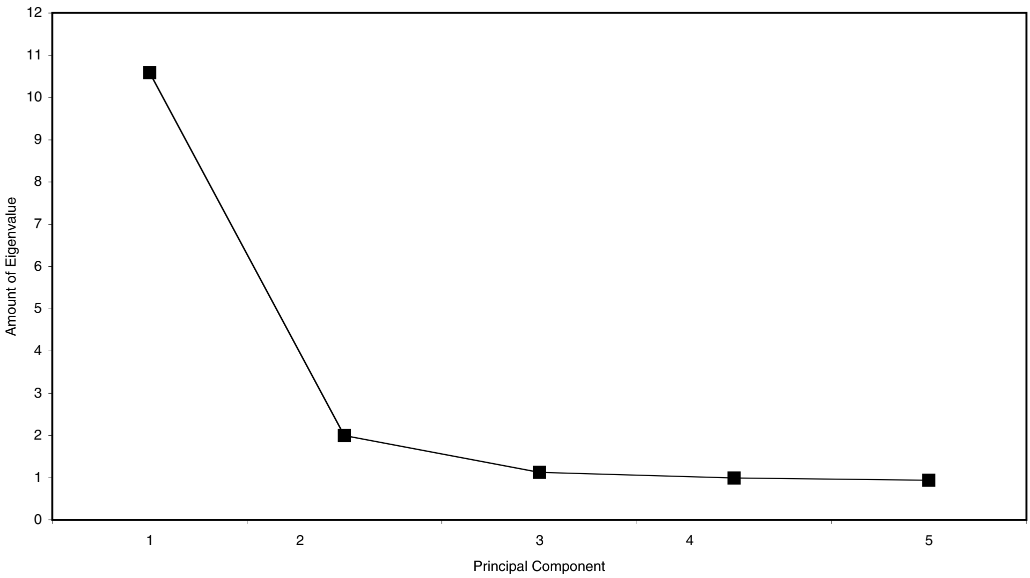
> What underlying attitudes lead people to respond to the questions on a political survey as they do? Examining the correlations among the survey items reveals that there is significant overlap among various subgroups of items—questions about taxes tend to correlate with each other, questions about military issues correlate with each other, and so on. With factor analysis, you can investigate the number of underlying factors and, in many cases, you can identify what the factors represent conceptually. Additionally, you can compute factor scores for each respondent, which can then be used in subsequent analyses. (SSPS Version 11.0, p. 2002)

SPSS produces the following statistics for each variable: the number of valid cases, the mean, and standard deviation. Among many other test results, the SPSS factor analysis program also produces a correlation matrix of variables, including their significance levels; an initial solution, with communalities, eigenvalues, and percentage of variance explained; an unrotated solution, including factor loadings, communalities, and eigenvalues; a rotated solution, including rotated pattern matrix and transformation matrix; a factor score coefficient matrix and factor covariance matrix.

In addition, the SPSS factor analysis program produces two plots: a "scree plot" of eigenvalues and a loading plot of the first two or three factors. The scree plot shown in Figure 15.1 was produced from a principal component analysis results in a report on the *London Deprivation Index* published in 2002 by the Greater London Council. The summary data are displayed in Table 15.3.

Scree plots are simply the value of the eigenvalue plotted on a *y*-axis (vertical), with the number of the factor (the composite variable) plotted on the *x*-axis (horizontal). The term "scree" is a word from geology that is used as the name for the rubble and other debris that collects at the bottom of a rocky slope (Child 1990). The SPSS-produced table in which eigenvalues and amount

Figure 15.1 **An Example of a Scree Plot Showing Eigenvalues for Five Components using Table 15.3 Data**



Source: From material in Greater London Council, "London Index of Deprivation Authority," 2002.

Table 15.3

Summary Data for 2002 London Deprivation Index

Component	Eigenvalue	Percent of Variance	Cumulative Percent
1	10.587	50.414	50.414
2	1.991	9.480	59.894
3	1.121	5.339	65.223
4	0.983	4.681	69.914
5	0.934	4.446	74.360

Source: Greater London Council, "London Index of Deprivation Authority," 2002.

of explained variance are displayed serves as a visual cue for deciding which factors to include and which to omit. There are no set rules for establishing the optimum number of factors in the final solution, but several different methods are used for making this decision. One is the scree plot; another is the Kaiser-Guttman rule of thumb, which specifies only factors with an eigenvalue larger than 1.0 should be retained (Cattell 1978; Hutcheson and Sofroniou 1999).

To determine how many factors or components to include in the final analysis using the scree method, simply use the point where the curve straightens out as the maximum number of factors to include. In the example in Figure 15.1, the curve begins to flatten out convincingly at the third component. Therefore, the London Index included three components in its principal components analysis. As can be seen in Table 15.3, three components account for more than 65 percent of the variance in the model.

The term *eigenvalue* (also known by the label *characteristic root* and other names) in the above example is an important mathematical concept in factor analysis; it is particularly important as a component in deciding how many factors or components to retain in the final analysis (Kim and Mueller 1994), and for determining how much variance is explained by each factor.

Eigenvalues are simply *the sum of the squares of the factor loadings on each independent factor.* This is the total amount of variance for that factor. A glance at the computed factor-loading matrix will reveal that variables load on more than one variable at the same time. This is not a problem, for it is the sum of all (squared) loadings—the "similarity coefficients"—that is of interest. The larger the eigenvalue, the more variance is explained by the factor.

Cluster Analysis

Cluster analysis is a generic label for a number of statistical processes used to group objects, people, variables, or concepts into more or less homogeneous groups on the basis of their similarities (Lorr 1983). Bernard (2000, p. 646) defined the cluster statistical technique as "a descriptive tool for exploring relations among items—for finding what goes with what." The result of a cluster analysis is a set of classes, types, categories, or some other type of group.

One of the difficulties researchers have with using cluster analysis is the lack of consensus on the terms used for cluster parts and processes. For example, some of the names used in the past for cluster techniques include *typological analysis numerical taxonomy*, *pattern recognition*, and *classification analysis.* Other terms that are used interchangeably in applications of cluster analysis include the following terms used to mean the "things" being classified: subject, case, entity, object, pattern, and operational taxonomic units (OTUs). *Entity* seems to be used most often, but certainly not by any meaningful majority. Terms used to mean the "things" that are used to assess the similarities between entities include: variable, attribute, character or characteristic, and feature, among others. Finally, the following terms are used interchangeably to mean similarity: resemblance, proximity, and association (Aldenderfer and Blashfield 1984).

Cluster analysis can be used for many different tasks, including but not limited to data reduction, identification of natural groupings or types, development of classification systems, and for the testing of hypotheses. There at least six objectives for a cluster analysis process (Lorr 1983, 3–4):

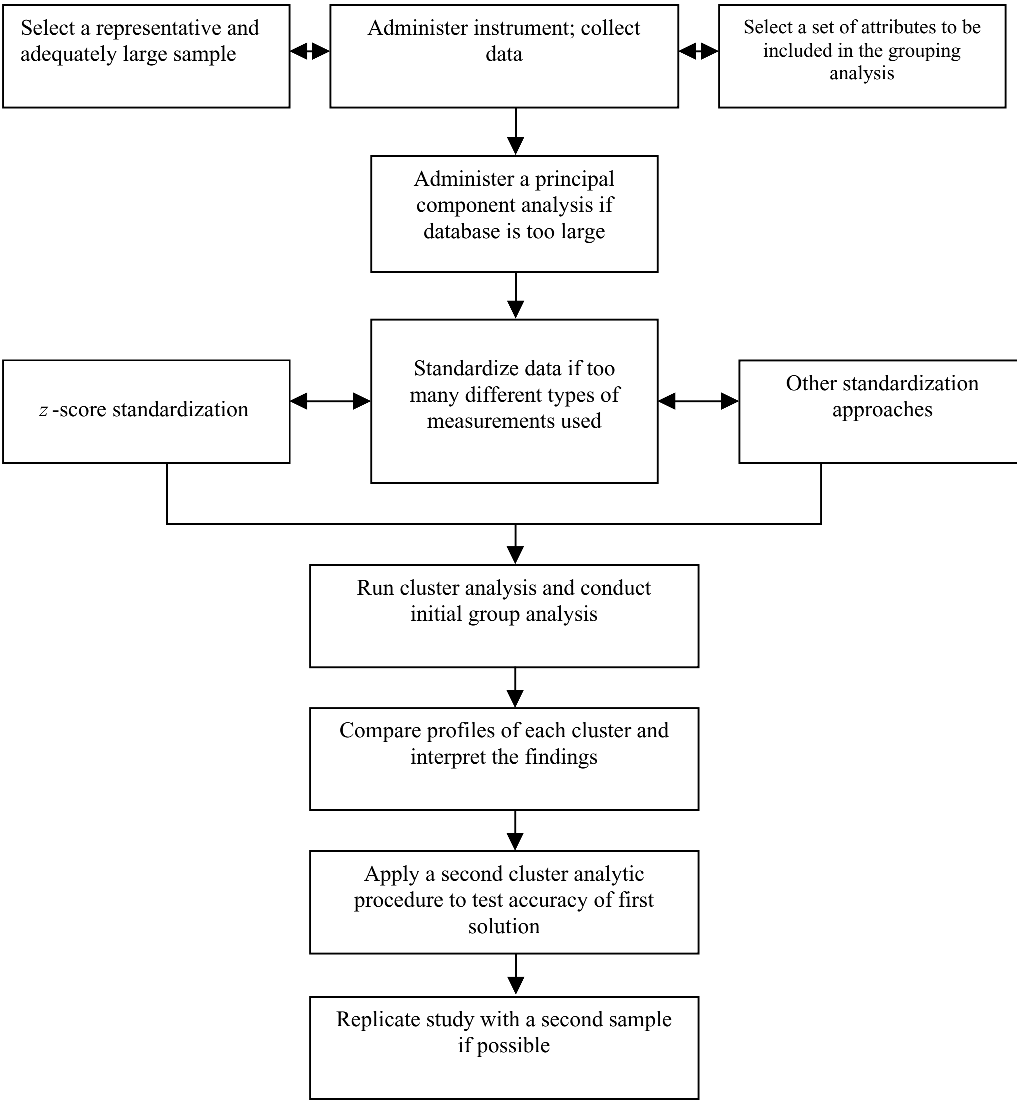
1. To identify natural clusters of independent variables.
2. To identify some number of distinguishable groups or clusters of cases.
3. To construct a rationale for classifying subjects or items into groups.
4. To generate hypotheses within the data by uncovering unexpected clusters.
5. To test hypothesized groupings that the researcher believes are present in a larger group of cases.
6. To identify homogeneous subgroups that are characterized by the patterns of variables upon which the classification reveals.

Problems with Cluster Analysis

Cluster analysis is not without its disadvantages, a number of which were pointed out by Aldenderfer and Blashfield (1984). Foremost of these may the fact that cluster analysis, unlike much of our statistical knowledge, is constructed upon rather simple mathematical procedures; the techniques are not yet supported by a large body of statistical reasoning. As a result, a great deal of subjective interpretation is required in the identifying underlying structure and the selection of distinct clusters from the output.

A second problem is that cluster analysis methods have been developed in many different disciplines, including anthropology, sociology, psychology, political science, and others. Thus, the

Figure 15.2 **A Flowchart of the Steps Involved in a Cluster Analysis Procedure**



conventions that have been built up over the years reflect the biases extant in those disciplines. Furthermore, as more applications occur, new users seem intent upon adding their own contributions to the process, as is evidenced by the lack of even a standard terminology.

A third disadvantage of cluster analysis is the problematic nature of replication—a key requirement for scientific analysis. Different cluster methods regularly result in different cluster solutions from the same dataset. A fourth disadvantage has to do with the strategic rationale for grouping in the first place: the reason for doing a cluster analysis is to identify the structure within a dataset, whereas the technique itself imposes a structure upon the data.

Like all statistical processes, the cluster analysis procedure progresses through a logical series of steps, which are presented in Figure 15.2. Not included in the chart, but a vital preliminary step just the same, is the establishment of *objectives* for the research. The researcher must always determine in advance what outcome of the statistical procedure is desired. Once this is established, the researcher then develops or selects an appropriate data-gathering instrument, for which there are an adequately large sample of subjects and a representative set of attributes or characteristics for collecting measurements.

Cluster analysis works with all types and levels of data, but it is usually best to standardize the scores so that a common measurement is used in the final analysis. If the database is too large, if there are too many variables and too many branches in the cluster tree for logical interpretation, the researcher may wish to reduce the number of active variables.

One way to do this is by conducting either a standard factor analysis or a principal component analysis first, and then refer to the results of this secondary analysis as input for the cluster analysis procedure. Selecting the right algorithm refers to choosing among the many different types of clustering methods that are available. Aldenderfer and Blashfield (1984) identified seven different clustering methods; hierarchical-agglomerative, iterative, and factor analytic are the three most popular methods used in social science. Of these, hierarchical-agglomerative cluster analysis is most common. Other types of cluster algorithms include hierarchical divisive, density search, clumping, and graph theoretic. Researchers interested in knowing more about these models should consult one of the many books written specifically on the cluster analysis method.

Within the hierarchical-agglomerative model, researchers can chose from several different linkage models—linkage refers to the way that *dendograms* (cluster analysis trees) are used to identify groupings—single linkage, complete linkage, average linkage. Because of its simplicity and ease of interpretation, single linkage may be the more popular model.

Cluster analysis may have any or more of the following goals: (1) to develop a typology or classification system, (2) to investigate methods for grouping subjects, (3) to generate hypotheses through data exploration, and (4) to test hypotheses by comparing cluster analysis groupings with groups identified another way. Of these uses, the creation of classifications is by far the most common use for cluster analysis. However, in applied cluster analysis, two or more of these uses are likely to be combined in the study.

Multiple Analysis of Variance (MANOVA)

Statistical procedures have been developed to test the impact on differences for more than two sets of groups at the same time. These tests compare all factors against each grouping variable individually, then test for interaction, and then test again for combinations of groups. These procedures are known as *multiple analysis of variance* (MANOVA). In addition, a procedure called MANCOVA has been developed that combines a regression analysis with ANOVA.

Neither MANOVA nor MANCOVA is employed sufficiently to warrant a more detailed discussion here. However, since they are based on the same concepts underlying analysis of variance procedures used in experimental research designs, they are not difficult to learn and use. Additional information about these two procedures is available in most advanced statistical methods textbooks.

Summary

This chapter looked at several popular multivariate statistical procedures: multiple discriminant analysis, factor analysis, and cluster analysis. Discriminant analysis is one of a series of statistical techniques designed to analyze relationships among two or more variables. It has been defined as a mathematical technique that weighs and combines a set of measurements in a way that their ability to discriminate between two or more groups is maximized. When more than two grouping variables are used in the design, the discriminant process is considered to be multiple discriminant analysis (MDA).

The underlying research problem in discriminant analysis is how to establish a decision rule that enables assigning (or predicting) a subject whose group membership is not known to be one of the categories that make up a complete group. Although assigning is done on the basis of measurements on sets of descriptor variables, selection of these loading items is the province of the researcher.

Discriminant analysis can be used for at least five different purposes: (1) as a way of classifying and describing subjects in two or more groups at the same time; (2) as a tool for improving the quality of predictions about which subject belongs with which group and why; (3) to determine which descriptive variables have the greatest power to discriminate between two or more groups of people; (4) as a post hoc test, in which it serves as a check for diagnoses or predictions made on the bases of other types of evaluations; and (5) to gauge how far apart the groups are located on a set of descriptive characteristics.

A number of multivariate analysis procedures have been developed to help researchers manage large databases—that is, datasets that consist of measurements in the neighborhood of 300 or more subjects and/or more than 100 variables. Among these tools are principal component analysis, standard factor analysis, and cluster analysis. Principal component analysis (PCA) is similar to standard factor analysis (SFA) in concept and application; it is one of seven different ways that the SPSS statistical software package provides for extracting the factors that underlie a set of measurements.

Factor analysis serves many different purposes, the most important of which are reduction in the number of variables and testing of hypotheses. Factor analysis requires the researcher to subjectively interpret each factor based on the variables that load on the factor—which some believe to be one of the greatest advantages of factor analysis. Subjective interpretation makes it possible to attempt to decipher meaning from what is otherwise simple numerical description.

Cluster analysis also results in a reduction in the amount of data with which the researcher must work, but involves more subjective decision making than factor analysis. However, cluster analysis is a popular tool for grouping people into similar categories. It has become an important statistical tool for identifying and describing voter segments in political campaigning, and even more important as a tool for segmenting groups of citizens with needs for various public services. MANOVA and MANCOVA are multivariate statistical methods for testing hypotheses with more than two levels.

Discussion Questions

1. What is multiple discriminant analysis (MDA) and what is it used for?
2. Describe the MDA procedure.
3. How does discriminant analysis improve the quality of predictions?
4. What is principle component analysis (PCA), and what is it used for?
5. What is standard factor analysis (SFA) and what is it used for?
6. What is cluster analysis and what is it used for?
7. What are MANOVA and MANCOVA?

Additional Reading

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Part 3

Qualitative Research Approaches and Methods

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16 Introduction to Qualitative Research Methods

One important consequence of the push to extend the scope of research has been a widespread increase in the use of subjective qualitative methods to replace or augment the once-prevalent emphasis on objective, positivist research principles. Lan and Anders (2000) have described this change in emphasis as a *major paradigm shift* in the philosophy of science.

Building their argument on the seminal work of Thomas S. Kuhn (*The Structure of Scientific Revolutions,* 1970), Lan and Anders concluded that more than one approach to research is not only possible, it is desirable. If science does progress by shifts in paradigms, as their interpretation of Kuhn's work suggests, and if it is indeed true that more than one paradigm can exist within a single discipline, then the question of which research approach to take is moot. Researchers are not required to follow the same set of rules. White and Adams (1994, 19–20) have summarized this point thus:

> We are persuaded by the weight of historical and epistemological evidence that no single approach—even if accorded the highly positive label *science*—is adequate for the conduct of research in public administration. If research is to be guided by reason, a diversity of approaches, honoring both practical and theoretical reasons, seems necessary.

The term *qualitative research* is used to describe a set of nonstatistical inquiry techniques and processes used to gather data about social phenomena. *Qualitative data* refers to some collection of words, symbols, pictures, or other nonnumeric records, materials, or artifacts that are collected by a researcher and have relevance to the social group under study. The uses for these data go beyond simple description of events and phenomena; rather, they are used for creating understanding, for subjective interpretation, and for critical analysis as well.

Qualitative research differs from quantitative research in several fundamental ways. For example, qualitative research studies typically involve what has been described as "inductive, theory-generating, subjective, and nonpositivist processes." In contrast, quantitative research involves "deductive, theory-testing, objective, and positivist processes" (Lee 1999, 10). Creswell (1994) identified five ways that these two approaches differ, based upon these five philosophical foundations: *ontology* (researchers' perceptions of reality); *epistemology* (the role or roles taken by researchers); *axiological assumptions* (researchers' values); *rhetorical traditions* (the style of language used by researchers); and *methodological approaches* (approaches taken by researchers). The differences identified by Creswell are displayed in Figure 16.1.

A key difference lies in the *epistemology* of the two approaches. In qualitative research designs,

Figure 16.1 **Five Ways Qualitative Research Differs from Quantitative Research**

	RESEARCH STRATEGIES	
Philosophical Foundations	Qualitative Research Designs	Quantitative Research Designs
ONTOLOGY (Perceptions of Reality)	Researchers assume that multiple, subjectively derived realities can coexist.	Researchers assume that a single, objective world exists.
EPISTEMOLOGY (Roles for the Researcher)	Researchers commonly assume that they must interact with their studied phenomena.	Researchers assume that they are independent from the variables under study.
AXIOLOGY (Researchers' Values)	Researchers overtly act in a value-laden and biased fashion.	Researchers overtly act in a value-free and unbiased manner.
RHETORIC (Language Styles)	Researchers often use personalized, informal, and context-laden language.	Researchers most often use impersonal, formal, and rule-based text.
METHODOLOGY (Approaches to Research)	Researchers tend to apply induction, multivariate, and multiprocess interactions, following context-laden methods.	Researchers tend to apply deduction, limited cause-and-effect relationships, with context-free methods.

Source: Creswell 1994.

researchers must often interact with individuals in the groups they are studying. Researchers record not only what they see, but also their interpretations of the meaning inherent in the interactions that take place in the groups. Quantitative researchers, on the other hand, maintain a deliberate distance and objectivity from the study group. They are careful to avoid making judgments about attitudes, perceptions, values, interactions, or predispositions.

Another way to describe the differences between qualitative and quantitative research methods has been proposed by Cassell and Symon (1997). The most fundamental of these differences is a bias against using numbers for qualitative research, whereas quantitative research is biased heavily toward numeric measurements and statistical analysis—the *positivist* approach to scientific analysis (White 1999). The objective of this positive approach to research is to control events through a process of *prediction* that is based on explanation; it employs inferential statistical methods (White and Adams 1994).

The second difference is what is referred to as the *subjective-objective dichotomy.* Qualitative researchers "explicitly and overtly apply" (Lee 1999, 7) their own subjective interpretations of what they see and hear—often, they are active participants in the phenomenon under study. On the other hand, a foundation stone of the quantitative, positivist research approach is researcher *objectivity.* The researcher is expected to function as an unbiased, unobtrusive observer, reporting only what happens or what can be measured.

These two approaches also differ in a third way: qualitative researchers tend to approach the research process with a willingness to be flexible, to follow where the data lead them. Qualitative researchers often approach a topic with few or no preconceived assumptions; these are expected to appear out of the data as they are collected and studied. Quantitative research, on the other hand, tends to be guided by a strict set of rules and formal processes. Typically, specific hypotheses are established prior to the data gathering and tested during the analysis. Variables are identified and explicitly defined beforehand. Searching for cause-and-effect relationships between defined variables that can be measured is a hallmark of quantitative research studies.

A fourth way that the two approaches differ has to do with the aim of the study. Qualitative researchers seek understanding of social interactions and processes in organizations, whereas quantitative studies are more often concerned with predicting future events and behaviors. To make these predictions, they often apply inferential statistical analyses to measurements taken from representative samples drawn from a population of interest.

A fifth difference is associated with the context of the study. Qualitative research is usually concerned with a situation or event that takes place within a single organizational context. A major goal of much quantitative research is to apply the study results to other situations; thus, quantitative research is what Lee terms "more generalizable."

A sixth way that these two approaches to research differ is the emphasis that qualitative researchers assign to the research process. The way that subjects interact with, and react to, the researcher during the qualitative study is of as much an interest as the original phenomenon of interest. Quantitative researchers tend to take great pains to avoid introducing extraneous influences into the study and seek to isolate subjects from the process as much as possible by controlling for process effects.

Qualitative Research Strategies

Qualitative research strategies can be grouped into three broad strategic classes. These are (1) *explanatory research studies*, (2) *interpretive research studies*, and (3) *critical research studies.* These strategies and the four key approaches that are followed in most social science research are displayed in Figure 16.2. These roughly correspond to the exploratory-descriptive-causal categories of quantitative research designs.

Explanatory Research

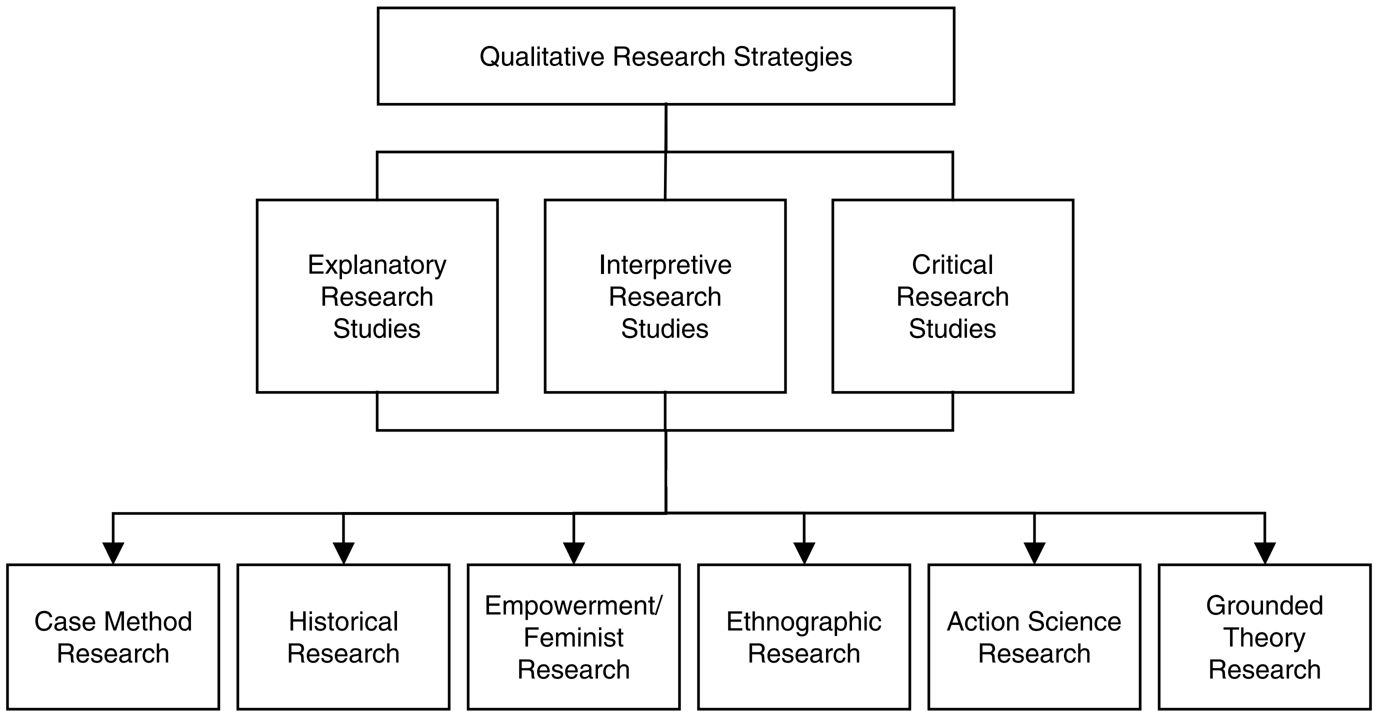
Explanatory research was described by Schwandt (1997) in his dictionary of terms and concepts encountered in qualitative research as studies that are conducted to develop a *causal explanation* of some social phenomenon. The researcher identifies a specific social event or circumstance (a *consequence*)—such as crime in the inner city—that he or she wants to investigate. The researcher then seeks to identify the social, economic, climate, practice, or other such characteristic (variable) in the social environment that can be explained as a *cause* of the consequence of interest.

One of the major objectives of explanatory research is to build *theories* that researchers can then use to explain a phenomenon, and which can then be used to predict future behavior or events in similar circumstances. The ability to predict responses allows investigators a measure of control over events. Therefore, the ultimate goal of all explanatory research is the control of natural and social events (White 1999). Explanatory research is the easiest approach to understand and apply, and is often used simply for this reason.

In addition to this controlling aspect of explanatory research, the strategy is seen by many as the fastest way to produce a cumulative stream of knowledge in a field or discipline. Possibly because of this, and because of their relationship to control, studies that are designed to explain a phenomenon are still the strategy seen most often in public administration research.

Explanatory strategies fulfill much the same role in qualitative research that exploratory research does in quantitative research; they are used as a means of gathering fundamental information about the topic, its contributing factors, and the influences a phenomenon might have on various outcomes. This process can be described as *gaining insights and ideas* about a study problem. These studies are seldom complete in themselves; they are conducted as preliminaries to additional, follow-on research.

Figure 16.2 **Some Qualitative Research Strategies in Political Science Research**



Interpretive Research

Not all research theorists agree that human events or actions can be defined by the causal explanations that are part and parcel of explanatory research. Instead, these critics argue that human action can never be explained this way. It can only be understood by studies that follow the second approach in the triad of qualitative approaches, which is *interpretation.* The researcher arrives at an interpretation of a phenomenon by developing (subjective) meanings of social events or actions.

Interpretive research helps us achieve understanding of actions of people in social circumstances and situations. White cites as an example the way an interpretive researcher goes beyond describing why a job-enrichment program is not working, using established hypotheses of motivation and job design. Instead, the interpretive researcher might circulate among employees in their job setting, ask them what they think about the program, the meaning it has for them, and how it conflicts or reinforces their existing attitudes, opinions, and behaviors. In this way, the researcher seeks to "discover the meaning of the program; how it fits with (the workers') prior norms, rules, values, and social practice" (White 1994, 45).

Schwandt (1997, 73) has offered this description of interpretation in research: "A classification, explication, or explanation of the meaning of some phenomenon." Thus, interpretive studies require the researcher to go beyond simply describing or explaining what a phenomenon is to also "interpret" the phenomenon for the reader. This entails providing an interpretation of what it *means*, as well as what it *is.* Schwandt concluded that the term *interpretation* is used as a synonym for *hermeneutics* or *Verstehen* (*Verstehen* defines an approach to the social sciences that is committed to providing *understanding* of human actions).

Research can be classified as *interpretive* when it builds on the assumption that humans learn about reality from the meanings they assign to social phenomena such as language, consciousness, shared experiences, publications, tools, and other artifacts. The task is made difficult because a fundamental tenet of interpretive theory is that social phenomena are constantly changing. Thus, the meanings that people assign are in constant flux. At the same time, interpretive research is always *context-laden.* Thus, interpretation is like shooting at a constantly moving target.

A primary goal of the interpretive research approach is to provide many-layered descriptions and interpretations of human experiences (Meacham 1998). To achieve this goal, interpretive research looks at the way humans make sense out of events in their lives—as they happen, not as they are planned. Therefore, to thoroughly understand an event or an organization, the researcher must also understand its historical context.

Interpretive research is important for the study of government organizations and agencies. The fundamental objective for interpretive research makes this approach particularly relevant in applications such as these:

> The basic aim of the interpretive model is to develop a more complete understanding of social relationships and to discover human possibilities. Recent studies of organizational culture demonstrate the importance of interpretive methods for properly understanding norms, values, and belief systems in organizations. (White 1994, 45)

Principles of Interpretive Research

Klein and Myers (1999) developed a set of seven fundamental principles to help researchers conduct and evaluate interpretive research studies. The first and most fundamental of these principles is the *hermeneutic circle*, derived from document and literary analysis. The hermeneutic circle was devised to illustrate a phenomenon of the learning/understanding process. People develop understanding about complex concepts from the meanings they bring to the parts that make up the concept; these can be words and the way that they relate to one another. Interpretation of the larger whole moves from a preliminary understanding of the parts to understanding the whole. It then moves back again to a better understanding of the parts, and on and on. The process of understanding thus moves continuously in an expanding circle of greater and greater understanding.

The second principle of interpretive research is the importance of the *contextual nature* of the studied phenomenon or organization that was mentioned earlier. The researcher's "meaning" is derived out of the particular social and historical context in which the phenomenon is embedded; at the same time, all patterns that can be discovered within this embedded context are constantly changing. The organization that is interpreted is thus time and situation specific.

The *interactions between researchers and the subjects they study* constitute the third of the seven principles of interpretive research; the information is not something inherent in the phenomenon. Rather, it is developed as a result of the social interrelations of both subjects and researcher. Gummesson (1991) likens this to the interaction that often results in the researcher metamorphosing into an "internal consultant" role during case study research. By interacting with participants, the researcher becomes one with the members of the group under study.

Abstraction and generalization together make up the fourth principle of interpretive research. This principle deals with abstractions as it attempts to bring order to disunited parts by categorizing them into generalizations and concepts with wider application. The inferences drawn by the researcher that are based on his or her subjective interpretation of the single case must be seen as theoretical generalizations.

The fifth principle of interpretive research is *dialogical reasoning.* In this intellectual process, the researcher explicitly weighs all preconceptions and/or biases brought to the planned research activity against the information that actually emerges from the actual research process. This principle forces the researcher to begin by defining the underlying assumptions that guide the research and the research paradigm upon which the study is based. Through a process of dialog with participant actors, the researcher defines and redefines the assumptions and research questions in light of the data that emerge.

The *principle of multiple interpretations* demands that the researcher aggressively compare his or her historical and contextual interpretation of the phenomenon against all other available interpretations and the reasons offered for them. Thus, the researcher subjects his or her own preconceptions and biases to comparison against competing interpretations, including those of the participants in the organization under study. Even if no conflicting interpretations are found during the study, the researcher is expected to probe for them and to document the fruitless process. In this way, the researcher strengthens the conclusions and interpretations derived from the analysis.

The final principle of interpretive research is that of *suspicion.* This requires the researcher to not accept an interpretation at face value. To avoid making false interpretations, the researcher must examine every personal preconception, conclusion, definition, and derived meaning with a healthy dose of skepticism.

Critical Research

Critical qualitative research is a third approach to investigations of social phenomena adopted by public administration researchers. Critical research in public administration has evolved from approaches exemplified in Marxian *critical sociology* and Freudian *psychotherapy* traditions (Argyris, Putnam, and Smith 1985. According to Klein and Myers (1999), a study can be considered to be *critical* in nature if it is a social critique that that exposes harmful or alienating social conditions. Furthermore, the purpose of the critique should be to emancipate members of the society from the harmful conditions, thus eliminating the causes of the alienation. Members of the society are not told how to change their conditions, but are instead helped to identify on their own alternative ways of defining their society and achieving human potential.

The primary objective of critical research is to help people *change* their beliefs and actions as part of a process of helping them become aware of the often-unconscious bases for the way they act or their beliefs. By becoming aware of *why* they live and think the way they do, "critique points out inconsistencies between what is true and false, good and bad; it compels [people] to act in accordance with truth and goodness" (White 1994, 46).

Critical public administration research begins with the assumption that a crisis exists in some aspect of society. The researcher approaches the study of this crisis from a deeply personal and involved commitment to help the people involved. Recognition of a "crisis," then, is one of the key concepts of the approach. The role of critical research in these circumstances is explained in the following:

> From [the crisis] perspective, society is seen as [torn] by social and political divisions that make the process of social reproduction . . . prone to actual or incipient breakdown. Society [is not] a harmonious, self-regulating system. Rather, it must be seen as a field of complex and contradictory possibilities for social actors who would . . . assume command of these possibilities and produce new social realities which would express their ability to act as empowered, autonomous agents. The task of critical research involves identifying these possibilities and suggesting what social actors might do to bring their lives under their conscious direction. (Hansen and Muszyaki 1990, 2)

A number of structural themes characterize critical research. The two that seem to appear most regularly in the literature of critical research methodology are distortion in the perceptions held by members of a group and rejection of the idea of the disinterested scientist. With the first theme, the goal of critical research is to integrate social theory and application or practice in such a way that the members of social groups become cognizant of distortions and other problems in their society or their value systems. Then the group members are encouraged to propose ways to change their social and value systems so as to improve their quality of life (Schwandt 1997).

The second key theme in critical research is the refusal to accept the traditional idea that called for the social scientist to remain objective or "disinterested," and its replacement with the concept of the active, change-oriented researcher whose emphasis is on motivating change processes in social groups and individuals. The technique of adopting a critical perspective in professional communication has been described thus:

> The critical perspective aims at empowerment and emancipation. It reinterprets the relationship between researcher and participants as one of collaboration, where participants define research questions that matter to them and where social action is the desired goal. (Blyler 1998, 33)

Which Strategy Is Best?

The choice of which strategy to adopt when designing a qualitative study will depend upon the objectives the researcher has identified for the study. Often considered the easiest of the three strategies to carry out, and possibly because of this, by far most qualitative research studies follow an *explanatory* design. However, according to White (1999) and others, there is a strong movement among researchers in all the social and administrative sciences to go beyond a simple descriptive explanation of a phenomenon to also explore whatever meaning underlies the behavior, event, or circumstance. Professionals, administrators, sponsoring agencies, and the public at large are asking researchers to explain what things *mean*, rather than simply describing them as they appear.

An even smaller number of researchers is extending the range of research even further by designing studies that begin with a critique of a social phenomenon and end with the design and introduction of subject-sponsored new ways of addressing old problems (Robinson 1994). The critical approach in public administration is still in its infancy, however (White 1999). This approach has been employed often enough, however, to result in a reputation for making it difficult to transform research results into meaningful program applications. The method requires subjects to formulate alternative concepts or courses of action; the role of the researcher is to assist the group in, first, identifying and then resolving their social problems themselves. Despite this difficulty, the critical approach is seen as an important way of addressing single-case studies.

Additional Qualitative Research Strategies

Many different types of research approaches are employed for conducting qualitative research. The four research approaches most often followed are *case studies*, *grounded theory*, *ethnography*, and *action science.* These are not the only approaches seen in research in the administrative and social sciences, however. Others include *phenomenology*, *hermeneutics*, *ethnomethodolgy*, *atmospherics*, *systems theory*, *chaos theory*, *nonlinear dynamics*, *grounded theory*, *symbolic interactionism*, *ecological psychology*, *cognitive anthropology*, *human ethnology*, and *holistic ethnography*, to name only a few (Patton 1990; Denzin and Lincoln 1994b; Morse 1994; Marshall and Rossman 1999).

Figure 16.3 displays six popular research approaches, their disciplinary traditions, some common ways data are gathered, and a suggestion of some of the types of research questions addressed. The disciplinary approaches compared include (1) *ethnography*, (2) *phenomenology*, (3) *case studies approach*, (4) *hermeneutics*, (5) *grounded theory*, and (6) *action science.*

Analyzing and Interpreting Qualitative Data

All qualitative research strategies and approaches involve three basic components: (1) collection of data, (2) analysis and interpretation of that data, and (3) communicating research findings in one or more communications media, such as producing a written report (Strauss and Corbin 1998).

The major methods used to collect qualitative data include: (1) participation in the group setting or activity, (2) personal and group interviewing, (3) observation, and (4) document and cultural artifact analysis. There are also many secondary methods of collecting information (Marshall and Rossman 1999). These include historical analysis, recording and analysis of live histories and narratives, films, videos and photographs, kinesics, proxemics, unobtrusive measures, surveys, and projective techniques.

Some researchers collect qualitative data by actually participating in a social situation and writing down what they see, while others do so by unobtrusively observing social interrelationships and behaviors. Researchers also gather qualitative data for analysis by video or audio tape recordings of narrative accounts of life histories, events, perceptions, or personal values; they question subjects using structured or unstructured, personal or group, interviews. Still others collect

Figure 16.3 **Various Approaches to Qualitative Research: Foundations, Methods, and Focus**

Qualitative Research Approach	Disciplinary Traditions	Typical Data-Gathering Methods	Types of Research Questions
Ethnography	Anthropology	Participant Observation; Unstructured Interviews; Analysis of Cultural Artifacts	*"Culture" questions:* What are the values of this group? What is accepted behavior? What is not acceptable?
Phenomenology	Philosophy	Personal Experience Narratives; Video/Audio Taped Discussions; In-Depth Interviews	*"Meaning" questions:* What is the meaning of a person's experience? How do group members cope with various phenomena?
Case Studies	Psychology; Public Administration	Observation; Personal Interviews; Organizational Studies	*"Explanatory" questions:* What is distinct about this group?
Hermeneutics	Biblical Studies; Literary Analysis	Content Analysis; Narrative and Discourse Analysis	*"Interpretation" questions:* What meaning does this text hold?
Grounded Theory	Sociology; Social Psychology	Personal Interviews; Diaries; Participant Observation	*"Process" questions:* What theory is embedded in the relationships between variables? Is there a theory of change?
Action Science	Social Psychology; Education	Discourse Analysis; Intervention Studies	*"Critique" questions:* How can we emancipate group members? What behaviors inhibit change?

qualitative data by examining collections of printed documents, past and present artifacts, or by an examination of cultural or artistic creations, including the media. And some use a combination of these and other methods.

Analysis

The analysis and interpretation of qualitative data begins with bringing the raw data into some level of order. First, the researcher identifies and selects a set of relevant *categories* or *classes* into which to sort the data. Comparing the data across categories—a step that is typically used in the testing of hypotheses—often follows the initial comparing phase of the analysis. Strauss and Corbin (1998) call this a process of *conceptualizing.* This means reducing the often bulky amounts of raw data into workable, ordered bits of information that the researcher can manage with confidence. Kvale (1996) described this act of data categorization as a key qualitative research activity and one that most distinguishes qualitative strategies from quantitative research.

Another procedure sometimes used for this purpose is what is known as *power* or *influence analysis.* In this process, the researcher first collects data by observing the way people interact or by questioning them on their perceptions of such factors as power or influence in the organization. The researcher can then draw a diagram or chart to illustrate the interactions and responses to others within a group or other social setting. Examples of graphic displays of this type include context charts, linkage patterns and knowledge flow charts, and role and power charts (Miles and Huberman 1994).

Interpretation

The next step in analysis of qualitative data is *interpreting the patterns and connections* that are revealed or hidden by bringing the data into order. Interpretation occurs when the researcher draws conclusions from whatever structure becomes revealed in the data. If graphic diagrams are used, the interpretation requires the researcher to explain the connections and interfaces that have been recorded by examining and describing the personal connections, misconnections, interfaces, relationships, and/or interplay of behaviors. These explanations become the gist of a *cogent and meaningful report*, which is the third step in the process.

These three steps must be followed in all studies, regardless of which underlying discipline the study falls into, which approach the researcher follows, or which technique is used to gather and analyze the data.

Summary

Qualitative research describes a set of nonstatistical inquiry techniques for gathering data about social phenomena. *Qualitative data* are words, symbols, pictures, or other nonnumeric records, materials, or artifacts collected by a researcher. The uses for these data go beyond simple description of events and phenomena; they are used for creating understanding, for subjective interpretation, and for critical analysis as well.

Qualitative research differs from quantitative research in several fundamental ways. Qualitative research studies employ inductive, theory-generating, subjective, and nonpositivist processes, while quantitative research uses deductive, theory testing, objective, and positivist processes. Creswell (1994) identified five ways these two approaches differ, based upon these five philosophical foundations: *ontology*, *epistemology*, *axiological assumptions*, *rhetorical traditions*, and *methodological.*

Qualitative research strategies can be grouped into three broad classes: (1) *explanatory*, (2) *interpretive*, and (3) *critical.* These roughly correspond to the exploratory-descriptive-causal categories of quantitative research designs. The choice of which strategy to adopt when designing a qualitative study depends upon what objectives the researcher has for the study; these must be clearly stated prior to going into the field to embark on the collection of data.

Many different types of research approaches are employed for conducting qualitative research in public administration. Among the disciplinary approaches often followed are *ethnography*, *phenomenology*, *case studies*, *hermeneutics*, *grounded theory*, and *action science.* All qualitative research strategies and approaches involve three basic components: (1) collection of data, (2) analysis and interpretation of that data, and (3) communicating research findings in one or more communications media, such as producing a written report.

The major methods used to collect qualitative data include: (1) participation in the group setting or activity, (2) personal and/or group interviewing, (3) observation, and (4) document and cultural artifact analysis. There are also many secondary methods of collecting information, including historical analysis, live histories and narratives, films, videos and photographs, kinesics, proxemics, unobtrusive measures, surveys, and projective techniques.

Discussion Questions

1. In your own words, define what is meant by *qualitative research.*
2. What are qualitative data? How do they differ from quantitative data?
3. Distinguish between *ontology* and *epistemology.*
4. Discuss the following statement: *Qualitative researchers seek understanding of social interactions and processes in organizations, whereas quantitative studies are more often concerned with predicting future events and behaviors.*
5. Name and define the three major types of qualitative research strategies.
6. Name and discuss a primary goal of the interpretive research approach.
7. Name the seven fundamental principles of interpretive research identified by Klein and Myers.
8. Discuss some of the objectives that would lead a political science researcher to design a critical research project.
9. Select two of the additional qualitative research designs listed in the text and describe how they might be used in a political science research project.

Additional Reading

Cassell, Catherine, and Gillian Symon, eds. 2004. *Essential Guide to Qualitative Methods in Organizational Research.* Thousand Oaks, CA: Sage.

Creswell, John W. 2008. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches.* 3rd ed. Thousand Oaks, CA: Sage.

Denzin, Norman K., and Yvonna S. Lincoln, eds. 2007. *Collecting and Interpreting Qualitative Materials.* 3rd ed. Thousand Oaks, CA: Sage.

Lee, Thomas W. 1999. *Using Qualitative Methods in Organizational Research.* Thousand Oaks, CA: Sage.

Marshall, Catherine, and Gretchen B. Rossman. 2006. *Designing Qualitative Research.* 4th ed. Thousand Oaks, CA: Sage.

17 Explanatory Research: Case and Historical Methods

This chapter looks at two increasingly popular explanatory research strategies: case research and historical research. The case method has been a popular research approach for more than fifty years; Whelan (1989) traced the case approach as far back as 1948, when a planning committee was formed at Harvard University to develop guidelines for applying the method to research in public administration. Under the leadership of Harold Stein, the original committee became the *Inter-University Case Program* (IUCP) in 1951. The IUCP published a text with twenty-six cases just a year later (Stein 1952). In the introduction to that casebook, Stein defined the public administration case as "a narrative of the events that constitute or lead to a decision or group of related decisions by . . . public administrators" (xxvii). The historical approach has been around even longer. Both are discussed in this chapter.

Case Method Research

A number of now-classic case studies were published beginning about the same time that the method was evolving at Harvard. Philip Selznick's *TVA and the Grass Roots* appeared in 1949; Herbert Kaufman's study of the forest service, *The Forest Ranger*, was published in 1960. A third classic case study, Michael Lipsky's (1980) study of city bureaucracies, *Street-Level Bureaucracy*, has helped the case approach to achieve recognition as a valid and important research methodology.

The popularity of the case study approach lies in the great flexibility of the method. Case studies can take a single-case approach, a multiple case approach, or an analysis of a group of case studies on a concept of interest in the meta-case approach (Yin 1994; Stake 2006). Case studies can be written to serve as examples of what a public administrator ought not to do, as well as what should be done. However, the primary purpose of the case is to identify what in the case is common to the group or groups and what is specific to the case or cases under study.

What Is a Case Study?

Many different definitions for case studies have been proposed. Yeager traced most of them to Harold Stein, who, in an article published in 1952, was one of the first to promote the method as a way to do political science and public administration research. He defined the method as "a narrative of the events that lead to a decision or group of related decisions by a public administrator or group of public administrators." T.V. Bonoma defined the case method in a *Journal of Marketing Research* article, approaching it from a management point of view:

> A case is a description of a [public] management situation based on interview, archival, naturalistic observation, and other data, constructed to be sensitive to the context in which management behavior takes place and to its temporal restraints. These are characteristics shared by all cases. (Quoted by Yeager 1989, 685)

In the first edition of his important book on the case method, Yin (1984, 13) wrote: "As a research strategy, the distinguishing characteristic of the case is that it attempts to examine (a) a contemporary phenomenon in its real-life context, especially when (b) the boundaries between phenomenon and context are not clearly evident." Yin described the case study as "an empirical inquiry" that investigates a contemporary phenomenon within its real-life context, and particularly when "the boundaries between phenomenon and context are not clearly evident."

Case studies are often intensive studies of one or a few exemplary individuals, families, events, time periods, decisions or sets of decisions, processes, programs, institutions, organizations, groups, or even entire communities (Lang and Heiss 1990; Arneson 1993). Discussing the case method as one of three qualitative approaches for research in organizational communications, Arneson (1993, 164) saw it as an appropriate research method when some noteworthy success or failure in a case is present, adding that "Qualitative case studies most appropriately address programs directed toward *individualized* outcomes."

Three Types of Case Studies

Three different types of case studies have been identified: instrumental, intrinsic, and collective (Stake 2000). The instrumental case study is the type used in exploratory research designs. It is conducted mainly because it promises to provide insight into an issue, not for any specific interest in the case itself. Stake saw the case as playing a secondary or supporting role. It is studied because it improves understanding of something else.

An intrinsic case study design is chosen when the researcher just wants more and better information about the case. The objective is not to study the case because it illustrates some specific characteristic or problem. Rather, it is undertaken just because the researcher thinks that it is interesting or will provide better understanding of the phenomenon. An example of an intrinsic case study would be a study of how a state legislature implemented a new electronic voting system in their chambers. In these situations, the subject case is expected to contribute to a greater understanding of a topic of interest, such as *performance measurement*, but not to serve as a design for applying performance measurement in the agency serving as the case. The case could highlight the improvements in time and correct recording of floor votes.

The collective case study is one of the major research approaches taken in comparative political studies. In this approach, a group of similar cases, say conservative parties in several different countries, are studied in order to examine a particular phenomenon. This method is known by several different names, including a *multiple-case* and *cross-case* study. Yeager (1989) called this type of case *multi-site qualitative research*.

The collective design is also used to suggest whether a characteristic might be common to a larger population of similar cases. An example of a collective case study might be a study of how five coal-rich states are handling environmental protection pressures from citizens' groups, with the objective of highlighting best practices for other state governments to follow. The cases selected might be chosen because they are similar or because they are different. They are selected because the researcher believes that understanding what is going on in those cases will result in better understanding about a larger group of cases.

When to Use the Case Study Approach

Van Evera (1997) proposed five different situations for which the case study method is a particularly appropriate design:

1. When the researcher wants to establish a theory or theories,
2. When testing theories that already exist,
3. When identifying a previous condition or conditions that lead or contribute to a phenomenon (what Van Evera called *antecedents*),
4. When the researcher wants to establish the relative importance of those contributing conditions, and,
5. When trying to establish the fundamental importance of the case with regard to other potential examples.

Establishing a theory upon which to base predictions of future events is an important reason for much of the published research in the administrative sciences. In his review of works that used the case study method to examine city planning and planners, Fischler (2000) noted that case studies are uniquely suited for exploring the interaction of personal behavior and collective institutions, and the interplay of agency and structure. In this way, case studies were seen as contributing to the development of a theory of government planning practices.

Fischler also called cases "the most essential tools" in theory development. Developing theory from case studies occurs through a four-phase process: (1) formulation of research questions and hypotheses, (2) selection of the case and definition of units of analysis, (3) data gathering and presentation, and (4) analysis and theory building.

Bailey (1994) also identified a variety of purposes for the case study. In addition to descriptive, interpretive, and critical purposes, case studies are used for solving administrative problems and for forming theory. They can have a purely practitioner-oriented focus, or they can be "esoteric scholarly studies." For maximum value, however, Bailey recommended that the ideal case study is one that has value for *both* practitioners and academics.

Because political science researchers have used the case study for so long and in so many different ways, it is not surprising that so many different purposes for the method have surfaced. However, most authors agree with Lang and Heiss, who contended that this one fundamental principle underlies all case studies:

> The basic rationale for a case study is that there are processes and interactions . . . which cannot be studied effectively except as they interact and function within the [case] itself. Thus, if we learn how these processes interact in one person or organization, we will know more about the processes as factors in themselves and perhaps apply [what we have learned] to other similar type persons or organizations. (Lang and Heiss 1990, 86)

For both the single- and multi-case approaches, the purpose of the study is not to be a representative picture of "the world," but rather to represent the specific case or cases. Yet while this is certainly true, good case studies do include features of the case or set of cases that are uniform and generalizable, as well as those that have the appearance of being relatively unique to the case(s) under study (Bailey 1994).

The Single-Case Study

Most case studies that are conducted in subfields of political science, with the exception of comparative politics, are single-case studies; they are used in all the social and administrative sciences, making them what Miles and Huberman (1998, 193) called the *traditional mode of qualitative analysis*.

In an example of a single case, Poister and Harris (2000) examined a mature total quality management program in the Pennsylvania Department of Transportation. The program began in 1982 with the introduction of quality circles and evolved into a major strategic force in the department, with quality concepts incorporated into all levels of the culture of the organization.

Poister and Harris (175) point to the experience of this department as an example for other agencies to emulate—one of the key purposes of the case study. They concluded their study stating that the department "Has indeed transformed itself over the past 15 years around core values of quality and customer service. Hopefully, its experience along these lines will be helpful to other public agencies that have embarked on this journey more recently."

The Multi-Case Method

Ammons, Coe, and Lombardo (2001) used a multi-case approach to compare the performance of three public sector benchmarking projects. Two of the projects were national in scope, while the third was a single-state program. The first project was a 1991 program sponsored by the Innovation Groups to collect performance measurement information from cities and counties across the country. This information was eventually incorporated into a national performance-benchmarking information network, the *PBCenter*. Although the effort started aggressively by measuring 43 programs, ultimately both participation and enthusiasm among potential users of the information lagged.

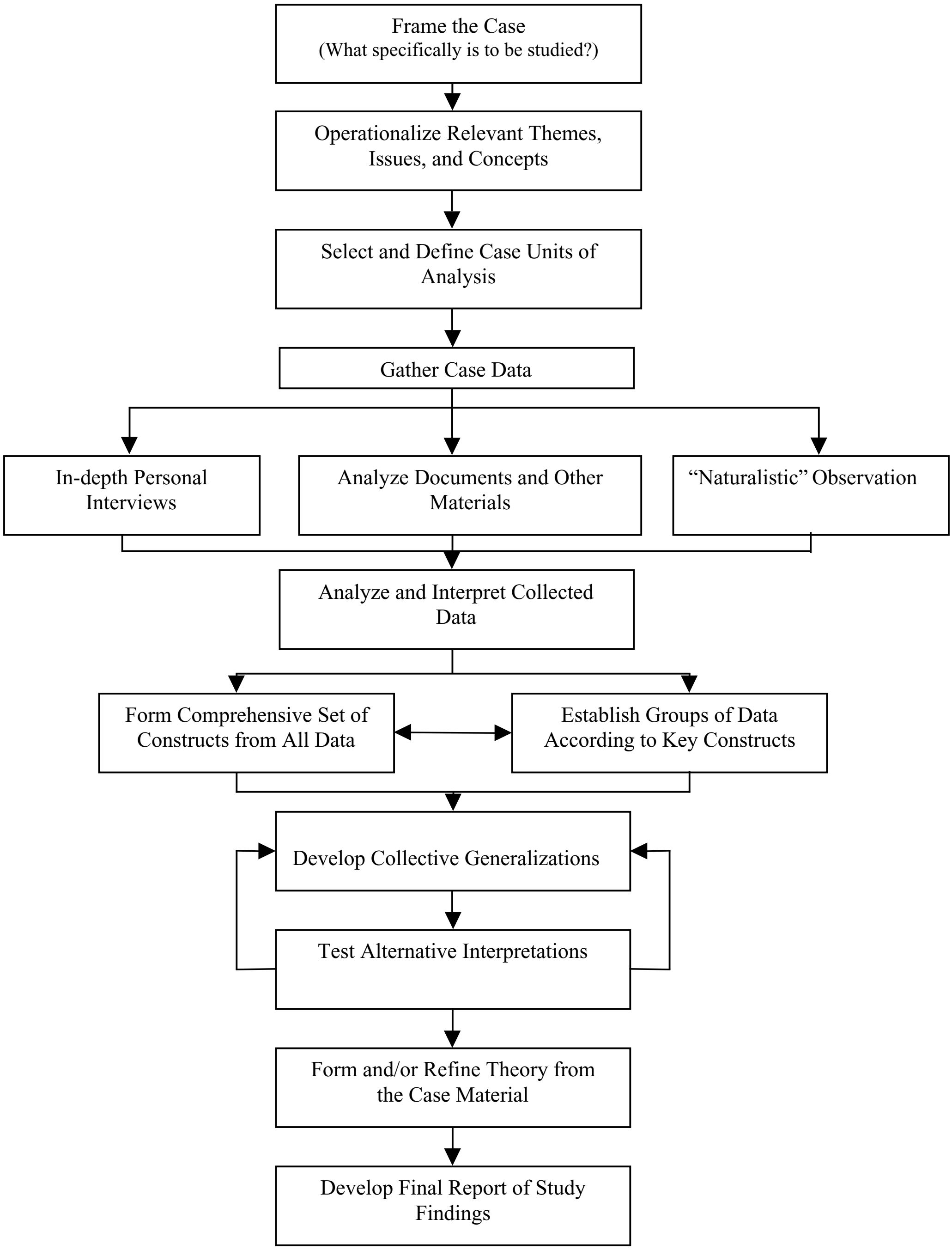
The second case in this multi-case study, the *Center for Performance Measurement*, was a national program sponsored by the International City/County Management Association (ICMA). The third case examined a North Carolina project to provide performance statistics to the state's city managers. By 1995, it had evolved into the *North Carolina Local Government Performance Management Project*, and was run by the School of Government at the University of North Carolina–Chapel Hill.

The Ammons, Coe, and Lombardo case study concluded that all three programs had failed to deliver results that even closely approached the expectations of their participants, and many felt that program costs exceeded any benefits. On the basis of their comparative analysis of the three cases, the authors recommended that administrators of similar projects in the future make sure that participants have realistic expectations for benchmarking before they buy into their programs.

Steps in the Case Study Method

The model presented in Figure 17.1 illustrates various steps in the selection and preparation of a case study. The model can be considered a *flowchart*; case study activities should begin at the top and proceed downward. The concepts included in the model owe much to Robert Stake's 1995

Figure 17.1 **Steps in Case Study Planning, Analysis, and Presentation**



synopsis of the case method. Additional contribution to the model came from the five components of a case study design identified by Yin (1994, 20). The components were (1) the study question; (2) its propositions (others call these *hypotheses*), if any; (3) the unit or units of analysis; (4) the logic that links the collected information to the propositions; and (5) the criteria selected by the researcher for interpreting the case. The necessary steps in case study research can be condensed as follows.

Step 1: Frame the Case

The first step in researching a case study is to establish a *frame* for the research. Framing goes beyond identifying the basic research problem. Instead, when framing the case, the researcher must answer three questions: First, why should the case study method be used in preference to any other research method in this situation? Second, why should this particular case be studied? Are there more representative cases available for study? And, third, why choose the specific behaviors or phenomena to study?

Step 2: Operationalize Key Constructs

Operationalizing relevant themes, issues, research questions, and variables is the second step in the process. "Operationalizing" describes the process of *defining* or *conceptualizing* the key constructs or themes that form and shape the research. Operationalizing also requires the researcher to identify any limitations and assumptions for the research. Depending upon the research approach followed, operationalizing activities can take place before or after the data are collected. When it is done after the data are collected, the study is more appropriately a *grounded theory study.* In the grounded theory approach, the structure and order emerge from the collected data; in these studies all data are "right."

Regardless of when this step takes place, its purpose is the same: to impose *order and structure* to the data, and to identify any limitations or assumptions. Order and structure imposed by the researcher before the data are collected helps to ensure that the needed data will be collected during case interviews and observations.

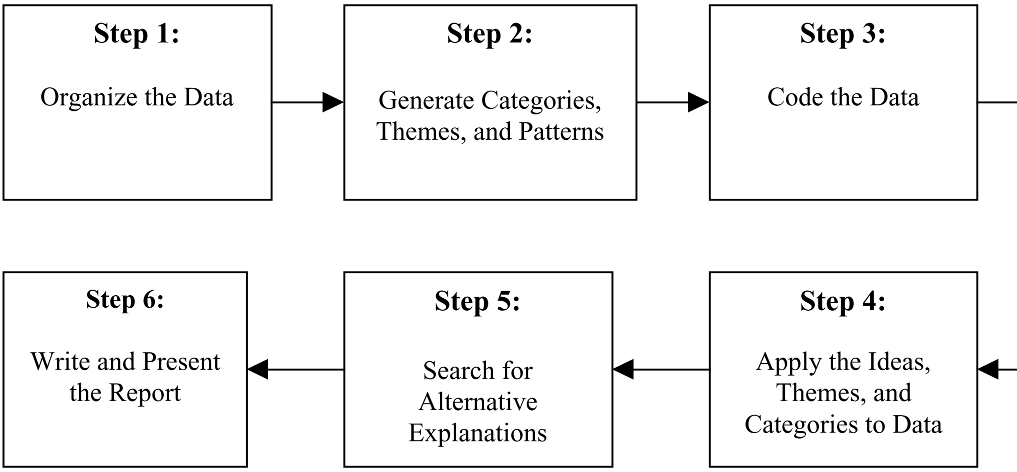
Step 3: Define Units of Analysis

The third step in case study analysis is defining the *units of analysis.* This critical step hinges upon how the researcher has defined the problem to be studied. As noted earlier, case studies can focus on many different types or amounts of phenomena; they can be either single-case or multi-case studies. While most case studies typically focus on individuals, on pairs (dyads), small or large groups, processes, or organizations (Marshall and Rossman 1999), they can also be about a decision or set of decisions made by administrators, supervisors, or work teams in programs, agencies, small subunits of agencies, or groups of agencies that address a similar problem or service. These are all what is meant by the term *unit of analysis*. Deciding on the unit of analysis it is what Yin (1994) called a *narrowing of the relevant data.*

Step 4: Collect the Data

The fourth step, *data collection*, can take place in a variety of ways. The techniques used most often include (1) interviews, (2) simple (also called *naturalistic*) observation, and (3) analysis

Figure 17.2 **A Six-Step Procedure for Analysis of Case Study Data**



of internal and external documents. One of the hallmarks of a good case study is the selection of two or more of these methods (Arneson 1993).

As well as providing a means for *triangulation*, the use of more than one approach helps ensure that relevant data are not missed. Triangulation is studying a phenomenon in two or more ways to substantiate the *validity* of the study findings; it is an important concept in the postpositivist approach to political science research. This term, taken from land surveying, map making, and radio direction finding, refers to the use of several different research methods to get a better handle on a phenomenon by looking at it in more than one way.

There are three popular ways to collect data that make triangulation possible: through interviews, by observation, and by analysis of documents. Gathering data by interview can take one of several different forms, such as in-depth personal interviews or focus group interviews. Interviews can be structured or unstructured.

Naturalistic or simple observation is another way data is gathered for case studies. Marshall and Rossman (1999) describe this method as "the systematic noting and recording of events, behaviors, and artifacts in the social setting chosen for study." The researcher records events and behaviors as they happen, collecting the written records into compilations of impressions that are similar if not identical to the field notes that characterize data collection in ethnographic studies.

The study of documents and archival data is usually undertaken to supplement the information the case study researcher acquires by interview or by observing in a situation. These may be official government records, internal organization reports or memos, or external reports or articles about a case subject. The technique that is usually used in document analysis is called *content analysis.* This process may be either qualitative or quantitative, or both.

Step 5: Analyze the Data

The analysis of all qualitative data takes place in a progression of six separate phases. Figure 17.2 displays a slightly different version of the progression of analysis steps. An important requirement inherent in all data analysis is that the data be reduced in volume at each stage. Unless this occurs, the researcher will be inundated with reams of unrelated information that make logical interpretation impossible. Organizing the data into sets of mutually exclusive categories is one way that data reduction occurs.

Step 6: Prepare and Present a Report of the Findings

The final step in the process is producing a comprehensive narrative of the case. The narrative is a descriptive account of the program, person, organization, office, or agency under study. It requires that all the information necessary to understand the case be included in the narrative. It typically revolves around the researcher's interpretation of the behaviors and events observed in the case during the study period. Patton (1990, 304) referred to the final case narrative as "the descriptive, analytic, interpretive, and evaluative treatment of the more comprehensive descriptive data" (collected by the researcher).

The case study report must clearly show that the researcher has accurately explained what he or she perceived to be the "facts." In addition, it must contain a discussion of what the researcher believes are relevant alternative interpretations, as well as an explanation of why the researcher chose not to accept those alternatives. Finally, all case studies should end with a conclusion that is soundly based in the interpretation adopted by the researcher (Yeager 1989).

Important Guidelines for Case Study Reports

A number of guidelines have been offered for preparing case study reports. Yin (1994) identified five key characteristics possessed by the best, most informative case studies. These are:

The case study must be significant. Cases that are "significant" are those that stand out as superior examples—they are the "best in their class." They illustrate a particular point in a better or more succinct way than others that could have been chosen. In this way, the researcher indicates that selection of the case or cases was not only appropriate, but that the study adds to the body of knowledge about the topic or issue; the study makes a *significant* contribution. Research problems that are trivial do not make good case studies.

The case study must be complete. Cases that are complete leave the reader with the feeling that all relevant evidence has been collected, evaluated, interpreted, and either accepted or rejected. The operative word here, of course, is *relevant*.

The case study must consider alternative perspectives. It is important that the researcher not limit the analysis of case data to a single point of view. Alternative explanations for a social phenomenon *always* exist (Marshall and Rossman 1999). Throughout the analysis of the case data, the researcher is obligated to identify alternative explanations or interpretations of the raw data.

The case study must display sufficient evidence. Data reduction solely for the sake of brevity in a case analysis is not desirable. All the relevant evidence must appear in the final narrative. Condensing, distilling, and combining data takes place at each step of the analysis; otherwise, the final report would end up as little more than a hodgepodge of unrelated, disjointed raw data.

The case study must be written in an engaging way. While this does not apply directly to the concept of completeness in a case report, it is relevant because it has a great influence on whether the case will ultimately be read, understood, and, where appropriate, used in policy development. It is a question of *style.* Complaints often heard about case studies include (1) that they are too long, (2) they are cumbersome to read and interpret, and (3) they are simply boring. Writers of cases should strive to engage readers' intelligence, entice their interest by early hinting at exciting information to come, and seduce readers into accepting the underlying premise (Yin 1984).

Historical Research in Political Science

Halfway through America's Civil War, during what may have been the greatest crisis of the nation's short history, defeat at the ballot box almost succeeded in destroying the Union where the force of arms had thus far failed. With the North and South still locked in armed conflict, President Abraham Lincoln and his supporters in Congress were dealt what Carson, Jenkins, Rhode, and Souva (2001) described as a "stunning defeat." After the votes in the 1862 mid-term congressional elections were counted, the Republican Party had lost its majority in the House of Representatives. This potentially crippling political loss forced the president to forge a coalition with the Unconditional War Party, a splinter party based in the Border States, in order to continue the war.

Why did Lincoln's political defeat occur? What ramifications did it hold for the future waging of the war? And possibly more important, what effect did it have on the peace that followed? What lessons might be learned from the dramatic shift in the fortunes of the majority party? The political scientists who authored the paper on this topic asked themselves these and similar questions, and embarked on a *historical research project* to find the answers. They also used the election results to test their hypothesis that modern political theories can be applied in an historical context to shed light on what otherwise might have remained hidden. They concluded that electoral district–specific events had at least as much if not more effect on the outcome of the elections than national events such as the horrendous loss of life resulting from the poor showing of the North's armies to that time.

This story of the congressional elections of 1862 is just one of literally hundreds of examples of historical research methods used in the analysis of political science phenomena. One or more historical studies may be found in nearly every issue of most of the journals in this discipline. However, not much can be found describing how to use the historical method in political science research. The purpose of this part of the chapter is to rectify that situation.

Capturing the Concept of History with Historical Research

Political scientists using historical research methods approach the study of history from a number of different points of view. One way of describing the different directions historians have taken was proposed by Georg Iggers (1985). Iggers identified three approaches that historical researchers have followed since history was recognized as a separate discipline in the nineteenth century. The first is the *hermeneutic* approach; the second is a *nomological* approach; and the third is a *critical* emphasis, as exemplified by *Marxist* and *feminist* approaches.

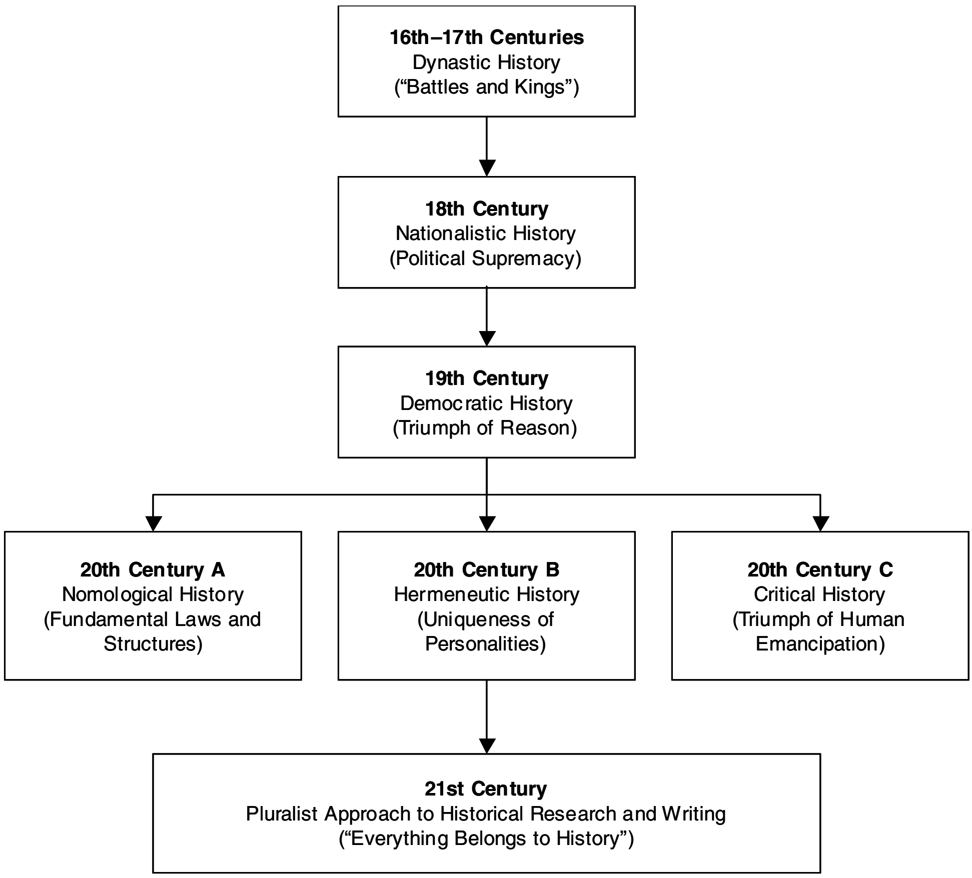
The model in Figure 17.3 illustrates the evolution of emphases in historical research as suggested by such authors as Barzun and Graff (1992) and Iggers (1985), among others.

The hermeneutic tradition of historical analysis has the longest record of use among the three approaches. Hermeneutics is a way of interpreting historical documents and other phenomena in light of the events that took place at the time of the writing of those texts, as well as approaching the interpretation from the intent and experiences of the text's author.

The hermeneutic tradition has its roots in the study of religious texts from the points of view of the writers and subsequent interpretists. The objective of historians who follow the hermeneutic approach is the search for what Iggers (1985, 37) termed "the uniqueness of historical personalities." This is similar to the *Great Man* approach of the early historians.

Nomology is the science of laws, and the nomological approach to a discipline attempts to discern fundamental laws that can be used to explain and eventually predict future events. This approach seeks to make history more "scientific." In doing so, it tries to apply the tools of the natural science to historical investigation. Nomological political scientists apply quantitative tools

Figure 17.3 **A Representation of the Evolution of Approaches in Historiography**



Source: After Barzun and Graff 1992, and Iggers 1985.

used in economics and the behavioralist school of the social sciences, using mathematical models to analyze dependent and independent variable relationships.

A variation on this theme is *structuralism*, which leads historians to make efforts to identify the underlying, invisible structures that form and guide societies and their institutions. The principle that guides structuralist researchers is that these structures always exist in society; if they did not, chaos would ensue. It is the job of the historian to "decode" the historical evidence in order to discover the underlying structure. The evidence exists in persistent, reoccurring events, economic records, social relationships, symbols, art forms, and other cultural artifacts; the structural historian applies quantitative methods to interpret the evidence in order to define the historical record.

The critical tradition of historical writing is one that views all social phenomena and historical events from the point of view of continually changing systems of social relationships and dependencies. Marxist and feminist historians are drawn to the idea of history as a record of social conflict leading to human emancipation. This tradition sees history as a critical social science that does not simply narrate but instead works to abet change in the human condition. For Marxists, the arena of conflict is social class; for feminists, it is gender bias.

Shifting Directions in Historical Political Science

The writing of political history has changed in a number of different ways during its several-hundred-year history. One way it has changed is in the same way that political science itself has changed. Orren and Skowronek (1995) traced the three positions of political science beginning with the formal academic discipline's first fifty years, beginning in 1880 and ending about 1930.

The focus of this period was on the *institutions* of politics. By institutions, Orren and Skowronek meant the fundamental formal and informal rules and agreements that made it possible for government to function and the political and economic world to survive even in the face of revolutionary change. The key institution that made this possible was the *Constitution*, with its formal structure. Therefore, the natural topics for research were constitutional arrangements. Addressing a series of contact points in society where political conflict occurs, Avery Leiserson explained this need for a formal constitutional institution:

> The distinction [that occurs] between social and political structures in a free democracy . . . a free people, voluntarily associated in a society . . . requires a political system, a formal structure of legally coercive public offices and [a] decision-making process based upon units of electoral organization different from those of the social and economic structures. (Leiserson 1968, 17)

During the 1950s and 1960s, adoption of the behavioralist approach by political scientists resulted in what has been described by Orren and Skowronek as a radical reorientation of the study of politics. During these two decades the focus of political science research shifted from institutions to *analysis of the behavior of individuals in political groups and organizations*.

Political history research, except for the continuing interest of researchers on political thought, also shifted; studies appeared that investigated changes in social structures and groups that were influenced by behavioral forces. Political scientists looked upon government as a process that could be defined and measured in behavioral terms. It was believed that inferential approaches could allow for the predicting of behavior in the future. The institutions of government were considered part of the larger political system that itself was a product of human creation.

The final phase of political science described by Orren and Skowronek began as a reaction to the strict empiricism advocated by behavioralists. Political scientists developed mathematical models to describe behavior in their application of *rational choice theory.* Adopted from economics, rational choice theory assumes that people make decisions, including political decisions, based upon their perceptions of achieving the greatest benefits, or *utility*, from the chosen alternative.

The principles of game theory have been widely adopted by rational theory researchers, together with a renewed interest in institutionalism. Some "new institutionalist" researchers now study institutions to "make sense of institutional politics as a more or less stable game in play." Institutions—the formal and informal rules, norms, and standards of the political world—exist to bring equilibrium to the process of government.

Capturing the Nature of Political History

If history is the written record of past or current events, then political history must be the written record of past or current political phenomena (Hockett 1955; Elton 1984). This makes political history the recorded story of politics, political institutions, and the actors in the political world. Political history began with the first written records of society in the Middle East and continues up to and including the political activities taking place today.

Politics are social phenomena; they occur in the context of society. As a result, some might describe political history as social history. Without people interacting with people, there can be no politics. As Elton has noted (1984, 6), *there is no politics without contact*. As a result, political history entails the description of the events, institutions, societies, and *individuals* that come into contact with one another, in whatever form at whatever time.

It has also been said that political history is the record of *power*—the striving for, getting, preserving, or reacting against—power over one's fellow human beings (Elton 1984; Stoker and Marsh 2002). Thus, by its very nature, the history of politics is the story of humans in conflict over power. Certainly, some of this conflict involved rational, intelligent, peace-loving diplomats sitting across from one another, negotiating in a civilized manner. But most of it has been a long and bloody record of war, famine, pillage, fratricide, regicide, genocide, and the whole litany of examples of man's ability to do harm to his fellow man. It can make for a great read!

Changing Focus of Political History

According to Elton (1984), the broad, or *global*, focus of political history has also undergone a relatively slow process of evolutionary change in the past 200 years. The earliest focus of political historians—and the one with the longest record of inquiry—is the *history of political thought*. This type of history reached its full stride with historical analyses of the historical treatises of Greece and Rome, and may have peaked with the political discourse of Machiavelli. It includes analyses of the writings of influential observers and commentators on politics and government such as Plato, Hobbes, Locke, and Marx, to mention just a few examples (Tuck 2001). Because political science was for many years a branch of philosophy, the philosophical approach to politics was to be expected.

The second emphasis for political history was *diplomatic and military history*. This approach to history became popular during the nineteenth century when writing history became the province of "professional historians." As history departments appeared in colleges and universities, history professors took on the task of writing history in addition to teaching it. This history was generally written in a straightforward—some would say *dry*—manner. It focused on detailed reporting of the recorded activities of governmental institutions, important diplomats, and famous military leaders. The primary source for this history was the archival records of various branches of government, including agencies and departments. This is referred to as the *Great Man* or *Battles and Kings* approach to political history. In the words of Elton, this type of history is "under a cloud," but it is still being written today.

The third approach, and essentially a product of only the nineteenth century, is *constitutional and administrative history*. The historical record of these topics was considered important because they helped to explain the rules of the society from which they were drawn. In this sense, this shift in focus helped facilitate the focus of research from attention on the stories of great men and great events to the institutions that make government possible. Elton considered the writing of administrative history to be more "basic" and constitutional history able to prove more information. He concluded:

> The political historian needs first to be thoroughly acquainted with what happened and could happen in the ordinary running of affairs within the society that is his concern, and thus to understand the machinery which made possible the translation of power into action; only then is he able to tell the political story both accurately and in depth. (Elton 1984, 28)

Political history has not seen a new guiding force emerge to replace the emphases of the past. Instead, in the words of Burke (2001), today history is concerned with nearly every activity of humanity. One new unifying thread is concerned with culture, and the idea that reality is socially or culturally constructed; this is the concept of cultural relativism. It is often "history from the bottom," a narrative of everyday humans and their efforts to survive—the story of ordinary people and the way they cope with change in their society.

The sources of this history are no longer the archives of governments or the diaries of important people, but oral histories, private letters, cultural artifacts and paraphernalia, photographs—anything that helps tell a story. These and other, related changes have not made history easier to write: "The discipline is now more fragmented than ever before," according to Burke (17). Despite the lack of a solid foundation upon which to evaluate historical research, for political science researchers, one good thing has come from the shifting philosophical ground. According to Burke,

> The long-standing opposition between political and non-political historians is finally dissolving. G.M. Trevelyan's notorious definition of social history as "history with the politics left out" is now rejected by almost everyone. Instead we find concern with the social element in politics and the political element in society. On the one hand, political historians no long confine themselves to "high" politics, to leaders, to elites. They discuss the geography and sociology of elections and the "republic in the village." They examine "political cultures," the assumptions about politics which form part of everyday life but differ widely from one period or region to another. (Burke 2001, 18)

Conducting Historical Research

Historical research should be as systematic and intellectually rigorous as every other research design. The historical approach takes place at the same pace, identifying a study problem and research questions. It then follows a logical a series of distinct steps or stages. However, recommendations on how to define these steps vary from author to author.

For example, Hockett (1955) claimed that historical research occurs in three steps: the gathering of data; the critical evaluation of the data; and the presentation of the facts, interpretations, and conclusions the historical researcher draws from the data. W.H. McDowell (2002), on the other hand, went so far as to spell out a series of twenty distinct steps for historical research. McDowell's list of twenty steps is paraphrased in Table 17.1.

Of all the tasks in the McDowell's detailed list, the most important of all may be the third step in the list of activities under gathering and interpreting data: Research notes can be entered on individual sheets of notepaper, kept in bound notebooks, written on note cards, or even entered directly into a computer. They should be organized according to topic areas and filed together. Individual notes should include the following information: a descriptive heading, the chapter and/or section in which the information is to be used, a clear distinction between paraphrased and quoted material, and complete source identification. Detailed bibliographic information is usually kept in a separate file, but enough information to clearly identify the name of the author, date of publication, and page number of the material should be included on every note.

Summary

The case method has long been one of the most popular approaches followed in public administration research. The popularity of the case study approach lies in the great flexibility of the method. Case studies can be written to serve as examples of what a public administrator ought not to do, as

Table 17.1

A List of Steps for Conducting Historical Political Science Research

I. Planning the Research
1. Select a subject for research
2. Define the subject more precisely; identify key themes; set research objectives; prepare timetable for completion of the project
3. Identify source material; prepare a working bibliography; identify keywords and check bibliography of data
4. Identify research methods to be used: document analysis, personal interviews, artifact analysis, etc.
5. Begin background reading and, where necessary, refine the proposed project

II. Gathering and Interpreting Data
1. Prepare a draft outline of the paper
2. Peruse source material to prepare research notes
3. Review research notes and materials; prepare a list of key topic areas to subdivide the final paper
4. Prepare draft outline of chapter(s); create list of research questions for each key topic area
5. Prepare a detailed research proposal, incorporating chapter headings, and chapter summaries with topic organization
6. Form manageable subunits of work, as in chapter sections or paragraphs
7. Complete the survey of sources and source material

III. Writing and Presenting the Findings
1. Write the first draft; edit the first draft; continue editing as needed
2. Write the final draft
3. Type the final draft; incorporate changes and alterations
4. Proofread the typeset pages
5. Edit the typeset draft, if to be sent to a publisher
6. If producing a published book, check the page proofs
7. Prepare an index from a set of the page proofs
8. Congratulate yourself on a task well done

Source: McDowell 2002, 90–92.

well as what should be done. However, their primary purpose is to instruct public administrators in what other administrators are doing.

Case studies are often intensive studies of one or a few exemplary individuals, families, events, time periods, decisions or set of decisions, processes, programs, institutions, organizations, groups, or even entire communities. Discussing the case method as one of three qualitative approaches for research in organizational communications, Arneson (1993) described the approach as an appropriate research method when some noteworthy success or failure in a case is present.

There are three types of case studies: (1) intrinsic case studies, (2) instrumental studies, and (3) collective studies. *Intrinsic* case studies are done when the researcher wants to provide a better understanding of the subject case itself. *Instrumental* case studies are used to gain greater insight into a specific issue. *Collective* case studies are a multiple-case design in which a group of individual cases is studied together because it is believed that they can contribute to greater understanding of a phenomenon. Another name for this type of case is *multi-site qualitative research*.

Five purposes for case studies are: (1) when the researcher wants to establish a theory or theories, or (2) to test theories that already exist; (3) to identify a previous condition or conditions that lead or contribute to a phenomenon, or (4) when the researcher wants to establish the relative importance of those contributing conditions, and (5) to establish the fundamental importance of the case with other potential examples.

Case studies can be single-case or multi-case designs. Designing and preparing a case study takes place through a series of interlocking steps. The case must be framed; key constructs, variables, and terms must be operationalized; unit(s) of analysis selected and defined; data analyzed; and a final case report prepared.

Historical research has a long history as a separate discipline in the nineteenth century. Over the centuries, various approaches in this research method have evolved. One is the *hermeneutic* approach; the second is a *nomological* approach; and, the third is a *critical* emphasis, as exemplified by *Marxist* and *feminist* approaches.

The objective of the hermeneutic approach is the search for "the uniqueness of historical personalities." This is similar to the *Great Man* approach of the early historians. The nomological approach looks for fundamental laws that can be used to explain and eventually predict future events. Nomological historians apply quantitative tools used in economics and the behavioralist school of the social sciences. A variation of the nomological approach is *structuralism*, which leads historians to identify the underlying, invisible structures that form and guide societies and their institutions.

Political phenomena and historical events are viewed by the critical tradition of history as systems of social *relationships* and *dependencies* that are continually changing. Marxist and feminist historians—two examples of schools in the critical tradition—see history as a process leading to human emancipation. The historical approach follows a series of distinct steps or stages.

Discussion Questions

1. Describe the case study research method.
2. What role does the case method play in political science research?
3. Describe how a political science researcher would use the instrumental case study approach.
4. Describe how a political science researcher would use the intrinsic case study approach.
5. Describe how a political science researcher would use the collective case study approach.
6. Discuss the meaning of the following statement: The study is not to be a representative picture of "the world."
7. Name and define the steps in the case research method procedure.
8. What role does the historical research method play in political science research?

Additional Reading

Burke, Peter, ed. 2001. *New Perspectives on Historical Writing.* 2nd ed. Cambridge, UK: Polity Press.

Denzin, Norman K., and Yvonna S. Lincoln, eds. 2008. *Strategies of Qualitative Inquiry.* Thousand Oaks, CA: Sage.

Marshall, Catherine, and Gretchen B. Rossman. 2006. *Designing Qualitative Research.* 4th ed. Thousand Oaks, CA: Sage.

Miles, Mathew B., and A. Michael Huberman, eds. 2002. *The Qualitative Researcher's Companion.* Beverly Hills, CA: Sage

Yin, Robert K. 2002. *Case Study Research: Design and Methods.* 3rd ed. Thousand Oaks, CA: Sage.

18 The Interpretive Approach I: Grounded Theory Methods

The *grounded theory* approach to qualitative research has, since the late 1960s, captured the methodological interests and imagination of researchers in all the social and administrative sciences. One of its principal inventors, Barney G. Glaser (1999), described this approach as a *methodology for getting from the systematic collection of data to production of a multivariate conceptual theory.* The grounded theory method has been used successfully in many different circumstances, disciplines, and cultures. The fact that it is easily generalizable to many different disciplines and a variety of research topics has contributed to its increasing acceptance worldwide. Accordingly,

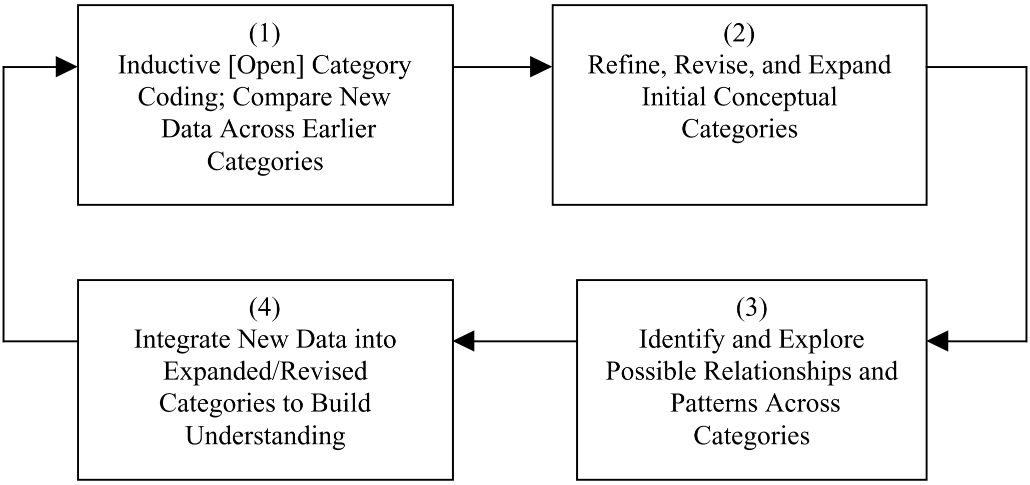
> Grounded theory is a general method. It can be used on any data or combination of data. It was developed partially by me with quantitative data [which] is expensive and somewhat hard to obtain. . . . Qualitative data are inexpensive to collect, very rich in meaning and observation, and rewarding to collect and analyze. So, by default to ease and growing use, grounded theory is being linked to qualitative data and is seen as a qualitative method, using symbolic interaction, by many. Qualitative grounded theory accounts for the global spread of its use. (Glaser 1999, 842)

The grounded theory method evolved from roots in the *symbolic interactionism* theoretical research of social psychologist George H. Mead at the University of Chicago, his one-time student Herbert Blumer, and others (Robrecht 1995). Mead believed that people defined themselves through the social roles, expectations, and perspectives they acquired from society and through the processes of socialization and social interactions.

Blumer added three additional concepts to Mead's thesis: (1) the meanings that people assign to things will determine the way they behave toward them, (2) these meanings come from people's social interactions, and (3) to deal with these meanings, people undergo a process of constant interpretation (Annells 1996). Grounded theory was "invented" by Glaser and Strauss (1967) as a way to develop explanatory and predictive *theory* about the social life, roles, and expected behaviors of people.

From its early roots in sociology and social psychology, the method has evolved and grown in importance to become what Brian Haig (1996) has described as "currently the most comprehensive qualitative research methodology available." Also noting this increased acceptance, Denzin and Lincoln (1994b, 204) called it "the most widely used interpretive strategy in the social sciences today." Recently, this method has also become an increasingly important research approach in political science. Miller and Fredericks commented on this growth:

Figure 18.1 **Processes in the Constant Comparative Method of Data Analysis**



Source: Maykut and Morehouse 1994, 135.

> It is increasingly apparent that the grounded theory approach has become a paradigm of choice in much of the qualitatively oriented research in nursing, education, and other disciplines. Grounded theory has become a type of central organizing concept that serves to both direct the research process as well as provide a heuristic for data analysis and interpretation. (Miller and Fredericks 1996, 538)

Early Goals for Grounded Theory

Grounded theory was first proposed as a reaction against the restrictions that its inventors saw in positivist research methodology. Chief among these perceived restrictions was the requirement to conduct research for the purpose of testing preconceived theoretical hypotheses. Today, the primary objective of all grounded theory research is to develop *theory* out of the information gathered, rather than the testing of predetermined theories through a process of experimentation.

The process begins with the researcher focusing on some area of study. This could be any phenomenon, circumstance, trend, or behavior in any of the social or administrative science areas. Using such tools as observation and interviewing, among others, the researcher gathers relevant data from as many different sources as are available. Analysis of the data begins with grouping it into categories and assigning codes. Through a process of continually comparing data with other categories, theory can be generated.

Grounded theory requires the researcher to organize and apply *structure* to the data according to an eclectic set of researcher-determined groupings or *categories.* As the researcher forms categories, new data are compared across the formed categories. Linkages between categories and characteristics are also identified. The data and their linkages are assigned discrete codes that enable the researcher to identify them with their specific groupings. Similar codes are in turn assigned to other data that fit a broader category or categories. As the process continues, categories are constantly reevaluated and changed when necessary. Only when no additional revisions are intuitively possible does the analyst form a *theory* from the collected and analyzed data. Figure 18.1 illustrates the constant comparative method of data analysis.

Importance of Grouping and Coding

Rather than being only a matter of convenience for later reference, the actual assigning of data to their relevant groupings is a critical early step in the analysis process. Strauss and Corbin (1998, 3) defined the coding process as, "The analytical process through which data are fractured, conceptualized, and integrated to form theory." It is the key activity in the *microanalysis* stage of the data; it includes both the first and the second stages of coding.

The researcher applies a rigorous analytical process in order to develop theory out of the investigated social situation(s) *after* several runs through the raw data and coded categories. Thus, a key concept in grounded theory is the *continual analysis* of the data during and after they are collected.

Insights and ideas are also generated after in-depth analysis of the data. The analyst searches for commonalties and differences in the data. New data are fitted into the constructs or categories that are seen as pivotal in the data. Commonalities are compared and contrasted as the analyst weighs possible theories against other possible interpretations. Ultimately, a theory that is "grounded" in the data will emerge from the analysis.

Two Approaches to Grounded Theory

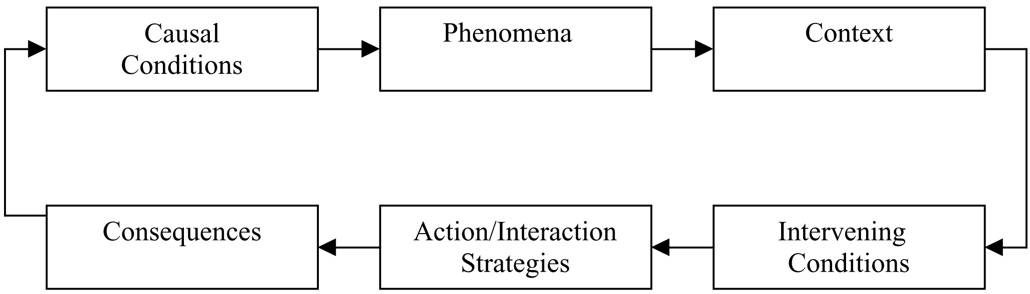
The analysis process identified by Glaser and Strauss in 1967 has been modified over time, so that today there are (at least) two approaches to grounded theory. Locke (1996) identified the two approaches as the *Straussian*—after Anselm Strauss—and the *Glaserian*—after Barney Glaser. Strauss and Corbin (1990), reporting that they observed their graduate students having great difficulty in organizing, coding, and analyzing their data, proposed that an additional step be added to the process. Glaser responded in 1992, taking issue with Strauss and Corbin for straying from the original emphasis on developing theory and adopting instead a process that he believed emphasized *conceptual description* over theory generation.

Both approaches are fundamentally similar, however, with whatever controversy that surfaces focusing on the addition of a third level of coding proposed by Strauss and Corbin. Both approaches emphasize the importance of coding as a key concept in the analysis. Glaser (1992) advocates sticking to the two steps in the coding process introduced in the original work. Glaser's two coding processes are *open* and *theoretical.* During the first phase, coding can be relatively freewheeling, and open to continuous revision, compression, and merging. During the final, theoretical, phase of the analysis, the researcher is advised to rework the groupings as required to bring substance to any emerging theoretical conclusions.

Strauss and Corbin (1990) reported that the grounded theory process as originally proposed in 1967 made it difficult for beginning researchers to produce clear and cogent theory from the data. Retaining the open and substantive coding levels, they proposed that a third, intermediate step in the coding/analysis process be added. They called this intermediate step *axial coding* (Glaser 1992; Kendall 1999). This step—proposed as a way to "demystify" the grounded theory process—requires the researcher to place all the initially "open-coded" data into six categories specified by Strauss and Corbin. The six predetermined categories are: (1) *conditions*, (2) *phenomena*, (3) *context*, (4) *intervening conditions*, (5) *actions/strategies*, and (6) *consequences* (Figure 18.2).

A number of authors have objected to what they see as an artificial restriction that "axial coding" forces upon the researcher. Hall and Callery (2001), for example, concluded that the intermediary six steps resulted in a "mechanical approach" to data analysis that limited theory building. Kendall (1999) saw that axial coding could be advantageous for beginning researchers, but added that it

Figure 18.2 **The Strauss and Corbin Paradigm Model for Axial Coding of Data**



Source: Strauss and Corbin 1990; Kendall 1999.

forced her from original the research question when she used it in her dissertation analysis.

Kendall added that, after several years of working with her data, she found herself spending so much time trying to fit the data to the Strauss and Corbin "paradigm model" that she stopped thinking about what the data were communicating about the original study question. She added that she felt that using predetermined categories directed her analysis artificially by limiting her thinking to only the six categories.

The important thing to remember about the two different approaches is not that the two creators of the grounded theory method disagree on how many steps there should be in the coding process, but rather that they agree on almost all other aspects of the process. Data should be continually compared with new data, coded, and placed in categories for interpretation. The researcher selects both the code and category in the first and the last steps in the analysis.

Steps in the Grounded Theory Process

A number of different approaches to grounded theory research have been proposed. Two models are presented here. The first is an eight-step model suggested by Lee (1999); the second is a seven-step process developed from the work of Glaser and Strauss. The Lee model is spelled out in the series of steps in Table 18.1.

Lee emphasizes the importance of continuous comparisons of categories in his eight-step process, but does not include the Strauss and Corbin axial coding step. In this way Lee's process is very similar to the original Glaser and Strauss and Corbin works.

A Seven-Stage Model for Grounded Theory Research

Figure 18.3 is a model of the grounded theory research process; it was developed by the author to illustrate the sequential nature of the method. The seven key steps in this process were described in detail in Glaser and Strauss's 1967 narrative of how the method was developed, and reiterated elsewhere (Glaser 1992; Strauss and Corbin 1998, for example).

Stage 1. Select a Topic of Interest

In political science, theories explain and predict human behavior among public employees, the citizenry, or organizations that are in some way acted upon or that influence public decisions.

Table 18.1

An Eight-Step Process for Conducting Grounded Theory Research

STEP 1. The researcher comes up with some ideas, questions, or concepts about some area of interest. These ideas can come from the researcher's own experience in the field, from a few key interviews, or from an analysis of the published literature.
STEP 2. By creatively looking at the ideas, questions, or concepts, the researcher proposes some possible underlying concepts for the phenomenon and their relationships (linkages).
STEP 3. The researcher now tests these initial linkages by comparing them with real-world data.
STEP 4. By continually comparing the concepts to the objective world phenomena, the first step in testing a theory takes place.
STEP 5. By continually analyzing the data and comparing new data against the concepts, the researcher works to integrate, simplify, and reduce the concepts, seeking to establish core concepts.
STEP 6. The researcher prepares "theoretical memos" (these are simply preliminary attempts to spell out possible connections and/or theoretical explanations). This is now a continuing process, requiring the researcher to continually test and revise possible theory.
STEP 7. The researcher continues to collect data and to code data by categories and or characteristics, while also producing theoretical interpretations of the material; this often requires the researcher to go back and repeat earlier steps in the process.
STEP 8. The researcher prepares a final research report. In grounded theory research, this is not simply a "detached, mechanical process"; it is instead a key part of the research process.

Source: After Lee 1999.

Research topics for grounded theory research are not hard to come by; they are everywhere in the researcher's field of interest, career field, and the practice of politics. The key thing to avoid in grounded theory is approaching a study area with a preconceived hypothesis. Hypotheses *must* come from the data. Glaser, warning budding researchers to avoid misleading advice, cautioned:

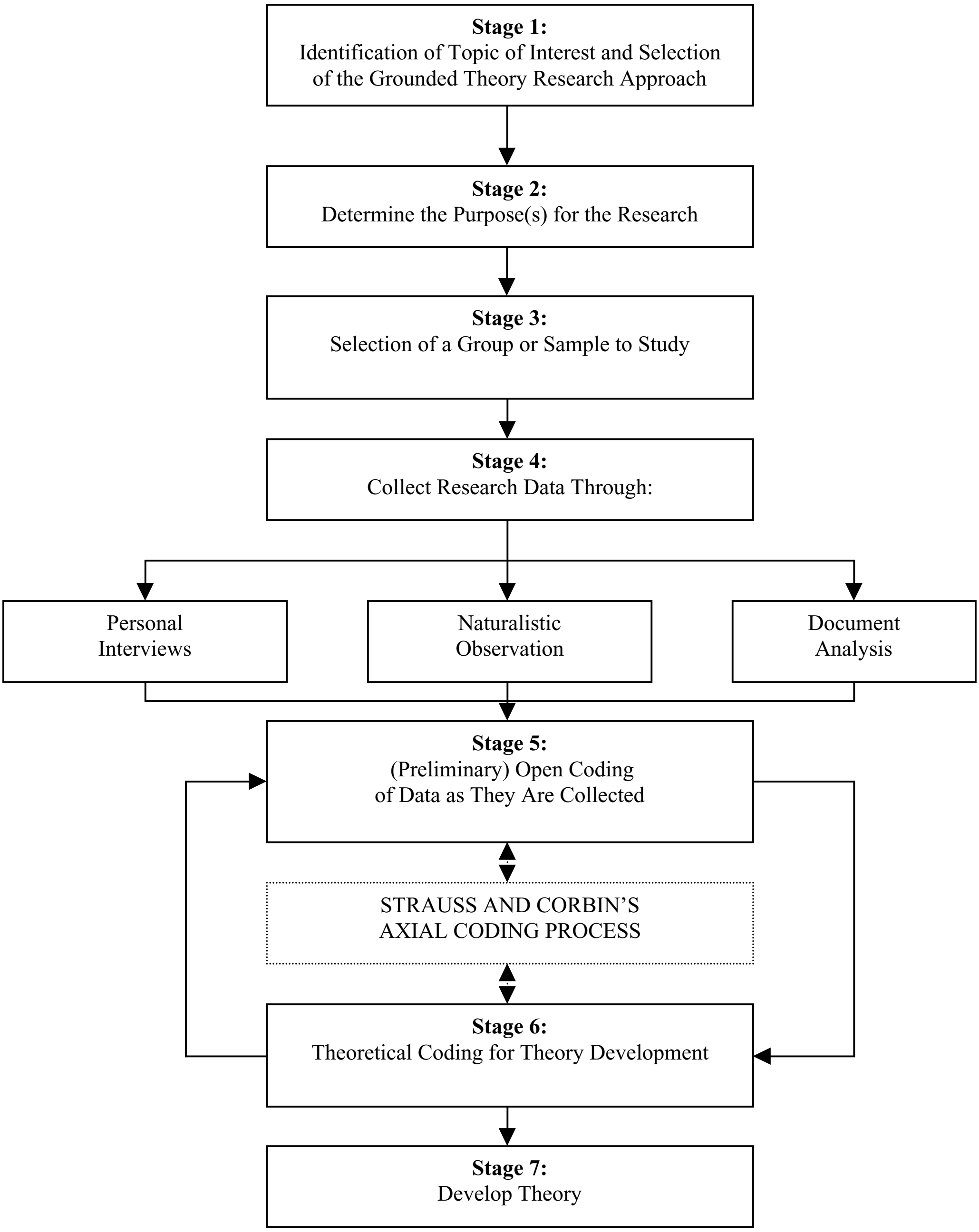
> When a research problem is elusive or hard to come by a lot of people tend to give advice . . . the researcher's search for the preconceived problem is subject to the whims and wisdoms of advisors with much experience and of colleagues. He (or she) should be careful as he may just end up studying his advisor's pet problem with no yield for him and data for the advisor. And he will likely miss the relevance in the data. (Glaser 1992, 23)

Moreover, Glaser added that it is important to remember that the identification of a research question is not a statement that clearly and succinctly identifies the topic that is going to be studied. Rather, the problem emerges from the data as they are collected. Open coding, selective (theoretical) sampling, and constant analysis of this information—these form a focus for the research study.

Stage 2. Determine a Purpose for the Research

Glaser and Strauss (1967) identified five main purposes or uses for grounded theory. These are: *evaluating evidence*, *establishing generalizations from the data*, *specifying a concept*, *verifying a theory*, and *generating theory*. In the first, *evaluating evidence*, data from additional groups are collected to compare with data that have already been collected for the purpose of assessing whether the first evidence was correct. This often serves as a test for replicability, and can be ap-

Figure 18.3 **A Glaser and Strauss Model of the Grounded Theory Data Collection and Coding Processes**



plied for validating both internal evidence (from within the study group) and external evidence (data from sources other than the study group).

It can also be a powerful and important use for grounded theory because a study's categories and properties are generated from collected evidence. Collected and compared evidence is used for a defining illustration of the conceptual category. Glaser and Strauss (1967, 23) considered these categories to be the fundamental building block of theory: "In generating theory, it is not the fact upon which we stand but the conceptual category that was generated from it."

The second purpose of grounded theory is *establishing generalizations from the data.* If a theory is to emerge from the collected "facts," they must be generalizable to other situations or they remain isolated bits of data—interesting but irrelevant. If they are applicable only to a single case, group, circumstance, or situation, they remain descriptors of only that specific phenomenon. In searching for generalizations, or *universals*, the researcher establishes boundaries of applicability, while at the same time attempting to broaden the theory.

The third purpose is *specifying a concept.* This design requires specific identification of a study sample or population for a one-case study. Grounded theory's comparative evaluations are used to clearly identify the key dimensions (i.e., key *concept* or concepts) that make the study group distinctive. It tells your readers why you chose to study one group and not another. It involves comparing the unit of analysis (individuals or groups) selected for the study with other units that are not selected. This comparison often brings to light the distinctive properties of the selected unit.

For example, a study of homeless women—such as Alisse Waterston's (1999) *Love, Sorrow, and Rage: Destitute Women in a Manhattan Residence*—has many different categories of subjects from which to select for a subject sample. Waterston chose to study a group of HIV-positive or possible HIV-positive homeless women residing at a shelter in a metropolitan area. Waterston could have begun her data analysis with a comparison of the characteristics of this study group with other similar groups of at-risk women. By revealing the specific characteristics of the study group that are of interest to the research, the reader will be unlikely to confuse members of the study group with others who are not included.

Verifying a theory is the fourth purpose for using grounded theory. When conducting this type of research study for the purpose of verifying an existing theory, the researcher focuses on finding information that corroborates the existing concept. In the process, the researcher generates new theories only for the purpose of adjusting or modifying the original theory. No new theories are sought. Neither Glaser nor Strauss said much about this potential use for the grounded theory method, emphasizing instead its role in generating new theory.

The fifth purpose, and the one for which the method is named, is *generating theory that is related to the research topic.* This is the primary purpose of grounded theory research; the researcher's main goal is the systematic generation of new theories from the data collected. There are two broad types of theory that can be generated through this process: substantive and formal. *Substantive* theory addresses specific, empirical, or applied tasks in public administration, such as police and fire department community relations, management development programs and employee training, solid waste disposal, water purity, road construction, city planning, and similar items. *Formal* theory, on the other hand, deals with broader, often philosophical issues. Example topic areas include public participation in the democratic process, authority and power in management situations, reward systems, and so forth.

Both of these applications are what Glaser and Strauss (1967, 32) identified as "middle-range," meaning they fall somewhere between practical working hypothesis in the everyday conduct of an administrator's job, and all-inclusive *grand theories*, such as global warming. It is important to note that both of these types of theories must be grounded in data if they are to be accepted as relevant.

Stage 3. Select a Group to Study

According to Strauss and Corbin, determining where to go to get the data needed for a research study remains one of the major issues confronting grounded theory researchers. Researchers need to know who can provide the information that illustrates the central or core concept in the study. They call this the *theoretical sampling problem* and define it as the process of picking the sources that can provide the most information about the research topic. The aim of theoretical sampling is "to maximize opportunities to compare events, incidents, or happenings to determine how a category varies in terms of its properties and dimensions."

This suggests that the researcher must be more concerned with ensuring the representativeness of the sample than in the concept of randomness. Researchers are encouraged to carefully select the subjects from whom information will be acquired. This becomes even more important as the study progresses. Sampling must become more specific with time because the theory that is emerging must eventually control the sample selection. Once some categories are established, all further sampling must be focused on developing, solidifying, and enriching the formed categories. Accordingly,

> The basic question in theoretical sampling is: what groups or subgroups does one turn to next in data collections. And for what theoretical purpose? In short, how does the [researcher] select multiple comparison groups? The possibilities of multiple comparisons are infinite, and so groups must be chosen according to theoretical criteria. (Glaser and Strauss 1967, 47)

Stage 4. Collect Research Data

There are no restrictions to how data are collected in a grounded theory design. However, most researchers use personal interviews, simple or naturalistic observation, and narratives, and often include some document or artifact analysis. One of the distinctive characteristics of the grounded theory method is that the data collection, coding, and interpretation stages of the research are carried out in concert, not as individual activities. One leads to the other, then on to the next, and back again. These steps "should blur and intertwine continually, from the beginning of an investigation to its end." Grounded theory methodology can be used for arriving at theories from data that are collected in any type of social research—quantitative and qualitative. All theories are developed for one or both of two fundamental purposes: to explain or to predict.

Stage 5. Open Coding of Data

Coding is the process of applying some conceptually meaningful set of identifiers to the concepts, categories, and characteristics. The key things to remember about open coding are that it is always the *initial* step in data analysis, and that its purpose is to establish (or *discover*) categories and their properties.

Open coding is the free assignment of data to what the researcher sees as the naturally appearing groupings of ideas in the data (Lee 1999). As many categories as needed can be created. These can be looked upon as the fundamental, explanatory factors that identify the central research concept. Each category contains as many bits of data (*datum*) as found to fit in that category. Data bits are more or less indivisible, and intuitively fit into just one category.

The open coding process continues until one or more "core categories" are established. Then, the coding process turns either to Strauss and Corbin's *axial coding*, using preconceived categories,

Table 18.2

Twelve Tactics for Generating Meaning in Conceptual Categories

1. Counting	7. Particular to general
2. Noting patterns, themes	8. Factoring
3. Seeing plausibility	9. Relationships
4. Clustering	10. Finding intervening variables
5. Making metaphors	11. Chain of evidence
6. Splitting variables	12. Theoretical coherence

Source: Miles and Huberman 1994, 215.

or proceeds directly to the theoretical coding identified by Glaser and Strauss (1967) or Glaser (1992). *Axial coding* refers to the process of assigning categories into more-inclusive groupings. Strauss and Corbin urged the researcher to use the six second-level classifications they proposed. Lee (1999), on the other hand, following the original Glaser and Strauss (1967) model, called for the researcher to propose the axial categories. In this process, the researcher first comes up with several categories that seem to bridge all the open-coded categories. Then the researcher examines all the open categories to see which fit within the selected second-level category. The remaining data are then compared across these second level categories. The process continues until all the data have been compared against all the second-level categories and classified. Additional axial categories might have to be added to encompass all the data.

There are no hard-and-fast rules for grounded theory research (Lee 1999). Even the inventors of the method disagree about how to go about coding and categorizing collected data. There are also many different ways to discover or establish meaningful categorical distinctions in data. Miles and Huberman (1994), for example, discuss twelve different ways to go about developing codes for raw data (see Table 18.2)

An example of a code set developed for an educational site study can be found in Miles and Huberman (1994, 58). These five broad constructs (categories) and their codes were proposed in the preliminary coding: innovation properties (IP), external context (EC), internal context (IC), adoption process (AP), and site dynamics and transformations (TR). These five constructs are the core categories of this study.

A different number of characteristics/dimensions were identified for each of the categories. Five of the characteristics that were determined to contribute to the innovation properties category were: objectives, organization, implied changes–classroom, implied changes–organization, and user salience.

A complete set of definitions was developed for each of the categories and the specific characteristics associated with the category. For example, in the site dynamics and transformations (TR) category, the code TR-START was assigned to data that fell into the "initial user experience" category and dimension. The definition for this code was: "Emotions, events, problems or concerns, assessments, made by teachers and administrators during the first six months of implementation." Similar definitions are produced for every category/dimension in the study.

Glaser is adamant that open coding and category building *not* be forced into any preconceived second-level (axial) groupings. Strauss and Corbin, on the other hand, give the researcher more leeway in this decision. As a result, both approaches to grounded theory coding are found in the research literature. There is no disagreement regarding the third (and final) coding process: selective (or *theoretical*) coding.

Stage 6. Selective (or Theoretical) Coding of Data

Selective or theoretical coding is the name given to the process of imposing a final structure to the data and establishing rank-order importance of the conceptual categories (Lee 1999). Just as in the second-level coding process, the research proposes a small number of overarching categories. Next, these categories are ordered according to how the researcher sees their potential to contain or explain the collected data. In the third step, the researcher picks what he or she estimates is the most powerful or important category; all of the data are then judged for their fit in that theoretical category. The researcher then repeats the process, using the second most important category and all remaining data for fit in this category. The process continues until all data are categorized. The researcher is then ready to develop theory about the phenomenon.

The underlying purpose of all theory is to explain and/or predict. The purpose of the theoretical coding stage is to identify the relationships between categories and their properties as they are found in the data. Theories are built in a process that moves from the *specific* (individual examples, incidences, or cases, for example) to the general. In this way, the researcher develops a *theory* that is applicable (explains and/or predicts) to more than the individual example, incidence, or case. The process occurs in the following six stages (Miller and Fredericks 1996):

1. Preliminary (open) categories are formed from the first data collected.
2. More general or broad categories that include preliminary groupings are formed from this and new data as they are added to the analysis.
3. Categories are further refined and defined.
4. A set of *core* categories is finally accepted.
5. As data are analyzed, they are assigned as *characteristics* or *dimensions* of these core categories.
6. Continual comparison may produce a revised coding scheme, which, in turn, may require revisions to the characteristics/dimensions of the codes.

Step 7: The Final Stage—Development of a Theory

This is the culmination of all preceding activities in the process: forming a theory that is grounded in the data. Although it is last in this process model, theory development is not "saved for last." Rather, at each stage in the process of grounded theory, the researcher prepares *theoretical memos* in which he or she records ideas, conclusions, propositions, and theoretical explanations of the phenomena under study.

These memos serve as summaries of the researcher's conclusions—recorded as they are being formed—and, as such, are the grist from which a *theory* or set of hypotheses are developed. To qualify as a *grounded theory*, a theory must exhibit these key characteristics (Locke 1996):

1. The theory must closely fit the topic and disciplinary area studied.
2. The theory must be understandable to and useful to the actors in the studied situation.
3. Finally, the theory must be complex enough to account for a large portion, if not most, of the variation in the area studied.

A Brief Caveat About the Method

Often, grounded theory research results neglect to address the issue of theory in the presentation of their findings. This does not take anything away from the process, however, because in describing what was discovered from the research and proposing specific recommendations, some *derived theory* must underlie the conclusions. It is just a matter of putting it into words. The researcher would not have the confidence necessary to make recommendations regarding the findings unless he or she were sufficiently confident in the theoretical conclusions derived from the data.

One of the reasons why Strauss and Corbin proposed their six pre-established categories for the second-level or *axial coding* step was because they saw that their graduate students were having great difficulty in conceptualizing the necessary categories for collected data. Lee also commented on the difficulty of the method:

> Grounded theory is a long-term, labor intensive and time-consuming process. It requires multiple waves of data collection, with each wave of data based on theoretical sampling. In addition, the iterative process should continue until a theoretical saturation is achieved. Given all this, researchers should avoid grounded theory approaches unless they can commit substantial resources to a study. (Lee 1999, 50)

Grounded Theory Research in Practice

King, Feltey, and Susel (1998) used grounded theory methodology in their study of the underlying causes of public antipathy in the political process and ways to improve participation in public administration policymaking decisions. Using personal interviews and focus group discussions, they gathered data from private citizens and public administrators from several communities in Ohio. Focus group participants were asked to respond freely to four broad questions:

1. How can more effective public participation be achieved?
2. What does public participation mean to the participant?
3. What are the barriers to participation?
4. What advice do you have for people trying to bring about more and more diverse participation?

Their analysis occurred in two stages. First, in the open stage of their coding, the transcribed interviews were coded by each researcher working independently and using a qualitative form of content analysis. Second, the researchers synthesized the individually coded responses to come up with a set of categories and themes. These were discussed in detail in their report. Specific quotations from respondents were woven throughout their final narrative, thus providing insightful reinforcement of the thematic concepts they drew from the data.

King, Feltey, and Susel (1998) identified three categories of barriers to effective public participation: (1) contemporary lifestyles, (2) existing administrative practices, and (3) current techniques for participation. The pressures and complexity of daily life, together with certain demographic factors such as class, income, education, family size, and a breakdown in traditional neighborhood ties, were identified as probable causes for the lack of public participation in the communities studied.

The theory generated from this research included a three-part proposal for dealing with the three sets of barriers to participation. First, citizens within the community must be "empowered," while at the same time, citizens need to be educated in ways to organize and research issues and policies. Second, public administrators must be reeducated; their traditional role of "expert manager" must be replaced with one of "cooperative participant," or "partner." Administrators must also develop their interpersonal skills, including listening, team building, and the like. Finally, the structures and processes of administration must be changed to make it easier for the public to become involved in and contribute to the policy formation process.

Grounded Theory and Public Policy

Cook and Barry (1995) used the grounded theory method to research the public policy interactions between the public and private sectors. They chose the grounded theory method because of what they saw as the "paucity of work" in the area, and because of a desire to build a rich description of the business owners' ideas and beliefs about public policy and their ability to help shape it.

Over a two-year study, they conducted 31 in-depth interviews with owners in 27 firms, together with three government administrators. All of the executives were owners of their firms. In addition to these in-depth interviews, Cook and Barry also attended 9 trade association meetings with a government-relations focus; more than 50 additional executives participated in the meetings. Concluding their data-gathering process, they examined more than 150 public documents, papers, memos, and newspaper stories.

In an example of what is clearly one of the major disadvantages of the method—an overabundance of raw data—Cook and Barry reported that their initial transcripts produced more than 700 individual pages of data. Before they could code and analyze the data, they were forced to produce detailed abstracts of each transcript, thus eliminating some 60 percent of the original data.

Two levels of coding were then used on the remaining data: "received" coding and "emergent" coding. The first level was derived from their review of the literature in the field, their prior learning and biases, and categories that the interviewees themselves used. These were primarily descriptive and definitional in nature. These codes were than merged into broader codes—what the authors called *overarching dimensions*—that related to issues, issue characteristics, and the influence process.

In the sense of *theory*, Cook and Barry found it to be "evident" that interactions between owners of small firms and policymakers helped to create a system for interpreting and making sense of the process. These determined (1) whether a small business executive would commit to working on a policy issue, and (2) how he or she would carry out that work. Executives tended to agree to work on issues that they believed they had some possibility of influencing, and to not concern themselves with policy questions that they felt were beyond their reach.

Summary

Grounded theory is a general qualitative research method that can be used on any data or combination of data. It was developed initially for use with quantitative and/or qualitative data. However, quantitative data often are expensive and difficult to obtain. On the other hand, qualitative data are inexpensive to collect; they can be very rich in meaning and observation, and are often rewarding to collect and analyze. So, by default to ease and growing use, grounded theory research today is linked to *qualitative* data; it is classified as a qualitative method that uses symbolic interaction (Glaser 1992).

The grounded theory research process begins with focusing on some area of study—a phenomenon, circumstance, trend, or behavior in any of the social or administrative science areas. Using observation and interviewing, among other methods, researchers gather relevant data from as many different sources as are available. Analysis of the data begins with grouping it into categories and assigning codes. Through a process of continually comparing data with other categories, theory can be generated.

Completion of a grounded theory research project results in the researcher identifying (1) one or more core concepts that relate to the issue of interest, (2) examples in the data that are representative of each core concept, and (3) an indication of a set of relationships between the core concepts and their example indicators. It is important to remember that grounded theory research involves a long-term, laborious, and time-consuming process. The researcher should have a substantial grounding in the area of interest and the ability to formulate a broad, meaningful conceptual interest area.

Discussion Questions

1. Define and describe the grounded theory approach to qualitative research.
2. Describe the *symbolic interactionism* concept developed by Mead and the additions that others have made to his theory.
3. Why was grounded theory first developed, and what made it so popular so quickly?
4. Discuss the importance of grouping and coding to grounded theory research.
5. Compare the *Straussian* and the *Glaserian* approaches to grounded theory.
6. Name and discuss the seven steps in the grounded theory research process.
7. What is *open coding*?
8. Discuss the example of grounded theory research in public policy included in the chapter.

Additional Reading

Charon, Joel M. 2006. *Symbolic Interactionism: An Introduction, An Interpretation.* 9th ed. Upper Saddle River, NJ: Prentice Hall.

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Miles, Mathew B., and A. Michael Huberman, eds. 1994. *Qualitative Data Analysis: A Sourcebook of New Methods.* 2nd ed. Beverly Hills, CA: Sage.

Strauss, Anselm, and Juliet Corbin. 1998. *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory.* 2nd ed. Thousand Oaks, CA: Sage.

19 The Interpretive Approach II: Ethnographic Research Methods

Ethnographic methods are not often employed in political science research, but when they are, they can provide great quantities of important information. The main reason for their infrequent use is that these study designs typically require more time to conduct than researchers are able to devote to their research projects. In their parent disciplines of anthropology and sociology, ethnographic studies may take as long as six months to a year or more to complete. When they can be used in political science research, however, they have the potential to produce powerful narratives that provide deep insight into the needs of society.

The practice "thick description" is a hallmark of all ethnographic research. *Thick description* refers to research notes that exhibit the great depth and detailed complexity found in ethnographic reports. An example is the description of a social event that might last three minutes or less, but takes up many pages of descriptive narrative. This use of detailed description means that ethnographic methods can be an excellent design choice when the study objective is to provide deep background information for long-term, strategic public policy forming. On the other hand, ethnographic methods are generally not appropriate when a management decision must be made immediately on the basis of the findings of the research.

Despite their drawbacks, ethnographic methods have a long and important history in research in the social and human sciences. They can be traced at least as far back as the Industrial Revolution, if not longer (Neuman 2000, 346).

Industrialization and the Social Sciences

A by-product of the industrialization of Western society was a belief by some observers that factory labor was dehumanizing society; unskilled workers were often seen as just another easily replaceable component in the production process. Beginning in the nineteenth century, however, concern over the deteriorating human condition in tenements and factories resulted in calls for changes in the way society treated its citizens. An increasingly educated public, the clergy, and a few in the governing elite came to recognize that the deterioration in social conditions needed to be stopped and, if possible, reversed. These early critics looked to *science* for solutions to the problems of the new industrialized society.

This faith in the power of science to produce answers to the problems of society encouraged adoption of a "scientific approach" to the study of the social problems and needed changes. If advances in the natural sciences and technology could be *profitably* applied to problems in industrial invention and innovation, it was reasoned, why couldn't they also be applied to solving social problems? If science could be used to improve production, why couldn't it also be used to improve everyone's quality of life?

The Contribution of Anthropology

Anthropology, one of the source disciplines for ethnographic research, has three main focuses: *cultural anthropology*, *physical anthropology*, and *archeology*.

Cultural anthropology, originally devoted almost exclusively to the study of distant and unfamiliar cultures, was soon found to be an appropriate way of studying less complex but still-modern world societies that had remained in relative isolation from the emerging industrialized world (Alasuutari 1995). From that expanded application it was not long before anthropology and its research tool, ethnography, were seen to have a place in the study of modern cultures and subcultures.

Physical anthropologists followed the lead of Darwinian ideas and began to seek answers to questions that dealt with the evolution of humankind. Physical anthropologists are sometimes called in to assist forensic scientists in the identification of crime and accident victims, and to aid in the design of living and work spaces, including furniture and tools.

Archaeologists were at one time included under the cultural anthropology umbrella, but found their own niche by focusing on studies of ancient and unknown material cultures. Today, however, archaeologists can be found conducting analyses of relatively recently deposited cultural artifacts. An example is the archaeological study of garbage dumps to depict trends in fashion, invention, and other descriptions of cultural artifacts.

The Contribution of Sociology

The traditional focus of sociology—another discipline that uses ethnographic methods in research—has also changed. Initially, the purpose of sociological research was to identify cause-and-effect relationships between the perceived ills and abuses of the new industrial society and the lives of adults and children forced to live and work in crowded, dangerous, and often unsanitary conditions.

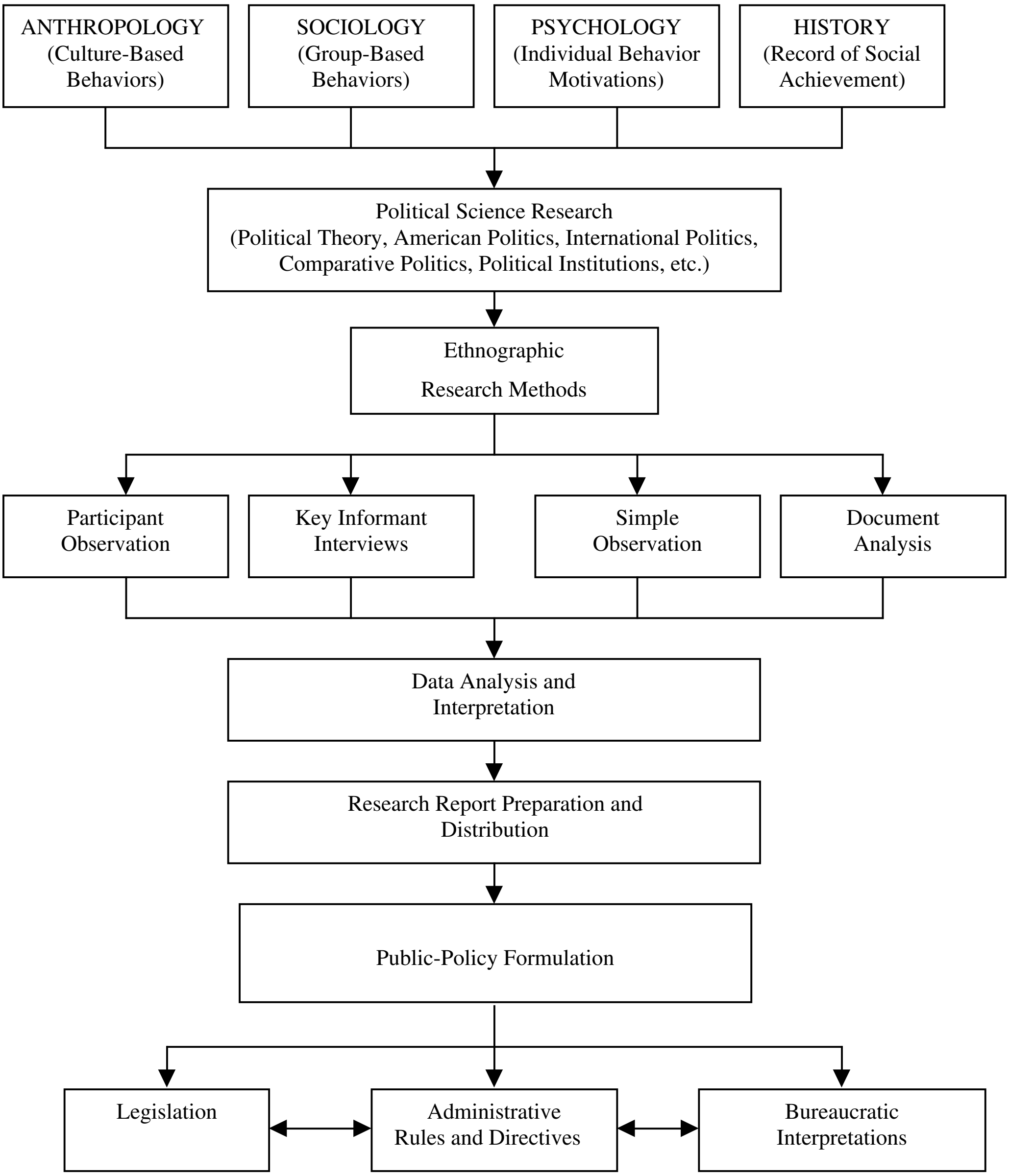
Because of the continually evolving nature of the focus of study for the social sciences, a new direction for ethnographic research has emerged. Ethnographic studies are carried out in the inner cities of modern societies, in suburban and rural settings, in cross-cultural situations, in large and small organizations, and in investigations into any way in which the social forces of culture and subculture impact people. More important, however, may be the emphasis on *interpreting* social behavior—including political behavior—that has replaced the earlier model of simply *describing* it. The ethnographer has thus taken on the important task of contributing to the formation of public policy.

Through an eclectic process of trial and error, anthropologists and sociologists developed a way of conducting research that allowed them to meet their study objectives in all kinds of social and cultural settings. Researchers in political science have also adopted the ethnographic research method. Among other applications, ethnography has become one of several important approaches for the study of the groups in the polity, the act of governance, the grass roots formation of public policy, and the administration of diverse agencies and functions of government.

Ethnography, Ethology, or Ethnology?

Ethnographic research has several different forms. Among these are ethnography, ethology, and ethnology (see Figure 19.1). *Ethnography* is the descriptive study of living cultures, while *ethnol-*

Figure 19.1 **A Model of How Ethnographic Research Is Used to Shape Public Policy**



ogy refers to the activity of *using* the information gathered by ethnography (Encyclopedia.com 2008). Thus, a public administrator might use an ethnological report in the process of framing public policy. *Ethology*, on the other hand, is simply a different approach to the research process; it refers to the somewhat less-intense practice of simple observation (Jones 1996).

Ethology is most commonly encountered in the context of animal behavior studies, although a branch seeks to apply ethological principles to human behavior as well. Ethnography involves actively observing, recording, and explaining why a culture is described in the way it is by the ethnographer. While ethnography is sometimes used as a synonym for "participant observation," ethology is used as a synonym for "simple" or unobtrusive observation.

Ethnographers immerse themselves into the day-to-day activities of the group they are studying. The goal is to learn as much as they can about the behaviors and social processes taking place in the culture. They do this in order to (1) describe the setting in as much detail as possible (a process called *thick description*), and (2) to come up with some theoretical ideas that allows them to interpret and explain what they have seen and heard.

Terry Williams (1996, 31), writing about his ethnographic study of the cocaine subculture in New York after-hours clubs during the 1970s and 1980s, defined ethnography as a "science of cultural description; more than that, it is a methodology. It is a way of looking at people, a way of looking at a culture. It is recording how people perceive, construct and interact in their own private world."

Ethnographers live, work, and play with their study populations for long periods of time. Their aim is to be absorbed into the group. Their underlying objective is to be "accepted" as a non-threatening or nonintrusive member of the group. Then events and interrelationships will unfold as they would naturally, as if the observer were not in attendance. This process is called "gaining entry" and is the key to a successful research project. Without acceptance, without entry into the inner workings of the group, the researcher remains an outsider; he or she is then perceived as a threat and subsequently either shunned or lied to, at best.

The process of living with a social group (doing fieldwork) involves observing and recording individuals' behaviors. The ethnographer summarizes these field notes into a larger descriptive generalization that is purported to describe the behavior of the larger society. The researcher must then develop *subjective descriptions* that are based on a large number of *generalizations*. In making these generalizations, the ethnographer moves from the specific to the general. That is, the behaviors of one or a small group are used to infer that those behaviors are also those of the larger groups in similar circumstances. The ethnographer should also develop *interpretations* of the observed behaviors; the question "why" should be answered to the best of the ethnographer's ability.

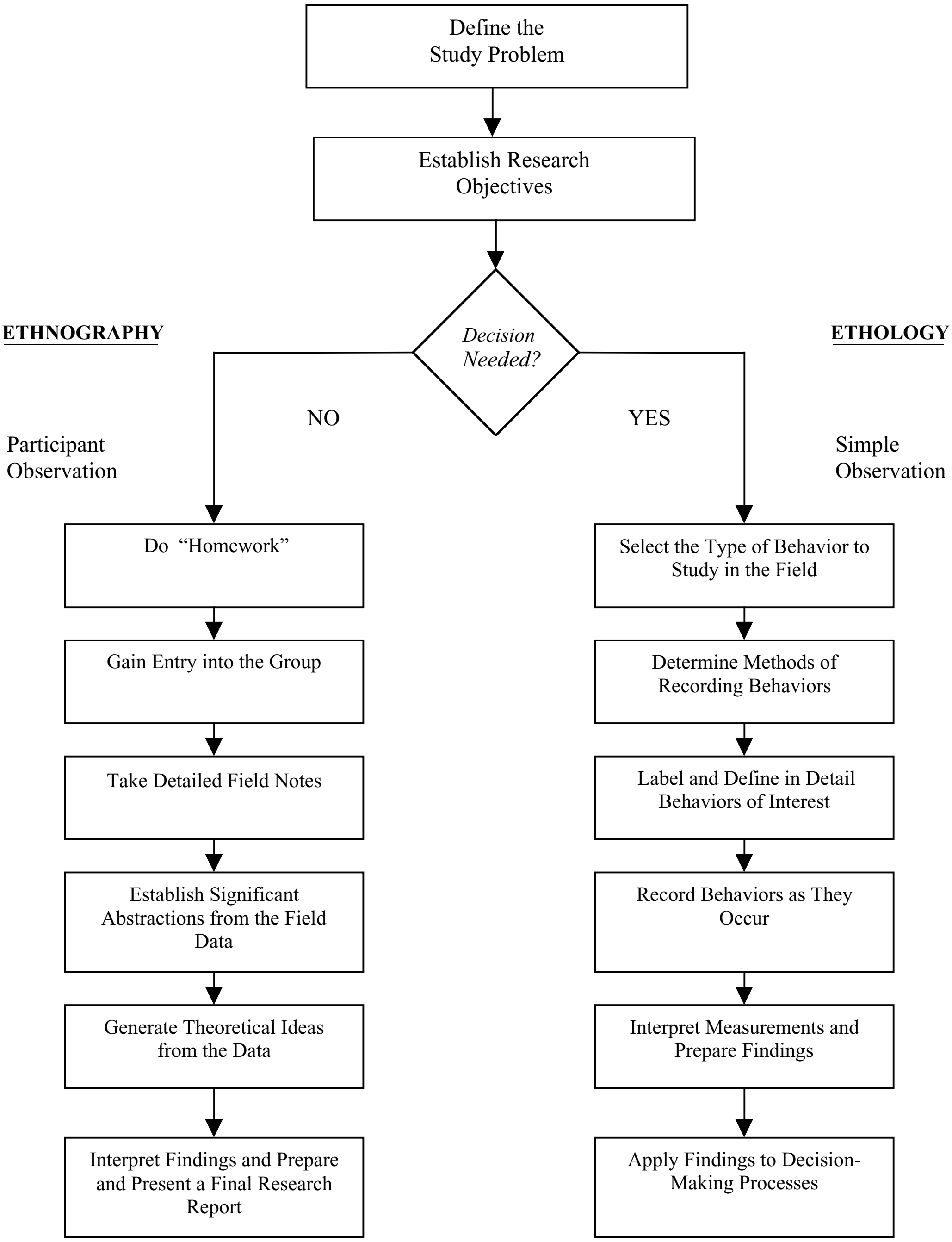
According to Jones (1996), one of the major attractions of ethnography for field researchers is that it permits them to develop meaningful, coherent pictures of the social group and setting. Researchers get to see the phenomenon as a whole, in all of its complexity, and not just bits and pieces. Jones also suggested a way to differentiate between ethnological and ethological research involving human behavior.

The key differentiating characteristic is whether the research is conducted to develop a theory or to provide background information needed to make a management decision. Figure 19.2 illustrates that, despite the different steps involved in the two approaches, they are very similar. For most of the early history of ethnography, study results were often little more than simple descriptions; interpretation of the event, setting, or behavior was left to the reader.

This often resulted in questioning confidence in the *validity* of ethnographic generalizations. The following statement illustrates the older paradigm: "Ethnographic generalizations are by themselves only best fit statements about the incidence or frequency of occurrences in the society. By themselves they say little or nothing about what goes with what" (Cohen 1973, 37). Cohen's solution to this problem was to call for more correlational or *causal* research into ethnography. This, he believed, would improve validity by improving interpretation.

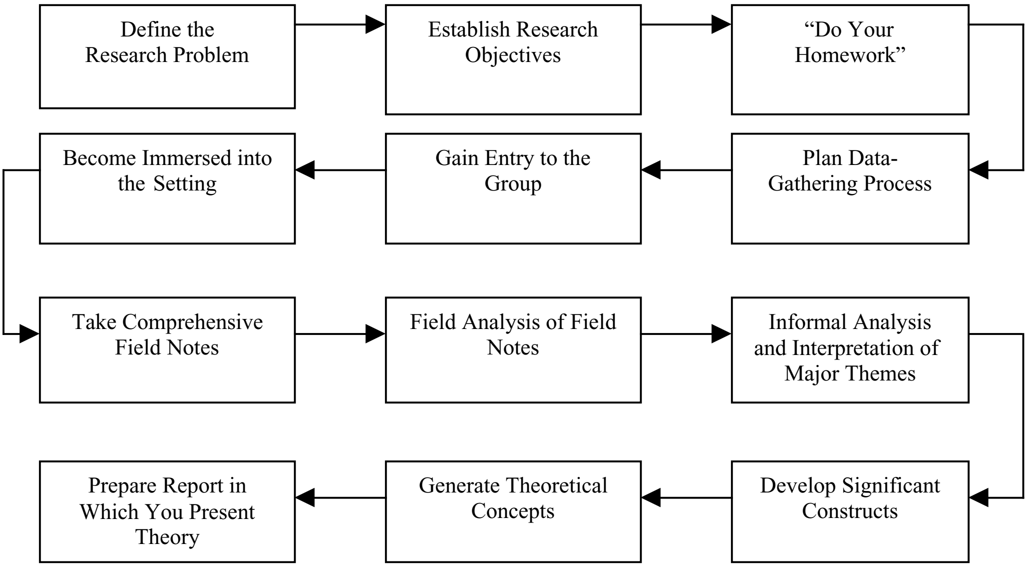
According to Whiting and Whiting (1973), ethnographers collect samples of types of behavior in order to understand the cognitive and social-structure *regularities* in a society. Ethnographers study the roles people adopt, economic systems, political systems, religious systems, personality, and many other aspects of any or all types of social organizations and systems.

Figure 19.2 **Fieldwork Processes for Ethnography and Ethology**



Source: After Jones 1996, Chapter 3.

Figure 19.3 **Ethnographic Fieldwork, Analysis and Presentation Processes**



Source: After Jones 1996.

Duveen (2000) has described the work that ethnographers do as the production of *thick description*, and sees it as a two-part process. First, the researcher writes down everything that he or she sees. Duveen refers to the thick description of events, settings, and behaviors as capturing the sense of the social actors, groups, and institutions being described. Second, he called attention to the fact that the researchers' own interpretations of what are recorded influence the final description. Together, the two-part process of observation-interpretation moves from one activity to the other, then backward to repeat itself again and again.

Figure 19.3 is a chart illustrating the key processes involved in conducting and presenting the results of an ethnographic study. It illustrates the several different layers of observation-interpretation that characterize good ethnographic fieldwork, field notes, and final report preparation.

Ethnographic methods are employed in a number of different forms. Examples of these variations are *ethnomethodology*, *community-based ethnography*, and *ethology*. Each of these research approaches has its own advocates and detractors, but all are considered to fall under the larger category of *field research*.

Ethnomethodology has been defined by Neuman (2000, 348) as "the study of commonsense knowledge." It combines themes from sociology and philosophy, and is usually seen as an application of *phenomenology* (Adler and Adler 1998). Researchers who follow this approach focus their concern on how people go about living their everyday lives.

Ethnomethodologists study mundane, everyday behaviors in exceptionally close detail. They often use mechanical and electronic methods of recording the behavior of people. They then analyze in minute detail these audio- and videotapes, films, and other records, using what Adler and Adler (1998, 99) have described as "an intricate notational system that allows [them] to view the conversational overlaps, pauses, and intonations to within one-tenth of a second . . . they have directed a particular emphasis toward conversation analysis."

Community-based ethnography (CBR) is closely associated with the critical approach known as *action research* (Stringer 1997) and has been used primarily in research in education. Stringer described the purpose of community-based research as a way of providing workers in professional and community groups with knowledge that is normally only used by academic researchers. As with all action research, CBR is designed to help people expand their knowledge and understanding of a situation, and on their own to come up with effective solutions to the problems they face. Everyone—researcher and researched—is involved in the process. Stringer (1997, 17–18), describes CBR as:

> intrinsically participatory; its products are not outsider accounts, portrayals, or reports, but collaborative accounts written from the emic—or insider—perspective of the group. Such accounts, grounded in hermeneutic, meaning-making processes of dialogue, negotiation, and consensus, provide the basis for group, community, or organization action. People can review their activities, develop plans, and resolve problems, initiate projects, or restructure an organization."

Applying Ethological Methodology

Ethology research addresses many of the same issues addressed by traditional ethnography. Initially, the method focused primarily on animal behavior—Charles Darwin, for example, is considered to have been one of the pioneers in this field of research. Today, however, this approach is often used in organizational research, where it is employed for identifying and describing behavior in social settings.

The approach taken in an ethology study involves *simple observation*, which can be either visible or hidden (unobtrusive). Organ and Bateman (1991), discussing ethologic observation in the context of organizational behavior research, referred to the method as *naturalistic observation.* They identified a number of appealing characteristics, as well as some of the shortcomings, for this approach.

Possibly the most important advantage is what Organ and Bateman call the *contextual richness* that is possible with observation (36). Because the observation approach makes it possible for the researcher to provide extensive detail in researcher findings, this approach has gained wide acceptance over the years; its use can be seen in many published articles, books, autobiographies, newspaper stories, conversations, and speeches.

In addition to this extensive body of available literature, the natural experience that researchers gained from working in and dealing with organizations of all types, sizes, and purposes is also an advantage. This is what is referred to as the *richness in personal insight* of naturalistic observation in organizational research. Summarizing their critique of the method, Organ and Bateman concluded:

> [Simple] observation is an attractive method of research because it confronts its subject head-on. It deals with raw, real-world behavior. Because the data are rich with the drama of human existence, it is easy to relate to accounts of these studies. (Organ and Bateman 1991, 37)

Among the disadvantages of observation is that it often results in a report bias that is traceable to the natural tendency of people to exercise *selective perception* and *selective retention*. Selective perception means that from all the myriad stimuli that we encounter, everyone sees what they want to see, what they are interested in, and what they think is important. Whether they do so consciously or unconsciously, people ignore much of what else goes on.

This idea has been suggested by a number of different investigators. John Dewey, for example, noted that human perception is never neutral. Rather, human knowledge and intelligence, what we think of as *past experience*, always influences perception. Furthermore, judgment is involved in all perception. Otherwise, the perception is nothing more than a form of what is called *sensory excitation* (Phillips 1987, 9).

According to Hanson (1958), the theories, hypotheses, frameworks, or background knowledge held by researchers have the power to influence everything that is observed. Therefore, observation cannot have a neutral foundation. The process of observation is unconsciously influenced by the ideas, theories, hypotheses, or general knowledge that the researcher holds going into the observation.

Selective retention means that people usually remember what they *think* was said, what they *wanted* to hear, what they *believe* occurred, or what fits within their personal framing of the issue. Hence, what is remembered is inherently subjective; it can never be considered the "Truth."

Because observation is recorded as the field notes of one or more researchers, it will always contain what the researcher *feels* is important, or the researcher's belief about what action or actions caused or influenced a reaction. Field notes will often omit what the researcher believes to be trivial or unimportant. We are all drawn to dramatic or exciting situations—they make for interesting reading, even when they have little or no bearing on the central issue or issues.

Field notes and the material that is eventually included in a report pass through a filter formed from the perceptions and memory of events held by the researcher. Therefore, researchers must always struggle with the answerable question: Would another observer have drawn the same conclusion from these events? Researchers use thick description in an attempt to provide an answer.

Conducting Ethnographic Fieldwork

All variations of ethnography involve fieldwork. *Ethnographic fieldwork* includes such activities as (1) engaging in participant observation, (2) collecting genealogies, (3) recording conversations, (4) writing field notes, (5) interpreting the findings, and (6) writing up the field notes and interpretations as reports. Field notes describe events, incidents that catch the researcher's eye, in addition to any and everything that is deemed to be relevant to the study at hand at the moment it occurs.

According to Fetterman (1989, 12), fieldwork is the key activity in all ethnographic research designs. Applying the basic concepts of anthropology, methods and techniques of collecting data, and data analysis are the fundamental elements of "doing ethnography." Major decisions in fieldwork involve the choice of what equipment to use—including tape recorders and video cameras.

Anthropologists and sociologists who study cultures firsthand have determined that the best way to do their fieldwork is with the process of *participant observation.* The early ethnographic researchers chose participant observation as their preferred way to function in the field for many reasons. One was the often great distances they had to travel simply to reach the study society. That meant that they were forced to spend longer periods with the groups under study simply to justify the cost and physical hardship they were often forced to endure. Living for long periods of time in the "primitive" community, sometimes in the same huts or shelters of the members of the society under study, researchers were forced into being participants in order to survive—not to mention understand what they were observing.

According to Bernard (1995), participant observation requires researchers to get close to people, making them comfortable enough to permit the researcher to observe and record observations about their lives. Establishing rapport with people in the new community means learning how to act in such a way that the people go about their day-to-day business when the researcher appears. Possibly most important, it means being able to retreat from the group-member role to think about what has been learned, and writing about it convincingly.

Ethnography in Political Science Research

When political science evolved into an academic discipline in its own light during the early decades of the twentieth century, its own journals, professional associations, conferences, and academic departments soon followed. Bits and pieces from all the social and behavioral sciences were incorporated into its structure—and its research methodology. It is important to remember that *all* the tools and methods used in political science research were invented for other purposes.

Ethnography has become one of the most widely applied qualitative research methods in all social science research, including political science. It has been shown to be a valuable tool for gathering information about behaviors embedded in, and specific to, *cultures* and *subcultures.* In its application during the early decades of the twentieth century, it was often used to identify administrative options for making decisions on matters of public policy.

Fetterman (1989, 11) has defined the method and its focus this way: "Ethnography is the art and science of describing a group or culture. The description may be of a small tribal group in some exotic land or a classroom in middle-class suburbia. [The] ethnographer writes about the routine, daily lives of people. The more predictable patterns of human thought and behavior are the focus of inquiry."

Ethnographic methods are used in administrative sciences to analyze and diagnose the *culture* and *operating climate* of organizations (Wilson 1989; Schein 1992). In this application, the purpose of the research is to improve the *practice* of administration in the public sector, while ethnographic research is a way of acquiring the information that makes such improvement possible.

Yeager (1989, 726) has described participant observation as an "old and widely used research method both in public administration and in other fields of study." In public administration use today, it incorporates many different techniques, including simple, group, and unobtrusive observations, depth-interviewing of key informants, ethnography, and controlled observation techniques. Yeager adds,

> Participant observation includes material that the observer gains directly from personally seeing or hearing an event occur. Often the participant observer establishes personal relationships with subjects and maintains those relationships over a period of time. . . . Rapport and trust are established with subjects to a far greater extent than in other methods. Typically, more exhaustive data are gathered on fewer subjects using participant observation than with other methods. (726)

Ethnographic field research requires the most intense connection between the researcher and the subjects of the study (Kornblum 1996); it is not unusual for ethnographers who have lived and worked within a group for many years to begin to take on a self-identity that places greater loyalty and connection to the study group than to the researcher's prior connections.

While similar in method and analysis, ethnography as it is applied today is far different from the ethnography that evolved with the social sciences more than a century ago. "Ethnography is no longer a method used only to study foreign cultures; it has also become a method to study what is foreign or strange in our society and how social subcultures or subworlds are constructed—the adventure that begins just around the corner" (Flick 1999a, 641).

As ethnography has moved beyond its original focus on describing small, distant, and primitive societies, or of examining the social disruption that was rooted in communities undergoing industrialization, it was used to study groups in locations that its founders would never have considered. One of these is the modern city.

Urbanism Research

According to Fox (1977, 9), there are several different directions being taken by urban political scientists and sociologists: the anthropology of urbanism, the anthropology of poverty in urban settings, and the anthropology of urbanization. Despite their differences, they all appear to have the following principles in common: First, there is near unanimous agreement among urban anthropologists that cities are important locations for research. Second, urban anthropologists are convinced that anthropology can make "important methodological and theoretical contributions to the study of urban place."

Ethnography and Organizational Culture

Every organization, whether in the public or private sector, has its own distinctive culture, as well as its distinct operating climate. The study of organizational culture owes much of its method and underlying principles to ideas produced through ethnographic research. Change-agent consultants working on organizational development projects with organizational culture are very likely to use either ethnographic or ethologic methodology for their data gathering. Organizational culture has been defined in many different ways, but most are similar to the following classic definition:

> Organizational culture is the shared and implicit assumptions held by a group and that determines how members of the group perceive, think about, and react to its various environments. (Schein 1992, 229)

Other definitions include those of Margulies and Wallace (1973), who defined culture as the learned beliefs, values, and patterns of behavior that characterize an organization; Peters and Waterman (1982) saw culture as the shared system of values that manifests itself through different cultural artifacts.

In addition to a culture, organizations can also be said to have a distinct operating *climate* that results from the interaction of employees, administrators, and managers functioning within that culture. *Operating climate* has been defined as a concept that reflects the content and strength of the salient values, attitudes, behaviors, and feelings of the people working in an organization (Payne 1971).

The study of culture in organizations is approached from two broad perspectives: (1) the traditional positivist approach, and (2) the postpositivist approach. Researchers who study organizational cultures from a positivist viewpoint hold the opinion that there are clear, easily identified dimensions of culture that can be measured (usually with a questionnaire).

McNabb and Sepic (1995), for example, developed a scale for diagnosing the organizational culture of an agency of the federal government. They used employees' attitudes and opinions on nine dimensions of culture and climate. These included (1) organizational structure, (2) responsibility, (3) risk and challenge, (4) rewards, (5) warmth and support, (6) conflict, (7) organizational identity, (8) ethics, and (9) approved practices.

The descriptive profiles developed with such studies of an organization can then be compared with the cultures of other groups. Organizational culture is something that can be reinforced or *changed*—the fundamental goal of an organizational development initiative.

The second school of thought follows an interpretist view. To these investigators, it is impossible to measure culture. This is because the culture of an organization changes form with each attempt to pin it down; each observer comes away with a different interpretation, based upon his or her personal values and experiences. Culture is, therefore, extremely difficult to manage; efforts to initiate a desired change may be fruitless—a mindless task with no hope of a concrete, lasting result.

Summary

In the new social science disciplines that emerged in the eighteenth and nineteenth centuries, curiosity was raised about primitive societies, as well as how industrialization was affecting children, families, and the working poor. This resulted in research efforts to understand (1) why social problems occurred, and (2) what could (or *ought* to) be done to change society in order to improve the lot of the poor and disenfranchised. Adding to this curiosity was news about many strange societies and cultures.

Sociology evolved as a way to conduct systematic investigations into the newly emerging industrial society and the litany of social ills that was seen as an unwanted by-product of the industrialization process. Early attempts at establishing a systematic way of explaining human behavior and mental aberrations resulted in the creation of the science of psychology. Building on a tradition born from early travel stories and forging a scientific way of looking at indigenous cultures, another group of scholars created the new social science of anthropology.

Through an eclectic process of trial and error, anthropologists and sociologists developed a way of conducting research that allowed them to meet their study objectives in all kinds of social and cultural settings. The name given to this method was ethnography.

Ethnographers often live, work, and play with the members of the group they are studying for long periods of time. Their aim is to be absorbed into the group, with the underlying objective of becoming “accepted” as a nonthreatening or nonintrusive member of the group so that events and interrelationships unfold as they would naturally, as if an observer were not in attendance. This process of gaining entry is the key to a successful research project.

The process of living with a social group during fieldwork involves observing and recording individuals’ behaviors. The ethnographer summarizes these field notes into a larger descriptive generalization that purports to describe the behavior of the wider society. The researcher must then develop *subjective descriptions* that are based on a large number of *generalizations*. In making these generalizations, the ethnographer moves from the *specific to the general*. That is, the behaviors of one or a small group are used to infer that those behaviors are also those of the larger groups in similar circumstances. The ethnographer should also develop *interpretations* of the observed behaviors; the question “why” should be answered to the best of the ethnographer’s ability.

Discussion Questions

1. Describe how you would design an ethnographic study to investigate voting behavior among minority women.
2. Explain what the term *thick description* means in ethnographic research.
3. How has field research evolved from its early stages?

4. What do ethnographers do when they study groups?
5. How does ethnography differ from ethnology?
6. Explain the role of ethnographic research in adding to greater understanding of questions in political science.
7. Define the term *ethnomethodology.*
8. Describe how you would use participant observation in a political science research project.
9. What are *urbanism studies*?
10. Discuss the role of ethnography in the study of organizational culture.

Additional Reading

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20 The Critical Approach: Feminist and Empowerment Research

This chapter addresses two increasingly important approaches in the broader category of critical research: feminist research and empowerment research. These approaches evolved out of the *action research* model developed in the 1940s by Kurt Lewin, who is considered to be one of the founders of social psychology. Subsequent researchers working in this approach recognized the need for a research design devoid of any gender bias and included feminist research as a variation of the action-oriented research approach. Lewin, a refugee who fled to the United States in the 1930s from Nazi Germany, also developed a research model that focused on empowering members of minority groups who were dominated by a more powerful majority. This empowerment research was conceived as a way for exploited groups to break the chain of exploitation by taking action against their exploiters. The role of the researcher in this model was to function as a guidance resource for the people.

The action research model is founded on research into the psychology of communities that was carried out by Lewin and other social psychologists during and after World War II. Both the feminist and empowerment approaches are generally considered to be *qualitative* research methods, although some quantitative methods are also used in the research activity (Small 1995; Westmarland 2001; Sarantakos 2004).

Although much research in political science still follows a positivist model, nontraditional approaches such as feminist and empowerment research have made substantial strides toward becoming "mainstream." Schulz and Mullings commented on this state of affairs in their 2006 text *Gender, Race, Class, and Health:*

> At this time in the United States [2005], traditional methodologies remain highly valued, while many other countries rely more on qualitative and consensus studies in setting their public policy agendas and enacting corresponding legislation. The current U.S. Congress is calling for, and in some cases requiring, very narrow "scientific" research designs and protocols that focus on "proving" cause and effect—a troubling and obviously political move. (Schulz and Mullings 2005, 22)

The Feminist Research Model

The feminist approach has made significant contributions to our understanding in political science. Feminist issues took center stage in many political theory studies during the turbulent 1970s. An initial goal of feminist research was to "document the dreadful history of misogynist statements by male authors—statements that were considered to have justified the exclusion of women from the political realm and confine them to the private world of the family" (Saxonhouse 1993, 15). The feminist approach took on greater importance during the decade of 1980s when it grew in acceptance as a perspective of choice in many research studies on political theory. Galston chronicled this phenomenon:

> [No] story of political theory in the 1980s would be complete without stressing the extraordinary development and vitality of feminist thought. Its explorations ramified into all aspects of politics, society, personality, and inquiry; the constitution and construction of gender differences; the retrieval of neglected writers, agents, and questions, and the corresponding expansion or reconstitution of what political theory theorizes about; the exploration of covert gender assumptions in theoretical categories such as the public/private distinction, rights, and justice; the examination of bias and discrimination in practical spheres structured by such categories; and the questioning of entire modes of philosophy and social inquiry . . . as gender-based and partial. (Galston 1993, 31)

The feminist approach to research and to science in general is based on the value-free fact that women see things differently than men. Moreover, education research has shown that the genders have different ways of learning and different ways of describing meaning. Thus, how women and men view research phenomena often differs in many, often highly meaningful ways.

For centuries, men have dominated academic, administrative, and managerial career fields; most research in these areas was designed and conducted by males for male readers. Hence, the extensive and important role of women in society was often ignored or, at best, glossed over. However, many believed that the centuries during which females were forced to accept a lesser status in the academic and political spheres demanded that a new, more equal approach to science be implemented.

The drive toward equal career opportunity revealed that a new approach to research was needed to ensure that an equal voice was given to both genders in description of social and political phenomena. The changes occurring in society during the last quarter of the twentieth century essentially demanded establishment of a feminist-oriented approach to research in political science and the other social sciences. The feminist research model—which today is used by researchers of both genders—was seen as the methodological emphasis that would aid in this critical emancipatory effort by eliminating the gender bias seen in most of the social science research then being published.

Researchers who employ the feminist approach contend that gender-based political theory and political writing have long been both overtly and covertly gender biased. Thus, many feminist researchers saw traditional positivist research as resulting in a science with a gender bias that was potentially misleading at best, and insulting and derogatory at worst.

When feminist researchers in political science examine such political phenomena as international relations and politics, state formation, war and peace, revolutions, international political economies, and global governance, they now include in their analyses discussions about the role of gender in these events. Thus, gender is finally considered to be a relevant factor in all international politics, public policy, and other writing on governance phenomena (Locher and Prügl 2001).

Research for Women by Women

Feminist research, according to Small (1995), has as its primary goal "the promotion of the feminist agenda by challenging the male dominance and advocating the social, political, and economic equality of men and women." It has also been described as *research for women rather than about women* (Allen and Baber 1992). Feminist researchers share with their fellow social scientists what has been described as a concern for ethical issues, a belief in social justice, an ethic of compassion, and an awareness of the power of language to distort the experiences of research subjects.

Typical of the themes approached from a feminist research perspective are the papers published in the April 2002 issue of the *International Feminist Journal of Politics:* "Toward a Feminist Political Economy" (Prügl), "Rewriting (Global) Political Economy as Reproductive, Productive, and Virtual (Foucauldian) Economics" (Peterson), and "The UN Approach to Harmful Traditional Practices" (Winter, Thompson, and Jeffreys).

Feminist research methodology has a long history of use in political science research. For example, two papers with feminist research foundations were published in the July/August 2002 issue of *Public Administration Review.* These were "Gender Differences in Agency Head Salaries: The Case of Public Education" (Meier and Wilkins) and "Sex-based Occupational Segregation in U.S. State Bureaucracies, 1987–97" (Kerr, Miller, and Reid).

Another example of the growing influence of feminist theories and the feminist research approach can be found in the Winter/Spring 2004 issue of the *Brown Journal of World Affairs* (Peterson 2004; Prügl 2004; Sylvester 2004; Tickner 2004; Wibben 2004). The five papers included in this special symposium section on feminist theories in international relations have interest for both political science researchers because of their emphasis on eliminating gender bias in government.

Focus of Feminist Research

Feminist research, which is sometimes referred to as *emancipative* or *empowering* research, is considered to be one of the four chief variations of action research. Action research is research or analysis done in order to improve the performance quality of an organization or group. It has been widely applied in efforts to improve public education operations and in programs of organizational development. This approach has as its key objective helping research participants to identify and understand the causes of their circumstances or malfunction, and then to empower them to bring about the change that they feel is required. Neuman (2000) described the approach as a process of inquiry that helps people change their working or living conditions and build a better world for themselves.

Small described the focus of feminist research as promoting the feminist agenda by challenging male dominance and advocating female and male social, political, and economic equality. As with all other models of action research, feminist research seeks to (1) bring about social change, (2) emancipate participants (i.e., women), and (3) enhance the lives of the participants.

Writing about gender inequality in science, Sandra Harding described how this multipart focus translates into actual research topics in more specific terms:

> Indeed many feminist research projects are "mission directed," that is, they are designed to produce solutions to pressing economic, legal, medical and health, political, or other problems that women encounter in some particular social context. Thus, these projects do not aim to discover value-neutral, transcendental truths. Yet, they do produce theoretical knowledge through such research. Indeed, for feminism, theoretical knowledge is also action in the world; how we conceptualize the world around us changes how we will interact with it and how others will interact with us. (Harding 2006, 68)

Feminist researchers are more likely to adopt a postpositivist approach to their work, although there are no hard-and-fast rules that make it the required epistemology. Furthermore, while some have advocated that a distinctive set of feminist methods should exist, others are less convinced that a purely feminist methodology is possible. And a third group argues that while, indeed, no special feminist methodology currently exists, as more feminist research appears, one is slowly being formed. Accordingly, "Feminist researchers share the values of overcoming oppression, empowering women, and transforming society so that equality between men and women can be achieved. The purpose of knowledge is to change or transform what is considered the patriarchal nature of society" (Small 1995, 947).

Arriving at the current focus of the feminist research perspective has been an evolutionary process, including contributions from liberal, Marxist, and radical political philosophies on the one hand, and the ideas of women of color and lesbians on the other. Talking about how this dynamic early history of the women's movement in the 1970s influenced the adoption of a new feminist perspective on research, Harding (2006, 66) described the almost mainstream status that feminist research has been awarded in the middle of the first decade of the twenty-first century: "In this heady context, feminist science studies projects headed off in different and sometimes conflicting directions. . . . Today, [however] the field can seem to have settled into the kind of more sedate mopping-up projects characteristic of mature intellectual and social movements."

A Consensus on Feminist Research

The debate on whether there is such a thing as a distinctive feminist research methodology has diminished, but not extinguished. A number of authors note that this is still a divisive issue among some advocates of the feminist research model (Harding 1987; Small 1995; Westmarland 2001; Waller 2005; Ironstone-Catterall 2006). Other chroniclers of the evolutionary development of feminist research have pointed out the disagreement among the several branches of this approach regarding the question of whether research methodologies that are uniquely feminist do exist.

The consensus appears to be that, while no unique methods have been identified, feminist researchers do apply the existing quantitative and qualitative methods in a distinctly feminist way. As a consequence, it is common to find feminist survey research, feminist experimental research, and feminist field research being used when they are consistent with feminist principles.

However, it is more common to find feminist researchers using such qualitative methods as in-depth interviews, participant observation, document analysis, ethnographic studies, and similar methods. Despite this tendency to use methods that were originally developed by others, feminist researchers typically adjust them to meet their specific perspectives, as one author has noted:

> It must be kept in mind that when feminist researchers employ methods that were developed for and by other groups of researchers, they adjust them so that they fit within the critical and emancipatory stance of feminism, and they are directed towards breaking down taken-for-granted concepts and rebuilding them into new entities. In doing so, they lay bare the essential concepts of research and use this as the basis for revealing what is really going on. (Sarantakos 2004, 63)

If no feminist research methods exist, what, then, makes this approach different from other research methods? According to analyses of the various branches of feminist research, the following points are common to this approach.

- Feminist researchers are likely to focus their attention upon marginalized people in a social context. Their objective is to ensure that everyone is heard or represented. This often means that, since most research has focused on men, only women's voices have not been heard.
- In the belief that action in social settings is subjective and political, feminist researchers often substitute subjectivity for the strict objectivity of the positivist traditions. This is often manifested in a strongly anti-positivistic orientation.
- Feminist researchers often study the social conditions of women in a sexist and patriarchal society in order to enlighten citizens about sexist practices that have produced unequal and discriminating social environments.
- Because society is organized in ways that overtly and covertly support sexism, feminist research typically exhibits an explicit focus on change in these social settings, structures, and cultures.
- Feminist research is not exclusively about women, but it is often done—with an emancipatory emphasis—for women. This research tends to emphasize women's experiences.
- Published feminist research is often critical of nonfeminist scholarship, is based on feminist theory, may be multidisciplinary, focuses on social change, and seeks to ensure equal concern for all humanity.
- Because feminist researchers often develop a special relationship with the subjects in their studies, published feminist research often includes the researcher's story.

Empowerment Research

Empowerment research has been seen as a tool to aid people in gaining mastery over their own affairs. Small (1995) defined *empowerment* in this context as being concerned with individuals and groups who are excluded by the majority on the basis of their demographic characteristics or because of some other physical or emotional difficulties. Empowerment research may be a particularly relevant model for some research in the nonprofit sector. For example, because the focus of many nonprofits is on aiding minorities and less-advantaged citizens in a society, managers of these organizations may see significant advances in the conditions of some client groups as a result of successfully carrying out an empowerment research activity.

The selective focus of much of the empowerment research that has taken place thus far supports this conclusion. Typical questions addressed in published empowerment research include issues of mental health, citizen involvement, sexuality, and community health problems. Certainly these topics are also of interest to political scientists, but with declining resources coupled with greater and greater demands on their efforts, public agencies have turned more and more to the private and nonprofit sectors to handle much of the service load in these areas. As a result, political science researchers have had to adopt many of the research methods first developed in other social sciences.

How Empowerment Research Works

The empowerment research approach begins with researchers identifying situations where a group has felt isolated, or been forced to remain silent over some social injustice, or been banned from seeking equal or fair treatment by a more powerful majority. These groups are often considered the "outsiders" of a society, an organization, or a community. The role of the researcher or research team is to help the outsider group take action to rectify the injustice.

The second step in the empowerment process is helping these outsider groups gain for themselves an understanding of the underlying issues at the root of their isolation. This must be done with only supportive rather than directive help from the researchers. The process concludes with the outsider group gaining a voice in and power over the decisions that affect them—and an ability to force needed change. In a word, it is a process designed to help people to become *empowered.*

Page and Czuba (1999, 3) addressed this issue from the perspective of using extension education to empower citizens. They defined the process of empowerment as a "multi-dimensional social process that helps people gain control over their own lives. It is a process that fosters power (that is, the capacity to implement) in people, for use in their own lives, their communities, and in their society, by acting on issues that they define as important."

Page and Czuba identified the three components of this definition as: multidimensionality, socially embedded, and a continuing process. By *multidimensionality* they meant that it involves elements of sociology, psychology, economic, and other components that shape a society. They also noted that the empowerment process occurs at the individual, group, and community levels, often concurrently. Empowerment is a *socially embedded* process because it takes place with individuals acting and reacting with one another; it cannot occur in isolation. The *process* component refers to the characteristic of beginning from a starting point and working through a series of phases toward accomplishing an identified goal. Finally, they emphasized that the fundamental tenet of empowerment is the connection in collaborative activity between individuals and a community or group.

The Collaborative Nature of Empowerment Research

Empowerment research is necessarily collaborative in nature. Researchers provide a mechanism for members of the group to identify group strengths and resources that may not have been recognized prior to the appearance of the research team. As the group becomes empowered, group members are able to achieve control over the internal and external forces that affect them and are thus motivated to bring about relevant and needed change.

Finally, the process focuses on bringing out the natural abilities and skills of the members of the group under study. Rather than focusing on group members' weaknesses, empowerment research aims at bringing their strengths to the fore and providing guidance in the task of putting those strengths to work for the members' benefit.

For the research team working on an empowerment activity, the process is often a long, time-consuming, but eminently personally rewarding process, with seemingly as many steps backward as forward. Disenfranchised people, or citizens in other ways subjected to demeaning pressures, are often loath to take up the fight again after having failed in many previous efforts; beating your head against a wall only feels good when you stop. This is where the outside research team can contribute to turning those attitudes around.

When the outsiders see that there is someone with a genuine and lasting interest in helping them to help themselves, the world for them can, indeed, be turned upside down. The individuals are able to make the transition on their own from subjugation to empowerment. Page and Czuba warned that the researchers cannot give people power and cannot make them "empowered." Rather, the researchers can only supply the resources, opportunities, encouragement, and support the people need to make the change on their own.

Empowerment research is not without its problems and potential pitfalls. Myron Glazer discussed one of the most damaging of these pitfalls in his small volume on field research:

> Field workers often immerse themselves in societies characterized by deeply rooted social inequality. Indeed, this problem and its solution have long captured the imagination and dedication of social [and administrative] scientists, yet the analysis of human suffering

> places a special burden on researchers. They are constantly plagued by their own feelings of bitterness and anger. Their very scholarly detachment and struggles for objectivity often lead to a profound sense of guilt and impotence. Some field workers hope to strike back through their writing. Others, less patient, more action oriented, join the downtrodden and suffer their fate. (Glazer 1972, 59)

The Empowerment Research Process

Critical research, including empowerment research, takes place in a series of six steps (Kuhne and Quigley 1997). These steps are grouped into three distinct phases. The first phase, *planning*, includes steps 1, 2, and 3. Phase two, *action*, involving implementation of an intervention or program (step 4), is the single most critical step in this phase. Finally, the third phase—*reflection*—covers steps 5 and 6. In step 5, the researchers and community or group engage in evaluation of their progress or lack of progress. The last step in this process involves implementation of any changes that emerge after evaluation of the activities conducted to that point. The relationship between these six steps and three phases is displayed in Figure 20.1.

First Phase Actions

The first phase in the empowerment approach to critical research involves three key foundational steps. The first step is observing and working with the community of actors to develop an understanding of the problem that includes as much as possible, including causal factors and potential solutions.

Developing an understanding of the problem involves conducting extensive interviews with members of the group in order to bring out the subjects' perceptions on the problem and its possible cause or causes. The research team then arranges for community participants to discuss these perceptions in order to arrive at a group consensus.

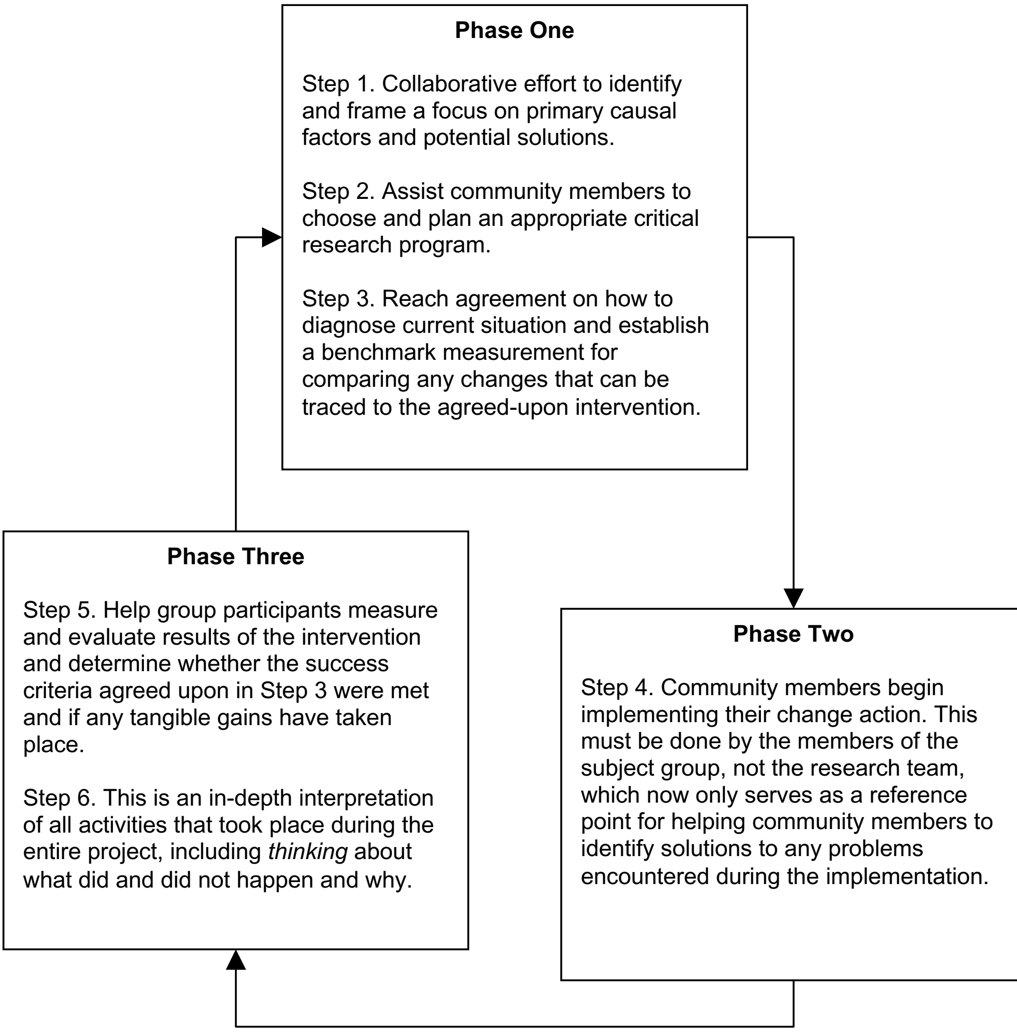
In collaborative transformation actions such as empowerment research, the researcher's perception of the problem is not nearly as important as how the participants view it. If the study group does not agree on a problem and the action they will take for solution, the researcher may become a part of the problem rather than a contributor to a solution. Gathering the benchmark information may involve brainstorming with participants and other researchers, exploring the published professional literature, and, often, simple observation of the group. Finally, the researcher and group participants must decide together whether the problem is significant enough to warrant the study.

Defining and planning the project is the second step in the first phase of the empowerment research process. The most important part of this planning activity is deciding how to deal with the problem at hand. In a collaborative research activity, this means getting the participants to agree on the intervention program they want to implement and then organizing the group for action.

The end result of this step should be generating among the members of the group a readiness to not only put in the effort that will be required, but also to accept change of any kind. Finally, it also entails (1) agreeing on how individual participants are to be involved in the action phase of the process, and (2) what action will be taken in the event of a failure of the program to achieve the desired results.

Determining the measurements is the third step in this first phase. This step is the diagnostic stage of critical research. In order to know if something has been improved, if it is "better" in some

Figure 20.1 **Phases and Steps of Critical Research**



Source: Includes elements from Kuhne and Quigley 1997, 28.

way, the researcher must have a *benchmark* against which to measure any change. A benchmark is a clear, comprehensive description of the way things are prior to an intervention. This process includes specifying what will be measured during the later evaluation stage of the research program.

In addition to knowing what to measure, it will also be necessary to determine *when* to measure and how long the drive for empowerment intervention should run before an evaluation occurs. There is no set answer to these questions; timing is a function of the severity of the problem and the degree of participatory involvement of the participants. Lewin described this process in his 1947 paper *Frontiers in Group Dynamics:* “In discussing the means of bringing about a desired state of affairs one should not think in terms of the ‘goal to be reached’ but rather in terms of a change ‘from the present level to the desired one’.” (Cartwright 1951, 224)

Second Phase Activity: Action

A single step is involved in the second phase of the research program, the *action phase.* The implementation of the emancipation task is the responsibility of the members of the group, not the research team. The role of the researchers at this time is to function as a reference point, providing methodological advice if asked, but not acting as leaders or instigators of the action. Empowerment research, like other action research, involves collaboration and direct participation of the research subjects.

Another important aspect of the role of the research team in this phase is keeping the group moving according to its initial plan. If, in the opinion of the researchers, the plan will not generate an appropriate intervention or produce the desired change, the team can help the community group plan and initiate a second version of the activity—something in the way of a contingency plan. Finally, to keep the research program focused on meeting the group's objectives, the research team must maintain good records of the intervention implementation, its effects, and how and in what form changes are generated.

Third Phase Activities

Phase three is the *reflection* part of the emancipatory research project. It includes the last two steps: (5) *evaluating results* and (6) *transitioning the change into the group or organization.* Evaluating the results of the change effort may take as long as or longer than the actual implementation of whatever action the team takes on. All aspects of the data collected before and during the action phase must be collected and studied.

The research team must work closely with group participants to evaluate what the data reveal about the problem and results of the intervention. This includes determining whether the success criteria agreed upon in step 3 were met, and spelling out whatever tangible gains may have occurred, regardless of how small or great. If the problem is resolved, end the project; if not, repeat a second cycle—or more. Action research cycles should continue until the desired change is accepted and functioning.

Suchman (1967, 177) described what is involved in the evaluation process this way: "What we evaluate is the action hypothesis that defined program activities will achieve specified, desired objectives through their ability to influence those intervening processes that affect the occurrence of these objectives. . . . An understanding of all three factors—program, objective, and intervening process—is essential to the conduct of [evaluation]."

The Implementation Process

The last step in the third phase of the process is the actual implementation, or transitioning the change into the behavior and attitudes of the oppressor and oppressed groups or organizations. During this stage of the research, the team and subject population also begin planning for carrying the change initiative to the next level.

At this point the research team assists the community in thinking about what happened, and what did not and why, while preparing the group to continue on the path to emancipation after the research team has departed. This includes answering such questions as: Did the project produce promising results? Do the promised changes reflect what is actually happening? Should another cycle of action research be initiated? Kuhne and Quigley (1997, 34) described this step as a process of "analyzing outcomes and revising plans for another cycle of acting."

This sixth step also involves putting together a final report of the entire process for group participants and any other researcher/participant team planning for a similar intervention of their own. Thus, the report must be complete, produced in a form that everyone can understand, and it helps to add to theoretical knowledge of change in groups and organizations and the action research process in general.

Summary

This chapter has addressed two related critical research approaches: feminist research and empowerment research. The feminist approach to research and to science in general is based on emphasizing the point that women see things differently than men, and the genders have different ways of learning and different ways of describing meaning. Feminist research is conducted to promote the feminist agenda by challenging male dominance and advocating female and male social, political, and economic equality. This research seeks to (1) bring about social change, (2) emancipate participants (i.e., women), and (3) enhance the lives of the participants.

While no uniquely feminist methods appear to exist, feminist researchers use existing quantitative and qualitative methods in a distinctly feminist way. It is common to find that feminist survey research, feminist experimental research, and feminist field research are used—but only in ways consistent with feminist principles. Feminist researchers typically use such qualitative methods as in-depth interviews, participant observation, document analysis, ethnographic studies, and similar methods.

Empowerment research focuses on helping people find ways to gain mastery over their own affairs. Empowerment has been defined as being concerned with individuals and groups who are excluded from mainstream society by the majority because of demographic characteristics or some other physical or emotional characteristic. Empowerment research may be particularly relevant for some nonprofit sector research.

Empowerment research takes place in a series of six steps, which are grouped into three distinct phases. The *planning* phase includes the first three steps. Phase two, *action*, involves step 4—implementation of an intervention or program. The third phase—*reflection*—covers the last two steps of evaluation and implementation of any changes that emerge from the research.

Discussion Questions

1. What is feminist research and how is it applied in political science?
2. Why has the feminist research model been so enthusiastically adopted by many political science researchers?
3. What is the meaning of the term gender bias? How can it influence research findings?
4. What is the primary objective of feminist research?
5. Do you believe that a purely feminist research methodology exist? Why or why not?
6. Name and define the seven points that were said to be common to the different variations in feminist research.
7. What is empowerment research and why was it developed?
8. What is meant by the phrase the collaborative nature of empowerment research?
9. What is the role of field workers in empowerment research?
10. Describe in detail the three phases of empowerment research.

Additional Reading

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21 Analysis Methods for Qualitative Data

The fundamental building block of all research consists of *data*. Data can take many different forms and can be gathered in many different ways. In their most irreducible form, data can be quantitative or qualitative. Increasingly, and in more and more disciplines, data employed in political science research projects exist in *both* quantitative and qualitative form. In addition to different forms, data can be gathered in many different ways—by interview, questionnaire, overt or covert observation, by analysis of documents or artifacts, or by the subjective experiences of the researcher, to name only the most commonly encountered data collection methods (Martin 2000). Regardless of their form or how they are gathered, in their raw state data have little or no intrinsic meaning. Data must be processed, analyzed, and interpreted by a researcher before they take on any rational sense.

The analysis processes for quantitative and qualitative research data are similar in some ways, but different in others. Similarities include (1) data are not just *there*, they must be collected in some way by a researcher; (2) when processed, both quantitative and qualitative data can be used for inference; (3) comparative analyses are used with both data types; and (4) researchers are concerned with both the reliability and the validity of all data.

Quantitative data differ from qualitative data primarily in the way they are tabulated, collated, and processed. Quantitative data are typically computer processed and analyzed with a variety of standard statistical tests. These tests are applied for one or more of the following purposes: (1) to describe a data set, (2) to generate hypotheses through a process of association testing, and (3) to test hypotheses (Fitz-Gibbon and Morris 1987).

Qualitative data, on the other hand, exhibit variety in both form and context. They can also be evaluated and interpreted in a variety of ways. Qualitative data can be words, pictures, artifacts, music scores, and so on. Furthermore, each of the several different analysis approaches has its own underlying purpose, and each often produces a different outcome. This chapter discusses a few of the more prevalent ways of analyzing qualitative data and includes three separate but similar processing models.

What Are Qualitative Data?

Qualitative data are data that have been gathered during the conduct of interpretive or postpositivist research studies. This kind of data exists most often as some sort of narrative. Thus, it can be a written text, transcripts of conversations or interviews, transcripts of therapeutic or consultive interviews, records of legal trials, or transcripts of focus group discussions. It can exist as historical or literary documents, ethnographic field notes, diaries, newspaper clippings, or magazine and journal articles. It can also be in the form of photographs, maps, illustrations or paintings, musical scores, tape recordings, films, or any other nonquantitative or quantitative source. Most of the time, however, qualitative research data are haphazardly stored in collections of rough field notes.

Miles and Huberman (1998, 182) suggested that qualitative data exist as "the essences of people, objects, and situations." In their discussion, *essences* refers to the reactions and interpretations that researchers take away from the raw experiences of a research encounter or situation. A researcher must process, analyze, and interpret these "essences" in order transform them into a meaningful conclusion.

The following brief statement bears emphasizing: *All data must be analyzed and interpreted before they have meaning.* All unprocessed and uninterpreted data are called *raw data.* Raw quantitative data refers to the compilation of a set of numbers arranged according to values assigned by a researcher to optional responses to questions or as counts of event occurrences. Raw qualitative data exist most often as a body of unorganized unstructured field notes or narratives; that is, in the form of words or other symbols, but not numbers.

Components of Qualitative Data Analysis

There are two parts to the interpretation and analysis of qualitative data. The first is *data management*; the second is *data analysis.* Data management includes three important steps. First, managing data begins with organizing the collection process. This includes preplanning, careful selection of the sample or situation to be included in the study, and making sure that entry into and acceptance by the study group is achieved. The researcher must maintain a concise record of the steps and processes taken throughout the study. A précis of this record must be included in the final research report under the heading of *methodology*.

The second step in this process is designing a system for storage of the collected data. In the past, this meant devising a system of index cards, preparing analytical memorandums, and careful categorical coding—in what some analysts referred to as the *clerical* portion of qualitative research. It was laborious and time consuming. Today, however, computer software programs are increasingly taking the place of this unappealing activity. A key activity in this half of the management/analysis process is devising a system for retrieving data for comparative analyses and other interpretive activities. It is important to remember the process because some researchers still work this way:

> Only a few short decades ago, QDA (qualitative data analysis) was purely a manual process. Bits of data were copied onto cards, using the traditional technique of cutting and pasting. These cards were filed under appropriate categories generated by the researcher . . . [who] then strove to link the data and connect categories through these physical materials and manipulations, to produce meaningful reflections of the phenomena being studied. The process was a daunting one for researchers. Researchers had to manage overwhelming compilations of material, make analytical decisions that were rarely clear or simple, and work through the tedious and frustrating processes of coding, deriving themes, and building theories. (Este, Sieppert, and Barsky 1998, 138)

The second half of the interpretation process is the actual analysis of data. This phase of the interpretation process also includes three activities: (1) data reduction, (2) data display, and (3) drawing conclusions from the data. First, data reduction is almost always a crucial stage in the interpretation process. It involves selecting the most salient themes and constructs that emerge from the data. Not every bit of data can be its own category; if this were true, the research report would never be written. Qualitative investigations have been known to generate thousands of pages of records. From out of that mass of unconnected narrative, the researcher must choose or devise a conceptual framework. This framework will be constructed of themes, clusters, and summaries.

The next part of the analysis phase is *data display*. In the chapters on quantitative research methods, this was discussed as the use of descriptive and summary statistics, and presenting information in charts, graphs, and tables. These same graphic displays are often used to present qualitative data. Whatever research approach is followed, the objective is to be able to present findings as an organized, focused collection of pertinent information, out of which a researcher—and a reader—can draw relevant conclusions.

Finally, drawing conclusions forces the researcher to *interpret* the results of the study. It is not enough simply to present the data as they appear, even if they have been effectively organized, categorized, and structured. The research must explain what the data *mean* in relation to the study design and objectives and in terms of study's contribution to theory.

Bringing Order to Raw Qualitative Data

The analysis and interpretation of qualitative data begins with bringing the raw data into some level of order. First, the researcher identifies and selects a set of relevant categories or classes in which to sort the data. Comparing the data across categories—a step that is typically used in the testing of hypotheses—often follows the initial comparing phase of the analysis. Strauss and Corbin (1998) call this a process of *conceptualizing*.

Conceptualizing refers to the act of reducing the often bulky amounts of raw data into workable, ordered bits of information that the researcher can manage with confidence. Kvale (1996) described this act of data categorization as a key qualitative research activity, one that most distinguishes qualitative strategies from quantitative research.

Researchers can best analyze and interpret raw data if they employ some orderly process. Both a nine-step and twelve-step data analysis process are discussed below. Figure 21.1 displays a model of the first of the two processes, a nine-step process.

A Nine-Step Analysis Process

This nine-step process for analyzing and interpreting qualitative data has its roots in the three fold grounded theory interpretation models of Strauss and Corbin (1990), Neuman (2000), and information provided in Miles and Huberman (1994 and 1998). Each of the nine steps is discussed in more detail below.

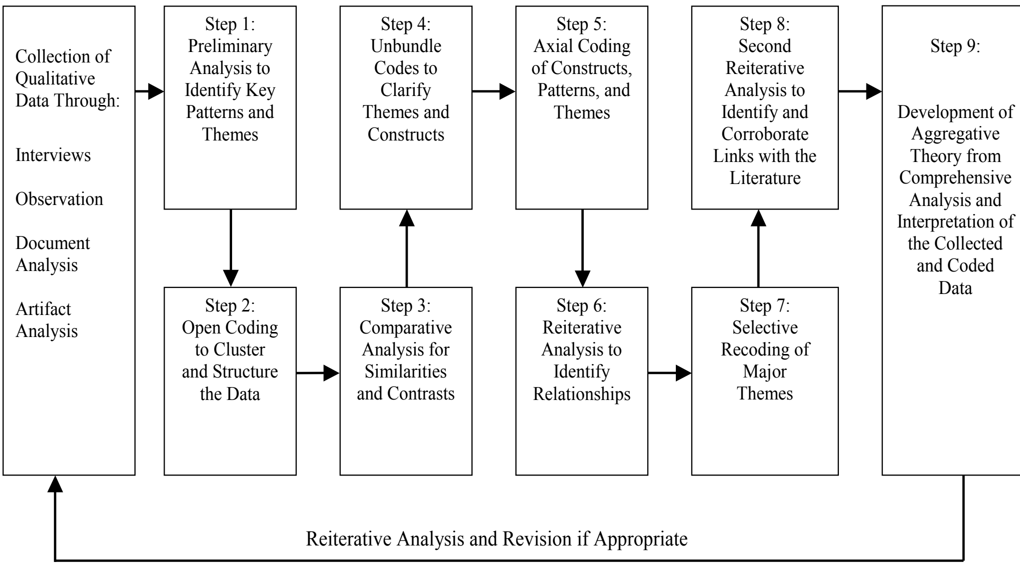
Step 1. Preliminary Analysis for Patterns and Structure

Order and structure must be brought to all data if they are ultimately to become *information*. Miles and Huberman (1994) refer to order—the patterns or themes in textual qualitative data—as Gestalts. This is because they pull together a variety of smaller portions of data into larger wholes.

A key task of the qualitative researcher is sorting and re-sorting data to identify *patterns*, from which meaning and definition can be established. Finding patterns in the data is a subjective process, and one that often comes naturally to the researcher. Miles and Huberman see this as a potential problem, however, and offer the following caveat:

> The human mind finds patterns so quickly and easily that it needs no how-to advice. Patterns just "happen," almost too quickly. The important thing, rather, is to be able to (a) see *real* added evidence in the same pattern [and] (b) remain open to disconfirming evidence when it appears. (Miles and Huberman 1994, 216)

Figure 21.1 **A Nine-Step Process for Analyzing Qualitative Data**



Step 2. Open Coding to Form Clusters and Identify Themes

A key activity in all qualitative data analysis is that of *clustering*. This entails putting things that are like each other together into groupings or classes. These may be preexisting classes, although this is not the recommended way to begin. More often, the categories are groupings that the researcher creates from smaller collections of ideas that emerge from the data itself. Coding and categorization go hand-in-hand during this phase of the analysis.

Straus and Corbin (1990) and Glaser (1992) identified the coding process that occurs in the first phase of the analysis as *open* or *substantive* coding. The goal of this first, open coding process is to begin to form the raw data into meaningful categories with a structure that will guide the researcher in all subsequent analyses, and any future gathering of more data.

There are no limits to how many codes are assigned during the open coding phase or to the inclusiveness (breadth) of each. The process has been described as a necessary task that can be "applied at many levels of qualitative data; at the level of events or acts, of individual actors, of processes, of settings or locales, of sites as wholes." (Miles and Huberman, 1994, 219)

In qualitative research, usually little or no categorization is done prior to the data being collected. The categorical codes that emerge at this time are taken from the data they embrace. However, the researcher should keep in mind that one of the goals of coding and categorization is the *reduction* of data into more manageable sets.

Step 3. Comparative Analysis for Similarities and Contrasts

Qualitative research studies usually require some comparative analysis of the collected data. In grounded theory research, comparisons are an integral part of the entire analysis process. Both Strauss and Corbin (1990) and Glaser (1992) recommended that comparative analysis should be an integral step in all studies involving qualitative data. Furthermore, they urged that previously gathered data be continuously compared with every bit of new data. Ragin and Zaret (1983) also considered comparative research to be one of the research tactics that distinguish research on social groups.

Neuman (2000) identified comparison as a "central process" to the analysis of all data. In this central role, comparative analysis has two broad objectives: the first is to find cases or evidence that belong together, based on one or more relevant characteristics. The second is to isolate anomalies in the data—events or cases that do not fit a pattern. Similarities enable the researcher to place the data within its proper category, as well as to develop new categorical codes that embrace the unclassified phenomenon. Anomalies are the distinct characteristics that are central to the research problem; finding distinctive differences in data is like a prospector finding the "mother lode."

Miles and Huberman (1994, 254) considered the process of comparative analysis to be a part of their *drawing and verifying conclusions* step in the analysis of qualitative data. Refuting critics whom they accused of considering the act of making comparisons "odious," they responded, "Comparison is a time-honored, classic way to test a conclusion. We draw a contrast or make a comparison between two sets of things—persons, roles, activities, cases as a whole—that are known to differ in some other important respect. This is the 'method of differences,' which goes back to Aristotle if not further."

Comparative analysis is not without its problems, however. Researchers planning a comparative study should first consider these warnings about the use of comparisons in research:

1. Mindless comparisons are useless. Researchers must be sure that their comparisons are the "right" ones, and that it makes sense to use them in the analysis.
2. Comparisons should extend beyond the data alone. They should also be compared with what the researcher knows about the things being studied.
3. Researchers should pause before including a comparison in a research report, to ask themselves, "How big must a difference be before it makes a difference?" and "How do I know that?"
4. With qualitative comparisons, researchers are concerned with the *practical significance* of the data; they cannot apply the statistical significance tests that are available in quantitative studies.

Strauss and Corbin (1998, 73) placed great importance on the activity of comparative analysis. In their opinion, making comparisons is an integral activity that should be used at any and all steps in the data analysis process. They define the comparative analysis process as "an analytical tool used to stimulate thinking about properties and dimensions of categories." They considered the act of making comparisons to be one of the two tasks that are essential for development of theory in qualitative research; the other essential task is *asking questions*.

Step 4. Unbundle Codes to Clarify Themes and Constructs

In this stage, the researcher reviews the coded to data to determine whether any categorical constructs make better intuitive sense as two or more factors rather than the one originally assigned. *Unbundling* means the dismantling of a major category into two or more categorical constructs; careful reexamination of data should always precede this. If an unbundling is warranted, care must also be taken to apply the characteristics originally assigned to the category to each of the newly established categories.

Step 5. Axial Coding of Constructs, Patterns and Themes

Axial coding affords the researcher a second opportunity to introduce order and structure into the initially coded data. Axial coding can use preestablished codes such as the six categories suggested by Strauss and Corbin (1998), or it can be freely employed without any imposed structure, as Glaser (1992) proposed. Strauss and Corbin added their six categories when they found that the lack of structure at this point made it difficult for beginning researchers to produce clear and cogent theory from the data. Retaining the substantive coding levels, they proposed adding a third, intermediate step in the coding/analysis process. They called this intermediate step "axial coding" (Glaser 1992; Kendall 1999). This step was proposed as a way to demystify the grounded theory process. It requires the researcher to place all the initially open-coded data into these six categories: (1) *conditions*, (2) *phenomena*, (3) *context*, (4) *intervening conditions*, (5) *actions/ strategies*, and (6) *consequences*.

These categories require the researcher to look for antecedents that lead to the particular event or circumstance, in addition to any resulting consequences. They also force the researcher to reexamine the strategies and processes involved in both the target organization and the research design.

Step 6. Reiterative Analysis to Identify Relationships

Researchers must establish categories and codes for the major and minor constructs within the data, develop meaningful ideas about the data in context, edit and make critical interpretations, and—perhaps most importantly—generate ideas and theories from them. A key activity in this process is identifying *relationships* between constructs and groupings.

Step 7. Selective Recoding of Major Themes

Patterns will usually emerge from the early analysis, permitting the researcher to identify salient themes. As the analysis and reanalysis of the mass of collected data continues, it is often possible to merge several themes into a smaller number of categories. In addition to themes, these broader groupings are referred to as *constructs* or *factors.* The process of merging is much like the data reduction statistical techniques of *factor analysis* or *cluster analysis*, in which the researcher collects data into a few salient themes. This data reduction or aggregation process makes it much easier to summarize the findings from the research.

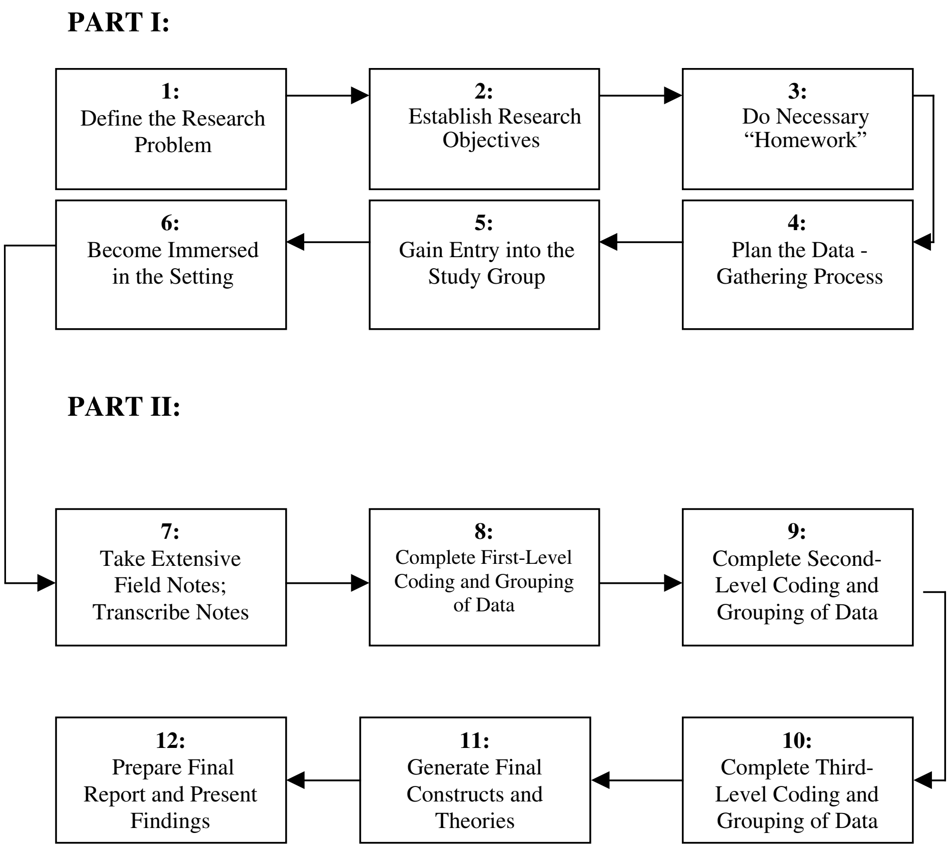
Step 8. Second Reiterative Analysis to Identify and Corroborate Links with the Literature

By the time the research has reached this point in the analysis, clear links with themes in the relevant literature in the field should begin to come apparent. The researcher must use this time to clearly show the reader how the collected data and the research activity connect to and/or build upon prior research in this field.

Step 9. Development of Theory from the Analysis

A major goal of research is to contribute to the body of knowledge in the intellectual or academic field in which the researcher is working. This means that one or more theories should emerge from the analysis.

Figure 21.2 **The 12 Steps of Qualitative Fieldwork, Analysis, and Report Preparation**



Source: Jones 1996.

The Jones Qualitative Data Analysis Process

Qualitative data gathering and analysis is carried out in a logical sequence of steps. Jones (1996) has organized this sequence into the 12-step process shown in Figure 21.2. The 12 steps fall into 2 equal halves, each with 6 steps: the first half of the process, involving steps 1 through 6, is the *preparatory* half, while steps 7 through 12 make up the *analysis* and *report* portions of the analysis.

Part I. Preparing for Qualitative Research

Steps 1 and 2—*Define the Research Problem* and *Establish Research Objectives*—are the initial activities in all research designs. **Step 3**, *Do necessary "Homework,"* means becoming conversant with the full nature of the subject or topic of interest. Interviews with a few key informants and extensive analysis of the relevant literature are the activities often used in this step.

Step 4—*Plan the Data-Gathering Process* should occur only after the researcher has developed a working familiarity with the subject and study group. The plan should include a preliminary list of the behaviors to be observed, the subjects to be interviewed, a list of the topics to be covered in the interviews, a preliminary coding scheme, and a schedule for each following step in the research process.

Steps 5 and 6—*Gaining Entry into the Study Group* and *Become Immersed in the Setting*—are closely related activities; in fact, they often occur simultaneously. While these are more appropriately tasks to use in ethnographic research, they are also important in other qualitative research designs. For example, researchers conducting a study of the operating climate within a government agency must first gain permission of the agency director and the support and compliance of both the managers and agency staff.

Part II. Analyzing and Reporting

Step 7—the first activity in the second half of the research process is *Take Extensive Field Notes. Field notes* are the notes, recordings, reminders, and other subjective reports that the researcher records while observing behaviors or interviewing respondents. They are the records produced during the process of conducting *field research*. Field research is what is done when researchers want to know something about people, understand behaviors, or describe a group of people who interact in some way (Neuman 2000). Field notes are the detailed written reports and/or diagrams or pictures of what the researcher sees and hears. The term used to describe the required detail needed in field notes is *thick description*. Finally, field notes should be written down or transcribed on a regular basis, as soon as possible after the observed phenomenon occurs.

Taking good field notes is not an easy process; the researcher must make a conscious effort to devote the time and work necessary to produce good notes because, without them, the final report of the research can only be second rate. Preparing field notes can be a tedious, laborious task, and it requires self-discipline to be done correctly. The notes contain extensive descriptive detail drawn from memory. Researchers must make it a habit—better yet, a *compulsion*—to write their notes every day and to begin to transcribe them immediately after leaving the field. Field notes must be neat and organized because "the researcher will return to them over and over again. Once written, the notes are private and valuable. A researcher treats them with care and protects confidentiality" (Neuman 2000, 363).

Once field notes are transcribed into organized records of the researcher's observations or interviews, they must then be put to a preliminary, interpretive analysis. This occurs during steps 8 through 11. Analysis is an ongoing process that begins during the first venture into the field experience and continues until a final set of codes, categories, and constructs is established.

The process concludes with production of the final report of the research. Miles and Huberman (1994) recommend employing a series of reporting guides or worksheets to ensure that this portion of the process is complete. These include the following: (1) a contact summary; (2) a summary of each document analyzed in the study; (3) first-, second-, and third-level coding and grouping of constructs, patterns, or factors discovered in the data; and (4) a final detailed summary of the site in which the activities, behaviors, and events were studied.

Step 8—*First-level Coding and Grouping of Data* begins with preparation of contact summaries and a summary of each document, if any, analyzed for the study. The contact summary is usually nothing more than a single sheet that contains answers to a set of focusing or summary questions about each subject contacted in the study. It often includes demographic information, indications of relative position in the group under study, and is used to ensure continuity in the treatment of responses from all contacts. The document summary is applicable only when documents of any type are acquired for analysis at the research site. The purpose of this guide is to establish a record of the document's significance and how it relates to observations, interviews, or final analysis.

First-level coding is done to develop the initial descriptive codes around which all subsequent data will be organized or grouped. These codes are abbreviations that establish descriptive categories or groupings in the data. Miles and Huberman (1994, 56) have defined a *code* as "an abbreviation or symbol applied to a segment of words—most often a sentence or paragraph of transcribed field notes—in order to *classify* the words."

Codes should be considered as *categories.* As such, they are *retrieval* and *organizing devices* that allow the analyst to spot quickly, pull out, then cluster all the segments relating to the particular question, hypothesis, concept, or theme. Clustering sets the stage for analysis.

Step 9—*second-level*, or *pattern coding* takes place during the analysis process. Second-level coding involves establishing *interpretive codes.* Here the researcher goes beyond simple description and begins to form interpretive labels for categories of behaviors. The goal at this point is to be able to read repeating patterns in the data.

Step 10—involves *third-level*, or *thematic development coding* (also called *memoing*). Memoing refers to producing preliminary or partial summary reports for the personal use of the researcher or research team. These might, for example, be used to summarize a pattern or a theme in the data, and even be incorporated wholesale into the final analysis. At the third analysis level, the researcher begins to establish *explanatory* codes that link larger groups of patterns into what are called *themes.* These are the major constructs that will make up the central structure under which the final analysis will occur and be recorded.

Step 11—the final activity in the coding and analysis process is a brief summary of the constructs, events, members, circumstances, and other relevant information that can serve both as a summary of the data-gathering experience and memory-jogger during the preparation of the final report.

Step 12—the last step in this, as in any other type of research project, is to combine the notes, constructs, patterns, and themes, along with the researcher's analysis and synthesis, into some form of *research report*. This important step in the qualitative research process is not simply putting the researcher's field notes together in one cover. Rather, it involves a number of important activities:

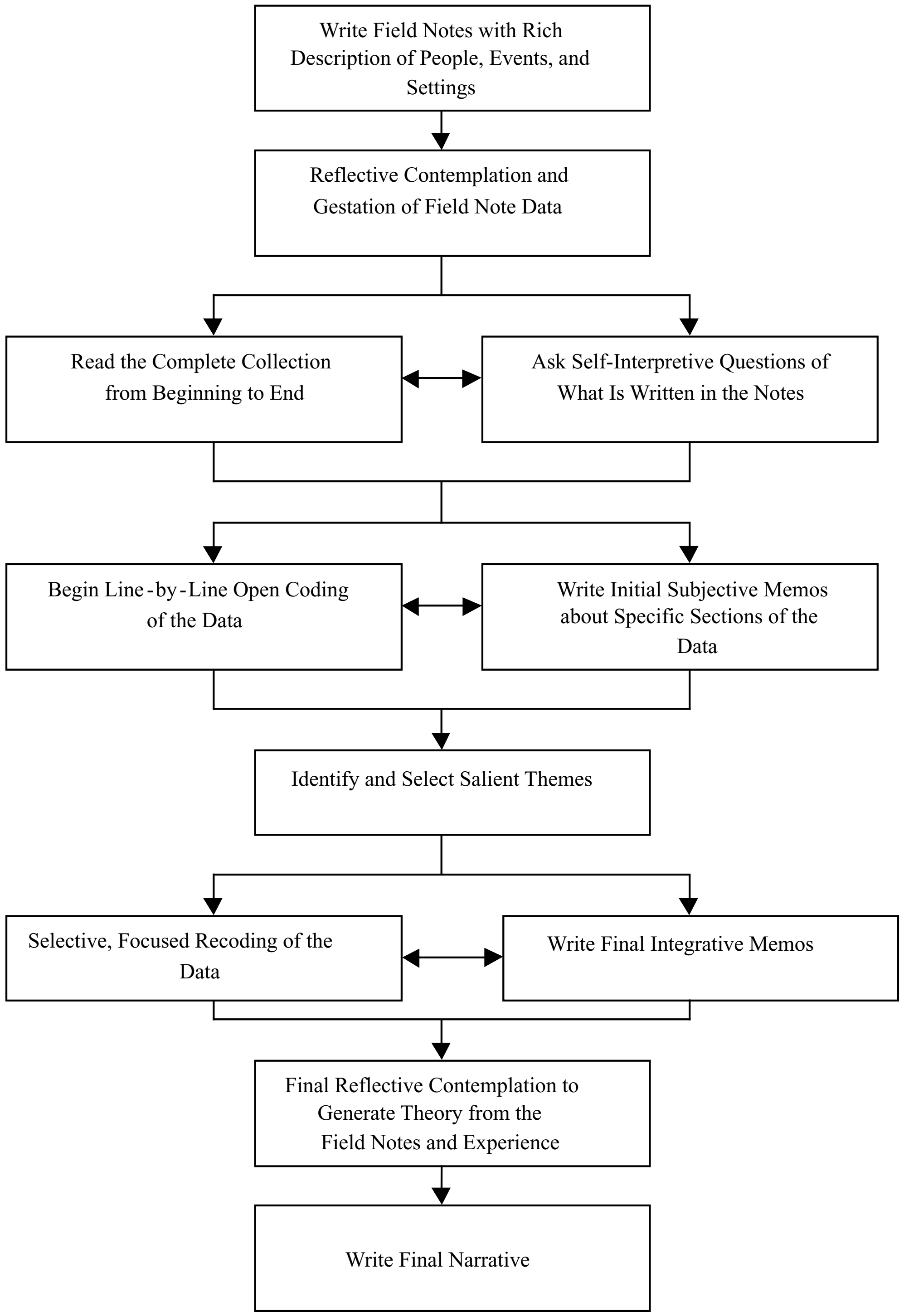
> Assembling evidence, arguments, and conclusions into a report is always a crucial step; but more than in quantitative approaches, the careful crafting of evidence and explanation makes or breaks [qualitative] research. A researcher distills mountains of evidence into exposition and prepares extensive footnotes. She or he weaves together evidence and arguments to communicate a coherent, convincing picture to readers. (Neuman 2000, 395)

Analysis of Ethnographic Study Data

Ethnographic *data* are the content of researchers' field notes, while ethnographic *narratives* are researchers' descriptions of the interplay of individuals in groups, and how that interaction is influenced by the culture of the group or organization.

The information contained in field notes consists of "rich descriptions" of the people, settings, and events observed by the participant researcher. They can be tape recordings of subjects' life histories, opinions, dreams, and so forth. They might also be photographs, drawings, films, videotapes, artifacts, or written documents. Ethnographers use descriptions of these physical objects in their reports of social interactions. The model displayed in Figure 21.3 reveals the detailed nature of the steps followed in the analysis of ethnographic data. The processes identified in the model are shown as individual activities. However, in actual practice, some are best carried out in conjunction with others. Collectively, they take place in these six analytical phases that culminate in writing of the research report.

Figure 21.3 **A Model of the Ethnographic Data Analysis Process**



Phase I. Reflective Contemplation

Once the data collecting activity is complete, many researchers like to step away from their material to pause for a while and simply think about what they saw, heard, and took away from the experience. This is the act of *reflective contemplation*. During this quiet time away from the study site and data collection, ideas, insights, and preliminary interpretations are free to gestate in the mind of the researcher.

After a brief period away from the data—too long and data will be lost from memory—the researcher returns to the data collection and begins a full reading of the material from beginning to end. It is likely that this experience will give the researcher his or her first "big picture" of everything that has occurred during the research study.

Phase II. Interpretive Questioning

Interpretive questioning is the process of making marginal notes or comments on separate pages for guidance in the continuation of reading and interpreting. It begins during the first complete reading of field notes that follows reflective contemplation. It involves writing questioning notes that help guide the development of structure and organization. These questions can also serve as suggestions for subsequent open coding of the data. They can include any self-directed questions, suggestions for groupings, and even ideas for subsequent coding. The following sorts of questions are typical examples of questions that might be asked at this time (Emerson, Fretz, and Shaw 1995, 146):

- What are people doing in this setting?
- What are they trying to accomplish? What are they avoiding?
- How, exactly, do they go about these behaviors?
- What sorts of things do people say to each other?
- How do people understand what is going on in their group or society?
- What assumptions guide their behavior?
- What was going on here? What did I learn about the participants when I made these notes?
- Why did I include this information?

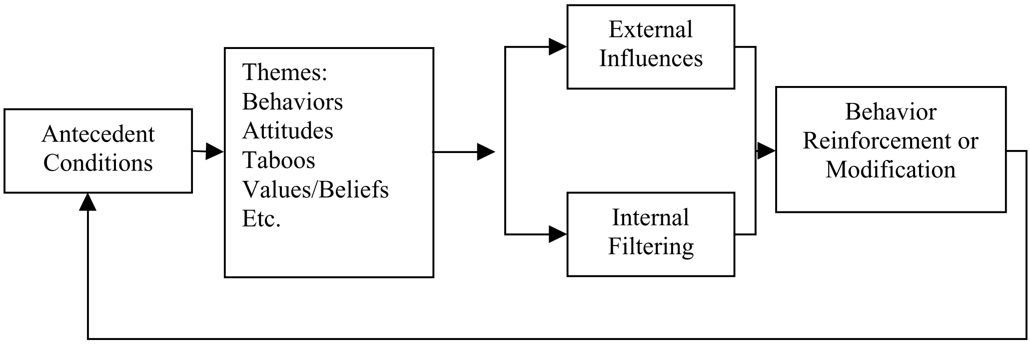
Phase III. Open Coding and Interpretive Memoing

This process also begins during the initial full reading of the data collection. The researcher writes identifying words or phrases to describe the portions of data that comprise relevant categories or classes of phenomena. The codes themselves should be detailed enough to inform the researcher to what they apply, without having to resort to looking up the meaning of a code in a reference file every time it appears. Also, it is important to remember that codes should emerge from the data themselves; they are not artificial constructs created by the researcher.

Both quantitative and qualitative data-gathering processes are used in this phase. Qualitative methodology consists of construction techniques (stories from supplied cartoon situations) and sentence completion techniques. These projective techniques can be employed to draw out the personal perceptions and attitudes of owners and managers of small businesses, for example. As Kassarjian (1974) has indicated, these techniques—more so than quantitative methods—force the respondent to respond in a manner that reflects his or her own need/value system.

The second part of this analysis phase is *interpretive memoing*. Memoing can be found in most research data analyses. In the open-coding step, memos are written to record the insights and ideas that come to the researcher during the initial, top-to-bottom reading of the data collection. They

Figure 21.4 **An Illustration of Linkages Between Themes and Other Factors**



Source: Emerson, Fretz, and Shaw 1995.

may serve as suggestions for further analysis, references to relevant literature, personal reminders, subjective opinions, preliminary evaluations, or for similar purposes. They should not be considered the final word on the data; the researcher still has much analytical work to do.

Together, initial open coding and memoing set the stage for the remainder of the analysis. At this stage in the process, however, it is important to remember that this is just the first pass through the data; changes are to be expected to occur at every subsequent phase. The need for flexibility at this stage was characterized by Emerson, Fretz, and Shaw (1995, 157): "Initial coding and memoing require the [researcher] to step back from the field setting to identify, develop, and modify the broader analytic themes and arguments. Early on [however], these efforts should remain flexible and open."

Phase IV. Identification of Salient Themes in the Data

In this phase of the analysis, the researcher should return to a broader view of the data collection in order to discern the core, reoccurring themes that he or she has found in the research data. At the same time, any linkages discovered between themes and constructs should be pointed out. Figure 21.4 illustrates how themes are shown to be linked to antecedent conditions and resulting consequences and transformations.

At the conclusion of this step, the researcher may elect to sort his or her field notes and/or memos into new groups that reflect the selected themes. This step can also be done during the final coding and memoing phase.

Phase V. Focused Coding and Interpretive Memoing

Focused coding—also called *selective coding*—is what Emerson, Fretz, and Shaw (1995) describe as the product of a "fine-grained, line-by-line analysis of the notes." It often results in preparation of an outline for a first draft of an ethnographic narrative. As one of the last steps in the data analysis process, focused coding should begin to integrate the final categories into a coherent whole that addresses the central issue or issues of the study. It may include unbundling of previously formed categories, the formation of entirely new categories, or making no change whatsoever. Its purpose is to bring the researcher to a point where no new categories, characteristics, or relationships emerge from the data (Strauss and Corbin 1998).

Integrative memoing also takes place during the open-coding phase. Integrative memos are the concrete manifestations of the researcher's thinking process at this stage. They are used to justify the decisions made during the selection of salient themes. Furthermore, memoing is done to provide a record of any conclusions, revisions, or insights that emerge from the second run-through of the data. Integrative memos may follow a single concept through the mass of data, connecting these data with other categories as required. Or it may serve to integrate two or more concepts into a larger whole. Integrative memos that chronicle the background information of the study should also be written. These help to set the stage for analytical narrative writing, as well as providing a record of the researcher's role in the investigation.

Three analytical tools can facilitate the final integration process: (1) writing a storyline, (2) applying diagrams and other graphic display techniques, and (3) reviewing and re-sorting the open memos. A *storyline* is nothing more than a subjective summary of the project in the words of the researcher, without referring back to the data or memos. It should flow as a freely written narrative, much as if it were a life history of the project. At this point, details of the research are not critical; they can be inserted later. The overall purpose is to enable the researcher to take an "omniscient narrator" view of the experience, writing what he or she believes occurred, its meaning and its relevance. The storyline is not the final interpretive ethnographic narrative, however. It should be considered just another interpretation guide for the researcher.

Diagrams and other graphic displays have long been important analysis tools. Miles and Huberman offer important guidance in the use of diagrams, including descriptions and graphic examples of several different approaches. They warn, however, that diagrams and other graphic displays should never be used in an analysis without a description of the content of the display. They describe the integrative capability of diagrams in the following terms:

> The display helps the writer see patterns; the first text [i.e., the first draft] makes sense of the display and suggests new analytic moves in the displayed data; a revised or extended display points to new relationships and explanations, leading to more differentiated and integrated text, and so on. Displays beget analyses, which then beget more powerful, suggestive displays. (Miles and Huberman 1998, 189)

Reviewing and re-sorting memos is a third way of arriving at a final integration of the data. Recall that memos are subjective notes prepared by the researcher during the review of the data. They contain the conclusions, questions, possible integrations, and perceived connections of themes and constructs as seen by the researcher. In one sense, then, they can be considered a reduced data set. Some researchers use this opportunity to re-sort their memos into new categories that emerged from selective coding of the open-coded data. This provides a possible final structure and organization to guide the researcher in final writing of the report.

Phase VI. Final Analytical Contemplation to Generate Theory

The final step in the analysis of ethnographic research data is to reach closure by generating theory that is grounded in the study and its setting. While the concepts are similar, the theory generated by ethnographic research is not the same as the grounded theory method first described by Glaser and Strauss (1967) and modified by Strauss and Corbin (1998).

Ethnographers do not "discover" theory in their data. Rather, they *create* theory during each and every step of their fieldwork and analysis (Emerson, Fretz, and Shaw 2001). For ethnographers, theory generation occurs during the "reflexive" interplay between theory and data. Ethnographers introduce theory at every point in their studies. Emerson, Fretz, and Shaw identify the key objective of this interactive process in the following way: "The goal of fieldwork . . . is to generate theory that grows out of or is directly relevant to activities occurring in the setting under study" (167).

Computer Analysis of Qualitative Data

There has been a dramatic growth in the use of computers in research and the availability of analysis software in the past several decades (Tak, Nield, and Becker 1999; Este, Sieppert, and Barsky 1998; Richards and Richards 1998; Miles and Huberman 1994; Weitzman and Miles 1995). In some research settings, technology has simplified the many necessary but time-consuming and often boring tasks of the data analysis process. However, qualitative researchers have not universally accepted them.

Although today's computer programs are capable of processing large volumes of text material and records, sorting and indexing the data, and retrieving information from a variety of different directions, few researchers have used the qualitative-data-analysis programs that are presently available (Richards and Richards 1998). Instead, most data coding, sorting, categorizing, and analysis is still done the way it has been done for more than a hundred years—by hand.

This section provides a brief introduction to the concept of computer analysis, using a single program package as an illustration. If readers seek more information about these programs they are encouraged to refer to one of several published reviews, such as *Computer Programs for Qualitative Data Analysis* by Weitzman and Miles (1995). Miles and Huberman (1994) include a valuable point-by-point comparison of a dozen or more commercially available analysis programs in their text on qualitative data analysis. Richards and Richards (1998) provide a useful introduction to the theoretical underpinnings of computer software programs for analyzing qualitative data, but without evaluating many specific programs.

In the taxonomy of analysis software suggested by Richards and Richards, software is divided into two broad classifications: general-purpose software packages and special-purpose software developed specifically for data analysis. General-purpose packages include standard word-processing programs, database management systems, and text-search software. Richards and Richards (1998) identify five categories of special-purpose software:

- Code-and retrieve software
- Rule-based, theory-building systems
- Logic-based systems
- Index-based systems
- Conceptual, or semantic, network systems

The two approaches that seem to offer the most promise at this time are logic-based systems and conceptual network systems. Richards and Richards (1998) provide an extensive review of a logic-based system they authored, NUD*IST (*Non-numerical Unstructured Data Indexing, Searching, and Theorizing*).

NUD*IST allows the user to code themes and categories by simply attaching labels to segments of the text (Tak, Nield, and Becker 1999). Like a majority of the systems discussed by Richards and Richards, NUD*IST is built around a code-and-retrieve facility. It has been expanded to include a number of different optional processes—a feature that may have turned out to be one of the program's greatest faults. Richards and Richards (1998) offer this caveat about their program:

> NUD*IST appears, compared with the other systems described here, as a rather awkward hybrid, containing features of code-and-retrieve, ways of handling production-rule and other types of conceptual-level reasoning, conceptual representations alternative to conceptual network systems, and database storage facilities, all interacting through interlocking tools. . . . And, perhaps most important, the software offers many ways for a researcher never to finish a study. (237)

Despite the potentially confusing complexity of NUD*IST, it has become one of, if not the most, popular computer software program for analysis of qualitative data. It is particularly popular in education, nursing and other medical studies, and some sociological applications. It seems to be used less often in ethnographic studies, and is hardly ever seen in political science research. Despite its slow adoption, a few innovators in political science and nongovernment organization research have started to test its capabilities.

The second software program to receive special mention by Richards and Richards was the conceptual network system ATLAS/ti. Thomas Mühr developed ATLAS in Germany during the 1980s, when most of the work on analysis software was under way. It was discussed in his 1991 article in *Qualitative Sociology*. ATLAS is built on a code-and-retrieve foundation, to which has been added an excellent memoing capability; codes can be assigned to memos as well as the original text. Its distinguishing feature, however, is its ability to create conceptual graphic displays that show relationships and linkages. Accordingly,

> Allied with ATLAS's sophisticated text-retrieval system, the graphs support subtle exploration of text via a visually immediate interface that relates the text to the systems or theories in the [setting] being studied. (Richard and Richards 1998, 240)

In conclusion, the application of special-purpose software packages for qualitative data analysis is probably here to stay. As more and more professional researchers discover the capabilities of the packages and more students are exposed to them in their research methods classes, this growth in use should accelerate. As of today, however, owing to their complexity—due in large part to their extensive capabilities—most researchers still analyze their data using traditional, minimal techniques and processes.

Summary

Conducting any qualitative research is a time-consuming, complicated, and often confusing task. One of the most problematic components of the process has been the task of analyzing qualitative data. The *analysis* processes for quantitative and qualitative research data are similar in some ways, but different in others. Similarities include (1) data are not just *there*—they must be collected in some way by a researcher; (2) when processed, both quantitative and qualitative data can be used for inference; (3) comparative analyses are used with both data types; and (4) researchers are concerned with both the reliability and validity of all data.

Quantitative data differ from qualitative data primarily in the way they are tabulated, collated, and processed. Quantitative data are typically computer processed and analyzed with a variety of standard statistical tests. These tests are applied for one or more of the following purposes: (1) to describe a data set, (2) to generate hypotheses, and (3) to test hypotheses.

Qualitative data, on the other hand, exhibit variety both in form and context. They can also be evaluated and interpreted in a variety of ways. Qualitative data can be words, pictures, artifacts, music scores, and so forth. Furthermore, each of the several different analysis approaches has its own underlying purpose, and each often produces a different outcome.

Qualitative data are data that have been gathered during the conduct of interpretive or post-positivist research studies. This kind of data can be written text, transcripts of conversations or interviews, transcripts of therapeutic or consultive interviews, records of legal trials, transcripts of focus group discussions. It can exist as historical or literary documents, ethnographic field notes, diaries, newspaper clippings, or magazine and journal articles. It can also be in the form of photographs, maps, illustrations, or paintings, musical scores, tape recordings, films, or any other nonquantitative or quantitative source. All data must be analyzed and interpreted before they are meaningful.

There are two parts to the interpretation and analysis of qualitative data. The first is *data management*, and the second is *data analysis.* Many different techniques and strategies have been developed for analyzing qualitative data; three are discussed in this chapter. The first is a nine-step process; the second follows twelve steps divided into two halves. The third was developed by anthropologists for analyzing ethnographic data.

Advances in computer software have resulted in a number of different special-purpose software packages for analyzing qualitative data. Researchers studying political science and nonprofit management topics are adopting these new approaches for analysis in greater numbers.

Discussion Questions

1. How do qualitative data contribute to the understanding of complex political questions?
2. Name the components of qualitative data.
3. The interpretation and analysis of qualitative data has two parts: name and describe them.
4. Name the nine steps in the qualitative data analysis process.
5. What is axial coding? Why is it used?
6. What is the purpose for data and concept comparisons during analysis?
7. Describe the process of reiterative analysis.
8. Discuss the twelve-point scheme for analyzing qualitative data. Are all the steps important?
9. What is meant by first-, second-, and third-level coding?
10. What role does reflective contemplation play in the interpretation of qualitative data?

Additional Reading

Auerbach, Carl, and Louise B. Silverstein. 2003. *Qualitative Data: An Introduction to Coding and Analysis.* New York: New York University Press.

Bryman, Alan. 1994. *Analyzing Qualitative Data.* New York: Routledge.

Fielding, Nigel G., and Raymond M. Lee. 1998. *Computer Analysis and Qualitative Data.* London: Sage.

Gibbs, Graham. 2008. *Analyzing Qualitative Data (A Qualitative Research Kit).* London: Sage.

Munton, Anthony G., Joanne Silvester, Peter Stratton, and Helga Hanks. 1999. *Attributions in Action: A Practical Approach to Coding Qualitative Data.* New York: John Wiley & Sons.

Silverman, David. 2006. *Interpreting Qualitative Data: Methods for Analyzing Talk, Texts and Interaction.* 3rd ed. London: Sage.

22 Analyzing Texts, Documents, and Artifacts

Sources of research data include people, their words and actions, publications, material culture, and any item or symbol that communicates a message of any kind. Data-gathering methods include watching the way that people act; asking them questions about their opinions, attitudes, or perceptions; reading what they have written; watching their movements; listening to their songs and other sounds; rummaging through their garbage; examining their tools and toys; deciphering their signs, symbols, or facial expressions—the list can go on and on. This chapter discusses some of the ways that researchers go about examining textual material, cultural artifacts, body language, and similar types of written and unwritten communications, records, documents, signs, and symbols.

For convenience, these different sources of research data can be grouped into four broad categories. The first is *written texts.* These include such sources as books, periodicals, narratives, reports, pamphlets, and other published materials. Collectively, this group of sources includes most if not all of the *mass media.* Research using these sources is often called *library research*, or *desk research.*

The second category is *formal and informal documents*; it includes personal messages and assorted types of archival information, such as personal notes and memos, government records and vital statistics, and other informal written materials, including e-mail. The third category of sources is made up of the wide variety of *nonwritten communications.* This group includes such things as graphic displays (graphs, tables, charts), photographs and illustrations, tools and other artifacts, films and videotapes. The final category includes all *nonverbal signs and symbols.* Among these are the silent messages in body language, facial expressions, gestures, music and dance, animal sounds and behavior, and even noise.

Researchers employ a variety of analysis tools and methods in their study of texts, symbols, and artifacts. Among these are *hermeneutics*, *content analysis*, *meta-analysis*, *semiotic analysis*, *discourse analysis*, *site surveys*, and more. Table 22.1 displays the relationship between various sources of data and methods used in their analysis. The analysis approaches used most often in public and nonprofit organization research are the formal literature review; hermeneutic analysis of textual material; content, discourse, and narrative analysis; meta-analysis; archival analysis; and semiotic analysis. Each of these will be discussed in greater detail in the following pages.

Preparing diagrams and other graphic representations of ideas and their interrelationships is a valuable process for several reasons. First, it forces the researcher to step back from the complexity of the data to take a broader view of the study in its entirety. Second, it forces the researcher to establish collective constructs that embrace a variety of ideas and categories. And third, it forces the researcher to examine relationships between themes, constructs, and events.

Another way to categorize these research approaches might be to look at the formal lit-

Table 22.1

The Relationship Between Sources, Examples, and Study Methods

Source	Examples	Analysis Methods
Written Texts	• Professional Literature • Mass Media • Narratives • Books and Stories	Hermeneutics Content Analysis Narrative Analysis Meta-analysis Literature Review
Informal Documents and Other Written Records	• Archival Information • Government Reports • Vital Statistics • Records, Documents • Notes and Memos	Hermeneutics Content Analysis Archival Analysis Semiotics
Nonwritten Communications and Material Culture	• Photos and Drawings • Films and Videos • Tools and Artifacts • Graphs and Tables	Semiotics Discourse Analysis Hermeneutics Site Surveys
Nonverbal Signs, Symbols, and Other Communications	• Body Language • Gestures • Music and Dance • Nonverbal Sounds • Signs • Noise	Semiotics Proxemics Kinesics

erature review, meta-analysis, hermeneutics, content analysis, and semiotics as *methods*, and archives, texts, artifacts, and signs and symbols as *sources* of research data. This chapter is structured along these lines, with the discussion of textual sources first discussed in a section on the literature search process. Narrative and discourse analyses are discussed in the content analysis section.

Analysis of Texts as Data

In political science, if not research in all of the social and administrative sciences, library-based research draws on documents of all types as the source of data. It is, in this respect, the opposite of the field research methods that have been discussed up to this point. These types of library or desk-research projects are common in such fields of inquiry as philosophy, social theory, law, and history, much of which rely almost exclusively upon documents as their key source (Denscombe 2002). They are also important in public administration research, with many studies drawing upon legislative archives for data.

From the researcher's point of view, literature or "documentary" research can be grouped into three key classes. The first is the traditional *literature review* that is or should be a part of all scientific research. A key purpose of the literature review is to provide background information that can then be used to design a complete research project. The second strategy is called the *archival study.* In substance similar to a standard literature review, it draws upon public and private formal documents, records, and other material of a historical nature for data. These may or may not be stored in a library. When they are, they are generally not open for general access or circulation. The third approach is what is known as a *meta-analysis* design. In this approach, researchers use other studies as subjects for analysis. Meta-analysis is a quantitative technique for summarizing other investigators' research on a topic; as such, it uses the literature as a source of data in its own right.

Reviewing the Relevant Literature

A crucial early step in the design and conduct of all research is a thorough investigation of the relevant literature on the study topic, the research question, and the methodology followed by others who have studied the same or similar problems. Called a *review of the relevant literature* or, simply, a *literature review*, the process has been defined as "a systematic, explicit, and reproducible method for identifying, evaluating, and interpreting the existing body of recorded work produced by researchers, scholars, and practitioners" (Fink 1998, 3).

The literature review serves three fundamental purposes: First, it shows those who read the research findings that the researcher is aware of the existing work already done on the topic. Second, it clearly identifies what the researcher believes are the key issues, crucial questions, and the obvious gaps in the field. Third, it establishes a set of guiding signs that help readers to see which theories and principles the researcher used to shape the research design and analysis (Denscombe 1998).

Purposes for the Literature Review

Despite the critical importance of the literature review, some researchers either skip this step entirely, in the mistaken belief that theirs is a "unique" study problem, or, if they do look into the literature of the study topic, field, or discipline, they often take a wrong approach. The literature review is not intended to be just a summary of each of the articles and books that were read. Nor should a literature review be a list of the authors with whom the researcher agrees or disagrees. The good literature review has a greater purpose than this: it is a source of data in its own right (Denscombe 1998).

Among the most meaningful strategic purposes to which the literature review can be put are the following (Piantanida and Garman 1999):

1. The review can *trace the historical evolution* of the study problem or key issues, themes, or constructs pertaining to the problem.
2. The review can provide a schematic of the *different schools of thought* that have developed or are developing with regard to the study problem.
3. The review can examine the study problem from several *different disciplines* (examples include looking at welfare reform from the point of view of both social work and economics).
4. The review can examine the positions of *different stakeholder groups*, such as public administrators, citizen groups, nonprofit organizations, and others.
5. The review can trace *different conceptual schools of thought* that have emerged over time and that may be currently taking opposing or conflicting views in the literature.

These are only a few of the many approaches for a literature review; the important thing to remember about this list is that *none of the approaches or strategies is mutually exclusive.* A good literature review can achieve many goals at the same time. Lang and Heiss (1990) identified two key purposes for reviewing the related literature. First, it should help the researcher hone his or her attack on a specific study problem, and second, it provides a point of reference when discussing and interpreting the findings of the research. Specifically, a well-conducted literature review can do all of the following:

- Help to set specific limits for subsequent research
- Introduce the researcher to new and different ways of looking at the problem
- Help avoid errors and omissions in planning the study
- Suggest new ideas
- Acquaint the researcher with new sources of data and, often, totally different ways of looking at an issue

A formal literature review should follow an organized series of steps. The action model portrayed in Figure 22.1 has been developed from several sources, but owes a special debt to the contributions of Arlene Fink (1998). The model begins with an encouragement to researchers to study all their options before embarking on their journey through the literature. This means that all potential sources should be considered. Limiting a literature search to a quick perusal of the Internet or a run through a single CD-ROM database is not the way to conduct a thorough scientific study of the literature.

The second step in the literature review process is made up of three equally important activities: establish some basis for selecting articles (content criteria); establish some methodological criteria, such as should the readings all be quantitative or qualitative studies, should there be a certain minimum size, were sample members randomly selected and assigned to groups, and so on. The decision will be based on the study question and may change somewhat when the search itself—the third activity in this step—is under way.

The collected research literature must then be read in detail. As this occurs, relevant categories of information should begin to stand out. These categories must be coded, with the pertinent information copied onto cards or worksheets.

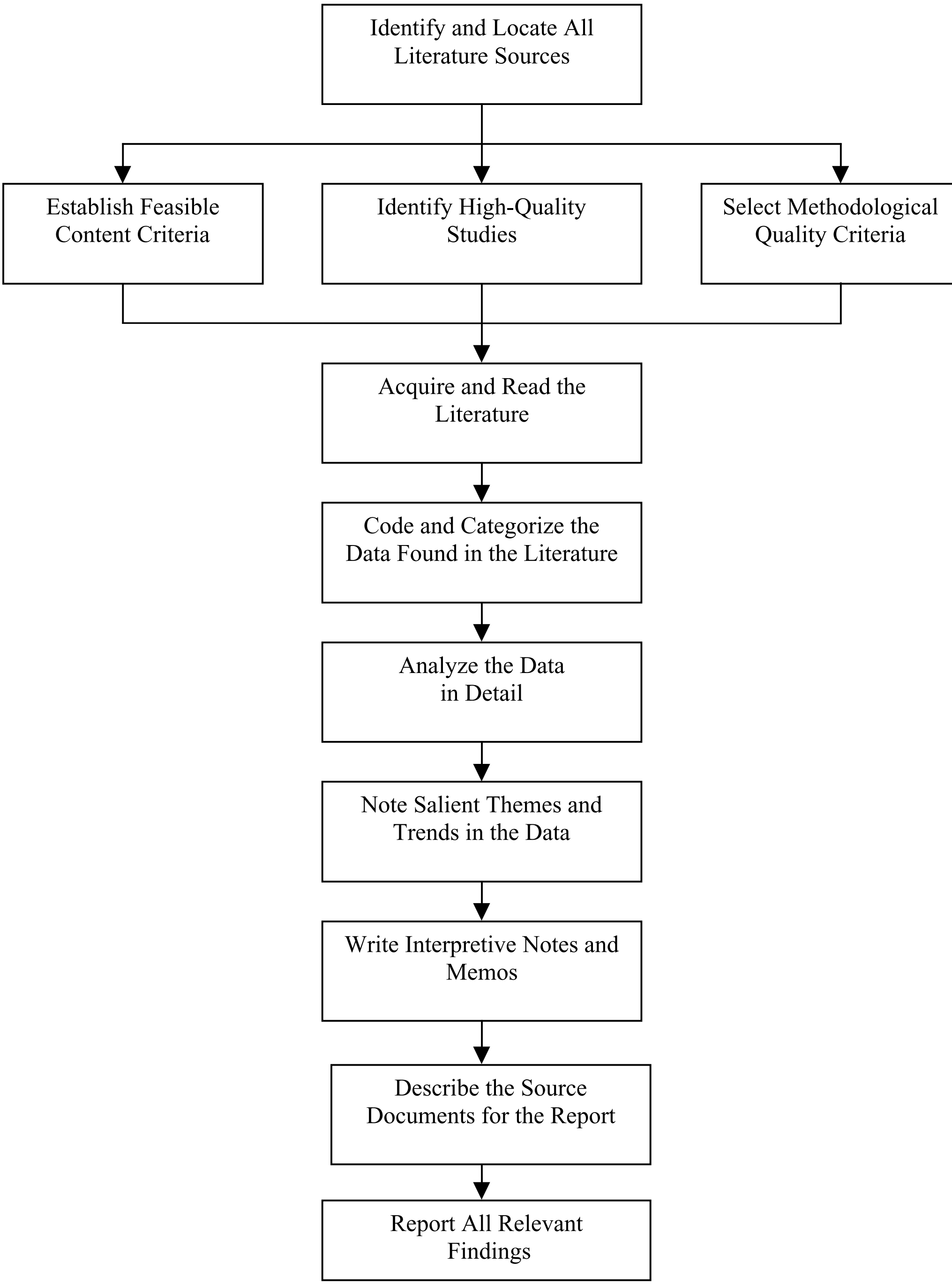
Repeated salient themes in the literature should be recorded; these often serve as discussion points during the writing of the final research report. At this point, the researcher often continues by writing interpretive memos that summarize the material and allow the researcher to comment on the content. These memos are sometimes carried into the final report with little or no revision.

During the next-to-last stage in the process, the researcher is encouraged to record all the important bibliographic information on the source documents. This usually includes information about the author(s), the discipline in which they did their research, all information about the source, and any connections to other sources that have been or might be investigated.

Document Research Using Archival Data

Archives, long thought to be of interest only to librarians, have come to be recognized as rich sources of research material in the social sciences, including political science. They are particularly valuable as a source for cross-checking interview and narrative study data. In this way they contribute to improved validity through triangulation—using several different approaches in a research study. While it is certainly possible for bias and dishonesty to exist in archival data, they are less susceptible to some types of error, including researcher error.

Figure 22.1 **A Model of the Literature Review Process**



Source: Fink 1998; and others.

The Archival Record

The research element in an archival study is the *record* (Dearstyne 1993). Records are concrete extensions of human memory. They are created and stored for record information, to document transactions, to justify actions, and to provide official and unofficial evidence of events. A record can be any type of saved information. A record can be created, received, or maintained by a person, an institution, or an organization. Records can be official government reports, recorded e-mail communications, letters, diaries, journals, ledgers, meeting minutes, deeds, case files, election results, drawings and other illustrations, blueprints, agreements, memoranda, and any other type of material that has some greater or lesser historical value.

Records can exist in many different forms and different characteristics. For example, they can be stored in the form of computer tapes or disks; in electronic data storage; words, figures and illustrations on paper or parchment; on microfilm and microfiche; cassette tape; film and videotape; among others. Records that are established and maintained by organizations or institutions are called *official records.* The *National Historical Publications and Records Commission* recently estimated that there are more than 4,500 historical record repositories in the United States alone. In addition, almost every state has its own historical society and can often direct the researcher to sources not kept in official government archives. A few examples of specific archival records included the following:

1. Private letters and collections
2. Political and judicial documents
3. Voter registration lists
4. The *Congressional Record*
5. Actuarial records (i.e., vital statistics)
6. Records of quasi-governmental agencies (weather reports, etc.)
7. The mass media
8. Professional and academic journals
9. Company and organization records
10. Personal histories
11. Published and unpublished documents

Activities of Archivists

Archivists collect, organize, and store documentary evidence of events, operations, correspondence, and organizational functioning. In this way, they perform a valuable service for historians and social science researchers. However, gaining access to archives can sometimes be problematic. If the attitude of one of America's leading archivists, T.R. Schellenberg, is any indication, a guiding principle of archival science might be *a place for everything and everything in its place.* One implication that can be taken away from Schellenberg is: *And that is where there they should stay.*

Researchers, by the very act of researching archival data, must often synthesize, reorganize, restructure, and condense archival data in order to interpret its meaning. Schellenberg grudgingly admitted this fact, but did so believing that researchers could not really be trusted to leave things the way they found them. He blamed this on their lack of knowledge of the archival profession, but forgave them for their ignorance, as can be seen in the following comments:

> If historians [and other social scientists] fail to preserve the evidential values of records by insisting on a violation of the principle of provenance, their action may be attributed to their ignorance of the archival profession, about which they are expected to know very little, and may for this reason be excused. (Schellenberg 1984)

Regardless of whether you feel that Schellenberg's statement displayed a condescending and biased attitude about the purpose of collections, he was indeed making a valid point—one that everyone should remember: As researchers, we all owe future investigators the same right of access to the original archival data that we expect. Therefore, researchers must always treat archives with care; they must be left in the state we would like them to be when we find them.

Types of Archives

Webb and coauthors (2000) group the many sources into just two broad classes or types of archives: the *running record* (essentially all types of public documents, artifacts, and mass media), and the *episodic and private record* (these are discontinuous and usually not a part of the public record).

Running record archives are the continuous, ongoing records of society. The first thing that comes to mind when we think about this source is the extensive body of vital statistics and other records kept by all levels of governments and the mass media. However, it also includes actuarial records of insurance companies, recorded votes of political officeholders, government budgets, and the like. As with the second type of archival records, these data can exist as words, numbers, pictures, graphic displays, and the residue of human activity, society's refuse, and so forth.

Webb et al. (2000) alerted the researcher to two classes of potential bias that can creep into public records—*selective deposit* and *selective survival.* Artifacts survive in nature because they are not consumed, not eroded away, or not combined into other artifacts and thus lost to view or memory. For example, ceremonial stones, decorative stone facings, and similar components of Greek and Roman structures have been removed over the centuries to be incorporated into the baser constructions of later generations. Temples have become stables.

Changes in political administrations usually result in the filing away and delivery to archival storage of volume after volume of written records. Potentially damaging or embarrassing records somehow get misplaced, "accidentally" removed from the archival record. In other instances, well-meaning historians or social science researchers may be charged with bringing order to a body of unorganized archival records. In the process, they often "edit" the raw data, unwilling to leave it as they found it. What survives may be what that researcher believed was important. Also, records of events tend to be grouped together, thereby blurring the real contextual time structure of events.

The phenomenon is visible today in the decay evident in many inner cities. Buildings are abandoned, their materials removed and used for other purposes. What remains for later generations to read is far different than the record as it was originally laid down. Researchers are encouraged in such instances to fall back on the tried and true practice of *triangulation*, the use of other sources to validate the remaining archival record. Other studies might include written records prepared by visitors from other cultures, biographies and histories, others' interpretations of the time, and for phenomena in the not too distant past, the remembrances of participants in the event or events.

A Triangulation Example Using Archival Data

An example of triangulation design in which archival data played a role is the Monopoli and Alworth (2000) study involving Navaho World War II veterans. Four surviving tribal members were part of a panel who participated in a 1950s Thematic Apperception Test (TAT) study of attitudes and opinions of Native Americans. The surviving subjects were interviewed and the data compared with archival records of the original study.

In addition to the benefits of a longitudinal design, the researchers were also able to identify some biasing errors in the earlier study results that might not have come to light with the use of the archival data in the modern study. Webb and colleagues (2000) also identified the mass media as an important source of archival data. Citing a number of different studies, they concluded that carefully selected media could clearly serve as a record of the values of society at a given period.

An example of triangulation in an archival design involving a comparison of official written histories with daily reports of speeches, paid announcements, and published articles appearing in the regional mass media of the period was conducted by McNabb (1968). The study subject was the conflict between advocates of public ownership of electrical power generation and distribution, and those represented by the large holding-company forces of investor-owned utilities led by the Samuel Insull group of utilities. The battle began in earnest shortly before World War I, eventually becoming one of the last great causes of the Progressive Movement in the United States.

Public administration researchers are often particularly concerned with political and judicial records, another source of the public record. These include speeches by candidates and office-holders, their supporters or their opponents, voting records, judicial decisions (including minority opinions), and other similar records.

Researchers may also be interested in legislators' seniority, party majorities, committee assignments, political philosophy, events participated in, or legislative emphasis during times of economic or political stress, and many other such phenomena. For example, a study conducted in the state of Washington evaluated legislative effectiveness under stress as measured by the number and scope of bills passed during two periods when a tie existed in the lower house.

Episodic and Private Archives

It is important to remember that episodic and private record archives are, first, private data. Furthermore, they are usually not as accessible as are public records; they tend to be stored for shorter periods and are often destroyed after a set period of time. This accounts for one of the major differences between the two broad classes of archives: it is often not possible to perform longitudinal analyses on private archival data.

Episodic archives can be grouped into three broad classes: company records, institutional records, and personal documents. Company information such as sales records has long been used to measure the popularity, preference, and loyalty toward a product, event, idea, or service. This information is also used to measure the effectiveness of advertising and government informational communications programs. Institutional records are the files of companies, organizations, agencies, and institutions. They can be used to measure job stress by records of absenteeism, tardiness, turnover, and labor union grievances, for example. They can also be used to evaluate agency effectiveness by measuring customer complaints and the content of suggestion programs, for example. Personal records such as letters, memos, collections, artwork, and other possessions are usually the concern of historians, and as such have little application for research in public administration.

A Word of Caution Concerning Archives

Caution is advised in the use of archival materials because of the potential distortion that can exist in personal archives (Webb et al. 2000). Low-paid clerical workers often indifferently keep archives with no stake in the accuracy of their product. Because record keepers may feel that the saved material has little value, it might be stored haphazardly. It could be years if not decades before the material is again examined; therefore, their diligence or lack thereof seldom comes to light. When a researcher appears on the scene, however, there is a tendency for their interest to be revitalized, with the unfortunate result of some altering or even destruction of recorded data.

Archive research involves a way of looking at published and previously prepared material, and also defines the type of materials that are examined. While this approach to the investigation of archival records of all types can serve as an excellent source of pertinent data for many studies in public administration and nonprofit organization management, archives are not without their disadvantages. This final warning was provided by Webb and coauthors:

> For all their gains [i.e., advantages], however, the gnawing reality remains that archives have been produced for someone else by someone else. There must be a careful evaluation of the way in which the records were produced, for the risk is high that one is getting a cut-rate version of another's errors. (Webb et al. 2000, 84)

Nontextual Archives: Physical Traces

Physical evidence is another information source that might be considered to be "archival evidence," in that it was recorded for future researchers to interpret. According to Webb et al. (2000), physical evidence is probably the least used source of data in the social and administrative sciences. However, it does hold what they called "flexible and broad-gauge potential." There are two broad classes of physical evidence:

- *Erosion measures*—the degree of selective wear or erosion that occurs over time; an example would be the rate of wear in museum floor tiles, which serves as a measure of exhibit popularity.
- *Accretion measures*—the degree to which materials collect over time. There are two subclasses of accretion measures: (1) *Remnants*, where only one or a few traces are available for study, and (2) *series*, where an accumulated body of evidence remains.

The major advantage of physical evidence data is its inconspicuousness. It is, indeed, a *silent* measure of change. What is measured is generated without the subjects' knowledge of its use by investigators. It circumvents the problems of awareness of being measured and removes the bias that comes from the measurement process itself becoming a part of the phenomenon. With all types of physical traces, and particularly when the phenomenon still occurs, index numbers are generated for comparisons, rather than the specific measurements themselves.

Performing a Meta-Analysis of Existing Research

Examining the literature of a study topic has been shown to have many purposes. First, it allows the researcher to frame his or her study in light of what others have investigated previously. Second, it can provide insights and new ideas regarding the study problem. Third, it can suggest new ways of examining the problem or conducting analysis of the gathered data. A *meta-analysis* is a fourth purpose for analysis of existing literature on a topic, method, or conclusions.

Lipsey and Wilson (2001) defined *meta-analysis* as a type of survey research in which, instead of surveying people as subjects, previously prepared research reports are the subjects of analysis. Meta-analyses are used in order to summarize and compare the results of many different studies; other researchers have produced most if not all of these other studies. Meta-analysis is an excellent way of establishing the state of research findings on a subject—it provides the researcher with the "big picture," rather than simply another discussion of one or a few parts of the question, problem, or issue.

Furthermore, meta-analyses can only be applied to empirical research reports—that is, studies using primary research and data gathering. The technique is not appropriate for the types of qualitative studies that summarize a set of other research studies. Although it is not necessary that the studies that are examined in the meta-analysis be the results of experiments, many research analysts have focused on these types of studies in their meta-analyses.

Advantages and Disadvantages of Meta-Analysis

Lipsey and Wilson (2001) identified four important advantages of the meta-analysis research design. First, the complete process of establishing a coding scheme and criteria for selecting studies (a *survey protocol*), reading the study reports, coding the material, and subjecting it to a rigid statistical analysis imposes a discipline on the researcher that is sometimes missing in qualitative summarizations and comparative analyses.

Second, the process results in greater sophistication in summarizing research, particularly when compared with qualitative summary attempts. The application of common statistical tests across all the studies can correct for wide differences in sample size, for example.

Third, meta-analysis may enable the researcher to find effects or associations that other comparative processes miss. Finally, it provides a way to organize and structure diverse information from a wide variety of study findings. Meta-analysis is not without its disadvantages, however. Lipsey and Wilson admit to the validity of these criticisms, but are convinced that the strengths of the method far outweigh any such disadvantages. A few of the criticisms that have been cited for the method include the following:

1. The large amount of effort and expertise it requires is an often-cited disadvantage of the method. Properly done, a meta-analysis takes considerably more time than a conventional qualitative research review; many aspects of the method require specialized knowledge, particularly in the selection and computation of appropriate effect sizes (i.e., the statistic chosen for comparison across all the studies).
2. It may not be sensitive to some important issues, including but not limited to the social context of the study, theoretical influences and implications, methodological quality, design issues, procedures, and the like.
3. The mix of studies (an *apples and oranges* issue) combined into larger groups may hide subtle differences seen in individual studies.
4. Finally, inclusion of studies that are methodologically weak can detract from the findings in strong studies.

How to Do a Meta-Analysis

Fink (1998, 216) has recommended the following series of seven steps for conducting a meta-analysis:

- Step 1. Clarify the objectives of the analysis.
- Step 2. Set explicit criteria for including and excluding studies.

- Step 3. Justify methods for searching the literature.
- Step 4. Search the literature using a standardized protocol for including and excluding studies.
- Step 5. Devise a standardized protocol to collect data from each study, including study purposes, methods, and outcomes (i.e., effects measured).
- Step 6. Describe in detail the statistical method for pooling results.
- Step 7. Report the results of the comparative analysis, included conclusions and perceived limitations.

A slightly longer, but possibly more informative, list of steps can be discerned by combining ideas from Lipsey and Wilson's (2001) manual on the method with Fink's later review (2004). This summary procedure model is displayed in Figure 22.2, and the steps are discussed below.

Statement of the topic or question. This step provides the framework upon which all subsequent steps in the process follow. An example question statement for a meta-analysis might be: How have mandatory sentencing guidelines affected the number of repeat arrests for crimes in which a weapon was involved?

Identify the form(s) of research relevant to a meta-analysis on the topic. The "form" aspect refers to the type of analysis conducted in the individual research studies. For example, this could be studies that report treatment/control group experiments. Or it could be studies that focus on correlations between two or more variables.

Another example is a standard two-sample comparison study. In the example proposed in the first step in this discussion, a typical form might have been studies that compare mean rates of arrest or length of sentences before mandatory sentencing, and then a repeat study after imposition of sentencing minimums. This is a typical pre- and post-treatment comparison or hypothesis testing research design. The test statistic for the next step could be *t*-test scores or *p*-values of comparisons.

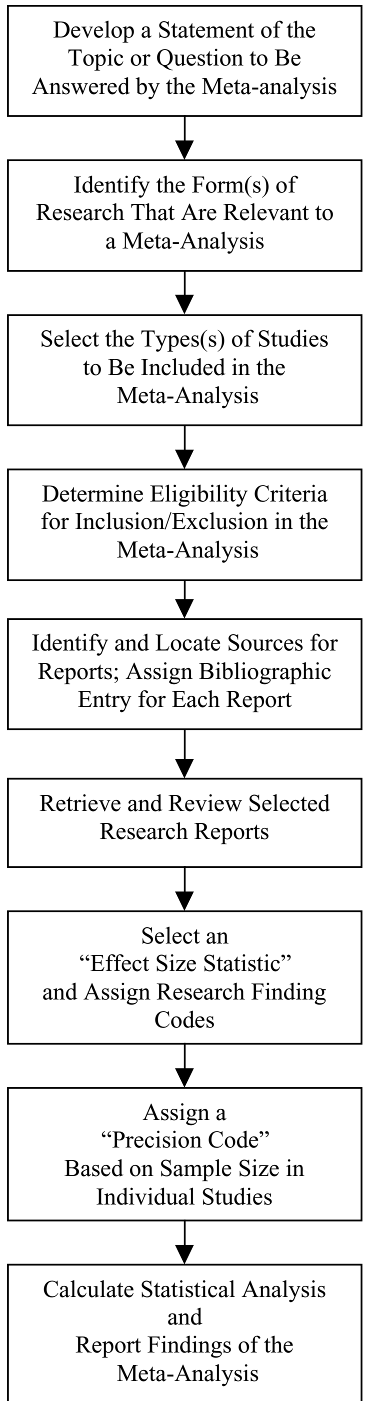
Select types of studies to be included in the analysis. This decision step is similar to the step above, but refers more to the statistical tests used. Four types of tests are regularly used in meta-analyses: (1) central tendency descriptions (such as mean scores), (2) pre-group/post-group hypothesis test studies, (3) other group contrasts, either pure experiments or nonexperimental grouping comparisons (for example, comparing gender or age groups, etc.), and (4) studies employing regression analysis.

Determine eligibility criteria. In this step the researcher chooses the criteria upon which to base a decision to include the study in the meta-analysis. Examples of types of criteria often used include (1) the distinguishing feature of a study (what made writing about it worthwhile), (2) research subjects (i.e., types or characteristics of respondents used in the study), (3) key variable(s), (4) research designs, (5) cultural and/or linguistic range, (6) time frame involved, and (7) type of publication.

Identify and locate sources of research reports. At this stage the research must apply the decision criteria established in the previous step. Lipsey and Wilson urged that the researcher develop a meticulous accounting system so that each study is assigned its own detailed bibliographic entry and its own identification number in order to facilitate future cross-referencing and to ensure that reports are assigned to their appropriate comparison group. A brief description of the subject report should also be prepared at this time.

Some sources and listings for research reports include review articles, references in other studies, computer databases, bibliographies, professional and academic journals, conference programs and proceedings, correspondence with researchers active in the field, government agencies, the Internet, colleges and universities, professional associations, and others.

Figure 22.2 **Steps in a Meta-analysis Research Design**



Source: From material in Lipsey and Wilson 2001.

Retrieve and review eligible research studies. This step involves several activities: first, researchers must find bibliographic references to potentially eligible studies. Second, a copy of the study must be obtained for screening. If it is considered to be eligible, it must be coded for inclusion in the meta-analysis.

Select an effect size statistic for use with the entire sample of reports. In a meta-analysis, a single quantitative research finding may serve as a statistical representation of the relationships among the variables of interest. This statistical representation is the effect size statistic that will be used in comparative analysis during the meta-analysis. Research findings in the subject reports are test statistics; each must be coded as a value on the same effect size statistic. This must be the same statistic across the entire sample of reports.

For example, if the effect size statistic is the correlation between two or more variables, the variables in all the reports must have been measured at the same level (nominal, ordinal, or interval), with the same correlation statistic employed (Pearson's *r*, Spearman's *rho*, the chi-square-based *phi*, or Cramer's *V*). Similar restrictions apply for other statistical measures that might be selected.

Assign a precision code for each research report. A precision code is similar to a weighting system. It is based upon the sample size employed in each subject report. For example, a study in which a sample size of 500 was tested can be expected to be considerably more precise than one in which the sample size was, say, only 5—or even 50. The statistical calculations used in meta-analysis take these precision weights into effect, thus correcting for possible error associated with small samples. The greater the perceived reliability, the greater should be the precision code value assigned to the study.

Statistical analysis and report findings. Finally, researchers must keep in mind that there are two parts to a meta-analysis coding process. The first part is the information that describes characteristics of the subject report; this is the "study descriptor" portion of coding. Study characteristics include such information as the methods, the measures, sample characteristics and size, constructs developed, treatments given, and the like. The second part of the coding protocol is the part that covers information about the empirical findings contained in the report; this is the "effect sizes" portion of the coding, together with the precision code for each study. Effect sizes, for example, are the statistical values that indicate the association between variables.

The first three sections of this chapter discussed documentary data as a source of data that researchers turn into information. The following section begins a discussion on some of the ways that researchers actually conduct analyses of texts. Texts will be shown to include such things as signs and symbols, as well as artifacts and other facets of material culture. Methods such as *hermeneutics*, *semiotics*, and *content analysis* will be discussed.

Hermeneutic Analysis of Text and Nontext Material

Hermeneutics is a method of analyzing all types of data (but, particularly written texts) according to a set of principles that requires the analyst to decipher the meaning of the text (1) through the eyes and intent of the writer or creator of the text or artifact, (2) according to the time frame existing at the time of the writing, and (3) considering the political and cultural environmental influences existing at the time of the creation of the text or artifact.

Hermeneutics owes its long history of interpretive applications to the analysis of first, religious texts, and, second, legal documents and written administrative rulings (see, Gadamer 1975a and 1986; Bauman 1992; Alejandro 1993). The term originates from the Greek word *hermeneutikós*, which refers to the act of explaining. "Explaining" refers to making clear or clarifying the obscure (Bauman 1992).

Hermeneutic analysis requires that the researcher take a holistic, or "contextualist" approach to analysis of a problem. The meaning of a text or social phenomenon that is analyzed hermeneutically depends on the whole—that is, the text, the author(s), *and* the context. Meaning cannot be deciphered without understanding the context as well as the text or phenomenon (Wachterhauser 1986).

Hermeneutics is a way of clarifying the meaning of a text by interpreting it *historically* (Moore 1990, 94). It looks upon a text as the "medium which links human subjects [i.e., writers of textual material] to their world and to their past . . . it involves identification with the intentions and situation of the [writer]." Maas (1999), writing about the hermeneutic analysis of religious texts, explained this two-part focus by describing both a *material* and a *formal* object for the process. The material object is the text or other document that is being explained; the formal object is deciphering the sense of the author at the time the text was written.

Hermeneutic analysis is particularly relevant when studying historical documents, such as past legislation, the records of discourse that occurred over legislative or administrative hearings, and similar applications. In this way, public administration hermeneutics deals with government texts or documents as its material object, with the deciphering of the intent of the framers at the time of its creation (i.e., passage or implementation) as its formal object. Thus, legislation that might seem silly today has the potential to be interpreted as logical and meaningful when considered in the light of events and circumstances at the time of its enactment, or lack thereof.

Principles of Hermeneutics

Several key principles underlie the hermeneutical analysis process. First, *all thought is derived from language and follows the same laws that regulate language.* A writer uses the traditions and conventions of his or her time and particular circumstances, including the rhetorical logic, the same sequence of ideas, and the same rules of grammar in use at the time of the text's creation. Therefore, if the analyst wishes to fully understand the writer and "correctly" interpret the writer's words, he or she must first understand the author's meaning *at the time and place of the writing.* The interpreter must know the writer's language, his or her train of thought or context of the text, and the writer's psychological and historical condition at the time of the writing. Hence, the first principle of hermeneutics is (Maas 1999, 3): "Find the sense of a book by way of its language (grammatically and philologically) by way of the rules of logic . . . and by way of the writer's mental and external condition [at the time of writing]."

Several other principles follow from this first principle of hermeneutics. Among them are that hermeneutic analysis presupposes (1) that the analyst has knowledge of both the grammar and historical evolution of the language in which the work is written, (2) is familiar with the laws of logic and rhetoric, and (3) has knowledge of psychological principles and the facts of history (of the time when the work was written).

Hermeneutic Analysis of Nontext Material

While it is used most often as a method for analyzing texts, hermeneutics is applicable to more than this; it is a broadly based theory of interpreting all creations of humankind. Henrietta Moore, describing philosophy's contributions to hermeneutic theory and application, wrote about the expanded application in these terms:

> [The] theory of [hermeneutic] interpretation may be extended beyond the written text to encompass other human phenomena which can be said to have textual characteristics. One such phenomenon is meaningful action . . . and action is understood when it can be explained why the individual acted as (he or she) did, and thus can only be explained when a reason or motive for the action can be adduced. (Moore 1990, 99)

Richardson also commented on the application of hermeneutic analysis to phenomena other than textual materials, although admitting a sense of puzzlement over the fact:

> Hermeneutics has come forward as that comprehensive standpoint from which to view all the projects of human learning. For those of us who have been puzzled by the new intellectual dominance of hermeneutics, the key is that the term no long refers to the interpretation of texts only but encompasses all the ways in which subjects and objects are involved in human communication . . . hermeneutics or interpretation has come to be regarded as shorthand for all the practices of human learning. (Richardson 1995)

Moore saw that the problem of analyzing *meaningful action* is at the very heart of much of the research and philosophical speculation in the social sciences, including public administration. She proposed that it be approached with the understanding that the social world is made up of individuals who speak and act in meaningful ways, and added that "these individuals create the social world which gives them their identity and being, and their creations can only be understood through a process of interpretation" (1990, 111).

Meaning and Emphasis in Hermeneutics

Hermeneutics holds that there is always a plurality of meanings available for every human phenomenon. Meaning is not something that just exists; every reader must interpret it. Interpretations will vary from reader to reader, and can be understood only in the light of historical, social, and linguistic traditions. According to Alejandro (1993), data interpretation is a "construction of meaning" that distinguishes the researcher's labor from the purpose of hermeneutics. The researcher seeks certainty; hermeneutics seeks clarity that is anchored in the principle that the meaning that interpretation makes possible is not arbitrary, nor is it the outcome of the researcher. The construction of meaning is framed by the boundaries inherent in the text (or phenomenon) itself as well as in the background established by the traditions in which it was created.

Bauman (1992, 12) also commented on this difference in emphasis. Social phenomena—the subject matter of political science research—because they are ultimately acts of human beings, must be understood in a different way than by simply explaining. Men and women do what they do on purpose. True understanding can occur only when we know the purpose, the intent of the actor, his or her distinctive thoughts and feelings that lead up to an action. "To understand a human act . . . [is] to grasp the meaning with which the actor's intention invested it . . . [this is] essentially different from [the goal] of natural science."

In terms of its importance for research on questions in political organizations, hermeneutics provides a new way of looking at public issues. The hermeneutic approach assumes that the "constant of history" exists in the mind of every individual, and that citizens' actions are inescapably influenced by their beliefs, traditions, and historical events. In the words of Vincent Descombes (1991, 254), *there can be no understanding without interpretation.*

The Hermeneutic Circle

The process of hermeneutic analysis is less a method than it is a philosophical approach to scientific inquiry. By this is meant that, counter to traditional scientific epistemology that focuses first on explaining and then predicting, the hermeneutic approach is concerned with *interpretation in order to understand.* Achieving understanding, according to Bauman (1992, 17), means following a circular approach "toward better and less vulnerable knowledge."

This path to understanding is called the *hermeneutic circle.* It means beginning by interpreting a single part of the whole, then reevaluating and restating the interpretation in light of information about the time and intent of the event or text. Only then does one move to the next part—again searching the context for greater enlightenment.

Merrell (1982, 113) added to understanding of this process by describing the way the analysis moves from the whole to its parts and back to the whole: "When written texts are broken down into isolated segments, those segments can then be relatively easily juxtaposed, compared, and contrasted. That is, they can be subjected to analysis by means of which consciousness of condensed and embedded wholes can be increased."

Understanding of parts thus builds on greater understanding. With each of the parts assessed and reassessed in this way—in a circular analytic process that Bauman described as being "ever more voluminous, but always selective"—full understanding emerges at last.

In a final word on the hermeneutic method, Wachterhauser (1986, 12) left researchers the following warning, referring to the principle of hermeneutic analysis that establishes and validates many different possible interpretations of a text: "There are no fundamental, underlying 'Truths.' Rather, the rationalistic ideal of discovering a set of self-evident, foundational truths from which all legitimate knowledge-claims would follow by strict logical inference is impossible to achieve."

Semiotics: The Analysis of Signs and Symbols

Semiotics is a relatively modern interpretive science; it emerged during the middle and last half of the twentieth century as a way of describing how meaning is derived from text, language, and social actions as symbols. The primary social action of interest was initially limited to *language*—in both its written and spoken word forms. However, it was soon applied to analysis of things other than texts, but which could be "read" as text. Social structure, ritual and myth, material culture, including art and tools: these all became the subject of research into the meaning of their signs and symbols. Today, semiotics is used as a way of interpreting all types of verbal and nonverbal signs and symbols, regardless of the discipline.

The Meaning of Semiotics

Winfred Nöth (1990), writing on the history of the science of semiotics, identified four underlying disciplines that have contributed to the development of the Western semiotic tradition. These included *semantics* (including the philosophy of language), *logic*, *rhetoric*, and *hermeneutics.* Other disciplines that helped forge modern semiotics include linguistics, aesthetics, poetics, nonverbal communication, epistemology, and the human sciences in general.

Many definitions of semiotics have been proposed; most relate it in some way to the interpretation of signs and symbols (Pierce 1962; Barthes 1968; Eco 1976; Sebeok 1976; Hodder 1982; Silverman 1983; Nöth 1990; Manning and Cullum-Swan 1998). For example, Nöth (1990) drew upon previous definitive work to give semiotics the broadest possible definition. In her *Handbook of Semiotics*, she referred to semiotics as simply *the science of meaning*, adding:

> [The science of signs] has for its goal a general theory of signs in all their forms and manifestations, whether in animals or men, whether normal or pathological, whether linguistic or nonlinguistic, whether personal or social. Semiotics is thus an interdisciplinary approach. (Nöth 1990, 49)

Manning and Cullum-Swan (1998, 251) were just as brief in their proposed definition, but took a slightly different approach, electing to refer to semiotics simply as "the science of signs." They defined a *sign* as "anything that represents or stands for something else in the mind of someone." This definition has two parts: first, what they term an *expression* (such as a word, a sound, a symbol, or the like), and second, a *content*, which is what completes the sign by giving it meaning. A sign has been defined as:

> [S]omething which stands to somebody for something in some respect or capacity. It addresses somebody, that is, it creates in the mind of that person an equivalent sign, or perhaps a more developed sign . . . the sign stands for something, its object. It stands for that object, not in all respects, but in reference to a sort of idea, which I sometimes call the *ground.* (Silverman 1983, 14)

Perhaps the most complete definition of what constitutes a sign was provided by Umberto Eco (1976, 16), who defined a sign as "*everything* that, on the grounds of a previously established social convention, can be taken as *something standing for something else*" [emphasis in original].

Components and Forms of Signs

Signs come in many different forms. Sebeok (1976) grouped the many different types of signs into six broad classifications: *signal*, *symptom*, *icon*, *index*, *symbol*, and *name.* Semiotics pioneer John Pierce, however, developed the most widely used classification system, in 1962. He grouped signs into just three classes: *icons*, *indices*, and *symbols.* An icon is a sign that signifies its meaning by qualities of its own. An index communicates its meaning by being an example of its intended sign, such as a weathercock or a yardstick. Pierce considered the symbol to be a synonym for sign.

Political science researchers may use semiotics in any research involving verbal or nonverbal communication. Table 22.2 contains an extensive list of fields and study types that Eco (1976, 9–14) believed belong to the field of semiotics. By extension, they may be of interest to political scientists, public administrators, and managers of nonprofit organizations as well.

A Final Word of Caution About Signs

Anthropologist Christopher Tilley (1989), who identified himself first as an anthropologist and only second as a student of symbols, offered this final caveat regarding the interpretation of signs:

> Meaning . . . resides in a system of *relationships between signs* and not in the signs themselves. A sign considered in isolation would be meaningless. Furthermore, the meaning of a sign is not predetermined, but is rather of cultural and historical convention. Consequently, it does not matter how a signifier appears, so long as it preserves its difference from other signifiers [emphasis in original]. (Tilley 1989, 186)

Table 22.2

Examples of Semiotic Research Applications

	Research Focus	Description of Content
1	Aesthetic Texts	Analysis of the aesthetic import of textual material.
2	Codes of Taste	Present in the culinary and enology fields. How tastes communicate certain images.
3	Cultural Codes	Behavior and values systems, including such things as etiquette, cultural systems, and social organization of groups and societies.
4	Formalized Languages	"Languages" of statistics, chemistry, engineering, psychology, etc.
5	Kinesics and Proxemics	Movement, gestures, special relationships.
6	Mass Communications	Coding, sending, receiving, interpreting messages.
7	Medical Semiotics	Signs and symptoms of the illness they indicate and other symbols forwarded by a patient.
8	Musical Codes	Musical "signs" with explicit denotative meanings, such as trumpet calls in the military; music that conveys selected emotional or conceptual meanings, such as "tone poems."
9	Natural Languages	Studies in such areas as logic, philosophy of language, etc.
10	Olfactory Signs	The "code of scents"; important in atmospherics.
11	Paralinguistic Sounds	Sounds without linguistic features, such as grunts, growls, etc.
12	Plot Substructure	Mythology, mass communication drama and novels, etc.
13	Rhetoric	An early contributor to the field of semiotics; includes models of oral persuasion, argument, etc.
14	Systems of Objects	From architecture to objects in everyday use.
15	Tactile Communication	Includes the communication systems of the blind, as well as such behaviors as the kiss, the embrace, slap on the shoulder, caress.
16	Text Theory	The study of text as a "macro unit"; text as a whole unit.
17	Visual Communication	Graphic displays, advertisements, brands and trademarks.
18	Written Languages	Includes unknown languages, secret codes, ancient alphabets, cryptography, etc.
19	Zoosemiotics	The communications behavior of nonhumans.

Source: Eco 1976.

Content, Narrative, and Discourse Analysis

Content analysis is a quantitative method of analyzing the content of written documents, transcripts of films, videos and speeches, and other types of written communication (Denscombe 2002). It has been defined as "*any technique for making inferences by objectively and systematically identifying specified characteristics of messages*" (Holsti 1969, 14).

The main advantage of content analysis is that it provides the researcher with a structured method for quantifying the contents of a qualitative or interpretive text, and does so in a simple, clear, and easily repeatable format. Its main disadvantage is that it contains a built-in bias of isolating bits of information from their context. Thus, the contextual meaning is often lost or, at the least, made problematic. Furthermore, content analysis has great difficulty in dealing with *implied* meanings in a text. In these situations, interpretive (hermeneutic) analysis may be more appropriate, with content analysis used to supplement the primary analysis method.

Content analysis is best used when dealing with communications in which the messages tend to be clear, straightforward, obvious, and simple. The more that a text relies on subtle and/or intricate meanings, the less likely is the ability of content analysis to reveal the full meaning of the communication. Thus, content analysis is used most often to *describe attributes of messages*, without reference to the intentions of the message sender or the effect of the message on the receiver (Denscombe 1998, 169; Holsti 1969, 27). Counting how many times in a speech a candidate denigrates the character of a political opponent is an example application of content analysis.

The major purpose of all content analysis is to be able to make inferences about one or more variables uncovered in a text. It accomplishes this by systematically and objectively analyzing either the content of the text, the process of communication itself, or both (Sproull 1988). Content analysis takes place in the nine-step process displayed in Figure 22.3.

The content analysis process begins with establishing objectives for the content analysis research. The first step in the process should be a familiar one by now: Establish objectives for the research process. This means determining *in advance* of the research what you want to accomplish by its conduct. Next, assuming that the researcher has some familiarity with the larger issues and/or themes at stake in the phenomenon, a list should be made of what *variables* are to be counted in the text. Variables are not the same as words; rather, they tend to be constructs that can be said to describe or refer to broader complex issues of behavior or attitude. This list is clearly embedded in the study objectives.

Once the researcher has decided what to look for and where to look for it, he or she must then establish a system for first coding the content items, while also determining how they are going to be counted and recorded. The texts themselves are then collected. Holsti (1969) recommended that at this time researchers should draw a random sample of the materials for a pilot test of the study. The pilot test will provided important clues as to the relative effectiveness of the research design. For example, since the variables of interest are established before measurement takes place, there is a possibility that the variables are not treated significantly in the sample of sources chosen. In that case, the researcher would have to go back and identify new variables for the study.

The final steps in the study involve conducting statistical analysis on the measurements. When possible, these should include correlation analysis and simple hypothesis testing.

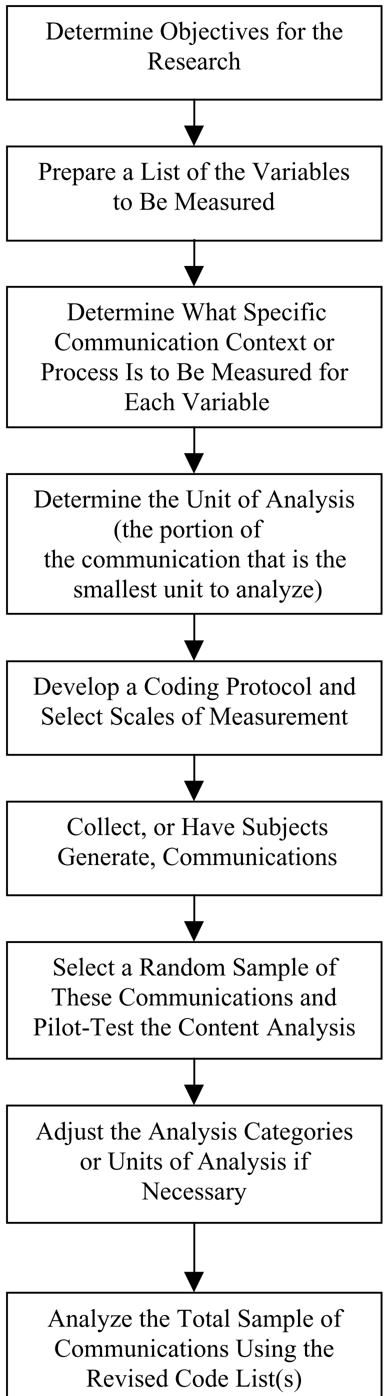
Complementary Tools: Narrative and Discourse Analysis

Content analysis is related to several similar research designs, among which are *narrative analysis* and *discourse analysis*. A *narrative* is an oral or written exposition that typically describes the events in the life of a person or people. It is usually the exposition of a single person. A *discourse* is either an oral or written communication designed to inform, rather than entertain. The term *discourse* is often used to identify an exchange of communication between two or more speakers or writers.

Narratives have been formally defined as "a means of representing or recapitulating past experience by a sequence of ordered sentences that match the temporal (time) sequence of the events which, it is inferred, actually occurred" (Labov, cited by Cortazzi 1993, 43). A *narrative analysis* is a qualitative approach to the interpretation of texts and, as such, is often used to augment a quantitative analysis of content. Noting the mutually supportive roles of the various methods, Holsti reminded researchers that

> the content analyst should use qualitative and quantitative methods to supplement each other. It is by moving back and forth between these approaches that the investigator is most likely to gain insight into the meaning of [his] data. . . . It should not be assumed that qualitative methods are insightful, and quantitative ones merely mechanical methods for checking hypotheses. The relationship is a circular one; each provides new insights on which the other can feed. (Holsti 1969, 11)

Figure 22.3 **Steps in Content Analysis Research Design**



Source: Adapted from Holsti 1969; Sproull 1988; and Denscombe 1998.

Table 22.3

A Variation of the Labov/Cortazzi Six-Part Narrative Evaluation Model

Structural Element	Comment	Questions
Abstract	A 100-word summary	*What was this about?*
Orientation	Establishes the situation	*Who? What? When? Where?*
Compilation	Major account of the events that are central to the story	*Then what happened?*
Evaluation	High point of the analysis	*So what?*
Result	Outcome of the events or resolution of the problem	*What finally happened?*
Conclusion	Return to the present	*Finish of the narrative*

Narratives are a record of events that have significance for both the narrator and his or her audience (a researcher, for example). Narratives are formally structured; they have a beginning, middle, and end. Furthermore, they are organized according to a set of distinct structures with formal and identifiable characteristics (Cortazzi 1993; Coffey and Atkinson 1996).

Cortazzi adapted the narrative evaluation or analysis model developed by W. Labov and J. Waletsky. Table 22.3 summarizes the model. Labov's purpose for developing the model was to illustrate how informal styles of narrative (speech) correlate with a number of extant social characteristics. The specific document selected for analysis might be newspaper stories, speeches at local service clubs, or official records such the *Congressional Record*.

Manning and Cullum-Swan (1998) have described several different approaches to the analysis of narratives, among which are *Russian formalism* and *structural methods* such as *top-down* or *bottom-up* approaches. Russian formalism emphasizes the role that form plays in conveying meaning in a narrative. It has been used to analyze the form that Russian fairy tales follow, for example. Each tale follows a similar, simple structure. Others have used the same approach to examine myths, poetry, and fiction.

Top-down approaches analyze the narrative text according to a set of culturally established rules of grammar and exposition. These methods are used extensively in education. Bottom-up methods, on the other hand, use elements in the text to build a structure for analyzing the whole. This is the approach followed most often in ethnographic research.

Karl Bühler (1934, cited in Merrell 1982) provided an early framework of narrative and discourse analysis that is still relevant today. Bühler saw three main functions for a language. First, it must be *expressive*: the message must serve to convey the emotions or thoughts of the user of the language. Second, it must serve a *signaling* or *stimulative* function: that is, the message must stimulate an expected response by the receiver. And third, it must have a *descriptive* function. The user of the language must be able to use it to describe a particular state of affairs in ways that convey the full picture. Others have added additional functions; the most important of these is an *argumentative* or *explanatory* function, by which language users present alternative thoughts, views, or propositions to the descriptive messages (Merrell 1982, 116).

Discourse Analysis of Communications

Discourse analysis is a method of analyzing oral or written communications in order to identify the formal structure of the message, while at the same time keeping a *use-of-the-language* purpose in mind. It can be applied to the same types of messages, texts, documents, and so on that are appropriate for content analysis, albeit for a different purpose. Discourse analysis is strongly associated with the analysis of linguistic structures in the message or text. Potter and Wetherell (1994, 48) refer to this point in their discussion of three particularly pertinent features of discourse analysis.

First, discourse analysis is concerned with talk and texts as "social practices." It examines the linguistic content—that is, the meaning and the topics discussed—in a message, as well as being concerned with the features of language form such as grammar and cohesion. Second, discourse analysis has a triple concern with the themes of *action*, *construction*, and *variability* in the message. Third, discourse analysis is concerned with the rhetorical or augmentative organization of texts and talks. And fourth, the objective of discourse analysis is to take the focus of analysis away from questions of *how* a text version relates to reality to ask instead how the version is designed to compete successfully with one or more alternative versions. These points are incorporated in the following five points that direct discourse analysis:

- Variation in theme and message is to be used as a lever in analysis.
- The discourse must be read and analyzed in minute detail.
- A key point in the analysis is the search for rhetorical organization.
- Accountability: Are points made with or without being supported?
- Finally, discourse analysis requires cross-referencing with other studies.

Examining Material Culture (Artifact Analysis)

The study of artifacts in material culture—the tools and other objects that are created, used, or left behind by society—is closely related to the science of semiotics. While it owes a great debt to the science of archeology, it is not restricted to the search for meaning among the shards and bones of ancient civilizations. Artifact analysis is a modern science as well; modern archeologists also study the garbage dumps of modern society.

Archeologist Ian Hodder (1982) considered artifact analysis to involve a process that began with the interpretation of signs and symbols, making it a legitimate target for both hermeneutic and semiotic analysis approaches. He defined the term *symbol* as the word used to refer to an object or social situation in which a "direct, primary or literal meaning also designates another indirect, secondary and figurative meaning." Hodder (1989) identified the key problem affecting the interpretation of artifacts as the need to locate them within the contexts of their creation, while at the same time interpreting them within the context of the modern researcher. By the very act of being interpreted, the artifact is removed to a new and different context, thus bringing decisive interpretation into question. Potentially, many meanings are possible; the researcher must decide not which is best, but which is most probable.

Also related to this problem is the fact that material culture, because it often lasts a long time, either takes on or is given new meanings the longer it is separated from its primary producer. While the artifacts typically retain their original form, their meaning changes: "Material items are continually being reinterpreted in new contexts" (Hodder 1989, 120).

Tilley (1989, 188) also commented on the need to look beyond the individual piece of material culture itself when deciphering its meaning: "To understand material culture we have to think in terms that go beneath the surface appearances to an underlying reality. This means that we are thinking in terms of relationships between things, rather than simply in terms of the things themselves." For the political science researcher who plans a study of material culture, Tilley urged researchers to remember that "The interpretation of the meaning and significance of material culture is a contemporary activity. The meaning of the past does not reside in the past, but belongs in the present."

The Interpretation of Material Culture

The interpretation of artifacts requires that the researcher function in a scientific environment that is halfway between past and present. Interpretation also involves comparing different examples of material culture. This makes the interpretation process problematic, at best. The physical evidence under study is often not what was expected; it has "The potential to be patterned in unexpected ways" (Hodder 1998, 121). Furthermore, because physical evidence cannot "talk" directly to the researcher, it forces the analyst to evaluate and enlarge his or her own experience and worldview. At all stages of the evaluation of material culture—from identifying categories, attributes, and what Hodder called the "understanding of high-level social processes"—the researcher must work at three levels of interpretation simultaneously:

1. The researcher must examine the *context* within which artifacts are deemed to have similar meanings.
2. Inseparable from understanding the context is the *identification of similarities and differences* in the artifacts. By showing that people responded the same way to similar stimuli, patterns are identified.
3. While working with the first two levels of interpretation, the researcher must also establish their relevance in terms of historical theories regarding the data.

Hodder also cautioned interpreters of material culture to not become locked into a theory simply because it is fashionable at the time of the research: "Observation [of material culture] and interpretation are theory laden, although theories can be changed in confrontation with material evidence in a dialectical fashion."(1998) In a final word of warning, he discussed controversies over what is seen as a major weakness of artifact analysis: the lack of a method for confirming interpretive conclusions. For all researchers working with material culture, Hodder proposed two processes to satisfy the critics of interpretation:

> Perhaps the major difficulty is that material culture, by its very nature, straddles the divide between a universal and natural science approach to materials and a historical, interpretive approach to culture. There is thus a particularly marked lack of agreement in the scientific community about the appropriate bases for confirmation procedures . . . the twin struts of conformation are coherence and correspondence. (Hodder 1998, 122)

As has been shown, material culture interpretation methods involve the simultaneous processes of these three activities: (1) definition of the context of the artifact at its time of creation, (2) identification of patterns of similarities and difference, and (3) the use of relevant theories of social and material culture.

The researcher's conclusions must present a coherent picture of the interpretation of the artifacts, while also establishing a corresponding relationship between the artifacts, their context, and the interpretive conclusion.

Summary

This chapter discussed some of the ways that researchers go about examining texts, cultural artifacts, body language, and similar types of written and unwritten communications, records, documents, signs, and symbols. The different sources of research data were grouped into four broad categories.

Written texts, *formal and informal documents*, *nonwritten communications*, and *nonverbal signs and symbols.*

Written texts include books, periodicals, narratives, reports, pamphlets, the mass media, and other published materials. Research using these sources is often called *library research*, or *desk research.* Formal and informal documents include personal messages and assorted types of archival information, such as personal notes and memos, government records and vital statistics, and other informal written materials, including e-mail. The wide variety of nonwritten communications, include graphic displays (graphs, tables, and charts), photographs and illustrations, tools and other artifacts, films, and videotapes. The nonverbal signs and symbols category includes all body language, facial expressions, gestures, music and dance, animal sounds and behavior, and even noise.

Researchers employ a variety of analytical tools and methods in their study of texts, symbols, and artifacts. Among these are *hermeneutics*, *content analysis*, *meta-analysis*, *semiotic analysis*, *discourse analysis*, *site surveys*, and more. The analysis approaches used most often in public and nonprofit organization research are the formal literature review; hermeneutic analysis of textual material; content, discourse, and narrative analysis; meta-analysis; archival analysis; and semiotic analysis.

Discussion Questions

1. In your own words, define "archives" and "archival material."
2. Name some types of archival data and explain how they can be important for political science research.
3. What is a *meta-analysis?* What are the steps in a meta-analysis procedure?
4. What is the hermeneutic approach to the analysis of textual data? How is the hermeneutic process carried out?
5. What is the hermeneutic circle?
6. What is semiotics? How can political scientists use this method?
7. What is content analysis? Give an example or two of how and when you would use the method.
8. What is narrative and discourse analysis?
9. What are some of the ways that culture affects political behavior?
10. How would you design a research project to study the role of neighborhood culture on campaign participation among young voters?

Additional Reading

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Part 4

Preparing and Presenting Research Findings

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23 Organizing Information in Tables, Charts, and Graphs

When first collected, "raw" data by themselves make little or no sense. Raw data are simply a loose collection of numbers; they have no inherent meaning of their own. Data must be put into some kind of order or structure; they must be grouped together into logical sets. Numbers do not speak for themselves; they acquire meaning only when they are organized in terms of some mutually understood framework (Wasson 1965). Researchers often use tables, charts, and graphs to do this.

Nearly all research reports contain statistical data presented in tables, graphs, or charts. Descriptive statistics particularly are almost always presented in some sort of tabular or graphic form (such as bar charts and pie charts). The type of table, chart, or graph used often depends upon the preference of the manager presenting the information. There are many different styles from which to choose. While the nature of the data has some influence on the structure selected for presentation, this is mostly a matter of user preference. For example, summary data are usually presented in the form of a table. However, graphic displays of numeric data can often have more impact for a reader.

Most good research reports make maximum use of graphic communications tools. Remember the old saying "A picture is worth ten thousand words"? This is true for research reports as well. Graphics and other illustrations make reports more readable and, in the process, more effective in meeting their communications objectives.

Tables, summaries, graphs, and other illustrations serve two fundamental purposes. First, they make it easier for the researcher to capture the meaning of data and to more clearly apply the data to the decisions or actions that are going to be made based on the results of the study. Second, they make it easier for the readers of the report to see how the researcher arrived at the conclusions and interpretations that are presented in the report.

This chapter describes three ways that researchers use structure and graphic representations to better discover meaning in their studies, while also improving the communications quality of their decision-making reports. It begins with a discussion on how to make sense of ungrouped or "raw" data. This is followed by a discussion on how to make and use tables. The chapter then examines several ways of developing charts and graphs.

Making Sense out of Raw Data

A principal objective of descriptive statistics is to summarize the information contained in a dataset. A collection of raw data by itself typically contains very little information; further analysis and bringing of order to the set is required. Researchers use tables and graphs to present data about a single variable, about two variables at the same time, and about more than two variables. Is statistical parlance, these are call *univariate*, *bivariate*, *and multivariate* statistics.

Univariate Statistical Presentations

One of the first analysis steps the researcher takes to establish some meaning from raw data is to construct a graphic presentation of the underlying structure. This can be in the form of a *frequency distribution table*, a *stem-and-leaf diagram*, a *histogram*, or any combination of these tools. Nearly all statistical-analysis reports include frequency distributions. However, for some reason, analysts often bypass stem-and-leaf diagrams.

Stem-and-leaf diagrams can often be more informative than simple frequency tables in that none of the underlying data are lost in the analysis; all values are displayed in the diagram. Histograms also present summary data, but they do not display individual values for a class in the same way that a stem-and-leaf diagram does.

Before any analysis occurs, raw data are typically entered into a *spreadsheet-based* data file. Examples include Microsoft Excel and the Statistical Package for the Social Sciences (SPSS). In all spreadsheets, individual variables are entered as separate columns, while "cases" are entered in rows. A different value is assigned to each category of a variable; each value is then assigned a definition. For example, for the variable *gender* the value 1 might be used for all females and the value 2 used for all males. Statistical software programs count the frequency of occurrence for each value, compute summary statistics and percentages, calculate measures of central tendency and variation, and conduct a host of other tests appropriate for the type of data. Collections of data are maintained in *datasets.* Statistically processed data are maintained in *data files* or *output files.*

Frequency Distribution Tables

Preparing frequency distribution tables is typically the first step in applying structure to a collection of raw data. Frequency tables present the *frequency of occurrence* for each class or category included in the data structure. The data in a frequency table are presented as counts and as percentages. Percentages are easily understood and typically convey more meaning than simple frequencies.

Statistical software programs that produce tables, charts, and graphs usually include a procedure for producing summary statistics as well. Summary statistics include relative frequencies, which are usually presented as percentages, measures of central tendency, and variation, among others. Usually, the researcher will want more information than just the counts of occurrences in a frequency distribution table. Therefore, statistical software programs such as SPSS also allow the researcher to print the row, column, and total percentage of the total that each class represents.

Four guidelines to think about when arranging data in a table are: (1) the total number of classes or categories to include, (2) the upper and lower limits of each category, (3) the titles, captions, headings, and legends you want in the table, and (4) any additional explanatory information to include, such as the relative percentage each number of occurrences represents.

Establishing Categories or Classes

Preparing a frequency table begins with determining how to group the table data into meaningful categories. The total number of categories or classifications that cover all possibilities for the dataset is called a *category set.* The category set should be selected as the data-gathering instru-

Table 23.1

Daily Applications for Entry Visas, Quarter 1 Data

Week	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	110	83	95	112	110	72
2	99	121	115	105	112	59
3	120	80	92	103	111	61
4	121	95	87	125	103	63
5	73	113	78	92	93	64
6	91	83	122	107	93	71
7	107	130	85	111	112	56
8	99	69	74	104	106	57
9	123	105	111	101	117	66
10	85	105	109	88	109	55
11	108	99	117	106	109	61
12	102	75	74	128	116	54
13	64	124	91	118	85	63
Totals	1,302	1,282	1,250	1,400	1,376	802
Mean	95.03					
SD	20.92					

Source: Hypothetical data.

ment is prepared. The number of classes or categories in the set—that is, the level of precision employed—depends on the purpose of the decision making. Decisions that involve large sums of money or potential loss of life, for example, will require greater precision than decisions that deal with routine activities. The number of categories or classes selected for such measures depends first on the nature of the data. For example, dichotomous data (male-female, yes-no, pass-fail) require two and only two classes. With multichotomous data (data with more than two categories), the analyst's choices are more complicated.

In the final analysis, the researcher who prepares the dataset is the one who establishes how many classes to include in a table. Despite the assumed "scientific" nature of statistics, there is little agreement on the number of classes. Recommendations can be found that vary from a range of five to fifteen classes up to a range of ten to twenty. However, when people are presented with numbers of classes beyond eight or so, some confusion or loss of continuity can occur.

When working with ranked data (ordinal measurements) such as candidate or program preferences or needs priorities, the most commonly used number of classes ranges from around six to a maximum of twelve subjects. Experienced data analysts are convinced that most people experience difficulty when asked to rank more than six to eight items. When asked to rank large numbers of items, people are usually able to quickly rank the top and bottom few, but distinctions tend to blur when they face items in the middle rankings.

Because a key purpose for presenting data in tables in the first place is to communicate patterns in the data, it is best to keep the number of categories to a number that makes most sense to the people reading the tables. This usually means using the fewest meaningful categories or classes possible. Convention suggests using no more than ten classes and preferably something closer to six or seven, at most.

The data in Table 23.1 represent a hypothetical count of the number of entry visas for the United

States processed at a U.S. embassy each week over a quarter. Numbers are smaller on Saturdays because of a shorter workday. The visa officer recorded processing an average of a little more than 95 visas per day during the quarter, with a standard deviation of almost 21. The embassy officer wants to display the data in a table that best explains the underlying structure of the data.

The hypothetical data in Table 23.1 are shown organized into rows and columns. The rows are weeks; each week is considered a case. Each column is a different day's total number of visa applications processed (these values are known as the "frequency of responses"). The width or inclusiveness of each class in a table is influenced by the nature of the data, the frequencies of occurrence, and the guidelines for the maximum number of classes to include. A formula to help establish class width follows:

$$\text{Class Width} = \frac{\text{Range of the Data}}{\text{Preferred Number of Categories}}$$

The range is determined by subtracting the lowest value from the highest measurement. The analyst has complete freedom to choose, again guided by the previously mentioned rules of thumb, the number of classes or categories to use. By scanning through the data, the analyst can see that the highest number of sales applications processed (130) occurred on Tuesday of Week 7. The lowest number (54) occurred on Saturday of Week 12. Therefore, the range is 130 minus 54, or 76. The embassy officer thinks that he would like to present the data after it is grouped in six or so classes. To establish class width, the officer substitutes the range and desired number of classes numbers in the formula, and comes up with a class width of 12.66.

$$W = \frac{76}{6} = 12.66$$

A class width of 12.66 would, of course, be very difficult to work with. However, since the nature of the data seems to lend itself to groupings of 10, and because 12.66 is about as close to 10 as it is to 15, it is much more likely that the officer would use a class width of 10 rather than the cumbersome 12.66. If a class width of 10 is selected, the number of classes must be increased from the desired 6 to 9. This is still below the convention-imposed upper limit of 10. The important thing to remember is that all the classes must be the same size (equal in width), and that all measures can fall into one and *only* one class. Thus, the 10-wide ranges for each class should be 50–59, 60–69, and so on. Table 23.2 was produced by the *Data Analysis: Histograms* capability in Microsoft Excel. Note that only one value of the class width range needs to be identified for the table bin-width requirement. Excel uses the term "bin" to refer to the categories within which response values will be collected, and bin-width to refer to how many values are to be included in each bin. For example, the age categories 15–24 and 25–34 are bins. Each bin has a width of ten values. Both bins and bin-widths may be chosen by the researcher.

Additional guidelines for presenting data in tables begin with numbering each table and including a caption. Most often, it is easier to read the table when the data are arranged downward, as opposed to having them spread across a page. Columns and rows must be identified, with qualifiers placed under the table in the form of footnotes. The caption and figure number of a table is always printed above the table; captions for graphs, charts, and other illustrations are presented below the figure.

Almost any type of data can be presented in a table. In addition, tables may display

Table 23.2

Excel Frequency Table Showing 10-Wide Bins, Table 23.1 Data

Bins	Frequency
50	0
60	5
70	8
80	8
90	7
100	11
110	18
120	13
130	8
More	0
Total:	78

Source: Example data from Table 23.1.

Table 23.3

Gender Distribution of Responses, Satisfaction Study Sample

Gender	Sample *n*	Count	Percent of Responses	Percent of Total Sample
Females	500	456	58.6	45.6
Males	500	322	41.4	32.2
Missing	—	222	—	22.2
Total	1,000	778	100.0	100.0

Source: Experimental data.

information about one, two, or more than two variables. That is, they may be *univariate*, *bivariate*, or *multivariate.* Table 23.3 is a *univariate* table; it displays data for only the variable *gender.*

Table 23.4 is a *bivariate table*, in which responses for two variables are included. The variables are *gender of respondent* and *political party membership.* Table 23.5 is a *multivariate* table, in which the distribution of frequency responses for three variables, *gender*, *height*, and *weight*, are displayed.

Relative Frequency Distribution Tables

A type of table often seen in research reports is the *relative frequency distribution table.* In a frequency distribution table, instead of reporting every measurement or response separately as is required for a stem-and-leaf diagram, all scores are grouped into classes, their occurrence counted, and converted to proportions and percentages. Relative frequency refers to the proportion of the total that each group or value represents.

Knowing the relative frequency of responses can be important for several different types of comparisons of the distribution of responses. The researchers compare counts and percentages. The

Table 23.4

A Bivariate Table Produced with SPSS *Crosstabs* Program

		Political Party			
Gender:		Democrat	Republican	Independent	Totals
Female	Count:	28	6	16	50
	% within Sex of Respondent	56.0	12.0	32.0	100.0
Male	Count:	12	26	12	50
	% within Sex of Respondent	24.0	52.0	24.0	100.0
Totals:	Count:	40	32	28	100
	% within Sex of Respondent	40.0	32.0	28.0	100.0

Source: Experimental data.

Table 23.5

Physical Characteristics of Fitness Group A-1, Week 1

Gender	Sample *n*	Mean Height (inches)	Mean Weight (pounds)
Females	456	66.6	129.50
Males	322	71.3	177.00
Total	778		

Source: Example data.

relative frequency of responses for each class can also be read as a *probability of occurrence* for that class. Table 23.6 is an example of a simple frequency distribution table that shows responses to a scale of exercise participation.

Rules for Frequency Distribution Tables

Researchers must be aware of the important rules to follow when preparing frequency distribution tables. First, the table must exhibit *internal consistency.* That is, groups or classes must be equal in size. In Table 23.6, except for the upper level, all classes consisted of three-hour levels. Although the highest category appears to be open-ended, it is not. It includes the highest count while making it possible for the researcher to deal with *outliers.* Outliers are "abnormal" counts that fall outside of the normal distribution confidence interval. That is, they are either excessively high or low. Because they fall outside of the assumed normal distribution, ignoring them results in loss of the information about the case. Therefore, if the outlier is abnormally high, it is grouped with the highest class; if it is abnormally low, it is grouped with the lowest class.

An example for the data in Table 23.6 would be if one member of the employer-sponsored fit-

Table 23.6

Weekly Exercise Rates, Total Sample

Weekly Hours of Exercise	Frequency	Relative Frequency	Cumulative Percent
3 hours or less	5	.156	15.6
4 to 6 hours	7	.219	37.5
7 to 9 hours	10	.312	68.7
10 to 12 hours	8	.250	93.7
13 hours or more	2	.063	100.0

Table 23.7

Weekly Exercise Rates, Total Sample

Weekly Hours of Exercise	Count	Percent	Valid Percent	Cumulative Percent
3 hours or less	5	14.3	15.6	15.6
4 to 6 hours	7	20.0	21.9	37.5
7 to 9 hours	10	28.6	31.2	68.7
10 to 12 hours	8	22.8	25.0	93.7
13 hours or more	2	5.7	6.3	100.0
Missing	3	8.6		—
Totals	35	100.0	100.0	

ness program was an "exercise freak," working out more than 3 hours a day, 6 or 7 days a week, or a total of 21 hours. The gap between 13 and 21 hours would require two blank classes. By including the outlier in the highest "normal" class, its ability to excessively influence the group average has been alleviated.

Second, frequency distribution tables should include the *relative frequency* and often, but not necessarily always, the *cumulative frequency* of occurrences. Relative frequency is the proportion of the total each class represents. It can be stated as a decimal or as a percentage. In decimal form the total must always equal 1; in percentages, the total must equal 100 percent. In Table 23.6, the relative frequency of the lowest category is .156, or 15.6 percent.

Table 23.7 is an expanded version of a relative frequency table. The final column on the right displays the *cumulative relative frequency*. This is simply the sum of a class and all preceding classes. For example, the cumulative relative frequency for the second level, 4 to 6 hours, is its value (21.9 percent) plus the value of the 3-hours or less class (15.6 percent), for a total of 37.5 percent. The data in Table 23.7 are from a fitness program study. In this example, the sample includes 35 workers instead of 32; three of the subjects did not respond to the question of how many hours they exercised each week.

Finally, some statistical software packages include provisions for computing relative frequencies when the data contain missing values. A missing value might occur when a subject refuses to answer a particular question on a survey. When this occurs, the relative frequency distribution column will include the proportion of the total represented by the missing values. A separate column labeled *valid percent* will appear in the table alongside the relative frequency column.

Preparing a Stem-and-Leaf Diagram

A *stem-and-leaf diagram* is a convenient way to display at one glance each of the measurements for each major value. As a result, it is appropriate for use with relatively small samples. In the Package 2 dataset displayed in boldface type in Table 23.8, the first value to show up in the stem diagram will be the whole number of ounces in a pharmaceutical research package: 7, 8, or 9. The second value in the stem is the first digit after the decimal point; in this dataset the lowest value is 7.5; the next is 7.9, and so on. The stem contains all whole numbers; leaves are the hundredths-of-an-ounce measurement after the whole number.

The following example of a pharmaceutical researcher at a research hospital is provided to illustrate how data might be presented in a stem-and-leaf diagram. The researcher is responsible for ensuring that the package-filling equipment loads eight ounces of a new pain-killing product into each package. The product is being distributed as part of a medical experiment to determine whether a new drug is more effective than aspirin at treating arthritis pain. It would not be cost effective to weigh every single package; instead, with the approval of supervising medical staff, the researcher randomly selects six sample packages from the package-filling line.

Over a four-hour morning shift, sets of sample packages are pulled and weighed every quarter-hour, until a total sample of 96 packages (4*4*6) in 16 samples of six packages each is collected. The researcher must present a summary of the measurements to the experiment supervisor. The summary can be presented as a *stem-and-leaf diagram*, a *frequency distribution table*, or *a histogram.* The stem-and-leaf diagram option is described here.

Before any of these communications tools can be processed by statistical software, however, the data must first be entered as a dataset in a spreadsheet format. Stems and leaves are the values of a variable. In this dataset, each package in a sample is assumed to be a separate variable. For the sake of brevity, the stem-and-leaf diagram in Figure 23.1 was produced for only one column, the Package 2 variable (a full stem-and-leaf diagram for all 96 packages in the sample, and the variable would be "Package Weights").

Preparing a Stem-and-Leaf Diagram with SPSS

Excel does not include a special function or "Wizard" for creating stem-and-leaf diagrams. However, with several simple intermediate steps, it is possible to come up with a satisfactory diagram. SPSS does have this capability to quickly produce a stem-and-leaf diagram for each variable in the dataset. For this example, each of the six packages selected was considered to be a variable; the Package 2 set was chosen for the example SPSS stem-and-leaf diagram. The results are presented in a different form than they appear in the table: the first value in the stem—in this column, 7 and 8 only—was the first digit in the stem. The second digit was the tenths value, resulting in stem values of 79, 80 and 81. The leaves in the diagram are the hundredths of an ounce measurement (i.e., the second number after the decimal point). The first column in the output lists the number of leaf measurements in that category. For example, there were two observations in the 7.9 to 7.9 category (7.95 and 7.99), seven observations in the 8.0 to 8.49 category, and four observations in the 8.00 to 8.19 category (8.11, 8.12, 8.13, and a second 8.13).

Communicating with Charts and Graphs

Charts and graphs are used to pictorially present numerical data. They are most often used to display summary information about a dataset, although they are not limited to this application alone.

Table 23.8

Weights of Sample Pharmaceutical Research Packages, Example Data

			Package Weights (in ounces)					
Sample	Hour	Quarter	Package 1	**Package 2**	Package 3	Package 4	Package 5	Package 6
1	1	1	8.04	**7.95**	7.87	7.90	7.98	8.07
2	1	2	8.02	**8.04**	7.93	8.11	7.94	8.98
3	1	3	8.00	**8.11**	8.04	7.99	7.97	8.08
4	1	4	7.90	**8.02**	8.06	7.98	7.96	8.05
5	2	1	8.06	**8.13**	7.97	8.09	7.88	7.97
6	2	2	8.05	**8.04**	8.04	8.07	7.89	8.00
7	2	3	8.04	**8.07**	8.11	8.06	7.94	8.01
8	2	4	8.06	**8.06**	8.02	8.11	8.04	8.02
9	3	1	8.05	**8.04**	7.99	8.06	7.99	8.01
10	3	2	8.20	**8.03**	8.06	8.05	8.00	8.00
11	3	3	8.00	**8.03**	8.01	8.10	8.01	8.00
12	3	4	8.00	**8.12**	8.02	7.89	8.01	7.90
13	4	1	8.01	**8.13**	8.05	7.88	8.00	8.01
14	4	2	8.02	**7.99**	7.07	7.79	8.00	7.89
15	4	3	8.01	**8.05**	8.24	7.78	7.90	7.99
16	4	4	8.03	**8.04**	8.11	7.77	8.01	8.00

Figure 23.1 **An SPSS-Produced Stem-and-Leaf Diagram for Package Design Two**

Frequency	Stem	Leaves
0.0	79 .	0
2.0	79 .	5 9
7.0	80 .	2 3 3 4 4 4 4
3.0	80 .	5 6 7
4.0	81 .	1 2 3 3

Stem width: 10
Each leaf: 1 case(s)

With today's increasingly powerful spreadsheet and statistical software programs, together with color inkjet printers, these pictorial devices are easy and quick to produce and use.

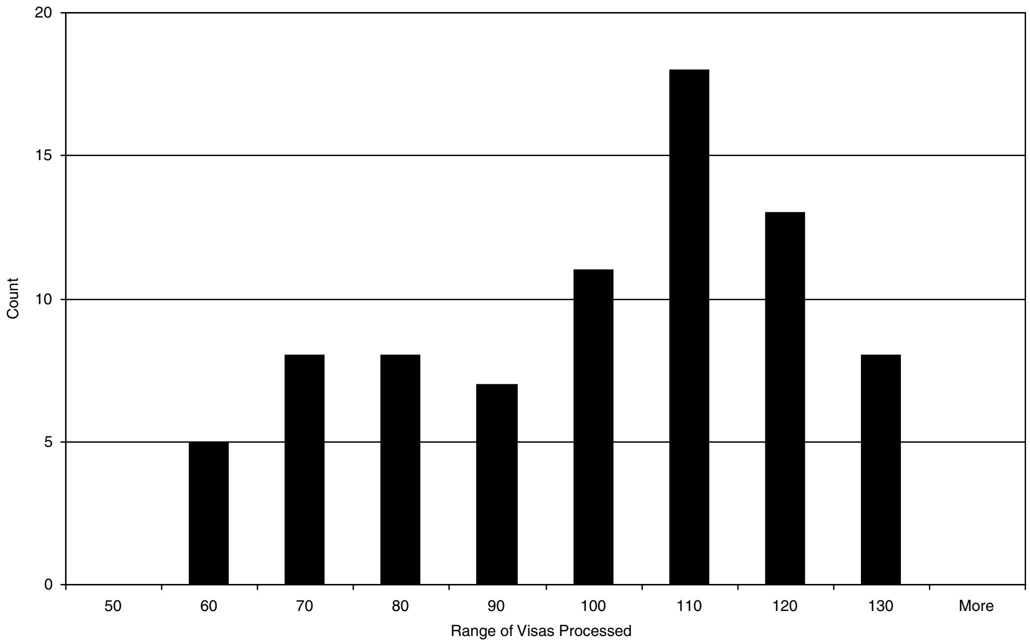
Charts and Graphs

Among the more commonly used types of charts and graphs are *bar charts*, *frequency polygons*, *line and area charts*, *scatter plots,* and *pie charts.*

Bar Charts

Bar charts show how many measurements or observations fall into each class or category of each variable. Printers may use asterisks (stars) or shading to represent the extent of the relative frequencies. It is important to remember that the bars are not accurate measures; they are symbolic.

Figure 23.2 **Vertical Bar Chart (Column Chart) Produced by Excel**



Bins	Frequency
50	0
60	5
70	8
80	8
90	7
100	11
110	18
120	13
130	8
More	0
Total:	78

The bars in any one chart may not appear to exact scale, but they do give a clear visual impression of the variation among the values in the class. Bar charts may be displayed either vertically or horizontally; charts with many classes should typically use the horizontal form (page width limitations might otherwise force the chart into an overlap, confusing the viewer).

Bar charts are often used to show changes or trends over time. In this application, the horizontal line is always the time line, while the vertical line represents the data values. Figure 23.2 is a vertical bar chart (column chart) of student visa processing example data; it is based on ten-wide bin sizes.

Histograms

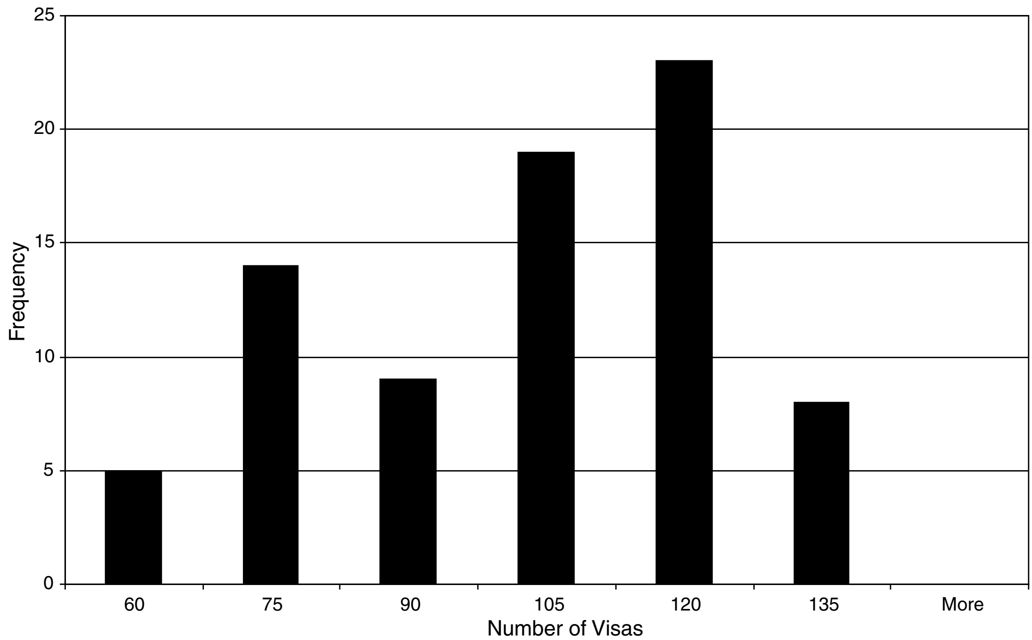
A second way to graphically display a frequency distribution is with a *histogram.* A histogram has a visual appearance much like a bar chart, except that in histograms the bars often touch one

Table 23.9

15-Wide Bins and Frequencies for Visa Applications Data

Bin	Frequency
60	5
75	14
90	9
105	19
120	23
135	8
More	0

Figure 23.3 **Histogram of Hypothetical Visa Applications Data (Quarter 1) for Table 23.9 Data**



another (gaps always separate the bars of a bar chart). And, while bar charts should only be used when displaying discrete data (that is, data in distinct categories such as occupations), histograms can be used to display both discrete and continuous data.

The Excel *Tools/Data Analysis/Histogram* wizard was used to construct the bin frequency table in Table 23.9 and the histogram in Figure 23.3. Recall that a computed class width using the mathematical formula resulted in a value of 12.66, which is a cumbersome span. Bin widths of 10 or 15 measurements could have been used with similar results. The histogram in Figure 23.3 was calculated using a bin width of 15, whereas ten-wide bins were used in Table 23.2 displayed earlier.

Examples of continuous data include income, height, weight, and other similar measures. As with frequency distribution tables, continuous data categories or classes used in histograms must

Figure 23.4 **Line Chart of First-Quarter Visa Totals for Table 23.9 Data**

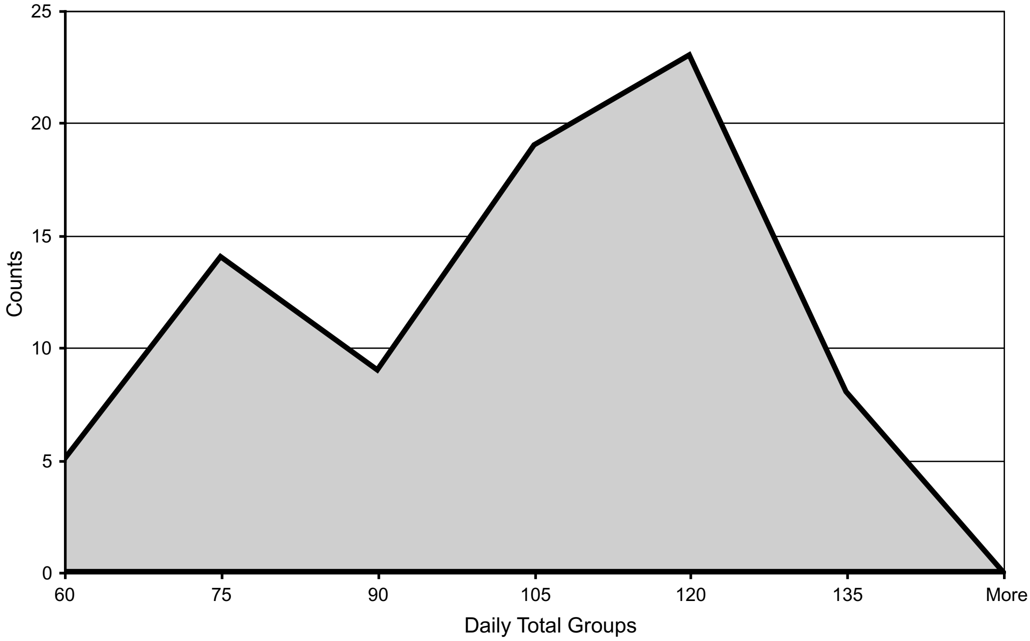


exhibit internal consistency; all classes must be of the same width. In histograms, the horizontal line (x-axis) displays the measurement values of the data, while the vertical (y-axis) represents the frequencies or counts of how often the values occur.

Graphs

Graphs are another good way to present a visual summary of data. The types used most are *line graphs*, *frequency polygons*, and *pie graphs* (also known as “pie charts”).

Line Graphs

Line graphs (or *line charts*) are used to show how values of a variable change over time. The time periods are always shown on the horizontal axis, while the vertical axis displays the values of the variables being examined. When plotting continuous data, the points at each time period represent the middle level of the class. Simple line graphs are used this way to display trend lines of single variables. Compound line charts displaying the component values of a larger sum are often used to visually display comparisons over time. A line chart is displayed in Figure 23.4.

Frequency Polygons

Frequency polygons display much the same data as histograms: the counts of occurrences of each value of a variable. In appearance, however, they look almost identical to line graphs. For many

Table 23.10

Vote Contribution by Region

Region	(%)
Pacific Northwest	11
Mountain States	20
Southwest	15
Central	27
New England	13
Southeast	14
Total	100

years, when statistical computations were done by hand or, at best, with a hand calculator, the frequency polygon was probably the most often used method for graphically displaying frequency distributions. This was because they are extremely easy to construct. However, today they are not encountered as often as bar charts and histograms.

With all frequency polygons, two axes are need. The vertical axis almost always represents the frequencies; the horizontal axis displays the measurement or class values. With grouped data, the mid-point of the interval is used. When plotting specific data such as individual scores, the actual score value is used. Lines connect all total frequency values. The polygon's lines are often extended to one value above and one below the observed data so as to "close off" the polygon instead of leaving it hanging in midair.

Frequency polygons can also be used to plot and compare two or more sets of scores or values that are based on separate scales. In this case, use the *relative frequency distribution* in place of actual frequency distributions.

Pie Charts

In pie charts, the data are presented as portions of a 360-degree total. Each portion of the "pie" is a representation of its proportion of the total (100 percent). Figure 23.5 is a pie chart of the data presented in Table 23.10. It was produced with the Excel *Chart Wizard.*

Scatter Plots

Scatter plots are a separate category of ways to visually present data. Scatter plots are used to display a series of points depicting the relationship between two (or more) related or associated variables. In one sense, they might be considered to be somewhat similar to line charts, except that no lines connect the various points on the scatter plot. Measurement units for one variable are marked on one axis; units for the second variable are marked on the other axis. For example, a quality scatter plot might list machine production rates on one axis and part failures on another. Each point represents a single measure of both variables.

When all measures are plotted, a visual picture of the relationship between variables can often be seen (Figure 23.6). When scatter plots are used to display dependent-independent variables, the horizontal axis is the independent variable. An example of an independent variable could be various levels of advertising expenditures; the dependent variable might be sales levels associated with different levels of advertising spending.

Figure 23.5 **Vote Contribution by Region for Table 23.10 Data**

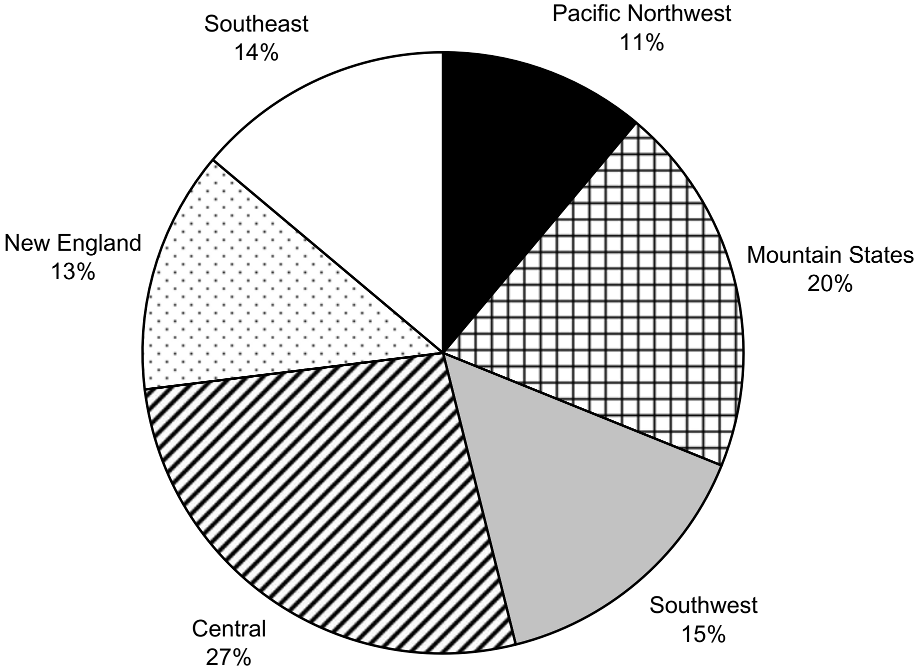
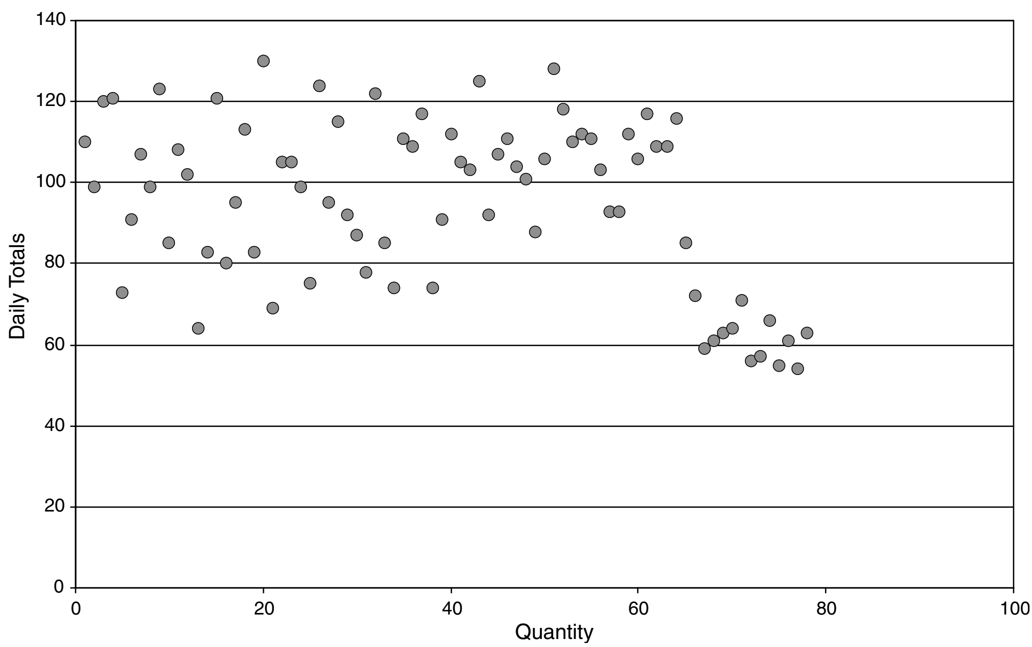


Figure 23.6 **A Scatter Plot Example**



Summary

When first collected, raw data seldom make sense. Raw data are simply a loose collection of numbers with no intuitive meaning of their own. Data must be put into some kind of order or structure; they must be grouped together into sets that have logic and structure. Numbers do not speak for themselves; they acquire meaning only when they are organized in terms of some mutually understood framework. To begin with, data must be ordered and classified into a structure that has meaning and pertains to the decision problem. Often, the first step in this process is the preparation of simple *univariate*, *bivariate*, and/or *multivariate* tables that present the data in summary form.

Tables are nothing more than sets of numbers and their identifying labels, presented in some organized, logical way. When quantitative information is arranged in tables, it is easier for persons reading the report to spot trends, relationships, and differences in the data. Examples of data almost always presented in the form of a table include demographic data, such as family incomes, subjects' occupational categories, the geographical dispersion of voters, and size or performance measures that fall within researcher-determined tolerances.

An early step in the analysis and interpretation of statistical data is arranging the collected numbers in some logical sequence; this is often done by reorganizing the data into ascending or descending order, or transforming it into standardized values, which can then be organized into logical tabular form.

Graphic displays of data also improve the researcher's ability to communicate meaning to readers. Bar charts, histograms, line and area charts, scatter plots, and pie charts are used to graphically display the information mined from datasets.

Discussion Questions

1. Why do good research reports make maximum possible use of graphic display tools?
2. What are some reasons to display data in tables?
3. What is a frequency distribution table? How does it differ from a *relative* frequency distribution table? What are the rules for making a relative frequency distribution table?
4. What is a stem-and-leaf diagram? What are its advantages?
5. Seven different types of charts and graphs were mentioned in the chapter. Name and describe at least five of them.
6. What is a pie chart? What is a frequency polygon?
7. How can you use Microsoft Excel to make charts and graphs?
8. How can you make tables with SPSS for Windows?

Additional Reading

Albert, Jim. 2003. *Teaching Statistics Using Baseball.* Washington, DC: The Mathematical Association of America.

Green, Samuel B., Neil J. Salkind, and Theresa M. Akey. 1999. *Using SPSS for Windows: Analyzing and Understanding Data.* 2nd ed. Upper Saddle River, NJ: Prentice Hall.

Myers, Judith G. 2003. *Banishing Bureaucratese: Using Plain Language in Government Writing.* Vienna, VA: Management Concepts.

Tufte, Edward R. 1983. *The Visual Display of Quantitative Information.* Cheshire, CT: Graphic Press.

24 Organizing and Writing a Research Report

Once research data has been collected, tabulated, and analyzed, the researcher must then organize the information and choose a structure for presenting the findings of the study and his or her conclusions. There are many different ways to do this. One way is to use a *chronological* organization style. A second approach is to use an organization style that goes from the general to the specific or from the specific to the general. The researcher could use the points in the *definition of the study question* or *the research hypotheses* as a discussion structure. This could mean starting a paragraph with a point or a hypothesis, then using material from the literature to show how the point is applied in practice. Many other approaches are also possible.

This book presents no ironclad rules to follow when deciding how to organize research findings and present ideas. However, it is recommended that the report writer avoid jumping around from one point to another with no underlying plan. Remember: a fundamental goal of your writing is that it be *read.* For that to happen, it must be interesting and readable. This requires adopting a structure and sticking to it.

How to Structure a Research Report

The key step in organizing and presenting ideas in a political science research is to select a *point of view.* This involves deciding how you will structure the paper so that the ideas flow smoothly from section to section. The chances of the paper being read can often be improved by following a simple, standard structure and by using a writing style consistent with the writing in that field of study. Later, if the researcher tries to publish the research report, the format *must* meet the specific structure and style requirements of the selected journal. For now, researchers should concentrate on meeting as many of the requirements as possible.

Points of View for Research Report

Different disciplines in the social and administrative sciences and the humanities often recommend a variety of ways to structure or organize their written report. A valuable overview of some of the different directions or points of view that researchers can take when planning and writing reports of their findings has been suggested by Sorrels (1984, Chapter 6), who lists seven different points of view (or "patterns") that are often chosen:

1. The *indirect pattern*, which moves from factual parts to a general conclusion.
2. The *direct form*, which reverses this order. With this form you move from a general conclusion to the facts that support it.

3. A *chronological pattern.* In this organization form you take the reader through an order of events, such as a sequence of dates.
4. A *spatial pattern.* An example of this method is a paper that moves the reader from one department or location to others in a logical sequence.
5. An *analytical organization*, in which the whole is separated into parts, with each part addressed completely before moving onto the next part.
6. A *comparative pattern.* As the name implies, parts of a whole are compared point by point.
7. A *ranked method*, where portions of the paper are presented in the order of their importance or impact; the importance may be in ascending or descending order.

Sections in a Research Report

Written research reports contain, at most, nine or ten parts or sections. These are usually organized in an order similar to that displayed below. However, it is also important to remember that not all papers and reports follow this format and not all include every one of these major components. The key is to find the structure that meets the requirements of the medium in which it will be presented.

I. Title Page
II. Abstract
III. Introduction or Rationale for the Study
IV. Review of the Literature examined for the study
V. Discussion of the Methodology used for the study
VI. Complete discussion of the Results or Findings
VII. Conclusions and/or Recommendations
VIII. Detailed list of the References and/or Sources Cited
IX. Appendices

The following sections contain a brief discussion of the major report components. Keep in mind that this represents a summary or compendium of many different report style recommendations. As they scan published papers and books, researchers are likely to encounter a host of variations from this list of components. This should not create problems; instead, it allows for greater *flexibility* in preparing the presentation. Keep in mind that most researchers and business writers in general do not regularly follow any *one* style or format for their reports. Thus, the format and style presented here have been designed to meet most writing requirements and can be safely followed in most instances.

Notice that this list does not include any mention of charts, tables, graphs, illustrations, drawings, models, or other graphic communication tools. That is because these tools are not limited to any one section of a report. Naturally, graphic items are seldom if ever found on the title page or in the abstract or references. However, there is nothing to say that they cannot be used in any or all of the other sections. When used correctly, graphic tools greatly improve the communicative ability of a report. They allow the researcher to present detailed information clearly, succinctly, and at a glance, regardless of where they are used in the report.

The Title and Title Page

The *title* is often one of the most important components of a paper. It should leap off the page at the reader, grabbing his or her attention. This does not mean that it should be "cute." In fact, always avoid using anything that smacks of being cute. Never use slang in your writing. If for some reason slang must be used for special effect, for example, it should always be set off in quotation marks or italics.

Most students and beginning researchers tend to use titles that are too general or that do not say anything about what the research or assignment involves. For example, "A Report in Compliance with the Research Assignment of February 2," is not an appropriate title, even if it is accurate.

Do not make the title too long; eight or ten words ought to be the maximum. Fewer are best. On the other hand, do not be too terse (abruptly brief). Research papers are not newspaper stories; short, tricky headlines as titles are not appropriate—even if they are explained in the first section of the paper.

Components of a Good Title

Good titles contain four key components. First, they identify the *topic*. Second, they spell out the *specific dimension* of the study. Third, they name *whom* the study is about; and fourth, they explain what *methodology* was followed. Thus, when coming up with a title, researchers must consider the following:

1. The topic of the study
2. The specific application or dimension of the topic you studied (examples might be *innovations*, *revisions*, *results*, *effects*, *use of*, *new ways of*, etc.)
3. The agency, location, people, industry, or other such relevant focus
4. Key methodology used (qualitative, quantitative, etc.)

The purpose of the title is to tell the reader what the paper is about—and to capture the reader's interest so that the full, finished product is read. For example, say that a researcher has examined the actions of a state agency accused of practices that are destructive to the environment. The research report might be titled: "Environmental Actions of a State Agency." But that's not good enough. Readers need to know what kinds of actions were studied, why they are important enough to study, and why a report has been written. Who really cares? A better approach to take with the above title, then, might be: "A Review of Reports of the Environmentally Destructive Logging Practices of the State Bureau of Water Resources."

The topic of the paper, the first component, is the "environment." The specific dimension studied is "environmentally destructive logging practices." The organization is the "State Bureau of Water Resources." The methodology is a "review" of published reports. A "'review" usually refers to a secondary literature research strategy. The researcher studies the issue by reading all available information about the bureau and the topic. Then, a synthesis of that information is presented in the research report. This *qualitative research* method is known as a "literature review."

It is good to include the research *method* followed in the title of the final report as often as possible. Some examples of titles for reports in these types of studies include the following.

Example Qualitative Study Titles

- "An Ethnographic Analysis of Using Community Meetings to Overcome Negative Public Attitudes"
- "Using Personal Interviews as a Way of Measuring Public Confidence in Mutual Funds"

Figure 24.1 **Title Page for a Research Report**

THE TITLE OF YOUR REPORT

by
Your E. Name

[Put the name of the group, team, or organization here]
[Put the name of the parent agency here]
[Put the submission date of the report here]

Example Quantitative Study Titles

- "A Factor Analysis of Consumer Attitudes About Banning Smoking in Tacoma, Washington"
- "A Time Series Analysis of Minority Hiring Data in Two California State Agencies"

Finally, the *title page* should include the title of the paper, the name of the author or authors (usually in alphabetical order based on the first letter of the last name), and any other relevant information. Examples of title pages for a typical class term paper and for a large paper (a master's thesis) are shown in Figures 24.1 and 24.2.

The Abstract

The *abstract* is a concise summary of the research study and report. It is placed at the top of the first page of the paper, immediately below the title and before the introduction section. While most reports are typed double-spaced, the abstract is usually typed single-spaced and indented five spaces on both margins of the paper.

Typically, the abstract ranges from 100 to 200 words. In some journals, such as the *Journal of Marketing Channels*, instructions for authors call for the abstract to be fewer than 100 pages. Whatever the length, in this short space the abstract must inform readers what was done, how it was done, the most significant results or findings, and what readers will find when they read the entire paper.

Abstracts are found in all professional journal articles and in the long-form listing of papers included in such CD-ROM databases as *ABI-Inform* and others. Abstracts contain enough information to accurately inform the researcher of the key ideas in a paper, while also encouraging the researcher to read the full paper.

In a report prepared for internal distribution, such as a study done for management or a consultant's recommendation report, the abstract is replaced by the slightly longer *executive summary.* While abstracts follow normal sentence construction, the executive summary may be presented

Figure 24.2 **Title Page for a Master's Degree Thesis**

THE PRIVATE vs. PUBLIC-POWER FIGHT IN SEATTLE:
1930–1934:
A study of efforts to influence public opinion

by
Your E. Name

A thesis submitted in partial fulfillment of the requirements for the degree of
Master of Arts in Communications

University of Washington
Seattle, Washington

in outline or bulleted form. The executive summary is often made into an overhead transparency and used to guide an audience through an oral presentation of the paper. The executive summary is seldom used for classroom reports.

A Sample Abstract

In the abstract in Figure 24.3, the authors tell the audience that the paper is about a survey of the perceptions and attitudes regarding environmental and social issues held by students in Canada, Taiwan, and the United States. It explains who were members of the sample and provides a rationale for conducting the research. A brief suggestion of the results is also included.

The Introduction

In some professional journal formats, this section might be called the *Background* section. In others it is referred to as the *Rationale for the Study.* In some journals, the section might have no label or headline; the writer just begins with the writing. Many political science journals continue to use the *Introduction* label. Whether the label is used or not, the purpose of the introduction section is to explain for the reader in some detail what the study and paper are all about. Beyond this, there are few specific rules about what goes in the introduction, only suggestions. The following are some ideas you might wish to think about as you write the introduction for the report or paper.

The introduction section is where readers are introduced to the full scope of the study topic. It includes background information on the topic or situation, the researcher, funding agencies, if any, and any other relevant preliminary information. It is the place to state why the topic was selected. It is also where the steps taken in developing the study are listed. The introduction section explains how or why the study was first considered, and what the researcher hoped to learn by studying this particular topic.

Figure 24.3 **Sample Abstract for a Research Report**

ABSTRACT

This paper presents findings of a cross-cultural survey of university students' perceptions of the importance of environmental and social issues, and of policies and programs to deal with the issues. Graduate and undergraduate students in Canada, Taiwan, and the United States were surveyed. The study grew out of discrepancies seen in various cultures' priorities for resolving environmental problems. The researchers developed a list of 45 environmental and/or social problems and 20 statements about how organizations deal with environmental problems. The findings supported the propositions that different countries have different ideas about global environmental problems, that more international cooperation is needed, and that management education must include more comprehensive discussions of environmental problems to prepare researchers to function in the sustainable-growth economies of the future.

The introduction section sometimes includes a brief discussion of some key items of the literature so that readers can see how the research relates to other work done on this topic. Special care must be taken to avoid simply repeating what others have written, however. It is important that the researcher *interpret* others' reports and indicate how they relate to the new study.

The introduction is the first place where the writing should begin to sparkle. It must be carefully written and rewritten. It is the first chance to "hook" the people who are in a position to judge your research and writing. To summarize, the introduction should include the following:

- A brief (no more than one or two paragraphs) review of the background of the study;
- A statement explaining why the topic was selected;
- If appropriate, a brief introduction to other research on the subject;
- An indication of what will be presented in the pages to follow; and
- Any additional information that logically could be considered as an introduction to the research project, study, topic, or paper.

Review of the Literature

The section that follows the introduction is the *Review of the Literature.* It should contain the majority of your analysis of what other researchers and authors have said about the topic. This is where results of the library and/or Internet investigation are presented. Since everything included in this section comes from the work of others, the researcher must be careful to always cite sources; if someone else did the work first, they must be given credit for their work.

For research papers that follow a document analysis strategy, this section might more appropriately be called the *discussion section.* For example, for a paper about how managers in public organizations exercise one or more aspects of good leadership, all data might come from already published sources, such as one or more broadly focused management journals or similar sources on CD-ROM or the Internet. Once this is complete, the researcher might then carry out a more extensive search of the public administration literature for specific articles on the managers in the public sector specifically. This is not as difficult as it sounds because good examples tend to get lots of attention in the media.

The researcher might include introductory paragraphs defining the topic and variables in question; in this example it means describing specific leadership traits. Then, the literature that addressed each of the traits might be examined. In this way, the researcher might do all his or her research examining already published sources.

Or, the researcher might be asked to prepare a more structured study that involves observing leadership traits as exhibited by managers in the researcher's own organization. The method of gathering this data might be either qualitative, quantitative, or a combination of the two. In this situation, the literature search can provide suggestions about what traits might be more important than others, how leadership traits are or might be measured, and other relevant foundation material.

Research and Theory

Developing new ideas and concepts requires that a researcher first have a thorough grounding in *existing* theory. This comes from a comprehensive review of the literature on the topic. Sources may be personal interviews you conduct with "experts." They may be the extensive body of domestic and international professional and/or occupational literature, or current and past textbooks. Or they may be other published materials such as newspapers, encyclopedias, yearbooks, unpublished papers, opinion pieces by other scholars, or material prepared expressly for and carried only on the Internet. To summarize, the review of the literature (or discussion section in a shorter paper) should do the following:

- Review earlier work done in the field;
- Explain how earlier work relates to this investigation;
- Give examples of directions being taken by other investigators;
- Give a sense of continuity or closure to your work;
- For a shorter paper, provide the body of your ideas and results of the study.

Methodology

Sometimes called *research methods*, or *methods and materials*, or simply the *methods* section, this is the part of the report where how the work was done is finally and fully explained. In research studies, this section describes in some detail how data were collected and processed. Was the study completely a library study? Was the research limited to a study of Internet sources? If so, why? Was a custom-designed questionnaire developed, or was a pre-prepared questionnaire used for the survey? Why? Were the data gathered by observation? If so, was the researcher functioning as a full participant or as an unobtrusive bystander? Did the research involve conducting a series of personal interviews? Was an experiment designed and carried out? These are only a few of the many different ways to gather information. The method chosen will depend upon the nature of the study problem, the relevant study variables, and the resources available to the researcher.

Methods and Data Differences

It is worthwhile here to briefly review one of the key differences in data as it relates to study methodology. This is the *primary-secondary data* dichotomy. *Primary data* are data that the researcher generates; they can be considered to be specific to the research project at hand. An example is the collective responses to the questions in a questionnaire (also called a *survey instrument*) that are acquired from a sample of subjects.

Secondary data, on the other hand, are data that were collected by someone else for a different purpose. Examples include published economic or demographic statistics. Typically, secondary data are cheaper and quicker to gather. Primary data tend to be the more reliable of the two data types, although there is a place and purpose for both. If the study is library or Internet research for a short paper, it will involve gathering secondary data exclusively. If the research study means conducting an experiment to evaluate citizens' responses to various public service announcements, it means gathering primary data.

When gathering secondary data, remember that every source of information used must be identified in the paper. This means including a complete bibliographic citation, including page numbers for actual quotes you include in your paper (page numbers should *not* be used with source citations when they are paraphrased).

Conducting a research study can mean studying published books and articles in the library or checking sources over the Internet. It can require examining artifacts or observing behavior in the field. It can involve developing a set of questions and asking people to respond to a questionnaire. Or it can require carefully designing and conducting an experiment with human subjects. In every case, the researcher must describe exactly what was done and how. That information goes in the *methods* section of the research paper.

The Results (Findings) Section

Once readers have been told what was researched and how it was done, it is time to tell them what the research revealed—what it accomplished. Sometimes this section is called the *Discussion* section; sometimes it is labeled simply *Results* or *Findings*. Whichever, this is where readers are shown the results of the effort; in the process, it explains the reasons for conducting the research in the first place.

This information must be present clearly, factually, simply, and without editorial comment. It is not the place for the researcher to introduce opinions or reactions. This means that conclusions, judgments, or evaluations of the information should not be interjected into this section of the report. The job of the author is simply to *explain what the data reveal*, nothing more.

Do not "editorialize" about the data in this section. Remain cool and objective; simply "tell it like it is." Avoid negative opinions. For example, don't say that a legislator was "unqualified to serve on the committee." However, it is possible to describe the behavior that makes you or others think that he or she lacked the necessary qualifications. Let your readers make their own evaluations and conclusions; never tell them what to think.

Style: First Person or Third Person?

Typically, quantitative reports are always written in the third person, while qualitative study reports may be written in either the first or third person. It is good to get into the habit of using the form that is used most often in your field of interest or study. For example, authors are strongly encouraged to avoid using the first person approach ("I") in reports on business or economics research, whereas many public administration journals include papers written in both forms. The topic and research methodology followed should dictate the form to use.

As a rule of thumb, however, it is difficult to get into trouble when always using clear, objective writing, and writing in the third person format. Having said this, it is also important to know that many instructors require that personal opinions be included in class writing. It is believed that doing so encourages students to develop critical thinking skills. Whenever the issue comes up, it is best to comply with one of the first requirements of all writing in organizations: Write for your audience. To summarize, here are some key points for the "Results" or "Findings" section of your paper:

- Political science and public administration papers are written in either first or third person format.
- Unless specifically asked for your opinion, do not editorialize in the Results section; your opinion goes in the conclusions section.
- Try not to editorialize about the study results in the Findings section. Remain cool and objective here.
- Avoid negative opinions in the body of the report; let the readers come to their own conclusions.
- Use clear, objective writing at all times.

Is It Style or Is It Format?

The words *style* and *format* are often used interchangeably to refer to the way a paper is put together. They shouldn't be, because they mean different things. *Format* refers to the way the research paper is structured or organized. It includes headlines, subheads, and the order of the components of your paper. *Style*, on the other hand, refers to the choice of words and sentences used in the report. It includes punctuation and grammar.

Format often varies from discipline to discipline, journal to journal, and according to the purpose of the paper. Sometimes, when people talk about s*tyle*, they are referring to the *writing rules* endorsed by an organization like the American Management Association or the University of Chicago. At other times, they mean the subjective, creative, artistic part of writing: selecting words that sparkle, using the active rather than the passive voice, using a variety of sentence lengths.

What to Avoid

What kinds of textbooks and articles do you hate to read? A volume with sentences that ramble on forever? One with huge seas of black or gray that put you to sleep because the author refused to end paragraphs, did not use headlines or subheads, or did not include illustrations or graphics to perk up the text? Those that offend you because they either talk down to you or assume you have twenty years of experience in the field and that you understand the complicated or esoteric jargon the author insists on using? Most people prefer books and articles that can be read and understood. These are the examples to use as models for your own writing. Good writing *can* be learned, just as poor writing can be avoided!

Conclusions and/or Recommendations Section

Writing a research report can be much like writing a speech. In both cases, the writer selects a topic, finds out something about the topic, and then writes about it. The writer closes with a summary and shares conclusions about the process with an audience. People who teach speech making have reduced this to a three-part structure: (1) tell your audience what you are going to tell them, (2) tell it to them, and then (3) tell them what you told them.

In a sense, we have been following these directions as we moved from section to section in this chapter. In the *Introduction*, readers are told how to explain what the research and report are going to be about. The *Methodology* section describes the way the data will be gathered and processed. The *Results* section presents the main body of your research findings. Now is the time to wrap things up by telling the audience what was learned from the research.

A good *Conclusions* section can be one of the most valuable components of a paper (Markman, Markman, and Waddell 1989). The well-written conclusion is part summary, part conclusion, and part recommendations. This section can be used for several different purposes. First, it provides an opportunity to summarize the main ideas gleaned from the literature. It also permits repeating any critical findings from any experimental research that might have been conducted. Second, it allows the researcher to *interpret* the findings and to present a subjective interpretation in his or her own words. In a good public administration paper, this may be the only place where the researcher can be original. To this point, the writing must have remained completely objective. Only the *facts* were reported. Finally, the conclusions section gives the researcher a chance to prove to the readers that the research idea, design, and project were valid and worth the doing.

Now, however, the researcher must explain what it all means. To do this well requires the researcher to finally be creative, analytical, and persuasive. At the same time, this is where the author tries to influence the audience or to convince them that the presented interpretation is the "right" one.

Preparing the Conclusions Section

Begin this section with a brief summary of the research, add your interpretation, and close the report with what you see as either implications of the findings, or your recommendations. The "Conclusions" section should:

- Summarize the main ideas;
- Say what these ideas mean;
- Include a personal interpretation of the findings (your *opinions*);
- Convince readers that the research was worth the effort;
- Make recommendations, if any, to the reader.

Source Citations, References, and Bibliography

This is where the writer identifies all sources of information used in the conduct of the research project and preparation of the research report. Typically, there are two parts to citations: (1) the place in your report where you cite the sources used in your study; and (2) an alphabetical list—a bibliography—of all sources cited, studied, or examined during the study.

The first part is the *Notes* or *Sources Cited*, and can be presented in the report as *endnotes*, *footnotes*, or *in-text citations*. Notes are gathered in end- or footnotes in the same numerical order as they appear in the paper. In-text citations appear in the body of the paper as the pertinent source information is used.

The second part is the *References* or *Bibliography* section; it contains complete bibliographic information about all sources used in the study. Many different bibliographic styles are used in research writing. It is usually best to follow the style used by the most influential writers in the field or to follow the style employed by the "best" journal in the discipline.

Writers may use footnotes, endnotes, or in-text citations to cite sources. Location information is needed for others to either replicate the study or test for flaws. For papers of approximately 10 to 12 pages, authors are no longer required to include endnotes or footnotes. This does not mean that authors can use the work of others as their own. Doing so is *plagiarism*, and plagiarism is theft. The practice is unethical, immoral, and in most cases, illegal. At some universities and colleges, students can be expelled for plagiarism.

What it does mean is that the citations issue can be dealt with by placing the author's name and date of publication in parenthesis at the beginning or end of the section dealing with that work. This is called the "in-text" or "author-date" citation. It is used in conjunction with a reference list. The in-text citation method is growing in popularity; most publications and organizations prefer that it be used exclusively. It is the method used throughout this book.

The "References" section of the research paper must include a complete bibliographic citation for every source used in the research. If a source has been examined for the study but not used, it is not necessary to include it in the references.

References Section Summary

The information used as background for a research project can come from published books; periodicals (magazines, newspapers, journals); interviews or surveys; films; electronic sources such as the Internet; government or company brochures, reports or pamphlets; television programs; or any other source you find. There are a variety of rules for how to list these sources, both as notes and references.

In the past, some stylebooks called for both notes and references to be included. Today, however, in-text citations are usually substituted for endnotes or footnotes. Most periodicals require in-text citations be used instead of endnotes or footnotes, together with a formal references (or sources cited) list at the end of the paper.

Appendix or Appendices

The *appendix* is the last component of a research paper. This word has two plural forms: *appendixes* or *appendices*; you may use the one you prefer. The appendix is where to place any attachments that might relate to the paper but that cannot or should not be placed in the body of the paper itself. A brochure or advertisement is an example. Other examples include a copy of the questionnaire used in a research study, a complicated mathematical table, or a copy of an article from a magazine, journal, or a newspaper. There are no limits to what can or what should be included in the appendices.

The wide variety of materials that could qualify as appendices suggests that there is no one rule or special format to follow for appendices. Style manuals with recommendations pertaining to the appendix tend to agree on the following conclusions, however:

- Research papers for public administration, business, or economics seldom require an appendix or appendices.
- When used, appendices should be attached after the bibliography.
- While it is not completely necessary, a single title page (with the label Appendix) should be placed before all the attached material.
- Only the number of the appendix title page is noted in the table of contents.
- When more than one appendix is used, the word Appendices is placed in the table of contents and on the section title page.
- Multiple appendices can be labeled alphabetically, as follows: *Appendix A*, *Appendix B*, *Appendix C*, and so forth.

Style in Research Report Writing

When editors talk about style, they mean one or more of these writing features: (1) an author's choice of words and sentences, (2) how the author employs basic rules of grammar and punctuation, or (3) the mechanics of footnotes, endnotes, in-text citations, and various ways of recording bibliographic (reference) notation. This section is about the third component of style: *notes*, *citations*, and *reference notation.* It is also a brief introduction to several of the most commonly used notation styles: the *American Psychology Association* (APA), the *University of Chicago* (Chicago Style), and the *Modern Language Association* (MLA). Several discipline style references are also explained.

Formats for Endnotes, Footnotes, and In-Text Citations

Endnotes, footnotes, and in-text citations are tools used to show your reader(s) where you found your information. Endnotes are placed at the end of your paper, just before or after your bibliography. Footnotes are placed on the bottom of the page where they are introduced. An identifying number or symbol is placed at the end of the material for which the endnote or footnote applies, and that number is used to designate the reference information. Superscript is the preferred font for the notations; [1] is an example of superscript.

Both endnotes and footnotes allow you to include additional or parenthetical information that is not otherwise considered part of the regular flow of your paper. Notes can be personal observations, or comments or questions raised about the sources. They can also be *asides*—information that adds to the understanding or fuller appreciation of a point in the paper itself. However, their primary purpose is to tell the reader the source of the ideas. Unless the ideas are exclusively yours, their source must always be cited.

Endnote and footnote entries are made in numerical order, from the first to the last. The first time a source is mentioned, a complete bibliographic entry is included. Use the same format required for a complete bibliography. If the end- or footnote is not a citation but rather additional or parenthetical information, it should be written using complete sentences with proper punctuation. With end- or footnotes, the complete citation is included in only the first note. After the first entry, all subsequent entries use only the author's last name. The Latin *ibid.* and *op. cit.* are no longer used in research reports or scientific writing.

Format for In-Text Citations

Today, the preferred way of noting sources in the body of a paper is the in-text citation method. In-text citations should appear following the source material to which they pertain. An in-text citation consists of the author's last name and the year of publication, without commas or periods. Page numbers are added if a direct quote is used, in which case a comma goes between the date and page number (e.g., Jones 2009; Jones 2009, 38).

Say, for example, that you are writing a paper about religion and business. One of your sources discusses parables found in modern business literature. If you use an idea found in the book or article but express it in your own words (i.e., you paraphrase), you need not place it in quotation marks. At the end of your reference to that work, you must add the following notation: (Manners 2000). Beyond this, no end- or footnote notation is required. However, if you quote from the work, you must add the page number after the date, thus: (Mannners 2000, 223). The work itself would be listed in your reference list this way (or in some other accepted form):

Manners, Donald E. 2000. *Biblical Parables in Modern Business Writing.* Sioux City: Reality Publishing.

Use of Notes in Large Reports

For larger papers and research reports (40 pages or longer), some editors suggest that it is better to continue to use footnotes or endnotes instead of in-text citations. However, if the paper is to be published in a professional journal, the system required by the journal must be used. If it is a paper for a class, follow the instructor's requirements. Here is a good rule of thumb to follow*: If the paper is shorter than 20 or so pages, do not use endnotes or footnotes; if the paper is longer than 20 pages, you may use endnotes or footnotes. Other than this, use them if doing so makes the paper easier to read or understand. For class, always do what your instructor requires.*

The Bibliography (References) Section

Most style manuals have grouped source materials into three broad categories: (1) books; (2) periodicals (magazines, journals), and newspapers; and (3) miscellaneous, including pamphlets, brochures, annual reports, letters, interviews, films, and so on. Today, a fourth category has been added: *electronic sources.* These include the World Wide Web, CD-ROMs, and miscellaneous electronically accessed databases.

A word of caution: There is a lack of agreement on which is the best or most appropriate way to list citations. Almost every discipline has its own format. It is up to you to determine which format is accepted or preferred in the organization for which the paper is written. Follow that style. Considerable disagreement also exists on citation formats for electronic sources. Several different citation guides are listed here; one is the *Columbia Guide to Online Style* (1998) published by Columbia University Press.

Political science, public administration, and economics publications usually follow format requirements established or promoted by their respective professional associations. These formats may differ somewhat from the three main style formats—APA, Chicago, and MLA. Communications courses also have format requirements of their own; they often follow a newspaper style established by either the Associated Press (AP) or United Press International (UPI). Citation formats for papers written for natural sciences also vary somewhat from the three major styles.

The following pages contain examples of citation styles for the MLA, APA, and the University of Chicago (as set forth in the *Chicago Manual of Style*). These are the three standard styles recommended for writers. However, some academic disciplines and professions use styles that may differ somewhat from any of the three standard styles. This section also includes mention of some style requirements for government, business, and economic disciplines. Included are styles approved for management, marketing, accounting and finance, human resources, public administration, and economics. Professional societies for each of these disciplines have adopted required styles for all writing in their professional journals. And, not all societies in the profession have identical style requirements. The following is a summary of style information:

- Most style manuals group sources into three categories: books, periodicals, and miscellaneous.
- Today, a fourth category is also used: electronic sources.
- There are many different ways to cite sources: Use *one* and stick to it.
- Three major styles are the standard forms used in academic writing (often with some variation): APA, Chicago, and MLA.

- Some disciplines recommend using either Associated Press (AP) style or United Press International (UPI) style.
- Never create your own style; never mix styles within the same paper.
- Style manuals have been written for many occupations. Find the one used in your industry or discipline and use it for all your writing.

Some Standard Style Requirements

APA Style Highlights

The American Psychological Association (APA) prefers that authors use in-text citations with references to an end-of-paper "Works Cited" section. This applies for all papers, regardless of length. All source listings in "Works Cited" should include author name(s), title of the work, and publication information. In the in-text citations, page numbers are required for all direct quotes. If a cited author is mentioned in a sentence, the publication date is placed in parentheses immediately afterward—for example, Manners (2000). If the source material does not mention the author's name, then the name and publication date appear in parentheses following all source material—for example, (Manners 2000).

APA style requires you to *underline* a book or title of a periodical (but not the title of an article in the periodical) if you do not have access to an *italic* typeface. Do not indent the first line of a listing; instead, indent the second and each subsequent line three spaces (MLA requires a five-space indentation). All author names must be listed—never use *et al.* All names must be inverted (listed last name first). If you do not have an author's name, alphabetize the listing by the first word of the title (except for articles such as *the, a,* or *an*).

Capitalize both words in short titles like *Atlantic Monthly.* Do not put quotation marks around the titles of journal articles. Capitalize only the first word of book titles; however, if the title is only two or three words, all can be capitalized. Capitalize only the first word in a subtitle of a book.

Use double space or space-and-a-half for listings. APA also allows but does not require you to drop short labels as Press, Co., Corp., or Inc., after the name of the publisher. Names of university presses are usually typed out in full, thus Oxford University Press.

Periodical citations include the name(s) of the author(s), date of publication, title or headlines of the articles, and name of the periodical; use initial capital letters for periodical title names (e.g., *Journal of Macroeconomics, Journal of State and Local Government*). Volume and issue numbers, when available, are also included, appearing just before page numbers. Do not include "vol." or "no.); instead, list the volume number, insert a space, insert the issue number in parentheses). The listing should read as follows:

Author(s) name, date. Journal article title. *Journal Title*, 24 (2): 123–32.

Other sources includes such things as pamphlets, government or company brochures, dissertations, conference proceedings, personal letters and interviews, annual reports, and the like. These are all legitimate published sources and should be listed in your bibliography in the same way as books and periodicals.

Chicago Style Highlights

The editorial staff of the University of Chicago Press, a major publisher of works by academic authors, printed its first *Manual of Style* for writers in 1906. Since that time, the manual has gone through at least fifteen revisions, with more on the way. Possibly because it deals with the publication of books more than articles or papers, the Chicago manual recommends use of footnotes rather than in-text citations. A full biographic listing is required in the end-of-work References section.

When available, all listings should include the author name(s), title of the work, and publication information. Page numbers are required for all direct quotes. Publication dates are placed at or near the end of the listing, immediately before the citation's page numbers. Chicago style requires book and periodical titles to be in *italics.* Bibliographic listings are presented in alphabetical order, single-spaced, with two spaces between each listing.

Only first-author names should be inverted (listed last name first); others are listed first name, middle initial, last name. If you do not have an author's name, alphabetize the listing by the first word of the title. All authors' names must be listed—never use *et al.* Capitalize the first letter of all words in book, journal, and newspaper titles, with the exception of articles and short prepositions. Put quotation marks around the titles of journal, magazine, and newspaper articles. Chicago style requires these items to be listed in the following order:

- Name of the authors or authors, editors, or institution responsible for the writing of the book (such as the University of Chicago)
- Full title of the book, including subtitle if one exists
- Series, if any
- Edition, if not the first
- Publication city
- Name of the publisher
- Date of publication

Periodical citations should include as many of the following as possible:

- Name(s) of the author(s)
- Title of the article
- Name of the publication
- Volume (and number) of the periodical
- Date of the volume or of the issue
- Page numbers of the article

Some style examples include the following:

1. A government pamphlet brochure, no author listed:

U.S. Dept. of Agriculture. *Regulations for Applying Pesticides.* Washington, DC: U.S Government Printing Office, 1990.

2. Company pamphlet, brochure, or annual report:

The Boeing Co. *1997 Annual Report.* Seattle: The Boeing Co., 1998.

Electronic sources must include as much of the following information that is available. For a known author, include the following:

- Author name(s)
- Date item was placed on the Web
- Title of the piece (including edition number, if not the original)
- Type of medium
- Producer (optional)
- If available: supplier or database identifier or number
- Date you accessed the article

When the author is unknown, include the following information:

- Title (edition)
- Type of medium
- Year
- Producer
- If available: Suppler/database identifier or number
- Access date

MLA Style Highlights

This style is seldom used in political science writing, so it is only introduced here. According to the Modern Language Association of America (MLA), all sources included in a bibliography include three main components: author name(s), title, and publication information. All other style formats are in agreement with these requirements; they differ, however, in the way and the order in which they are presented. MLA requires that this section be a separate page or pages and be titled " Works Cited."

In citing books using MLA style, an entry can include most (but seldom all) of the following information:

1. Author name(s)
2. Title of the section, if a part of a book
3. Title of the book
4. Name of the editor, translator or compiler, if appropriate
5. Edition of the work
6. Name(s) or number(s) of the volume(s) used, if a multivolume work
7. Name of the series, if part of a series of books
8. Place of publication (city)
9. Name of the publisher
10. Date of publication
11. Page numbers, if quoted or if the work is part of a compendium
12. Any other relevant bibliographic information and/or annotation

In addition to the above parts, as many as twelve or more types of book listings are described in the MLA style manual. These range from a single author to multiple or unknown authors. Also included are compilations by editors, various editions or volumes in a series, parts of books, the forward or preface, encyclopedias, and dictionaries.

Other Style Manuals

Many different style manuals have been written to help you with your writing. While they all seem to vary a bit in their recommendations, they serve a common purpose: that is to serve as a guide to the "proper" way to present your written report. Some of the manuals are slim pamphlets; others are full-size books. Some manuals give suggestions and rules for all aspects of researching; others are only guides to citing sources. The following is a partial list of available style manuals; most can be found in any college or university library.

General

1. *The Complete Guide to Citing Government Information Sources: A Manual for Writers and Librarians*
2. *Electronic Styles: A Handbook for Citing Electronic Information*
3. *The Little, Brown Guide to Writing Research Papers*
4. *The McGraw-Hill Style Manual*
5. *Manual for Writers of Term Papers, Theses and Dissertations* (Kate Turabian)
6. *A Manual of Style: U.S. Government Printing Office*
7. *Prentice-Hall Handbook for Writers*

Environmental and Earth Sciences

1. *Suggestions to Authors of the Reports of the United States Geological Survey*

Originally an internal USGS document, this manual has been made available to the public and serves as a guidebook for all writing in the earth sciences.

Education

1. *Journal Instructions to Authors: A Compilation of Manuscript Guidelines from Education*

Computer Topics

1. *Electronic Styles: A Handbook for Citing Electronic Information*

Journalism

1. *Broadcast News Manual of Style*
2. *UPI Stylebook* (United Press International)
3. *AP Stylebook* (Associated Press)

Law

1. *The Bluebook: A Uniform System of Citation*

Psychology

1. *Publication Manual of the American Psychological Association* (APA Style Manual)

Social Science

1. *Writing for Social Scientists: How to Start and Finish Your Thesis, Book or Article.*

Special Requirements for Political Science Research Papers

Style recommendations of the *American Political Science Association* can be found in such journals as the *American Political Science Review* and other journals of the American Political Science Association. In addition to in-text citations, the following style items are used.

1. *Cover page:* The title of the paper, author's name, position, and organizational affiliation (for class papers use the course number and name). At the top of the first page, only the title is repeated.
2. *Abstract:* An abstract of no more than 100 words should be placed on the first page between the title and start of the paper's text. No Abstract headline is required.
3. *Headings:* The introduction section does not have a heading. Do not number any headings or subheadings. Headings are typically used for the *Findings* and *Conclusions* sections. Other headings may be used at the discretion of the author.
4. *Summary:* Papers should *not* end with a summary section. If relevant, a summary may be included in the author's conclusion section.
5. *Tables, graphs, figures:* When the paper is distributed within an organization, the tables, graphs, and figures should be inserted into the paper itself. When sending the paper to a journal for publication, tables, graphs, and figures should be attached as separate sheets.

   Authors must explain all tables, graphs, and figures in the body of the paper itself. All tables, graphs, and figures *must* be numbered and titled. When submitting the paper to a journal, tables must be numbered with Roman numerals (Example: Table IX). For papers distributed within an organization, either Roman numerals or Arabic numbers may be used.

   A reference to the table *must* be included in the body of the text. Tables must have a title and a descriptive legend. Titles, column headings, captions, and so forth must be clear and to the point.

   Figures must be numbered with Arabic numerals (example: Figure 9). Each figure must have a title followed by a descriptive legend. The figure's title should be part of the caption.
6. *Endnotes* and *footnotes:* Authors should avoid the use of notes as much as possible. If notes must be used, they should be numbered sequentially. A listing of endnotes typed on a separate page must be placed before the References section. Footnotes appear at the bottom of the page in which they are listed. Papers of twenty pages or less usually do not include footnotes or endnotes; longer papers may include either end- or footnotes, but are not required to do so.
7. *Citations:* The first line of the citation should be flush left; all other lines are to be indented three spaces. Do not number the citations. In the body of the paper, use *Chicago Manual* style with in-text citations format for documentation:

   Jones and Smith (1997) found that . . .

If the in-text citation deals with a quotation, the page number must be added after the date of publication, separated by a comma.

Jones and Smith (1997, 25) reported, "The moon . . ."

8. *References:* The references section should include only works cited in the text. They must be typed on a separate page(s) under the heading: “References.” References are listed alphabetically according to the last name and first name and middle initial of the first author, followed by each additional author in first name first sequence. The following examples should be followed for reference listings:

   A. Book citations, more than one author:

   Rouge, Anna M., Madeline M. Smith, and Marvin O. Johnson. 1994. *Governing the Ungovernable City.* San Bruno, CA: Mathematics Press.

   For more than one work by the same author or authors, list the works in order of publication (earliest first). Use an eight-spaced underline in place of the author’s name in subsequent citations for same author. If subsequent works have different second or more authors, continue to list them chronologically (earliest first) after the first notation of the principal author. Examples include:

   Lee, Brian, and Elizabeth Chung. 1994. *American Government.* Chicago: Federated.
   ———. 1997. *Development in the Central City.* Roseburg, OR: City Press.
   ———, and Susan H. Arden. 1996. *Training for Quick Advancement.* Tacoma, WA: Pacific Lutheran University Press.

   B. Books with an editor (collective works):

   Rom, Charlene D., and William D. Brown. 1997. “Health Programs in the Inner City.’ In Richard E. Keating and John P. MacDonough, eds. *Medical Delivery Systems Today,* 33–52. Seattle: University of Washington Press.

   C. Periodicals:

   Pearl, Andrew O. 1995. “Measuring Organizational Climate in Public Safety Organizations. *American Journal of Political Science* 17 (Winter): 101–110.

Finance and Economics Research Reports

The *Journal of Macroeconomics* and the *Journal of Economic Perspectives* are examples of finance periodicals. They follow style requirements established by the American Finance Association. Style requirements for publications in these disciplines can be found in the *Journal of Macroeconomics.*

Public Management Reports

Papers written for management topics usually follow style requirements established by the American Academy of Management. Examples and guidelines for authors can be found in the *Academy of Management Review* and other periodicals published by the academy.

Like all other discipline publication requirements, the Academy of Management asks that all papers be double-spaced and typed in a plain 12-point typeface (font). If it is impossible to italicize in the paper, underlining is allowed. Boldface type should be used for the title and headings. Tables should be typed in the same font used for the body of the paper. A title page is required. An abstract of 75 or fewer words should be included under the title near the top of the second page. The abstract should state the purposes for the research; include any theoretical basis for the hypotheses, analyses, major results, and implications of the findings.

Summary

This chapter described a variety of methods and tools used for organizing and presenting political science research findings. It began with a description of the variety of points of views that research authors use to ensure that their ideas flow smoothly from section to section. Examples described include the indirect, direct, chronological, spatial, analytical, comparative, and ranked methods.

The chapter then described in detail the organizational structure of most research reports. This format is used for reports, but may not be appropriate for research reports prepared for professional journals. Journals have their own distinctive style requirements. Most political science journals follow some version of the American Psychology Association (APA) or University of Chicago styles. The chapter included a brief discussion of some of the most-often-used rules for in-text citations in a research report and ended with References (or Bibliography) section.

Discussion Questions

1. Several different points of view for research writing were discussed in the chapter. Compare and contrast the ones that you are most interested in using in your research.
2. What should you remember about the title of a research report?
3. In your own words, describe what makes a good abstract.
4. What should be included in the introduction section of a research report?
5. What are some of the important questions to answer in the methods section of the research report?
6. What goes in the results section of the research report?
7. Where should you discuss your research methodology in the report?
8. How does the conclusions section differ from the results section?
9. What is an in-text citation? Why should you use them instead of footnotes or endnotes?
10. When and why should you write in the first person? In the third person? What is the difference?

Additional Reading

APA. 2001. *Publication Manual.* 5th ed. Washington, DC: American Psychological Association.
Baugh, L. Sue. 1995. *How to Write Term Papers and Reports.* Lincolnwood, IL: VGM Career Horizons.
Becker, Howard S. 2007. *Writing for Social Scientists: How to Start and Finish Your Thesis, Book, or Article.* 2nd ed. Chicago: University of Chicago.
Lewin, Beverly. 2008. *Writing Readable Research: A Guide for Social Scientists.* London: Equinox Publishing.
Williams, Joseph M. 1990. *Style: Toward Clarity and Grace.* Chicago: University of Chicago.

25 Introduction to Statistical Software

The Statistical Package for the Social Sciences (SPSS) is a powerful software package developed to perform simple and complex statistical analyses of quantitative data. The program enables users to create, modify, and analyze very large sets of data. It can also produce such graphic displays as tables, charts, and graphs. Data entry is facilitated by the use of a standard spreadsheet format; cases are in rows, and variables are entered in columns. A *case* is the responses or measurements of a single subject or study element. A *variable* is something that the researcher is able to measure or count in some way. Depending on the version of SPSS purchased, users of the program may find some small differences in the display of their analysis processes. However, the data analysis instructions are the same or very similar.

This chapter is organized into five distinct sections. The first deals with how to access the SPSS program. Once you are in the program, several menus and toolbars will become visible. The second section describes the options available in the SPSS *Main Menu* bar at the top of the screen. At the lower left-hand corner of the screen are two file tabs, which are discussed in the third and fourth sections of the chapter. They are the *Variable View* and the *Data View* files; each is accessed by clicking on the appropriate file tab. The *Variable View* file is described first because it is where you insert all descriptive information about the data file, including variable and value descriptions and names. The fourth section briefly describes characteristics of entering numeric data into the *Data View* file. The fifth section deals with several introductory file processing activities. The instructions presented here are for Version 16 of *SPSS for Windows.*

SPSS®: The Opening Screen

The process of launching SPSS software is the same as that for any other frequently used software. At the initial window, double-click on the SPSS icon. The *Data Editor* window will appear on the screen. (If the SPSS shortcut icon does not appear on the main Windows screen, click on Start, then Programs, then select SPSS.) Superimposed on this opening screen may be a dialog box that asks: "What would you like to do?" Available options include:

- Run the tutorial
- Type in data
- Run an existing query
- Create a new file using the *Database Wizard*
- Open an existing data source
- Open another type of file

If you have a database loaded on the hard drive or on an external drive or disc, you may call up that file for immediate activity. Or, you may select *Cancel*, which opens the Data Editor for data entry. You *must* have entered data in the Data Editor before SPSS can perform any operations. Data can be entered directly or imported from an existing file, such as an Excel spreadsheet or a word-processing program.

The Main Menu Bar

The SPSS opening screen will show two toolbars at the top of the screen and a full-screen spreadsheet (with gridlines). Along the left side of the screen are row numbers. At the top of the spreadsheet is a row for you to indicate the names and qualities of the variables in your study. Above the spreadsheet is the *Main Menu bar* (For all versions lower than Version 10, this is the SPSS *Data Editor* Toolbar). Menus are named; tools are displayed as icons.

Look at the top line on the SPSS screen. Visible at the top of the screen are the names for eleven file menus. These menus allow you to access every process, tool, and feature contained in SPSS. Beginning at the left and running across the screen, these file menus are:

- *File* menu: This allows you to open, close, save, and otherwise work with all types of SPSS files.
- *Edit* menu: This allows you to cut and paste, move files, and find elements in a file or record (a *record* is all the data for a single case).
- *View* menu: This allows you to turn on or off visible features, change fonts, and show gridlines.
- *Data* menu: A key option, this allows you to define variables, indicate the type of measurements used, and assign labels to variables and values.
- *Transform* menu: This feature allows you to convert, transform or change variable values, count responses, recode values, etc. Transformation to standardized scores is a popular option.
- *Analyze* menu: Along with the Data menu, this is the option you will use most often; it can be considered to be the *heart* of SPSS. It allows you to name any type of analysis you want to carry out.
- *Graphs* menu: This feature allows you to select from many different ways to graphically display data, including tables, graphs, and charts.
- *Utilities* menu: This allows you to call up information about your variables and your data file.
- *Add-ons* menu: Allows you to access and/or apply a variety of lesser-used statistical tests, graphics and statistical guides.
- *Window* menu: Allows you to switch from one window to another, and back.
- *Help* menu: The standard online help feature that explains all features, tools, etc., as needed by the analyst.

Working with the Data Editor Toolbar

The *Data Editor toolbar* allows quick access to commands dealing with data and data files. A string of eighteen different icons is displayed on the toolbar, running across the screen just under the *Main Menu* bar. These icons are shortcuts to a variety of SPSS commands, most of which are also embedded within the main menus. Using the icons just makes it easier and quicker to do your analyses. Beginning at the left of the toolbar, the icons enable the following actions:

- *Open* a file
- *Save* the file you are working on
- *Print* a file or output from a statistical process
- *Dialog* box recall (recalls the last dialog box you used)
- *Undo* reverses the last process
- *Redo* redoes the last process
- *Goto* (chart) takes you to a named chart in the file
- *Goto* (case) takes you to a named case in the file
- *Variables* provides information about variables
- *Find* a record in a file
- *Insert* a case (record) into a file (cases are *rows*)
- *Insert* a variable into a file (variables are *columns*)
- *Split* a file on some dimension of a variable; allows for comparisons
- *Weights* allow you to assign weights to variables
- *Select* cases according to a user-selected dimension or measurement
- *Turn* value labels *on* or *off* in the visual display
- *Create* a set of variables to use as an index, etc.
- *Show* displays all variables in your file

The Variable View

Defining Variables and Their Characteristics

Look at the bottom left-hand corner of the SPSS Data Editor dialog box. You should see two file tabs: One says *Data View* and the other says *Variable View*; click on the *Variable View* tab. You are now ready to define your variables and their values. In this file, all information about each variable is entered in *row* format, going across the page (this is an important distinction because data for each variable will later be entered in *column* format). The first row will hold all the information for your first variable; row 2 will hold all information about your second variable, and so forth. SPSS will *automatically* move this information into the appropriate column for the variable.

You will have ten decisions to make about each variable in your dataset, although several will be made for you in the *default* mode. These variable characteristic decisions are in columns reading from left to right as follow:

- *Column 1:* This is where you enter the name of the variable. Variable names can be any length in these later versions of SPSS (older versions restricted names to eight characters) and should start with a letter of the alphabet. On the screen, variable names will appear in lowercase type.

- *Column 2:* This permits you to change the form of the variable data. The default is "numeric," which is the form you will use almost always; an SPSS manual may be consulted to learn about other data categories. Make sure that *numeric* is what appears in the cell. Move on to the next column.

- *Column 3:* This establishes the width of the cell. The default is eight spaces. You can widen it, reduce it in width, or leave it at the default width. The defining characteristic is the number of characters you use for the variable name or the number of characters in a value for that variable.

For example, a variable name that is 6 characters wide (such as "gender") will have values that are 1 character wide (such as the number 1 for female and 2 for male), and will require a column width of at least 6 characters—the length of the variable name. If, however, the variable length is, say, only 3 characters wide (such as "inc" for income) it might require from 3 to 5 characters. The column width for this variable will be based on the number of characters required for the variable name. A good rule of thumb to follow is to stick with variable names of 8 characters or less.

- *Column 4:* This changes the number of decimals you want to use for each variable. The default is two decimal points. It can be raised or lowered or left as it is. For categorical data, it is usually best to change this number to zero (0).
- *Column 5:* This is where you may enter a longer label for the short variable name you entered in column 1. Variable labels will then appear along with the shorter variable name in all printouts, making it easier for you to later remember what the statistical results apply to; this is very important with databases with many variables. In current versions of SPSS, variable labels can be any number of characters in length, including spaces and symbols (in earlier versions, the length was restricted to forty characters). It is still a good idea to keep variable names as short as possible while providing the necessary meaning.
- *Column 6:* This opens the box for providing definitions to the values of a variable. Earlier versions restricted value labels to twenty characters in length, including spaces and symbols. While no longer a limitation, it is still a good rule to follow. Follow this five-step procedure to input these value labels into your data dictionary:

  Step 1: Click on the blank cell in this column. Then, click on the small three-dot box that will appear at the right-hand side of the cell. This will bring up the *Values* dialog box.
  Step 2: Enter a number you have assigned for the value in the *Values* window.
  Step 3. Enter a label for the value in the *Label* window.
  Step 4: Click on the *Add* button. This is a critical step; you must do this after entering each value and value label!
  Step 5: Repeat the process for each value of the variables. Click on OK.

- *Column 7:* This is where you can assign a value for any data missing for this variable. Follow this procedure:

  Step 1: Click on the three-dot button.
  Step 2: Click on the *Discrete Missing Values* button.
  Step 3: Enter the number you want to use to signify missing data for this variable.
  Step 4. Click OK. You can use any number or numbers that are not actual values for the variable. For most variables, the value 9 is used. Note: If you leave a cell blank, it will still be counted as a zero and used in the divisor when calculating statistics for the dataset.

  TIP: *Never* leave a cell blank and *never* leave a row blank! You will know if it is blank (that is, without a missing value assigned) because a faint period (dot) will show up in the cell when you are in the *Data View* file.

- *Column 8:* This column allows you to specify how wide the variable name will be. The *default* is the exact width of the name as it appears. If not, change the width to match the number of characters taken by the name, but no more than eight. Usually, you will not need to change this value.
- *Column 9:* This column allows you to specify the alignment you want for the data in each cell. You can choose from flush *right*, flush *left*, or *centered.*
- *Column 10:* In this column you tell the computer the type of measurement for the variable. The three types to choose from are *scale, ordinal,* or *nominal.*

Assigning Variable Names

Assigning a name to a variable is the first of the ten decisions you must make in the *Variable View* file. Here are some tips to help you with the naming process:

- Variable names can be as long as needed. However, it is best to keep them short, so they still have meaning.
- Variable names typically start with a letter of the alphabet, but can include some numbers and symbols among the eight characters. For example, you can name variables var1, var2, etc., but not 1var, 2var, 3var, etc.
- Each variable must have its own distinct name; *never* repeat a variable name.
- Use names for variables that have some meaning to you and that are easy to remember. For example, instead of "plofbrth" for the variable "place of birth," you might want to instead use the full word "state," or "birth," or "place," or simply POB. It is always your choice!
- Some words *cannot* be used as variable names. These are words used in computational syntax, such as AND, OR, BUT, LESS, MORE, and so forth. You will discover these as you try to use the reserved words.
- All variable names will be entered in lowercase type, so forget about using capital letters. For example, you might type in gender, Gender, or GENDER for a variable name, but it will be displayed as "gender" on the screen and in all statistical output.
- Always remember to also enter longer variable labels when there is a possibility of confusion or misunderstanding. These labels can be as long as forty characters (including spaces). They will always be printed along with the shorter variable names in statistical output.

The Measurement Type Column

The second column in the *Variable View* file is naming the measurement type for each variable. The most common types are numeric and alphanumeric. Of these, numeric data is the most-used data type. Numeric data is simply numbers, as an assigned number or a concept, such as female or male for the variable "gender". In alphanumeric data, the names of the value would be inserted. By informing the program that, say, female and male (or, a and b, or x and y, etc.) is being entered instead of a number, the program will count these names or letters just as if they were a number.

Width and Decimals

The next two columns in the *Variable View* are for column width and for the number of decimals of a value. Changing these two columns is optional. Column width applies to the width of the values used for variables. You may change the size for variables with values of more or fewer digits. The default space for the column width is eight spaces. You may leave it at eight or change it.

The default value for decimals is two. However, since most values you assign to a variable value are only one or two discrete numbers, you may want to change the number of decimals to zero. Remember: the decimals only refer to the value of the categories for the variable; if your values are discrete data, change the number of decimals to zero. If you do not make this change, every value for this variable will have as many decimals as the number indicated in the data editor—a real problem when processing and presenting data.

Variable Labels

It is typical to have a longer, more meaningful statement or label for the variable name spelled out in all SPSS statistical output. This is particularly important if the name assigned to a variable is an abbreviation of parts of two or more words or an acronym. SPSS makes this possible by allowing you to add a longer name once during the define variables phase of the data entry. You can then continue to use the shorter variable name in your processing commands, but the output will automatically print out the full name as well. For example, you might select this three-character name for a variable referring to subjects' date of birth: PDOB. You could add the longer variable label *Subjects' date of birth* to avoid confusion later. To add labels, follow this simple procedure:

1. To enter new, longer labels into your program file, move the curser to the first empty cell in the fifth column of the first line; this is the *Label* column. Click in this empty cell.
2. This will bring up a new dialog box, one that permits you to enter the longer name for each variable. Enter the longer name you wish; the cell will increase in size as you type. Then move down to the next line and repeat the process for the second variable.
3. Repeat this process for each variable in your dataset. Remember: while variable names ought to be short, usually eight characters or less in length, variable labels can be as long as you want them to be. Labels of less than forty characters long (including spaces and/or symbols) used to be a requirement and are still traditional.

Value Labels

The value labels (*Values*) task is the sixth column in the defining variables process. You will usually want a full value label printed out for each value of your variables. For example, if the variable is "gender," you will have two possible values, one value for female and a different value for male. If you enter only the numeric values, say 1 for female and 2 for male, when the data are processed, you will get results for each numeric value, but your reader will not know that you meant 1 to signify females and 2 for males. The added *labels* for each value ensure that they will always appear with the results of any statistical analysis carried out with that variable. This is especially important when you have many possible values for a variable.

As noted, the variable "gender" will have two values: 1 for females and 2 for males (and possibly a third value for a *No Response* category, where subjects did not respond to this question). Because you could enter only numerical data into the data file, you must now take this opportunity to tell SPSS what each of these numerical values means.

Entering value labels is as easy as entering labels for variables. It is also possible to go back later and add, change, or remove values and their labels. To add labels in a new dataset, follow this simple procedure:

1. Click on the empty cell under the *Values* box in the dialog line. A small box with three dots will appear at the right side of this cell. Click on this small box. The *Value Labels* dialog box will appear. This will allow you to enter a value and a label for the value for each variable. There are three windows in this box.
2. The first window is the *Values* section; enter the number for the first value for this variable here. To return to the gender variable example, for that variable the first number to be entered would be a 1.
3. Now click on the *Label* window. This will bring up a new dialog box, one that permits you to enter the longer name for the variable.
4. Once you have entered the desired label, click on *Add*. The value and label assigned should now appear in the larger white area alongside the *Add* button. NOTE: If you do not click on *Add*, the value and label will not be saved.
5. Click on the *Values* box again and then the *Label* to add the next value and its label. Be sure to click on the *Add* button after entering every value and its label.
6. You may also wish to add a value such as a zero for missing values in the data; missing values occur when a question is not answered, for example. That procedure is discussed in the next section.
7. To change or remove values and/or their labels, such as would be necessary if you were to combine two or more values into one, click on the *Change* or *Remove* buttons and follow instructions.

Missing Values

Every cell in a dataset will be considered to have some numeric value entered—even if it is left blank. In SPSS, a blank cell is automatically read as a zero (0) unless the program is given other instructions. Therefore, when entering data it is a good idea to not leave any cells blank. However, you do not always have data for every cell; often subjects will either intentionally or accidentally omit a response to a variable. When this happens, researchers using SPSS usually enter a value to indicate that those data are missing.

These values are counted separately and not included in analysis requiring a mean (average) of the data. An example of a missing value is the number 9 entered when subjects fail to indicate their gender on a self-administered questionnaire. The number used to indicate missing data is only valid for a single variable, although the same valid number can be used for as many variables as desired. Any number other than those values specifically assigned in the dataset can be used; however, the values 9 and 0 are what are usually used.

Whatever value is assigned to represent missing data, that same number must not be used for another response in the same question. For example, if subjects are asked to indicate their rank order preference for a set of nine or ten items, the numbers 9 or 10 cannot be used to signify missing data in the data file; the value must be one that is not used for this one variable. To add labels in a new dataset, follow this simple procedure:

1. Click on the *Variable View* tab for the Data Editor to appear.
2. Select the *Missing* function.
3. This will bring up the *Missing Values* dialog box. Two buttons appear at the top of

the box: one is titled *No Missing Values*; if you have not already assigned a value, this button will show a black dot inside. The second option is for *Discrete Missing Values*. Click on this second button.

4. Enter the number you wish to use to signify missing data in the first of three small boxes below the *Discrete Missing Values* button.
5. When you have entered the missing value for a variable, click on the *Continue* button; this brings you back to the dialog box.
6. You may now select the *Value Labels* option to add a label for the number you want to use to signify a missing value. This is done in the same way as adding all value labels. First enter the value, and then enter the label "Missing Values," or "No Response," or any label you want to use. Remember to click on the *Add* button when you have entered the value and its label.
7. When you are finished, click on the *OK* button. Repeat this process for each missing value of each variable in your dataset. The number you selected for the missing value for that one variable will now appear in the *Missing* cell for the variable.

Columns and Align

The *Columns* file characteristic is simply another option that allows you to specify the width of the area on the spreadsheet file that your data will occupy. The default is again eight characters; it can be raised or lowered as much as you desire. Most analysts only bother changing the default if it is too limiting.

Align is another housekeeping option, affecting only the way the data will appear in its final datafile form. Options are flush *left*, flush *right*, and *centered*.

The Measure Column

The final defining decision in the *Variables View* file is *Measure;* it lets you specify the type of data each variable will provide. You have three options: *Scale, Ordinal*, and *Nominal*. These tell the statistical analysis processor what type of data it has for each variable. Different types of measurement data require different types of statistical analyses. When you indicate to the Data Editor the type of data represented by each variable, it will automatically select the correct analysis technique for each test you ask it to do.

Scale data consist of measurements that are considered to be either *equidistant interval* (usually simply identified as *interval*) or *ratio* data. Statistical analyses conducted on these data types usually provide the researcher with the greatest amount of information possible. Examples are comparative rating scales, attitude scales, awareness scales, and similar question types. The key to understanding this type of measurement is that the intervals between the various points on the scale are (or are considered to be) exactly the same size; they are equidistant from one another. They are the closest things to a ruler that we have available in the social sciences. In the second variety of *scale data* encountered in statistical texts is called *ratio* data. In these measurements, an equal difference remains between points on the scale, but the *ratio scale* has a "fixed" or absolute zero point. The same statistical analyses are used for both variations of *scale data*.

Another way of defining *scale* measurements is that the data produced are considered to be *continuous* rather than *discrete*. Continuous data (or data from continuous variables) are data that can be any value on the scale. For example, an average or mean score on a 5-point attitude scale can be 2.0, 3.4, 1.7, 4.3, etc., etc.; these are continuous data.

The second option in this question about the type of measurement data gathered for a question

Table 25.1

SPSS Data Types and Their Applicable Rules

Data Type	Applicable Rules for Differentiation
Nominal	Different numbers *always* refer to different things.
Ordinal	The numbers can be *ranked* or ordered on some dimension.
Scale	The different points on the scale are *equidistant* (i.e., equal), and the scale may have a fixed or absolute zero.

is what is called *ordinal scale data.* The easiest way to differentiate ordinal data from scale or nominal measurements is that these measurements are ranked or ordered on some set of characteristics, but the differences between rankings are not known or considered to be equidistant. All rank order preference scales are *ordinal* measurements.

Discrete data are data taken from *nominal scale* measurements. An example of discrete data is the values assigned to a dichotomous question such as "What is your gender?" The answer could only be female or male (i.e., 1 or 2). No mean can be calculated. Another example is a list of eight different types of occupations from which subjects might select one that applies to them. Frequency distributions of all responses for a sample would result in a distribution of responses across the eight options; no mean can be calculated.

The above set of rules (Table 25.1) should help you differentiate between the different types of measurements; prior rules also apply to higher-level data (i.e., the nominal rule also applies to ordinal, interval, and ratio; the ordinal rule also applies to interval and ratio, but not to nominal, etc.):

The Data View

Entering Data into an SPSS Data File

If you have not done so already, you are now ready to enter data. Remember: in *fixed format,* which most of you will use, all data for any one case must be entered in rows and inserted in the correct columns for that variable. Remember to regularly save the data on a disk or a memory device.

SPSS is somewhat limited in what it accepts as data. The easiest way to deal with these limits is to treat all information that is going to be processed in an SPSS analysis as *numeric data.* Other than names developed for *variables* and measured or assigned *values* of those variables, only numbers should be entered for processing. Numeric SPSS data are numbers used to signify a set of measurements or labels for a specific set of cases.

The term *case* refers to a single entity in a data set; the case usually has more than one variable. Examples of cases include the data for one person among a group of people studied (i.e., in a *sample*); one city in an investigation of a group of cities, or one household in a group of political precincts examined for voting results. Whatever the element included in the study, the collective group of cases is called either a population (all possible cases) or a sample (a selected group of cases taken from an identified population).

Cases are always entered in rows in an SPSS data file. Each case in the sample is assigned its own identifying number (1, 2, 3, etc.). Each case contains a set of features that are identified and recorded as numbers. These features are the values assigned to each of the *variables.* Examples of variables include the gender of a subject (*subject* is another word for a case), the number of school-aged children in a community, or the number of citizens in a precinct who voted in the last

Table 25.2

A Sample SPSS Data File with Variable Labels

SNO	Gender	Age	Education	MS	State	UrbSub	Occupation
01	1	19	12	1	50	1	5
02	2	18	11	1	48	2	5
03	2	17	11	1	32	1	4
.							
.							
04–09 are omitted for this example.							
.							
.							
10	1	20	13	2	47	2	4
11	1	22	10	1	33	1	3

election. Any feature or concept that can be measured or assigned a value on any one of the four measurement scales (*nominal*, *ordinal*, *interval*, and *ratio*) may be a *variable.*

Variables are always in columns in an SPSS data file. The measurements or values for each variable must always be placed in the data file in exactly the same reference order in the file. For example, if the values assigned to the variable "gender" follow the values assigned to the variable *age* in the first case entries, they must always be entered in this same order. In an SPSS data file a complete row for an individual case is called a *record.*

It is possible to enter data in an SPSS data file in *fixed format* or *free format* style. In a fixed format file, every value for every variable is always entered in exactly the same column in the data file. Thus, every line of the data file will have the same number of columns, with the data for a variable always in the same place in the file. This is the format used by most researchers because it allows for easier editing and proofreading of a file; it is the only format to be discussed here.

If desired, empty spaces may be left between each variable, as in the fixed format example in Table 25.2; cases 4 through 9 are omitted for this example only. If empty spaces were not used, the file would look like this (cases 4–9 omitted for this example):

011191215015
022181114825
032171113214
04 . . .
09 . . .
101201324724
111221013313

In this data file, values 1 and 2 were used as database values for the two possible answers for the gender, females and males. Education is answered as years of school completed; "MS" refers to number of parents at home; place of birth is by state, with each state assigned a numerical value; and the occupation of the primary wage-earner parent is distinguished by a different value assigned to different types of careers.

Putting SPSS to Work

This is the fifth and final section of this chapter. Assuming that you have successfully entered data to a data file, defined all the variables in that file, and established labels for variables and values of those variables, you have competed the set-up phase of SPSS. You can begin to use this powerful software to manipulate and analyze the dataset. The remainder of the guide will focus on four analytic processes: Developing summary statistics for the dataset, preparing graphic displays, transforming data, and some inferential statistical analysis on the data.

Processing Numerical Data with SPSS

Data (the numerical values you collect or assign to phenomena) are entered into a file using the SPSS Data Editor capability. This can be done in several different ways. The most common way is to manually type the data directly into the appropriate columns in the Data Editor window. You can do this before or after you define your variables and assign labels to all possible values of each variable.

Figure 25.1 is a classification of some of the key layers of statistical analysis seen in public administration research reports, together with the statistical analysis tools in SPSS and the commands for conducting those analyses. When all the variables and values are defined and all the data have been entered into your data file, it is time to save this information into an SPSS *Save* file (SPSS.sav).

Developing Summary Statistics

SPSS calculates summary statistics for three types of measurements: scale, ordinal, and nominal. *Scale* data is the label SPSS uses to identify both interval and ratio data. Summary statistics are produced in three SPSS analysis programs: *Frequencies, Explore*, and *Descriptives*. *Crosstabulations* provides similar statistics and are used more for multivariate analyses and presentations of data.

The Frequencies Procedure

Nominal level measurements are numbers that are applied to categorical variables. The values assigned to categorical variables refer to mutually exclusive groups, categories, or classes within a variable, and have no quantitative reference. Examples include the categories used to differentiate subjects by gender, by race, by political party affiliation, by voting behavior (did vote vs. did not vote), and so forth. Researchers want to know how many cases fit into each category. The statistics used for these measurements are called *nonparametric.*

The SPSS procedure used to develop descriptive statistics for categorical variables is called *Frequencies*. This procedure counts the number of cases in each designated category and identifies the mode for the variable (the mode is the category with the most cases). The mode is one type of average (or *measure of central tendency*); it is the only average to use with this kind of data.

Figure 25.1 **A Classification of Some Key Statistical Analysis Procedures in SPSS**

Analysis Level	Analysis Process	Data Type	Available Statistics	SPSS Commands
Level 1-A (Descriptive)	Univariate frequency distributions	Any data	Counts, percentages, chi-square	**Frequencies, Explore, Descriptives**
Level 1-B	Bivariate frequency distributions	Any data	Counts, percentages, chi-square, phi, Cramer's *V*	**Crosstabs, Multiple Response**
Level 2-A	Bivariate relationship tests	Nonparametric (nominal and ordinal data)	Phi and Cramer's *V* Spearman's rho	**Crosstabs**
Level 2-B	Bivariate relationship tests	Parametric (interval and ratio data)	Pearson's *r*	**Correlation, Simple Regression**
Level 3-A	Bivariate differences tests	Nonparametric (nominal and ordinal data)	Chi-square Mann-Whitney *U* or Wald-Wolfowitz runs test	**Nonparametric Statistics: Chi-square, M-W *U*, W-W runs**
Level 3-B	Bivariate differences tests	Parametric	*t*-test F-test (ANOVA)	**Compare Means: *t*-Test** **One-way ANOVA**
Level 4-A (Relationships)	Multivariate association tests	Parametric and nonparametric data transformations	Multiple regression analysis, multiple discriminant analysis, time series	**General Linear Model: Multivariate** **Classify: Discriminant** **Time Series**
Level 4-B (Differences)	Multivariate differences tests	Parametric and nonparametric data	Multiple analysis of variance	**Compare Means: Means**
Level 5 (Data Reductions)	Multivariate statistics	Parametric	Cluster analysis, factor analysis	**Classify: Hierarchical Cluster Analysis** **Data Reduction: Factor**

SPSS *Frequencies* produces its results in the form of a table—sometimes referred to as a *frequency distribution* table. Within each *Frequencies* table are five columns of information; moving from left to right, these are:

1. User-assigned *Value Labels* (such as female, male, yes, no, etc.).
2. The *Frequency* (i.e., the count) with which this category occurs.
3. *Percent* of the total that each row represents. If any data are missing, a row will indicate what percentage of the total is missing cases represent.
4. A *Valid Percent* column, in which are displayed the percentages of the total *minus* any missing cases that are accounted for by the counts for each category. If there are no missing cases, this column will be a repetition of the third (Percent) column.
5. Finally, a *Cumulative Percent* column, in which are shown the percentages of each row *plus* all rows preceding this row. For example, if the percentage of responses for the first category on a five-point rating scale is 13, and the percentage of the second category is 12, the cumulative percentage for the first category is 13. For the second category, the cumulative percentage is 25. If the percentage for the third category is 10, the cumulative percentage for this third row is 35. The *Cumulative Percent* column has no statistical relevance to qualitative variables, however, and should be ignored when processing this kind of data.

Using the Frequencies Dialog Box

To carry out the SPSS *Frequencies* procedure on data entered into a data file, first click on the *Analyze* option on the *Main Menu* bar. Then click on the second option from the list that appears: *Descriptives*. You will have four options from which to choose: (1) Frequencies, (2) Descriptives, (3) Explore, or (4) Crosstabs. Click on the *Frequencies* button.

The *Frequencies* dialog box contains two large windows and several different command options. All variables in the data file will appear in the large window at the left-hand side of the box. Highlight the variable you wish to analyze by clicking on it in the list. Then click on the small arrow between the two large windows. The selected variable will now appear in the right window. To remove it, simply reverse the process. It is possible to highlight as many variables as you want to at the same time. One click on the center arrow will move all variables you select to the *Analyze* window.

Now click on the small window that reads *Display Frequency Tables*—it appears just beneath the main variable list. A check mark showing in the small window means that a table will be produced. Now go to the *Statistics* button located near the bottom of the gray dialog box. This will bring up the *Frequencies: Statistics* dialog box. You may request percentile information, measures of dispersion (such as the standard deviation, etc.), measures of central tendency, or measures of distribution. Go to the *Central Tendency* section and click on the small window alongside the *Mode*. All you need to do to have SPSS process your request is to click on *Continue* in this dialog box, and click on *OK* in the *Frequencies* dialog box that reappears after you clicked on *Continue*.

Summary Statistics for Continuous Measurements

Statistical analysis of *quantitative (numerical) measurements* can be said to take place on two fundamental levels—*descriptive* and *inferential* statistics. There are, of course, statistical tools that do not fall into either of these categories; learning about them is best left to a course in quantitative methods.

Descriptive statistics are used to summarize the numerical information in a dataset, to numerically describe the cases, and to provide some sort of structure to the data. *Univariate* descriptive statistics does this one variable at a time. It is also possible to develop descriptive statistics for two variables at the same time; this is called *bivariate* statistical analysis (i.e., two variables). It is also possible to analyze more than two variables at once in what is called *multivariate* statistical analysis.

The use of *Frequencies* with quantitative—nominal—data is the same as it is for qualitative data, except for the selection of the appropriate measure of central tendency. For quantitative variables, the *mean* and *median* are also calculated. The mean is the arithmetic average; the median is the midpoint in the range of possible values. Also important for quantitative measurements are *measures of variation* and of *dispersion*. To employ the *Frequencies* procedure, follow this set of steps:

- Select Analyze → Descriptive Statistics → Frequencies.
- Select the variable or variables desired; move them into the *Variables* window.
- Click on the Display Frequency Tables button.
- Select Statistics → Central Tendency → Mean, Median**,** and Mode.
- Next, in the Dispersion box of the Statistics Dialog box, select Std. Deviation, Range, Minimum, and Maximum.
- Select Continue.
- Select OK.

How to Use the Explore Procedure

To calculate descriptive statistics for a variable using the SPSS *Explore* process, begin by clicking on the *Analyze* command on the *Main Menu* bar. From the list of available statistical processes, select *Descriptive Statistics*. Then select *Explore*. This will bring up the *Explore* dialog box. This box has four windows. The largest box displays the names of all the variables in your dataset. Highlight the variable you want to analyze. Then click on the small arrow alongside this box; the variables will be moved to the window labeled *Dependent List*. When you want complete analysis for one variable at a time, ignore the other two windows (i.e., *Factor List*, and *Label Cases By*). Click on *OK* and complete descriptive statistics will be produced for each variable named.

Explore can also be used to develop descriptive statistics for different levels of a variable. The phrase “different levels” means the different categories represented in the variable. For example, the variable “gender” has two levels (also referred to as *categories* or *groups*): female and male. The variable “political party” might have three levels: Democrat, Republican, and Independent. The variable “class standing” might have five levels: freshman, sophomore, junior, senior, and graduate. *Explore* will quickly and easily produce descriptive statistics for each subgroup in the variable.

- Select Analyze → Descriptive Statistics → Explore.
- Select the variable or variables desired; move them into the Dependent Variables window.
- Select the “grouping variable” for which you want the statistical breakdown and move it into the Factor List window.
- Click on the Display Frequency Tables button.
- Click on the Statistics button.
- Select Continue.
- Select *OK*.

How to Use the Descriptives Procedure

Descriptives is the third way to produce descriptive statistics for numeric data with SPSS; it provides a quick list of each variable, the number of valid responses for each variable, and selected descriptive statistics. To access the program, follow these steps:

- Select Analyze → Descriptive Statistics → Descriptives.
- Select the variable or variables desired; move them into the Variables window.
- Select Options. For quantitative data, click on Mean, Std. Deviation, and if desired, Minimum and Maximum.
- You can choose to have the data presented in any one of four different ways: (1) by the way the variables appear in your variable list; (2) in alphabetical order; (3) by ascending value of their means; and (4) by descending order of their means.

The Crosstabulations Procedure

Known as "two-way frequency distribution tables," the results of a *Crosstabs* table present the distribution of responses, with percentages, of two or more variables at the same time. In addition, a wide variety of statistical analyses are included in the *Crosstabs* procedure. All types of data can be analyzed in a *Crosstabs* table. The SPSS *Crosstabs* procedure is a tool for displaying the data from one variable against those of another variable or variables. The *rows* of a crosstabulation table (called a *Crosstab* by SPSS) represent the different values or levels of one variable, while the *columns* of the table represent the values of a second variable. A simple 2 × 2 crosstabulation will look something like this (Table 25.3).

Convention requires that each box in a table (except for those with labels) be called a *cell.*

Table 25.3

A Typical 2 x 2 Crosstabulation with Cells Numbered

	Response	
Gender	Yes	No
Female	(Cell 1)	(Cell 2)
Male	(Cell 3)	(Cell 4)

Thus, in the above example, the data for females who answered "yes" will fall in Cell 1, data for females/no in Cell 2, males/yes in Cell 3, and males/no in Cell 4.

Crosstabs tables can have as many rows and/or as many columns as required. However, be advised that when they exceed something like five or six rows or columns, tables can become cumbersome to read and difficult to interpret. *Crosstabs* produces statistical tests for use with interval, ordinal, and nominal (i.e., categorical) data.

SPSS permits up to four bits of information to be displayed in each cell. These include (1) the count of occurrences, (2) the percentage of the row total represented by the count in a cell, (3) the percentage of the column total in the cell, and (4) the percentage of the total number of counts for the variable. Row and column total counts and percentages are displayed in the table margins.

Table 25.4

An Example 3 x 5 Crosstabulation Table with Counts and Totals

Political Party Affiliation	Response Category: Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Totals
Democrat	38	27	15	9	7	96
Republican	7	10	12	22	30	81
Independent	10	11	7	8	10	46
Totals	55	48	34	39	47	223

Crosstabs tables are most appropriately used when both variables are categorical (i.e., nominal data). However, there are times when the researcher wishes to display the distribution of ordinal- or interval-level responses across the entire range of cells. In such cases, the categorical variable is often referred to as a *grouping variable* and its values are placed as rows. The scale data are displayed in columns. The example in Table 25.4 uses party affiliation data as its row variable and the responses of a sample of subjects to a five-point rating scale. Rating scale values in columns are *Strongly Agree*, *Agree*, *Neither Agree nor Disagree*, *Disagree*, and *Strongly Disagree.*

From the information in Table 25.4, it is clear that this is a relatively cumbersome way to present data; the table is complex and "busy." Possibly a more meaningful way to present and analyze the information in the table would be a simple 3 × 1 table, with the means scores on the scale shown for each of the three categories of party affiliation. A one-way analysis of variance test could then be conducted to test for statistically significant different attitudes among the three party affiliation groups.

Using the Crosstabs Procedure

The *Crosstabs* procedure is bundled into the same Summary statistics package as *Frequencies*, *Explore*, and *Descriptives*. In addition to this summary table, another key feature of *Crosstabs* is its ability to produce both association and differences test statistics for nominal, ordinal, and scale data.

Tests for Independence

The *chi-square test of independence* can be used with all data types. Its purpose is to test whether the row subgroups are independent from each other. The chi-square test is interpreted by examining the probability value produced with the chi-square value. When using a 95 percent confidence level, if this *p*-value is 0.05 or less, the null can be rejected and the alternative hypothesis is retained (that is, if the *p*-value is 0.05 or less, the responses of the groups can be assumed to be statistically different or independent).

Measures of Association

The Crosstabs procedure makes it possible to carry out a variety of association tests for nonparametric data. Several are described here.

Statistics for Nominal Data: There are four categories of statistical tests from which to select for nominal data: the contingency coefficient, *phi* and *Cramer's V*, lambda, and the *uncertainty coefficient*. Of these, the two easiest statistical tests to use for testing for association are the *phi statistic* and *Cramer's V*. Both the phi and *Cramer's V* statistic measure association in one direction; the values produced can range from 0.0 to 1.0. Therefore, while they indicate the strength of an association, they do not indicate the direction of that association (i.e., positive or negative). The phi statistic should be consulted for 2 × 2 tables only; *Cramer's V* is applicable for all rectangular tables. These are accessed through the same selection in the Nominal Data section of the *Crosstabs* → *statistics* → select the desired tests.

Statistics for Ordinal Data: SPSS *Crosstabs* statistics provides a variety of optional association tests for use with ordinal data. The first of these, and the one that is often considered to be most appropriate, is the *Spearman correlation coefficient*, called *Spearman's rho.* This test is accessed through the *Correlations* button on the *Crosstabs* → Statistics dialog box. The program produces both a *Pearson's r* correlation coefficient for use when the column variable is interval or ratio level, and the *Spearman's rho* when the column data are ordinal. Care must be taken in selecting the correct statistic, since the values appear in the same output box.

Both *r* and *rho* are interpreted in the same way—as indicators of the relative strength of an association. They should *not* be interpreted as measures of causation. Their values can range from –0.1 to +0.1.

Other ordinal-level statistical tests available in *Crosstabs* include Gamma, Somers's *d*, Kendall's tau-*b*, and Kendall's tau-*c*. To see examples and more detailed explanations of what these tests do and when to use them, consult *SPSS for Window Base System User's Guide* (2008) or *SPSS Guide to Data Analysis* (2005), both by Marija J. Norušis.

Statistics Involving Interval and Ratio Data: A test for association is also possible when one of the variables in a *Crosstabs* procedure is interval (or ratio) level and the other variable is nominal level. This is the *eta coefficient*. *Eta* is interpreted in the same way as Pearson's correlation coefficient. *Eta* does not assume a linear relationship exists between the two variables. When squared, the value of *eta* can also be interpreted as a measure of the proportion of the total variability in the interval-level variable that can be known when the values of the nominal-level variable (gender, for example) are known.

Summary

This chapter was an introduction to file management procedures and basic statistical applications used in statistical software such as SPSS. The chief lessons presented included how to set up a spreadsheet-based data file and how to add the descriptive information that improves the interpretation of the many statistical tests that are possible with commonly available software packages, most if not all of which use the spreadsheet format. The chapter concluded with example instructions for using SPSS to process a variety of summary statistical tests.

Discussion Questions

1. Describe the Data Editor in SPSS.
2. Name the eleven file menus on the SPSS Main Menu.
3. What goes in the SPSS rows? What goes in columns? Is this a spreadsheet format?
4. Describe how to enter variable information (variable names, values, value names, etc.) into SPSS Data Editor.

5. Why is it important to enter a value for missing values in every subject's file?
6. The *Data Editor* toolbar holds icons for eighteen processes. How many of these can you identify?
7. How do you identify variables in the SPSS editor?
8. Name some of the descriptive statistical processes available in the SPSS software.
9. What results can the SPSS *Explore* subprogram produce?
10. What is a crosstabulation? How can you produce a *Crosstab* with SPSS?

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About the Author

David E. McNabb is professor emeritus at Pacific Lutheran University. After a career in business and government that has included positions as director of economic development for the city of Fullerton, California, and communications director for the majority caucus of the Washington State House of Representatives, Professor McNabb embarked on a second career in academia. He advanced to the rank of professor on the faculty at Pacific Lutheran University. He has a BA from California State College at Fullerton, an MA from the University of Washington, and a PhD from Oregon State University. He has taught a variety of courses both in the United States and abroad, including college and university programs in Latvia, Bulgaria, Germany, the United Kingdom, Italy, France, and Belgium. He is the author of seven books and nearly ninety peer-reviewed conference papers and articles.

He has served at different times as a member of the Seattle, Washington, Citizens' Advisory Committee on Solid Waste Management; the Kirkland, Washington, Central Business District Advisory Committee; and the Port of Tacoma, Washington, International Trade Association, among others. He has been a member of the Propeller Club and Rotary. He was a thesis advisor for the Evergreen State College MPA program, and a visiting faculty member. He is also a visiting professor at the Stockholm School of Economics–Riga. He continues to write and to teach graduate and undergraduate courses. Dr. McNabb is a member of the Academy of Political Science, the American Political Science Assocviation, and the American Society for Public Administration.