

Preface

Accurate measurement is central to scientific research. Minimizing measurement error is a central goal in empirical research. Reliability and validity are considered the foundations of measurement because they represent attempts to reduce measurement error. Although it is impossible to eliminate all errors, it is possible to use a fuller understanding of measurement error in designing research, analyzing and interpreting data, and acknowledging limitations. This book evolved from teaching a research methods course at the doctoral level and research courses at the undergraduate and graduate levels at the University of Illinois, Urbana–Champaign, for more than a decade. It is written for present and future empirical researchers in the social sciences. This book will show how researchers can identify and correct for error in the process of developing measures, using measures in substantive studies, and designing methods. Through an understanding of the issues involved in measuring one “thing,” this book lays a foundation for understanding the issues inherent in measuring many “things” (i.e., in designing research methods).

In describing the approach taken in this book, it is useful to understand what this book is not. This book is not a primer on statistical analyses in measurement. Basic statistical analyses are described and illustrated throughout, but the reader interested in a thorough treatment of this subject matter should perhaps look elsewhere. This book does not provide exhaustive coverage of recent measurement techniques, such as generalizability and item response theory. This book is not a comprehensive primer on measurement theory; classics on this topic are available elsewhere. Rather, this book takes an approach that is different from current and past offerings in this area.

This book is organized around the meaning of measurement error. It begins with a brief overview of measurement principles that is supplemented with many examples to provide necessary background to the reader. The book then explores the meaning of measurement error, the different sources

that could cause different types of measurement error, the nature of responses that would characterize each type of error, and the pattern of empirical outcomes that would be observed. Various sources of error lead to different types of error, which are reflected in response patterns that are assessed through empirical procedures. A detailed examination of this interplay provides the foundation for this book. Such an approach provides guidance in developing and editing items and measures and designing methods. It is also useful in analyzing data and interpreting empirical results in light of measures and methods used.

This book attempts to answer many questions: What is measurement? What are the steps in the measure development process? What is the meaning of measurement error? What are the types of measurement error? What are the causes of each type of error? What are the response patterns that follow from each type of error? What are the effects of each type of error on empirical outcomes? Given the understanding obtained from these questions, how can error be minimized in the design of items? Of measures? Of methods? How can innovative design and analyses be used to minimize error in the design of items? Of measures? Of methods? How do measures differ or how can measures be classified? How should different types of measures be developed, validated, and used? What are examples of measures and measurement across the disciplines? What are the implications of understanding measurement error for research design and analysis—that is, for using existing measures in research designs? For structural equation modeling? For measurement in applied research? How does an understanding of measurement error enhance the design of experiments and surveys? What is the role of measurement in science? And finally, what are the orientations underlying the material in this book?

This book is of particular value in designing measures and methods in the social sciences. It delves into the “soft,” intangible aspects of research design that the researcher confronts constantly when designing items, measures, and methods. Other books on measurement typically have presented a more statistical orientation or an orientation toward measurement theory. Although these approaches are invaluable, this book was motivated by the lack of literature that enhances understanding of measurement error, its sources, and its effects. Through the understanding provided here, the aim is to enhance the *design* of research, both of measures and of methods.

For the budding researcher, this book will facilitate understanding of the basic principles of measurement required to design measures and methods for empirical research. For the experienced researcher, this book will provide an in-depth analysis and discussion of the essence of measurement error and procedures to minimize it, as well as the interrelationship between

measurement and research design. This book aims to “push the envelope” by handling a host of issues in measurement heretofore not discussed explicitly. If the reader has no intention of developing a measure, the principles covered here are very relevant for *using* existing measures in empirical methods and in the design of research methods. A variety of issues of relevance to research methodology in day-to-day research are also discussed.

The unique treatment of measurement error in this book should become evident in the first few pages. Depth of understanding of measurement error is provided through the treatment of the subject matter at a nuts-and-bolts level with numerous concrete examples of errors and empirical procedures. The need for this book arose from the nature of treatment of measurement error in the literature primarily in terms of empirical analyses without sufficiently in-depth conceptual examination of measurement error. The approach taken here is to subject measurement procedures and measurement error to the same conceptual and operational examination that is involved in conceptualizing and operationalizing any construct. In other words, measurement error involved in operationalizing the concepts of measurement error in traditional empirical procedures is examined here! Hence, the level of treatment of subject matter traverses the linkage between conceptual notions of error and patterns of responses. Numerous examples of measures from a variety of disciplines are discussed to provide the reader with concrete instances and to stimulate creative measure development. Many figures, tables, and exhibits are used to illustrate concepts, procedures, and empirical outcomes. This book is also unique in using a measurement framework to examine a variety of issues in research methodology, both quantitative and qualitative. This book is about the design of measures and methods through understanding measurement error. In this context, statistical procedures are discussed at an intuitive level rather than in distant terms. Numbers analyzed through statistical procedures can be precise, concrete, and sometimes illusive. What numbers mean and where they came from is a central focus in this book.

A figure provides an overview of the chapters. Chapter 1 is an introduction to measurement that covers current knowledge in a succinct form with extensive use of examples. Chapter 2 provides a detailed discussion of measurement error and develops a taxonomy of measurement errors. The aim here is to provide clear understanding of types of measurement error. Chapter 3 develops a taxonomy of different sources of measurement error based on a detailed review of literature in the social sciences and cross-listed with a taxonomy of measurement errors. Thus, this chapter relates common error sources to errors, providing researchers with a framework to consider sources of error and their effects. Chapter 4 discusses traditional empirical

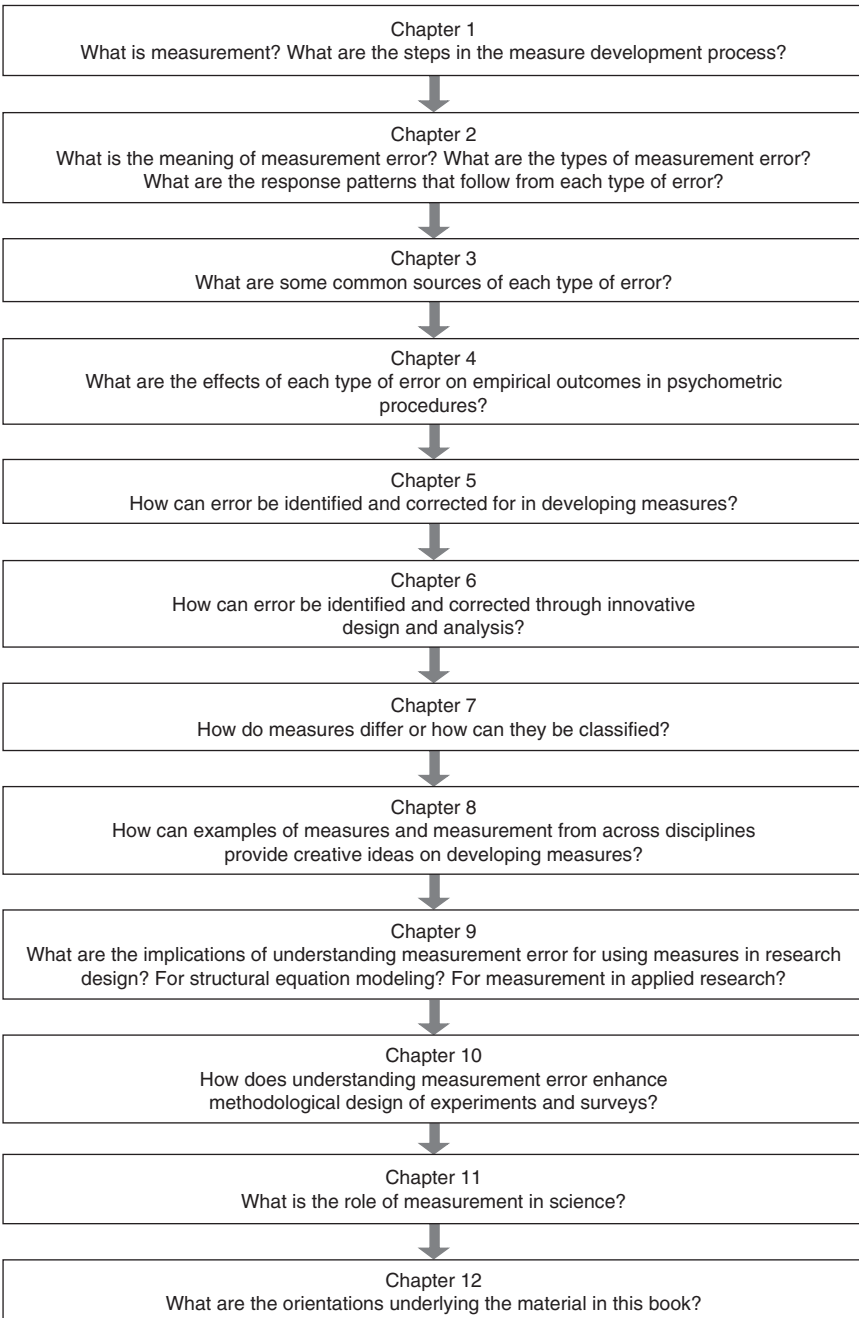
procedures used in assessing reliability and dimensionality in terms of the types of measurement errors that are captured by these procedures. Using Chapters 2–4 as a basis, Chapter 5 presents guidelines for identifying and correcting for measurement error. Chapter 6 presents some innovative design and analyses, in light of earlier chapters, that can be used to identify error.

Chapters 1–6 provide the basic foundation in measurement. Chapters 7–8 expand the discussion to several issues. Chapter 7 discusses how measures differ and how they can be classified, covering issues in measurement that lack coverage in the literature but are faced by researchers in day-to-day research. Fundamental differences in the nature of measures have implications for their development, validation, and usage. Chapter 8 provides examples of measures and measurement from a range of disciplines that will assist researchers in thinking outside the box.

The book then moves from discussing measurement as measuring a single measure to measurement as developing an entire research method where several variables are measured. The discussion moves from issues pertaining to measurement as in the operationalization of a single construct to measurement as in the operationalization of a complete research method. For example, a survey method could be thought of as a set of measures that involves measuring one thing (where issues such as item wording and response scale formats are germane) as well as measuring many things (where issues such as sequencing of measures are germane). An experiment involves manipulating independent variables (i.e., generating levels of measurement) and measuring dependent variables. Chapters 9–11 broaden the discussion to cover issues in research design and, more broadly, research methodology, using measurement concepts as the basic building blocks.

Chapter 9 discusses the implications of understanding measurement error for research design and analysis—that is, the use of existing measures in research designs and the use of structural equation modeling in data analysis—as well as for applied research. Chapter 10 uses the foundation of measurement to discuss issues in research methods such as designing experiments and surveys. Chapter 11 provides a broad discussion of the role and nature of measurement in scientific research. Chapter 12 summarizes the orientations of the book.

For the reader unfamiliar with the measurement literature, Chapter 1 is an ideal place to start. For the reader more familiar with measurement, Chapter 1 could be skimmed. The initial chapters, specifically Chapters 1–5, develop terminology and present detailed examples of a few measures that are used in later chapters. However, several of the subsequent chapters could be read independently, such as Chapter 8 on examples of measures.



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Wherever possible, data are presented from my own work, and data sets and instructions are available at the Web site for this book (<http://www.sagepub.com/viswanathan>). Suggestions for using this book in courses are also provided at the Web site <http://www.business.uiuc.edu/~madhuv/msmt.html>.

I have tried to appropriately cite past literature, old and new, and to give due credit. However, the measurement and methodology literature is vast and spans a long period of time. Despite my best efforts, I hope there are no oversights. I have also sometimes employed the adjective “methodological” in a narrower sense than suggested in dictionaries, for lack of a better descriptor, although I have employed the noun “methodology” more appropriately. In closing, I hope this book delivers what is promised here.