Book Reviews

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This is a very interesting book. It should be read by every graduate student and by every statistician who designs or intends to design experiments. It is written at a mathematical level that should not challenge anyone with an advanced degree in statistics. It is written at a mathematical level that provides real solutions to real problems in a way that is of immediate use; at the same time it provides an introduction to the theory in a concise, workmanlike manner. It should be suitable just to set the stage. As the authors point out, there are many quantitative variables. There is a chapter on analysis, but this is for a graduate semester, but there are no exercises. The first, comprising 8 chapters, is elementary but illuminative of the factors varied simultaneously? (3) Can one reduce the complexity of the data with a model?" In the chapters of Part I, the authors discuss the nature of the experimental problem, the objectives, and the stages in experimental research. Models, both linear and nonlinear, interactions, response surfaces, and other matters of importance are detailed in a lucid, nonchallenging manner. A discussion of regression and analysis of predication, which helps in forming criteria for the structure of a good experiment. Two level factorials are used to illustrate the application of these ideas and as a basis for composite designs for quadratic response surfaces. The last chapter in Part I is a brief excursion into the analysis of experiments: Substantial use is made of plots in the analysis and in a discussion of the rationale for transformations to enhance the modeling process. Part II is at a higher level, although up until the discussion of Bayesian designs in Chapter 19 the material is undemanding.

It begins with a discussion of the general equivalence theorem, which under mild conditions relates the optimum of a function (say, the determinant or trace) of the information matrix to the behavior of its derivative at points of the design. The theorem makes possible the practical construction of designs because the derivative can be used to assess individual points. Using the theorem, the most frequently encountered optimality criteria are described. D optimality receives an entire chapter, which ends with a collection of exact optimum designs for the second-order model. There is a chapter on mixture experiments and one on experiments involving both quantitative and qualitative variables that ends with a collection of exact optimum designs. The blocking of response surface designs is treated. Both the BLKL algorithm of the authors and the algorithm of Cook and Nachtsheim (1989) are referenced.

There is a chapter on algorithms for the construction of exact D-optimum designs, one dealing with restricted design regions, one on design augmentation, and one on nonlinear models. Designs for nonlinear models depend on an estimate of the parameter vector. This serves as an introduction to Bayesian designs in which prior distributions are considered for the parameter vector, which leads to a discussion of several versions of the general equivalence theorem. There is a chapter on the discrimination between models, in particular lack-of-fit detection, based to a large extent on work by Atkinson and others.

One criticism that has been made of optimum design is its reliance on a single criterion. In practice, one wants an optimum design but one also wants to allow for the possibility that the model is improper. The penultimate chapter addresses this problem by the use of composite criteria that balance the two needs. The final chapter touches briefly, but insightfully, on several topics—design for quality (robust design), clinical trials, and generalized linear models.

The appendix contains a FORTRAN listing of a straightforward implementation of the BLKL algorithm, which in the best tradition of FORTRAN contains no comments. There were 18 sample defects in the book, only one or two trivial ones attributable to the authors.

Robert E. Wheeler
ECHIP, Inc.

REFERENCE


This book addresses "the multiple testing dilemma while highlighting the pitfalls of excessive data analysis." The problem considered is how to adjust a set of p values obtained as a result of a multiplicity of tests so that a particular hypothesis may be rejected with a given familywise error rate. This book advocates the resampling method, in particular the bootstrap method, for computing these adjustments. In illustrating the technique on various real-life examples, the reference to the SAS software PROC
MULTITEST is repeatedly made throughout the text because this is the software that has been used to carry out the analysis in various examples in the book. The options of this software are fully presented in the appendix. It will be interesting to try out these programs, as the authors have suggested, on the data given in Chapter 7, which contains results on the analysis of many real-life data taken from various sources. This chapter is also indicative of the diverse fields in which p-value adjustments may be used.

In short, this is a resource book explaining how resampling methods can be used in various multiple-testing situations and pointing out that there exists a nice SAS program to do it. In between, various other methods are explained or compared with the bootstrap methodology just to bring out the necessity of resampling-based adjustments of p values. It also discusses other methods of multiple testing in the literature but brushes them off as almost saying "if you want to do it go find how to do it!" For example, it contains a reference to the recently proposed step-up method of Dunnett and Tamhane (1992), which comes up with either better or almost as good error rates and power properties compared to other methods, but the resampling method is put forward as an open research problem. It does explain step-down methods in detail, but readers are cautioned that these may not be reasonable.

The reader will not find in this book any detailed comparison on empirical grounds of other methods of multiple testing with resampling methods. There are some simulation experiments scattered throughout the book to emphasize some ideas put forward in the text. It is also demonstrated that the p value adjustments obtained under normality assumption may distort the real picture in what fact the data may be nonnormal and resampling-based methods may provide a better control over not rejecting too often.

The following is more of a critique of the method than the book. I must say that the book provides excellent reading even for a person who may not be well informed about multiple testing. It brings forth various issues and controversies beautifully with lucid presentation and precise description. Of course, the details of almost anything other than bootstrap are obscured. The book almost sermonizes that the bootstrap will provide you with the right answer. This may be true, but the practitioner has no way of knowing that. For example, to illustrate bootstrap adjustments in one-way heteroscedastic data, the authors choose an example with 10 observations per cell. Things may be all right there, but what if you have three observations per cell; what kind of results can bootstrap give you? Furthermore, in an output, which of the two adjustments, one obtained using the step-down method and the other obtained using the direct bootstrap method, should be considered more reliable? The second point is the considerable amount of computing. If p values are small, very many simulations are required; the authors have used up to 100,000 simulations in some examples. The user should be aware of that. The resampling methods may be the best recourse in the absence of anything better.

In Chapter 1, the issues related to multiple data screening, "data snooping," excessive data analysis or "data mining," and related controversies are highlighted. Next this chapter examines how the number of tests done in an experiment ought to affect the overall probability of rejection when the criterion is to use the minimum p value. Adjusting the p values to be able to compare with overall error rate (called FWE or familywise rate) affords a convenient way for the analyst, and this has been emphasized. The issue of adjusting all of the p values as opposed to adjusting the smallest one is addressed in Chapter 2, which also gives an introduction to bootstrap methodology and an algorithm to estimate probabilities from iid samples. It goes on to describe the multiple-testing-related controversies and finally describes the data structure to be used in resampling-based multiple testing.

In Chapter 2, "resampling-based adjustments" are elaborated with formal definitions, preliminary materials, and description of the bootstrap algorithm. These are demonstrated by using so-called single-step methods (or STP). Normality of data is portrayed as being highly influential on p value, and as such the need for resampling-based adjustments is highlighted. In this chapter step-down methods are described and different aspects of such methods are pointed out, and the use of PROC MULTITEST of SAS is pointed out, but it is not clear what criterion a user will employ to compare the two sets of adjusted p values.

Chapter 3 considers the univariate one-way analysis of variance setup and considers three models for discussion, (1) the homoscedastic location-shift model, (2) the heteroscedastic location-shift model, and (3) the randomization model. For all of these models, the bootstrap algorithm has been described, and examples are presented with respect to all pairwise differences and comparison with a single control. General linear contrasts and higher layouts are also considered. The limitations of PROC MULTITEST with respect to meta-analytic comparisons are pointed out.

Chapter 4 presents an adaptation of the methods in Chapters 2-3 to a multivariate setting. The randomization model, the linear regression model, and repeated measures experiments in this setup are discussed in this setting.

Chapter 5 discusses the experiments involving binary data in univariate and multivariate setups. Only single-sample experiments are considered, however.

Chapter 6 is called "Further Topics" and contains treatment of weighted p values, p-value adjustments involving F tests, and tests of correlations. It also addresses the issue of power and contains discussion of asymptotic results and some more complex models.

Chapter 7 presents data and description of several real-life examples and issues related to them. A summary of analyses using PROC MULTITEST is presented for each example.

There are four appendices. Two of them are reproductions of articles that highlight the perils of excessive data analysis, and these make interesting reading. Appendix III contains a full description of PROC MULTITEST, and Appendix IV contains software codes to perform analyses of some examples used in the book. It further contains an impressive list of references, an author index, and a subject index. In general the book does a good job on what it sets out to do, and that is commendable.

In conclusion, this book is about "why and how to do" multiple testing. It certainly complements in a practical way the book by Hochberg and Tamhane (1987), as has been pointed out by the authors, and can be used as a resource book for users of multiple testing or in a graduate course on multiple testing procedures together with the book just mentioned.

Yogendra P. Chaubey
Concordia University

REFERENCES


Anyone who uses or teaches multivariate analysis will find this to be a valuable book. It includes nine chapters and two appendices. Appendix A covers computer graphics in R. Appendix B
contains nine data sets, including a variety of sources from data on the U.S. economy to blood fat concentration and Buffalo snowfall data. The data are slightly dated with sources ranging from 1975 to 1989. These data sets are well chosen, however, with enough observations to justify multivariate analysis but small enough to be handled easily. Instructors who desire up-to-date data sets could use these as examples and ask students to obtain more.

In the Preface, Scott indicates that “A collection of software, primarily Fortran-based with interfaces to the S language, is available by electronic mail at scottdw@rice.edu.” In attempting to obtain those subroutines, I was informed that the software is available by anonymous FTP to stat5.rice.edu in directory scottdw. All the data sets in Appendix B were included in computer files in that directory, plus a few other data sets such as the iris data. Chapter 1, “Representation and Geometry of Multivariate Data,” presents several simple ways of presenting multivariate data. The Fisher-Anderson iris data are presented initially as six pairwise scatter diagrams covering the four measurements. The 3-D, color presentation of these iris data in Plate 1 clearly illustrates the benefit of modern methods of data presentation. Dual images in Figures 1.17 and 1.21 allow striking 3-D presentations, although Scott admits that many readers may have difficulty crossing their eyes to get the stereo effect. He also demonstrates that, as the dimension d gets large, all of the contents of a hypersphere are concentrated close to its surface. The implications of this result for multivariate analysis are discussed repeatedly in later chapters.

Chapter 2, “Nonparametric Estimation Criteria,” presents a strong argument for nonparametric estimation. Scott introduces MISE (mean integrated squared error), which is used extensively throughout the book.

Chapter 3, “Histograms: Theory and Practice,” examines the univariate histogram and its generalization to higher dimensions. Problems such as number of bins and bin width are examined. The “curse of dimensionality” is introduced to describe exponential growth in the number of bins as d increases.

Chapter 4, “Frequency Polygons,” discusses the advantages and disadvantages of frequency polygons versus histograms. Bin-edge problems are illustrated with a sample data set in which the number of modes changes with changes in bin width and number.

Chapter 5, “Averaged Shifted Histograms,” gives one way of dealing with bin-edge problems. By averaging several realizations of the histogram for a single data set, the bin-edge problem can be reduced. A kernel function (an isosceles-triangle density) is used to define the general kernel density estimator.

Chapter 6, “Kernel Density Estimators,” represents a substantial portion of the text. Scott notes that, “the histogram stood as the only nonparametric density estimator until the 1950s, when substantial and simultaneous progress was made in density estimation and in spectral density estimation (p. 125).” The chapter examines theoretical properties of univariate and multivariate kernel estimators, cross-validation, and adaptive smoothing.

Chapter 7, “The Curse of Dimensionality and Dimension Reduction,” deals with the limited dimensions in real data and techniques for data reduction. It is noted that most data sets require only four or five dimensions. This is fortunate because computational effort seems to grow exponentially with d.


Each chapter includes a few problems to illustrate the various techniques. Answers to some of the problems would be helpful to students who are using the book as a textbook.

As the title indicates, this is a textbook covering the basic facts about order statistics. The book can be treated as a monograph by a statistician who wants to brush up on this interesting and increasingly useful area. The text is extremely well written and is self-contained for readers having a one-semester course in mathematical statistics. There are 209 exercises, some of which are challenging.

Features that contribute to the enjoyment of reading this book are the unusual enthusiasm and the friendly style of the exposition. One illustration of this style, and a nice turn of phrase as well, is in Chapter 9 titled “Record Values.” The authors write, “The 21 year period following Chandler’s introduction of the topic saw a broad spectrum of researchers working in the record value vineyard. The major harvest was in by 1973 at which time . . .” (p. 241).

Another helpful feature is the manner of explaining proofs. The authors first explain various methodologies that can be successfully used. Then it is easy to follow the proofs presented. In some cases, multiple proofs are given to show various viewpoints.

Chapter 1, “Introduction and Preview,” contains introductory remarks about the usefulness of order statistics. Chapter 2, “Basic Distribution Theory,” deals with distribution theory for absolutely continuous populations. Distributions for particular statistics, such as the median and quartiles, are derived. In Chapter 3, “Discrete Order Statistics,” probability mass functions are derived and the dependence structure, which differs from the continuous case, is examined.

In Chapter 4, “Order Statistics From Some Specific Distributions,” results from Chapters 2 and 3 are applied to various populations. There is a section on computer simulation of order statistics.

In Chapter 5, “Moment Relations, Bounds, and Approximations,” identities and recurrence relations for moments of order statistics are given. One application of these is the reduction in the number of moments requiring separate calculation. Universal bounds for various moments and for functions of order statistics are derived from standard inequalities. Taylor series approximations of moments are discussed as well.

Chapter 6, “Characterization Using Order Statistics,” begins with a section titled “Who Cares?” There the authors explain in detail how these seemingly esoteric results are important tools in modeling and goodness-of-fit testing. Population distributions are characterized by various features of order statistics.

The important roles order statistics play in inference are described in Chapter 7, “Order Statistics in Statistical Inference.” Statistics, maximum likelihood estimators, best linear unbiased estimators, distribution-free intervals, and so forth are discussed. Censored samples are important examples given.

Chapter 8, “Asymptotic Theory,” principally concerns convergence in distribution of various order statistics. Last, Chapter 9, “Record Values,” examines distributions of record statistics, records in dependent sequences, and records in improving populations.

Many practitioners will find this “theory” book useful. The authors take every opportunity to show the utility of their material. It is not designed for someone who wants just a book of formulas for substitutions. This book is more erudite than that.

Philip H. Ramsay
City University of New York

David L. Farnsworth
Rochester Institute of Technology

This book is a general introduction to factor analysis with emphasis on the interpretation of factor-analytic results rather than complex mathematical developments or calculations. The first chapter contains a fairly accurate summary of the topics covered in each chapter of the book. The authors claim that only a reasonable understanding of high-school geometry, algebra, and trigonometry and a course in elementary statistics is required. Although readers can skip through the sections with extensive matrix algebra and still follow the subsequent general discussions, I think that an understanding of ordinary least squares multiple linear regression makes it much easier to follow the illustrations, particularly in the last half of the book.

The best feature of the book is that it contains fairly balanced, comprehensive, and clear discussions of the available options for factor-analytic statistical models. In cases in which there is controversy involving the interpretations of estimated models, the authors present the considerations and trade-offs in a reasonably equitable and complete manner. Examples are generally illustrated with accompanying graphs and summary tables. The extensive studies in Chapter 11 illustrate the investigative steps of exploratory factor analysis including validation.

The target audience for this book is students and research workers in the fields of psychology, education, and sociology. The case studies and examples drawn primarily from the academic social sciences may not directly indicate to Technometrics readers the value of factor-analytic methods for the physical, chemical, and engineering sciences. The use of factor analysis in the physical sciences is not that new or unusual. For example, Jackson (1981a,b,c) and Jackson and Mudholkar (1979) reported extensively on using this methodology for multivariate quality control and statistical process control. This book, however, does not directly illustrate the value of factor-analytic methods for complex physical-science models involving multiple variables that are highly correlated.

The first half of the book introduces the foundation and important elements of factor analysis including planning the study, rotational criteria, and interpretation of factor-analytic results. The latter half of the book explains the use of factor analysis as a complementary tool with multiple linear regression and hints at the more sophisticated extensions into confirmatory factor analysis and structural-equation models such as LISREL. The sections on the multiple simultaneous-equation systems such as LISREL are fairly brief and introductory. The authors rely on the simpler notation from Bentler's (1989) EQS models and give only modest presentation of it. For this reason, it would not suit the needs of instructors looking for an introductory simulation course textbook.

The authors offer listings of some FORTRAN computer programs with the book. Apparently they have developed this software over the years as companions for the algorithms presented in the book, although the programs do not appear to be professionally polished as the widespread commercially available factor-analysis software for mainframe and PC. The dominant commercial programs such as SAS, SPSS, and BMDP are illustrated with command and data listings as well as the corresponding output.

For the physical-research scientist who understands the basic mathematical foundations of factor analysis, the book is an excellent supplement because of the discussions of different factor-analytic criteria and comparisons between various algorithms presented in the book. Physical-science researchers and practitioners seeking their initial introduction to factor analysis may want to supplement reading this book with articles from Technometrics or the Journal of Quality Technology, such as those of Jackson (1981a, b, c) and Jackson and Mudholkar (1979), to gain a perspective about applications closer to their own disciplines.

Barbara Price
Wayne State University

REFERENCES


The authors state in the preface that this book “is meant for those readers who wish to acquire a basic knowledge of simulation.” I did not find this book to be geared toward students in an introductory simulation course, however. Neither is this book written exclusively for statisticians (the authors are not statisticians themselves). Instead, the approach is to present practical examples from varied fields, illustrating how simulation techniques are applied to such problems as model fitting and software generation.

The examples presented in this book assume that the reader has a basic knowledge in the particular field being considered. Economic and corporate models are presented in Chapter 4 to illustrate how simulation plays a role in economic and business applications. Simulation techniques in operations research models such as inventory and queuing models are presented in Chapter 5. Unfortunately, little or no background is provided in many examples to introduce all readers to the concepts and terminology. Therefore, although this book may appeal to a wide audience of applied scientists, most readers will only benefit from limited portions of it. For this reason, it would not suit the needs of instructors looking for an introductory simulation course textbook.

Each chapter begins with a short preview of its contents. This is extremely useful in reviewing which sections are of interest to a reader and which can be skipped. In addition, references appropriate for concepts within a chapter are listed at the end of the chapter. I found these features very useful, especially with the multiple disciplines included in the book.

For the reader wanting a brief primer in simulation, basic concepts are presented in Chapters 2 and 3. Chapter 2 presents five approaches to generating pseudorandom numbers. Tests for data randomness are also presented in this chapter, but readers must refer to other references for critical-value tables. Chapter 3 uses the pseudorandom numbers to obtain samples from nonuniform distributions. The reverse transform method for discrete distr-
butions (referred to as the somewhat-confusing term “table look-up method”) is presented, along with the rejection technique for continuous distributions.

Surprisingly for an applied book, many of the exercises left for the reader tend to be theoretical in nature rather than inviting the reader to practice applying the methods discussed. For some of the applied simulation exercises, suggested solutions are provided in electronic format on an accompanying 3.5-inch diskette. The diskette contains Pascal programs that can be executed on an IBM PC (and most compatibles). The diskette was not included with the book for review.

The authors provide a good survey of available simulation software in Chapter 6. This survey presents software examples and discusses software functionality, technical details, and literature references. Being from Europe, the authors also refer to many software programs from this part of the world, such as the NAG Library. Although this section may not be applicable for classroom instruction, it is invaluable for the researcher wishing to use simulation techniques in specific areas. The authors present a queueing system with parallel servers as a good example of how to design a simulation software package for a particular application.

Monte Carlo simulation is discussed through two examples. One considers a Student $t$ approximation to the uniform distribution. The other investigates the efficiency of estimated regression parameters between ordinary least squares and weighted least squares. The authors provide a good survey of available simulation software programs from this part of the world, such as the NAG Library. Although this section may not be applicable for classroom instruction, it is invaluable for the researcher wishing to use simulation techniques in specific areas. The authors present a queueing system with parallel servers as a good example of how to design a simulation software package for a particular application.

Simulation exercises in regression metamodels (Chap. 8) and experimental design (Chap. 9) are unique approaches to common areas of applied statistics. The final chapters in the book concern tactical aspects of a simulation (i.e., how long to run a simulation) and verification issues (i.e., how to determine whether the simulation is an accurate reflection of reality and is error free).

In summary, the primary setback with this book is the missed opportunity in presenting background information on the examples and how the scientist recognizes the benefits of simulation techniques while searching for problem solutions. As a result, this book is better suited as a reference for mathematical applied scientists and researchers, who will find portions of the book appropriate for the specific research at hand.

Robert A. Lordo
Bainelle


As the authors state in the preface, this book is “about planning and running experiments in an engineering environment.” It is clear that the authors have been heavily influenced by their work with Taguchi and the engineers at the Ford Motor Company. As a result, their approach is heavily oriented toward Taguchi methods. Unlike many books in this area, however, this one takes a critical look at Taguchi’s methods. Credit is given to Taguchi for his many valuable contributions, but the authors also point out where “Taguchi has asked the right questions without always supplying the right—or at any rate the best—answers” (p. 4). In many cases the authors propose an approach that combines the “best” of traditional experimental design with that of the Taguchi approach.

One of the main strengths of this book is its heavy reliance on simple statistical and graphical techniques. The authors correctly argue that “the only ‘significance test’ that counts in the end is a demonstration that a result is or is not repeatable” (p. 21). Because of this simplicity, the authors use a standard spreadsheet for their statistical computations. Included is a set of step-by-step instructions for each of the computations presented. Although I agree that the experimental design (DOE) techniques presented are simple enough to calculate with a spreadsheet, I also feel that the practitioner is wise to rely on an expertly written computer package. In addition to avoiding potential computational errors, DOE computer packages provide a more comprehensive set of tools for problem solving.

For those who are interested, the book is composed of the following 12 chapters:

Chapter 1: Introduction
Chapter 2: Experiments With Factors at Two Levels
Chapter 3: Statistical Methods
Chapter 4: Planning a Two-Level Experiment
Chapter 5: Experiments With Factors at Three Levels
Chapter 6: Plans for Fitting Second-Order Equations
Chapter 7: Mixed-Level Factorial Experiments
Chapter 8: Experiments to Measure Location and Dispersion
Chapter 9: Parameter Design and Transmitted Variation
Chapter 10: More Case Studies
Chapter 11: Topics in Quality Engineering I
Chapter 12: Topics in Quality Engineering II

Each chapter contains useful examples based on the authors’ work at Ford and its suppliers. As a result, all of the examples and case studies provided are related to the automotive industry. Although the authors have done a remarkable job of integrating separate topics, this book essentially consists of two parts. Part 1 (Chaps. 1–8) is a discussion of experimental design techniques, whereas Part 2 (Chaps. 9–12) is a cursory discussion of quality engineering. With the exception of Chapter 10, each chapter begins with a short introduction and ends with a detailed summary. The reader will find these useful for a quick overview of the book.

Chapter 1 is one of the better introductory chapters that I have seen in a statistical textbook. In addition to providing an excellent example illustrating some practical design issues, the authors have given an excellent introduction to engineering, experimentation, and the role of experimentation in quality improvement. Their example involves a saturated seven-factor screening design to study the cleanliness of carburetors after assembly. An interesting aspect of this problem is that the second largest effect (associated with the cleanliness of the environment) has the wrong sign, indicating that dirtier environments produce cleaner carburetors. The authors use this example to emphasize that “engineering knowledge and common sense” must be used along with statistical techniques when interpreting data from experiments.

Chapter 2, as expected, discusses the fundamentals behind two-level experiments. Factor interactions, orthogonal arrays, and confounding issues are introduced.

Chapter 3 describes and illustrates the normal probability plot and the F test. These are the two primary statistical techniques used throughout the book. Although their discussion of the standard deviation is somewhat lacking, their interpretation of normal probability plots is very thorough. One thing I found annoying, however, was their use of the name “Daniel plot” in reference to the half-normal probability plot.

Chapter 4 picks up where Chapter 2 left off. Most of this chapter is devoted to Taguchi’s $L_8(2^7)$ and $L_{18}(2^{17})$ orthogonal arrays. Several experimental plans based on the $L_8(2^7)$ and $L_{18}(2^{17})$ orthogonal arrays are cataloged, and additional statistical concepts, such as orthogonal contrasts, design resolution, randomization, blocking, and split-plotting, are introduced. In addition, several strategies for coping with factor interactions are compared. Chapters 5 and 6 extend these ideas to three-level experiments. Uses of response surface designs, second-order models, and contour plots are discussed in some detail.
Their discussion focuses on Starks's location or a measure of dispersion" (p. 219). It is my opinion, however, that much of the complicated material could have been eliminated if the authors were willing to use computer-generated designs. Although computer-generated designs may or may not be as efficient, their use would allow the experimenter to concentrate on engineering issues rather than complicated design issues.

Chapter 8 discusses experiments that can be used to estimate both location and dispersion effects. Taguchi's signal-to-noise (S/N) ratios, as well as the more traditional approach of separately analyzing $\bar{Y}$ and $\log(s)$, are discussed. In the end, the authors conclude that they "prefer not to use the S/N ratio because it cannot be given a clear interpretation as either a measure of location or a measure of dispersion" (p. 219).

Chapter 9 follows up with a discussion of "relation" gurus/ process design. Using a seat-belt example and the famous Wheatstone Bridge example, the authors illustrate techniques for reducing product/process variation by "removing the effect of the cause" rather than "removing the cause of the effect" as encouraged by Shewhart and Deming. Chapter 10, as the title suggests, is devoted to case studies.

Finally, Chapters 11 and 12 provide a cursory introduction to some quality-engineering topics. Much of the information in these chapters is "more speculative than the rest of the book, intended to be thought provoking, asking questions without always supplying answers" (p. 295). Nonetheless, I found these chapters to be a useful complement to the rest of the book.

Overall, I found the book to be well written and well organized. In fact, I only managed to find a few errors throughout the book. The authors are extremely articulate and have managed to explain complicated statistical techniques to readers without a great deal of statistical background. Nonetheless, the more background the reader has, the more useful he or she will find the book. The most negative thing I can say about this book is that it does not have sample exercises at the end of the chapters. This may limit its use as a textbook. Despite this, however, I overwhelmingly recommend this book to anyone interested in practical approaches to experimental design.

Michael S. Saccucci
BBN Software Products


Here is a book written on statistical methods by a professional engineer rather than a professional statistician. One hopes that this will make the author's statement that "many business processes could be improved if wisely applied statistical concepts were a part of these processes" (p. xiv) more convincing, because it comes from the member of the audience to which this book is addressed. The author describes his book as an "easy-to-understand guide that can help solve complex industrial problems" (p. xix) rather than as "a classical statistical text." Although, I have some reservations regarding the former (it is not always easy to understand, especially for the statistically "untrained" reader), I could not agree with him more on the latter. Since the book was designed as a "guide" to a wide variety of statistical methods and was aimed at a widely varying audience (mechanical, electrical, and aeronautical engineers, chemists, physicists, technicians, programmers, statisticians, etc.), it does lack the flow of a more traditional statistical textbook.

Of the three goals stated by the author (to provide a tool for practitioner on how to efficiently structure the experiment, "to make the topics practical to such an extent" that the book "would become worn out through continual use," (x, xx) and "sell employees and all levels of management on the power of wisely applied statistical concepts in their field" (p. xx)), the third one seems the most ambitious and as such the most difficult to achieve. Nevertheless, I think the author should be commended for the attempt to further advance the awareness of the usefulness of our trade. As far as the other two goals are concerned, I expect him to achieve them with reasonable success: The book has a good chance of being generally well received by nonstatisticians (engineers, physicists, chemists, etc.). Some of its phrasings, however, may cause less favorable reactions from statisticians (the introduction and several references to the central limit theorem throughout the text are some of the examples).

The book consists of three major parts. Part I addresses management philosophy (Chap. 3) and basic statistical concepts (Chaps. 4, 5 and 6). In Chapter 3, the author presents Deming's 14 points for management, accompanied by his own explaining comments. The Juran control sequence and breakthrough sequence are also presented. The author introduces through examples the concepts of cause-and-effect diagram, Pareto diagram, and control chart and gives a rather good description of a brainstorming session. On the other hand, introduction of the ideas of factorial and fractional factorial experiments in this chapter seems premature and may confuse rather than enlighten the novice.

Chapter 4 contains a very uneven and quite fragmentary introduction to such fundamentals as population and sample, probability density function, hypothesis testing, confidence intervals, and the central limit theorem. The author also talks about some common "experimentation traps." I had a persistent feeling when reading this chapter that the author was trying to introduce too much too fast to get the reader "up to speed" for the following chapters.

The next two chapters (5 and 6) introduce, through the examples, several distributions and related data-plotting techniques in reverse order. The author concludes Part I with a quite useful table on possible application examples for different distributions.

Part II (Chaps. 7-19) deals with applications of various statistical methods and techniques. In Chapters 7 and 8, the author gives cookbook-like descriptions of confidence-interval building for population parameters in the case of a continuous variable (Chap. 7) and an attribute variable (Chap. 8). Methods of sample size calculation are also introduced. Chapter 9 gives very brief examples of comparison tests for population means, variances, and proportions. There is also a section on analysis of means in this chapter. The author often refers to the techniques introduced in Chapter 9 as comparisons of parameters of the "samples." It seems to me that the emphasis on the inferences on "population" parameters would be more appropriate, especially in the titles of the sections in Chapter 9.

Chapters 10, 11, and 12 cover different aspects of reliability testing. The author presents, with reasonable details, reliability testing for repairable systems (Chap. 11) and for nonrepairable devices (Chap. 12). Several good examples are used to illustrate the ideas of sequential reliability tests, repairable systems with changing failure rate, and so forth. Unfortunately, there is a confusing statement in the introduction to Chapter 10, which incorrectly refers to the contents of Chapters 12 and 13.

Chapters 13, 14, and 15 introduce readers to the ideas and techniques of factorial and fractional factorial designs. There is also a short introduction to variance components in Chapter 13.
Breyfogle occasionally refers readers to other authors' works on these subjects (Box, Hunter, and Hunter 1978; Daniel 1976; Montgomery 1984). In my opinion, each of these particular works does present a better introduction to experimental designs and analysis than the one being reviewed here.

Chapter 16 contains a brief introduction (more for management than for a technical audience) to Taguchi's ideas. Second-order designs (central composite and Box–Behnken) are introduced in Chapter 17. The author also presents, through examples, response surface methodology. The major part of this chapter is devoted to the ideas and examples of mixture designs. Chapter 18 is a continuation of fractional factorial discussion for the pass/fail response situations.

Chapter 19, called “Analyses of Processes,” is a handbook-style introduction to control charts, process capability, and Pareto diagrams. Actually, it seems to be a more technical version of Chapter 3 of the book. It is rather unfortunate that the author did not find any room in the book for exponentially weighted moving average charts, which quite often present a better alternative to cumulative sum charts, especially when the process forecasting is of interest (e.g., see Hunter 1986).

Part III is the shortest one in the book (60 pages). In its three chapters, the author discusses important aspects of supplier/customer relations, such as using quality function deployment (Chap. 20), reviewing the guide for continuous improvement based on Motorola (Chap. 21), and, finally, giving further examples of methodologies presented in previous chapters.

The book has four appendixes, which contain information on various distributions, SAS outputs, design matrices for factorial designs and manual construction of histograms, among others.

Overall, this is a very unevenly written book with some good and some not-so-good pages. I would not consider it a “must” for a statistician's bookshelf, but some managers and/or engineers may find it useful.

**Boris R. Polsky**
Exxon Research and Engineering Company

**REFERENCES**


The main goal of the authors is to introduce the analytical tools useful in modeling automated manufacturing systems (AMS). They express the hope that “this book will form the first step toward formulating the so-called science of manufacturing, i.e., a set of scientific principles and theories upon which future-generation manufacturing systems are designed and operated” (p. xiii).

This book has been written with an AMS perspective in mind, and it consists of six chapters. Chapter 1 is a brief description of the contents of the book. Chapter 2 is an overview of AMS with the aim of creating a proper setting for the modeling techniques of later chapters. Topics discussed in Chapter 2 include the evolution of manufacturing, a generic input-output model of manufacturing systems, and the generic performance measures such as manufacturing lead-time, work-in-process, machine utilization, throughput, capacity, and so forth. Numerically controlled machine centers, material-handling systems, and plant layout are also discussed. Chapter 2 also contains a good discussion of flexible manufacturing systems and of computer control systems.

The principal analytical modeling paradigms of AMS—namely, Markov-chain models, queueing models, and Petri net models—are discussed in Chapters 3, 4, and 5, respectively. Chapter 3 contains standard material on discrete time and continuous time Markov chains, birth and death processes, time-reversible Markov chains, and semi-Markov processes. This chapter has some well-chosen examples illustrating blocking, deadlock, assembly, reliability, and transient performance of AMS. Chapter 4 has the usual material on queues and queueing networks. The networks discussed include open networks, closed networks, product form networks, and networks with blocking. Approximate analysis of queueing systems and performability analysis of the AMS are also discussed. Chapter 5 is devoted to classical, stochastic, and generalized stochastic Petri nets. It includes deadlock analysis and various extended classes of timed Petri nets. The theory is illustrated with examples drawn from manufacturing situations. Chapter 6 is a brief epilogue describing the reasons certain topics were not included or de-emphasized in the book. A particularly strong point of the book is the inclusion of detailed bibliography at the end of each chapter.

The book assumes elementary calculus, basic probability theory, and some transform techniques. As claimed by the authors in their preface, this book can be used as a textbook for engineering students at the senior undergraduate/beginning graduate level. Each section has end-of-section problems, but there are no solutions or answers given at the end of the book. The book does have an adequate number of illustrative examples. Most of the examples, however, are abstractions of real-world situations rather than actual case studies. This book emphasizes the mathematics of the analytical modeling techniques at the expense of many topics of practical interest. This reviewer would have liked to see some emphasis on issues such as numerical methods for analyzing various models, case studies of systems design, and analyzing the sensitivity of system performance. Given the emphasis chosen by them, however, the authors have done a competent job.

**Syed N. U. A. Kirmani**
University of Northern Iowa


In reviewing any book, I find it useful to begin by assessing how well the book meets the needs of its intended customers and accomplishes the author's stated purpose. This will be no exception.

The title of the book suggests that the customers are SPC/TQM administrators. To assess how well their needs have been met, I must first make some assumptions about these administrators and their responsibilities. They are

1. Administrators are knowledgeable about total quality management (TQM) in general.
2. They also have some knowledge of or exposure to the major proponents of TQM (i.e., Deming, Juran, and so forth).
3. Their job is to administer (supervise, manage, oversee) an internal TQM process.
4. The companies for which they work already learned about TQM and made some level of commitment to do it (else how could they be TQM administrators?)

The Deming Vision probably does not meet the needs of these people. Those already versed in Deming’s ideas will find little in the way of new information. (Fellers does not discuss Deming’s newest concept, the System of Profound Knowledge, which may be of interest to many. Instead, he focuses on the Deadly Diseases and the 14 Principles.) Those who are first learning about Deming, however, should find this an interesting and easy-to-read introduction.

It is noted in the introduction that “This book provides an easy-to-understand discussion of the theory that will enable the reader to see how and why it all works” (p. xii) and “This book offers some new insight into the previous writings on the Deming philosophy” (p. xi). I think that the first aim has been partially met (the book is very easy to understand). I am not sure that there is much new insight, although Fellers takes a different approach. Furthermore, I do not think that the reader would be able, after reading only this book, to see how and why Deming’s ideas work. Fellers also notes that “This book differs from most previous writings on the Deming philosophy in three ways. First, there are many more actual numerical examples. . . . Second, the main thrust pertains to administrative examples. . . . Third, the major emphasis is not just quality improvement, even though there are some guidelines included to help a firm improve quality. An equal emphasis is given to productivity, costs, job satisfaction, and administrative efficiency” (p. vii). These are all definitely true. I occasionally found the number of examples excessive, but this is a matter of personal preference. Others could easily see these examples as the best feature of the book.

Fellers begins by creating what he calls the “Deming vision.” This is a description of statistical thinking and problem-solving concepts. Consistent with the structure of the rest of the book, he introduces the vision with examples of the evils that might occur when such a vision is not held. Next, he shows how statistical thinking can help alleviate these evils. Finally, he describes problem solving and some of the tools that can be used to solve problems and improve processes. I identified several errors in this section—for example, a chart labeled a Pareto chart was, instead, a time- (not frequency) ordered bar chart. Furthermore, the description of all of the tools is weak, and the examples are less than wonderful. Better explanations can be found in several places—for example, the book by Ishikawa (1983).

After creating the vision, Fellers sets about demystifying Deming. As I mentioned earlier, his organization of Deming’s ideas is different from the typical treatment, and I thought it instructive. He begins by discussing each of Deming’s Five Deadly Diseases (he omits the high cost of health care and the high cost of litigation, which are external to the organization). After thoroughly explaining each disease, including numerous examples, he lists which of the 14 Principles apply to curing the disease and in what way. As you might guess, there is some duplication of principles. I enjoyed seeing the different ways he applied the same principles, depending on which disease he is treating. Finally, he discusses obstacles you might encounter while trying to cure the disease. Fellers has identified several obstacles that are not included in Out of the Crisis (Deming 1986), such as the fallacy of zero defects.

There are three appendixes: Appendix A restates the 14 Points; Appendix B restates the obstacles; Appendix C lists some typical output measures. This last may prove extremely helpful for those who are struggling to identify process measures, especially in administrative functions.

On balance, this book is painless. Fellers has an informal, conversational style that is refreshing and easy to read. His wry sense of humor made me chuckle many times, which counts for a lot. Even if there is not much new information for the experienced among us, the perspective is new. No matter what your level, you should find this an enjoyable addition to your library.

Annabeth L. Propst
Quality Transformation Services

REFERENCES


As stated in the preface, this book “is for individuals who want to learn to solve statistical process control problems using spreadsheet programs.” I suppose the appearance of a book like this one was inevitable, given the widespread popularity of spreadsheet software and the relatively narrow audience that is familiar with statistical software packages.

The book is organized into three parts, plus four appendixes. Part I, “Getting Started,” includes three chapters on basic concepts and spreadsheet fundamentals. Part II, “Statistical Fundamentals,” contains three chapters on basic statistics and statistical process control (SPC) concepts, including random-number generation. Part III, “Process Control,” contains seven chapters on the various chart types, process capability, and Pareto analysis. The four appendixes include a table of standard control-charting constants, a summary of Lotus function keys and menus, basic DOS and hardware information, and information on using spreadsheet programs other than Lotus 1-2-3. The book also includes a computer disk with 26 files containing the spreadsheets for many of the examples discussed in the text.

I cannot recommend this book for the intended audience. Although it could be argued that using a familiar computer program removes a major hurdle from the learning process, there are several oversimplified (and even erroneous) ways. For example, on page 120 it is suggested that the upper control limit of the $R$ chart be combined with the lower control limit of the $X$ chart to stay within the six-variable limit for plots that is imposed by Lotus 1-2-3 (and other spreadsheet programs). The resulting plot would be quite cluttered and potentially misleading.

The book is full of redundancy. Entire paragraphs are repeated essentially verbatim in several chapters, the only change being the name of the type of chart being discussed.

The most serious problems arise in the presentation of statistical and SPC concepts. Several important concepts are presented in oversimplified (and even erroneous) ways. For example:

1. The examples on page 9 illustrating the term “statistic” make it clear that the authors are using the term to mean “variable” or “measured process characteristic.”

2. At several points in the text (e.g., pp. 12, 213, 236) the distinction between “in statistical control” (i.e., stable) and “within specifications” (i.e., capable) is blurred, if not totally absent.
3. On page 158, in discussing the interpretation of charted data, the following statement is made: "When a point falls inside (outside) the control limits, there is a high probability that the process is (is not) producing results consistent with the past." Perhaps the authors are closet Bayesians, but if not, this statement reveals a misunderstanding of the meaning of frequentist probability statements.

4. On page 172, the formula for generating simulated binomial data for a p chart uses rounded exponential random numbers. The authors explain that this will "eliminate the negative numbers that sometimes occur when using the normal process generator," but of course it is far less accurate than using a normal approximation. Besides, it is quite possible to generate binomial data directly. It is surprising that the authors did not do this, because they provide an accurate Poisson generator.

5. On page 222, the authors incorrectly apply critical values for the Kolmogorov–Smirnov goodness-of-fit test to standardized data, instead of using the appropriate iliffe ratios critical values. They also compute a one-sided version of the test statistic "for simplicity." Taken in combination, these two errors render the procedure extremely conservative and essentially useless.

6. On page 227, "natural tolerance limits" are introduced with no mention of the required critical constants (Hahn 1970).

7. In the chapter on process capability, no mention is made of the effect of distribution shape on the relationship between capability index values and the probability of producing "bad parts."

8. On page 255, the authors propose using the standard deviation of all the data to determine control limits for an I chart without any discussion of the problems this will cause if the system is not in control. On page 256, they seem to be suggesting that the range of all the data (treated as a single sample) could be used, which is quite likely to be disastrous.

9. The discussion of moving average charts (Chap. 13) makes no mention of the artificial patterns that can occur on these charts (Nelson 1983).

As noted by Deming (1986, p. 126), there is no instant pudding. Those who need an introduction to SPC concepts and methods would be better advised to read a textbook that presents the concepts thoroughly and accurately (e.g., Ryan 1989) and use one of the major statistical packages that have incorporated SPC methods rather than rely on this book and a spreadsheet program that is not designed for the task.

Robert Kushler
Oakland University

REFERENCEs


From the title, one might expect that this book would extensively cover existing acceptance-sampling methods. This is basically, however, a book on single and double sampling plans for attributes and single sampling plans for variables. Special acceptance-sampling methods, such as continuous sampling plans, skip-lot sampling plans, and narrow-limit gauging, are not discussed. The discussion on multiple, sequential, and sampling plans is very brief and limited to attributes inspection.

This book does introduce a new method proposed by the author—namely, quick switching systems (QSS's), which consist of two sampling plans, along with a set of switching rules. The first sampling plan is called reduced inspection, which can be a single or double sampling plan. The second, called tightened inspection, is a single sampling plan with an additional parameter called switch number. At the beginning, incoming lots are subject to tightened inspection. If the number of nonconforming items found in the sample is less than the switch number, the next lot is subject to reduced inspection. Under reduced inspection, a lot rejection will result in switching back to tightened inspection. The concept is similar to those used in developing several existing sampling systems, such as MIL-STD-105E. In these existing sampling systems, the numbers of accepted and rejected lots are used to develop switching rules to avoid frequent switches among different inspection phases. Other practical factors, such as convenience for a user to find a sampling plan from a sampling table, were also considered.

When switching rules are based on the number of nonconforming items in a single sample, the sampling system will be more sensitive to lot variability. It also causes frequent switches between two sampling plans, however, especially when sample size is small. The author mentions in the book that the evaluation of QSS's was done in several unpublished working papers. From the descriptions of the book and the titles of the working papers, I roughly know what comparisons have been done. I believe that more studies are needed to support the use of QSS's.

There are nine chapters in this book. Chapter 1 discusses the objectives of the book, defines acceptance sampling, and compares acceptance sampling with other possible inspection and decision methods. Chapters 2 and 3 introduce operating characteristic curves, several quality indexes, and methods for selecting an attributes-sampling plan. Chapter 4 discusses the economical factors associated with attributes acceptance-sampling plans. Chapter 5 gives guidelines on how to use acceptance sampling in practice. Chapters 6–9 discuss double sampling plans for attributes, quick switching systems, MIL-STD-105E, and variables-sampling plans. There are scattered exercises in the book, most of which are straightforward and require little time to find the answers.

The software provided with the book contains programs for selecting single sampling plans for attributes and variables, QSS's, double-attributes sampling, profit/cost evaluation of attributes-sampling plans, and computation of several distribution functions. The results cannot be directly output to a data file. The software is not fancy, but it is convenient to use.

In general, this book provides a good coverage on three basic lot-by-lot acceptance-sampling plans. The book is also well written and organized. The learning objectives are clearly given at the beginning of each chapter. Many comments in this book, however, are based on the author's own opinions and experience, which may not be agreeable to everyone. For example, it was stated in Section 7.9 that a chain sampling plan is equivalent to a double sampling plan "except that the second sample is selected from previous lots instead of the current lot." In several cases, non-traditional terms were used. For example, "accept number" was used instead of "acceptance number." This book is well packaged, but perhaps overpriced.

Kwee Tang
Louisiana State University

This book is based on the very solid premise that using real data coupled with good statistical software (in this case SPIDA) is the best way to teach introductory statistical concepts. This book represents yet another attempt to demystify statistics and remove mathematical complexities to focus on solving real problems. Evidently, from the ubiquity of introductory statistics books that have the same aims, the problem has not really been solved.

I am, after thinking I could do just that, of the mindset now that there is no secret to making statistics user-friendly except hard work and focusing on the statistical basics. To use real data and statistical software is excellent. But these two tools only help in achieving a clearer understanding of statistical concepts by (a) being able to relate the results to real-world problems and (b) being able to do more examples via the computer. Besides those two very real benefits, there are no shortcuts to the basic principles—authors must move through the theory deliberately without taking conceptual shortcuts.

The authors, in the preface of this book, plead a salient case for starting with a real problem and real data and then applying appropriate techniques to address the problem. They seem to be confused as to the target audience. In Chapter 1, they say, "We have assumed that the reader has some basic knowledge of computing and has studied statistics to the level whereby the fundamental concepts of the subject are idealized, almost certainly on contrived and artificial data sets." Then, in Chapter 2, they say, you are not expected to have studied statistics before in any depth, but you are assumed to be capable of mastering basic statistical ideas. As a bare minimum, you should understand such fundamental concepts as mean, standard deviation, and skewness, you should understand what is meant by significance testing and a p-value and you should be familiar with both the uniform and normal distribution. (p. 25)

In the very next paragraph (the second paragraph of the chapter), the authors start in on a sketchy discussion of hypothesis testing, p values, and the null hypothesis. Having taught introductory statistics, I have always seen the difficulty students have with the concepts associated with hypothesis testing, so much so that I feel the uniform and normal distribution. (p. 25)

Examples of topics (that I consider advanced) are multiple regression and autoregressive integrated moving average time series (Chap. 3), log-linear models (Chap. 7), logistic regression and survival analysis (Chap. 8), principal-components analysis (Chap. 9), and multivariate analysis of variance, discriminant analysis, canonical correlation, and multidimensional scaling (Chap. 10). This is an ambitious bill of fare even for a book aimed at a second course in statistics.

These issues, though seemingly negative, are only negative because of the advertised audience. The most appropriate audience would be students in a second statistics (probably at the graduate level) course who need to learn SPIDA and some advanced techniques. The book is particularly appropriate for those working in the medical, epidemiological, and biological areas. Assuming this audience, the book is effective in introducing fairly complex statistical methodologies in a reasonably clear manner. Their approach to data analysis (i.e., looking at graphs of the data first) is sound. Using software included with the book and providing ASCII files for use in other software is commended. Although I might use a different package (I prefer Minitab for teaching purposes), the authors have selected SPIDA and have integrated the package effectively.

This book will also serve well those who require a quick review of advanced techniques that have been previously learned but not used. Lunn and McNeil have done an excellent job of demonstrating the applied nature of numerous advanced techniques, and their only failing is accurately marking the audience for their book. I would recommend this book for use in graduate second courses but not for undergraduate introductory courses.

Stephen A. Zinkgraf Motorola, Inc.


This book begins with the interesting observation, "The race is not always to the swift, nor the battle to the strong, but that's the way to bet—Damon Runyon (1884–1946)" (p. iii). "Part I of this book is a first course in probability for advanced undergraduate engineering students who are application oriented. It is assumed that the student has completed or is completing the usual first two years of mathematics and physics" (p. vii). "Part II explores applications of the probability theory of Part I to areas of interest to practicing engineers; it is intended for advanced undergraduate or beginning graduate students" (p. viii). "In Part I, probability theory is developed in the standard way and most theorems are proved, with the usual exceptions and usual limitations on their generality" (p. viii). "Part II concentrates on applications; it develops no new probability theory except that incidental to the application that is the subject of the chapter" (p. ix).

The book is organized as follows:

Part I
Chapter 1: Preliminaries of Probability
Chapter 2: Finite Sample Spaces
Chapter 3: Two or More Events
Chapter 4: Random Variable, Distribution Function, and Expected Value
Chapter 5: Functions of a Random Variable
Chapter 6: Two or More Random Variables

Part II
Chapter 7: Statistics
Chapter 8: Quality Control: Control Charts
Chapter 9: Tolerancing, Error Analysis, and Parameter Uncertainty
Chapter 10: Reliability Engineering
Chapter 11: Random Processes and Congestion
Chapter 12: Decision Trees
Appendix 1: Factorial, Gamma Function and Binomial Theorem
Appendix 2: Moments by Taylor Series Expansion
Appendix 3: Tables

Also included is a section on answers to problems and a bibliography.

This is definitely a superior book for the purpose intended; reading the book and working some of the problems was an enjoyable experience.

I do have a few negative comments, however. The binomial distribution as an approximation to the hypergeometric is mentioned (pp. 44) and some operating characteristic curves are shown for comparison (p. 80), but no guidance is given to the reader as to just when (in terms of lot-size to sample-size ratio) use of the binomial as an approximation to the hypergeometric is reasonable. Moment-generating functions are presented (p. 136) with no men-
tion that they do not exist for all distributions; in fact, the reader must continue for several pages just to get the usual statement “if it exists” (p. 176). The first moment is described as “the center of the distribution” (p. 165).

Considering the book’s purpose, the first eight chapters contain the material that one would expect; however, this book benefits from a generally superior and thorough presentation. The last four chapters warrant some special mention. Chapter 9, “Tolerancing, Error Analysis and Parameter Uncertainty,” provides a good discussion of subjects of special interest to engineers and is followed by a set of challenging problems. Chapter 10 on “Reliability Engineering” was written by a different author, Kailash C. Kapur of the University of Oklahoma. Like most treatments to his own work. Chapter 12, “Decision Trees,” provides discussion to the use of probability and statistics in experimental science.

In summary, this book has much to recommend it. I was particularly impressed with the quality of Chapters 9, 11, and 12.

Richard M. Bragger
U.S. Army Armament, Munitions
and Chemical Command (retired)

Probability and Statistics in Experimental Physics, by
Byron P. Roe, New York: Springer-Verlag, 1992, x + 208 pp., $39.

The jacket blurb on this book presents it as a “practical introduction to the use of probability and statistics in experimental physics.” Unfortunately it falls somewhat short of that goal. A more accurate description is that it is a collection of snippets of probability, statistics, and physics, with the treatment varying widely in sophistication and with some serious gaps in the statistical techniques presented. Furthermore, the book really emphasizes experimental particle physics. For example, the scattering problem is used several times to illustrate various probability concepts; this is a good idea for deepening understanding of a classic problem, but it does limit the breadth of material in what is already a rather thin book. Much of the physics seems in fact to be rather thin and more of a quick way of motivating a discussion; little use is made of real data sets, and there are few references to the literature.

My biggest problem with the book is in the selection and treatment of statistical topics. Some topics get a lot of space, particularly curve fitting (one chapter each on curve fitting and on interpolation functions). This is understandable because the topic is of great utility in particle physics. There are several glaring omissions, however, of topics that I would think would also be of use. There is no treatment of the design of experiments, unless you count a short section in Chapter 14 on determining the number of observations needed in an experiment. There is no mention of exploratory data analysis, nothing on graphics, nothing on diagnostics for model fitting (although both linear and nonlinear regression are described), and almost nothing on recent computer-intensive methods, except for a single page describing the jackknife. The description of Bayesian methods is almost unrecognizable: The assumption of a noninformative prior is characterized as the “hypothesis of desperation,” and one of the arguments used against it is that its use can violate mathematical sense—for example, that the sine of an angle must lie in the interval [−1, 1].

The author also devotes an entire chapter to random numbers. A chapter on simulation can be justified in terms of its usefulness to particle physics (simulations are used extensively in planning experimental configurations). The chapter is largely concerned with the generation of random numbers, however. If there are any lessons that the past decade has taught users of random numbers, they are to be very careful of the source of such numbers, due to the many pitfalls of numerical analysis and implementation details of such techniques, and to avoid writing such routines locally if at all possible. Encouraging students to write their own random number routines should not have a high priority in teaching experimental science.

A more subtle criticism is that the author has a rather convoluted way of formulating and explaining statistical concepts. For example, on page 9 there is a discussion in which correlation and independence are totally confused: “If two variables are unrelated, then the correlation coefficient is zero. The converse is not necessarily true. Correlations are subtle.” At first I thought that this was a proofreading error (if so, the proofreaders really fell down here!), but the surrounding material was so obscure that it was hard to be sure. As another example of this tendency to complicate concepts, on page 105 the author sets up an experimental situation in which a Poisson process is being observed. He formulates one research question as “What is the probability that the mean was 10?” He argues that this is the wrong question because to answer it requires the value of the standard deviation, which can only be estimated. He then gives his revision of the question: “I have a physical theory which predicts that the mean is 10. What are the chances of obtaining 5 or less events in this experiment?” He then says, “This last question is far more precise than the previous one. It does not require arbitrary assumptions or the hypothesis of desperation. By properly phrasing our questions, we can usually avoid these vague procedures.” But what if you do not have a physical theory?

A clue to some of the questions about omissions and the treatment of Bayesian statistics may be found in the references: Of the statistics works, only 3 (out of 16 or so) date from later than the early 1960s. One of these is the fourth edition of Kendall and Stuart, of the other two one is an article on statistics and probability that appeared in a high-energy physics book and the other is a set of lecture notes from Lawrence Berkeley. The only reference to Bayesian statistics (negative) is from a 1961 book.

I did find several positive points in the book. The conditions under which the central limit theorem is valid are discussed in some detail and illustrated by actual situations in physics in which the theorem is not valid. And the author has some good points to make about data dredging when data is limited and suggestions on how to use cross-validation. The sections on curve fitting are also useful, although they would be improved with more attention to diagnostics.

On the whole though I found the book to be disappointing. The convoluted wording of inference problems, the dated nature of the statistical content, and the omission of topics such as experimental design and graphical techniques would make me very hesitant to recommend the book’s use to people who are being introduced to practical statistics. The fact that the physics is largely limited to high-energy physics restricts its applicability even more. In addition, the author was not well served by his editors: The writing is choppy and uneven, as though the book were taken straight from a set of class notes without careful editing or even rereading (on p. 148 the author recommends that the reader take a look at three references, one of which is a private communication).

There is clearly a useful book to be written in this area. It would include modern statistical methods, plus more statistical attention
to problems of interest to physicists that are not a part of the usual statistical training. If anyone is searching for such a textbook for experimental physics courses, however, they should probably keep looking.


This volume of over 600 pages is certainly an adventure. An ambitious attempt has been made to cover a wide range of material at varying levels of technical detail. The mathematical detail provides a sound basis for the topics that are presented but sometimes obscures the fundamental ideas.

The book begins by introducing several concepts that appear later in the text. Topics covered in later chapters include Markov chains, renewal theory, point processes, continuous time Markov chains, Brownian motion, and the general random walk. The treatment of these topics is quite thorough and includes references for additional sources of information.

As a textbook for graduate students, the mathematical notation and concepts are appropriate. Step-by-step proofs with reference to specific theorems and techniques are especially helpful for use by beginning graduate students and practitioners with previous theoretical training. The level of the material presented in this book might be suitable for a practitioner with a good foundation in mathematics. An individual without sufficient mathematical training would be hard pressed to find this book useful but could gain insight into the different types of stochastic processes from the examples. As a reference, the examples might provide an introduction to the different types of problems that can be solved using the concepts of stochastic processes. The level of the mathematics is not extremely difficult, but the proofs and technical discussions would probably not benefit most practitioners. A statistician working with a nonstatistician might find this book useful as a source of examples for the client and sufficient technical detail for the statistician.

The book's strength includes the descriptive examples and clear indications of optional sections with additional mathematical detail. Numerous exercises make it especially suitable for classroom use. The author's advice to beginning readers regarding some of the proofs and the sections marked by an asterisk is helpful, but the conversational tone of the advice is at times a bit chatty and sometimes condescending to the nontechnical reader. The inclusion of more advanced content for the interested reader, as well as additional references, addresses the needs of advanced readers.

The broad base of material and varying levels of technical detail provide instructors with the flexibility to tailor a course to the intended student audience.

A unique feature is the use of a character named Happy Harry to illustrate the concepts discussed in the text. Harry's adventures include a variety of problems encountered in the restaurant business, sports, and other ordinary life scenarios. Happy Harry helps make the ideas concrete and clearly conveys the problems in everyday language, although the solutions are not always easy to follow. Oddly, Harry disappears after Chapter 5, leaving the reader to more traditional examples and exercises in Chapters 6 and 7. Lacking from the book is any recognition of the need to collect and summarize data that can be used with these methods. For example, some advice could have been provided on how to estimate transition probabilities, arrival times, or some of the other quantities that are always assumed known in the examples. Careful proofreading would have prevented typographical errors, missing words, and occasional TeX control sequences, but these errors do not detract seriously from the usefulness of the book. More bothersome was the incidence of incorrect page numbers in the index.

This book contains a good collection of material on different types of stochastic processes enhanced by illustrative examples. The author's description of the book as an introductory graduate textbook is appropriate. The book might be useful for practitioners as well; however, a practitioner would need to be suitably prepared to appreciate the mathematics and endowed with a sense of humor to appreciate Happy Harry.

**Joanne R. Wendelberger**
Los Alamos National Laboratory


This volume, reprinted from Philosophical Transactions of the Royal Society of London, Series A, includes six papers that apply modern statistical and probabilistic techniques to the study of complex stochastic systems. The papers are representative of applications that result in large amounts of data and that can now be analyzed using computationally intensive methods. The best way to represent the variety of problems treated in this volume is to give the table of contents and a brief description of each article.

1. P. J. Brown, C. H. Spiegelman, and M. C. Denham: "Chemometrics and Spectral Frequency Selection." This article develops methodology arising in calibration problems for infrared spectroscopy. Because of the large number of observed frequencies, it is necessary to use a variable selection technique to pick a small number of frequencies for predicting the true composition from the spectrum. The efficacy of the method is demonstrated in an analysis of a detergent that is a solution of four chemicals in water.

2. R. G. Aykroyd and P. J. Green: "Global and Local Priors and the Location of Lesions Using Gamma-Camera Imagery." This paper reviews the basic ideas of Bayesian image restoration and then focuses on the problem of modeling the location and size of a lesion using a gamma-camera image. Methodology and algorithms based on both global and local priors are developed and compared. Both simulated and actual images illustrate the methods.

3. F. P. Kelly: "Network Routing." Many modern systems are made up of networks through which traffic flows. This article gives an overview of the probabilistic modeling and control of telecommunications networks. Examples are given illustrating the difficulties in developing local rules for a network that minimize the average delay in flow through the network. Connections of network flow models with electrical circuits are developed. Loss networks are studied, and adaptive and dynamic routing schemes are presented.

4. A. F. Smith: "Bayesian Computational Methods." Bayesian computational models are being developed for an ever-increasing variety of applied problems. The computational problem of finding the posterior density can involve several numerical integrals, sometimes of a high dimension. This paper studies in detail the computational issues in numerical integration. Sampling techniques including importance sampling, substitution sampling, and Gibbs sampling are discussed.

now used for guidance in many complex situations. The authors use a probabilistic approach to develop a methodology for expert systems. Methods for assessing causal relations and constructing the corresponding Bayesian graphical representation are discussed in general and then applied to a two-drug reaction model. Computational algorithms are discussed.

6. W. Qian and D. M. Titterington: "Estimation of Parameters in Hidden Markov Models." The paper begins with the general missing-data model and discusses the special case of a mixture model. The hidden Markov-chain model allows for dependence in the missing values. Problems in parameter estimation for these models are discussed. A Monte Carlo-based iterative algorithm for estimation in hidden Markov models is developed. The methodology is illustrated on some satellite image data.

This volume will be of general interest to Technometrics readers as a collection of interesting applications of modern statistical and computational methodology. The articles are written at the level of an applied statistical journal such as Technometrics. Three of the articles contain applications specifically in chemical and engineering sciences. The other articles contain methodology that could easily be applied in these fields. The articles are all well written, and the volume is nicely edited.

Thomas Wehrly
Texas A&M University

Sense and Nonsense of Statistical Inference, by Chamont Wang, New York: Marcel Dekker, 1993, xiii + 244 pp., $39.75.

This book consists of eight chapters. I would not give a chapterwise description of the contents because it is not a textbook, and the broad contents and message of all the chapters are essentially interwoven in any event. The principal goal seems to be to direct the community's attention to misuse of statistical methods and the sometimes collective unconsciousness of the subtleties of statistics.

An enormous amount of effort has obviously gone into writing this book. I am quite sure that the profession as a whole will be appreciative of that. Commentaries on the abuse of statistical methods and philosophical writings on foundations are not new in the statistical literature. Basu, Efron, Moore, Berger, and many others have written much on this. This book, however, is quite special on several grounds. First there is the broad scope of inclusion. The author has indeed made a very significant effort toward collecting case studies, examples, and also results of a more mathematical nature for an honest educational purpose for the benefit of all concerned. It is also quite evidently more modern and up to date in comparison to the writings of others on these issues.

It seems necessary that as a reviewer I give the reader some flavor of the nature of examples given in the book. They range from the common dispute on utility of Neyman-Pearson tests to the more current controversies on robustness of Bayesian analysis with respect to the prior to the esoteric debates on whether chaos models can replace standard probability theory. They are generally all well written, and the opinions are generally well expressed, though not necessarily well thought out. An occurrence of 99 heads in 100 tosses should lead most sane individuals to conclude that the coin is not fair, and a Bayesian analysis with a symmetric beta prior with a parameter equal to 112 seems unnecessary and dubious. Like many others I know personally have written much on this. This book, however, is quite otherwise description of the contents because it is not a textbook, and the reader is introduced to a wide variety of case studies, drawn from several fields in natural and social sciences, involving different procedures of combining information.

Overall, this book is a good addition to the available writings on this issue. Much of it is informative, and it is good for bedtime reading. The author evidently feels very strongly about much of what he writes, which unfortunately has led him to make consistently derogatory statements about individuals and their works. Most of these were unnecessary. For this, I feel sorry.

A. DasGupta
Purdue University

**References**


This book gives a survey of techniques used in combining statistical information to produce more informative summaries and better decisions than those based on each source of information. The reader is introduced to a wide variety of case studies, drawn from several fields in natural and social sciences, involving different procedures of combining information. The write-up is expository in style and easily accessible to a quantitatively literate audience in a wide variety of fields in natural and social sciences. One of the main goals of the report is to stimulate the interdisciplinary dialogue in the use of combining information methodology, and this survey will surely accomplish it.

The introductory chapter contains a brief historical account of combining information in science and some motivating contexts. In the following chapter, the cases in which combining information makes sense are discussed. In particular, four cases—(1) combining information with a single data set, (2) combining data sets from separate experiments, (3) combining data and judgment, and (4) combining separate sources of judgmental information—are highlighted. The chapter concludes with a discussion of why and when to combine information, along with a cautionary note that combining information may produce worse answers if the data information or judgmental information is of poor quality.

Chapter 3, "Some Detailed Examples of CI," reviews in detail several examples of combining information drawn from different fields including medicine, education, engineering, physics, and psychology. The example from medicine involves a meta-analysis of independent studies of "Aspirin and Heart Attack," and this is discussed at great length. Another combining information example discussed in detail is from physics and relates to the adjustment of physical constants based on 38 independent experiments.

A detailed discussion of statistical methodology for combining information is the content of Chapter 4. In addition to a discussion of standard methods based on fixed-effects and random-effects models for combining information, the methods derived from hierarchical Bayes models and empirical Bayes models are also
Editor Reports On New Editions, Proceedings, Collections, and Other Books

This section reports on new editions of books, most previously reviewed in Technometrics. Descriptions are also given for conference proceedings, for collections of papers that should hold some interest for practitioners in the physical, chemical, and engineering sciences, and for statistics and other books of more general interest.

Eric R. Ziegel
Amoco Corporation


This is a proceedings volume from a 1989 summer program at the University of Minnesota, sponsored by its Institute for Mathematics and its Applications. This volume has 17 papers. These all are similar to the fare for any of the five current statistical computing journals, most having started since 1989.

There are no sections that categorize the collection of papers. For simplicity here, I am defining four topical groupings for them. First and easiest to classify are seven papers on visualization. Topics are a software model for graphics, use of a binned plot in coarse-grain parallel computers. Fourth, there are three application types of papers, which feature as topics importance sampling regression computing environment, algorithm development for nonstandard least squares problems, which here concern repeated categorical responses, and a stochastic approach to load balancing in coarse-grain parallel computers. Fourth, there are three application types of papers, which feature as topics importance sampling for Bayesian estimation, geometric abstractions for the constrained optimization of layouts, and GENSTAT as a computing environment.

Kudos here go to the publisher for a nicely bound volume, including six color-plate pages, at a low cost, though timeliness was not very good. The papers are worthy of examination for those with an expertise in statistical computing.

Cidambi Srinivasan
University of Kentucky


This edition follows five years after the first edition (Hogg and Ledolter 1987), with a new title for appeal to a broader audience. Our reviewer (Hansen 1988) gave a mixed review. On the positive side, he credited the authors for "providing an overview of the basic statistical methods that should be part of techniques used by engineers" (p. 348). Lack of case studies, failure to introduce regression analysis before experimental design, and the absence of graphical displays, however, led him to hope that a second edition might "better meet the statistical needs of engineers competing in a global economy" (p. 348).

Engineers and physical scientists nowadays mostly want to sit down at their computers and use statistics software to design experiments and analyze data without statistician assistance. Useful books for engineers must cater to that attitude. This book will not meet that need very well. Chapters 2-4, a large chunk of this book, cover discrete probability, continuous probability, and applications of sampling distribution theory. The last five chapters do cover the more useful stuff fairly effectively. Chapter 5 introduces quality control. Chapter 6 is about hypothesis testing, and Chapters 7 and 8 deal, respectively, with single and multifactor experiments. There is still a fair amount of theory and much use of formulas and equations here. In this edition, regression analysis not only follows experimental design, it is also now the last chapter.

Principal changes in this edition were having the quality-control chapter earlier instead of last and giving hypothesis testing a separate chapter. But the computer, the key to the engineer's and scientist's use of statistics, still has little role in this book. Engineering curricula and especially industrial short courses cannot permit so much time on the theory of statistics as this large and scholarly book provides. Agreeing with Hansen, I want a book that cuts to the heart of being competitive for American industry by teaching the use of the necessary tool, the computer, and an important methodology, statistics, to solve the kinds of data collection and analysis problems that engineers and scientists will encounter in their work projects. This requires a different approach from that which is generally felt appropriate by statistics department faculty members, which is what this book reflects. In the following reference list, however, reference to a book that I recommend versus this one overall is absent. The excellence of the presentation and the authors' experience as educators compensate for the computing void when compared to similar books for science and engineering.

REFERENCES


Over the past couple of years, current sampling books have moved from including only new editions of old workhorses, such as Scheaffer, Mendenhall, and Ott (1990) to several new and modern textbooks, such as Chaudhuri and Stenger (1992), Fareman (1991), Levy and Lemeshow (1990), and Thompson (1992), the order going from more theoretical to less theoretical. Here is a completely theoretical new sampling book, lying well to the
three chapters on frame errors deal with their definitions, their kinds of error. Not wishing to minimize their audience too much, the authors note in the Preface that a serious practitioner is expected to benefit from the theoretical results discussed here. I am not that serious about sampling, I guess.

All potential readers and purchasers are to be cautioned that a high-level background in probability theory and mathematical statistics, plus an inclination to reading that level of technical material, is a prerequisite to the reading of this book. It is very much a book of theorems and proofs. All is not completely disconnected from sampling practice. Each chapter begins with at least a couple of pages that explain the practical situation for which the theory is being presented. Some additional material of this type also appears within most of the chapters. The examples that are used are generally mathematical in nature, however.

Here is a mostly complete laundry list of topics for the 12 chapters: Finite populations, Horvitz–Thompson estimators, simple random sampling, auxiliary size measures in survey sampling (probability proportional to size, ratio estimators, regression estimators), cluster sampling, systematic sampling, stratified sampling, superpopulation approach, randomized response techniques, small-area estimation, nonresponse problems, and resampling techniques. This is an impressive book that will have only a limited audience.

REFERENCES


The publisher has done a really outstanding job of extending the scope of books for sampling methodology beyond the usual content, which is generally descriptive presentations of sampling principles and techniques. In books by Groves et al. (1988) and Kasprzyk, Duncan, Kalton, and Singh (1989), two specific sampling application methodologies were presented in extensive detail. In those by Groves (1989) and Bremer, Groves, Lyberg, Mathiowetz, and Sudman (1991), one finds two similarly complete volumes dealing with measurement errors in surveys. Here again the topic is survey errors, this time the nonsampling type.

In the introductory first chapter, the authors define the applicability of the book through their definition of a survey as "a scientific study of an existing population of units typified by persons, institutions, or physical objects" (p. 1). Similarly explicit is their definition of sampling error as "arising only from the conscious choice to study a subset rather than the whole population" (p. 5). They then use all other aspects of error in surveys to provide the scope for this book. The introductory chapter concludes with a section that classifies the nonsampling errors into three categories—frame errors, nonresponse errors, and measurement errors. These three topics then form the section headings for most of the rest of the text. There is also a second introductory chapter, which deals with the many sources for all these different kinds of error.

The frame is the means of accessing the population for sampling. Three chapters on frame errors deal with their definitions, their quantification, and the conducting of surveys with imperfect frames. Nonresponse, the failure to get sample information, is also covered by three chapters. One chapter again in a background chapter, then there are chapters on statistical effects of the problem and dealing with the problem. Measurement errors are wrong results for the sampled element. Here three more chapters again begin with an overview and continue with chapters on quantifying measurement error and on variability in measurement. A very mathematical twelfth and last chapter on total error models concludes the book.

Curiously, the book is classified in the publisher's mathematical statistics series (the one with the blue-striped covers). That is surprising mostly because much of the book is descriptive text. Anything else is equations, but this is hardly in the same class relative to mathematical statistics as most of the books in that first list that the publisher puts inside the front covers of its statistics books. I guess the authors and the publisher consider this material as survey research. In any case, it is generally easy enough to read and again a nice addition to the sampling literature.

REFERENCES


Here is another little paperback in the publisher's paper series "Quantitative Applications in the Social Sciences." This is number 84, all are still available, and I request and report on them occasionally (most recently Fox 1991) when the topic is possibly pertinent to the perceived readership. Some fuels evaluations, for instance, use a repeated-measures design. I did not like this book much. It is more on the theoretical and mathematical side rather than the practical and application side. There are some illustrations, but no use is made of statistical computing. The introductory initial two sections do provide a nice introduction to the situations to which repeated-measures analyses apply.

Four other sections make up the balance of the book—single-factor studies, two-factor studies with repeated measures on both factors, two-factor studies with repeated measures on one factor, and three-factor studies. Subsections for each concern the same things—models, analysis of variance (ANOVA), ANOVA assumptions, mean differences, alternate analysis using multivariate tests, and the strength of association between independent and response variables. There is not a lot of discussion in any of these sections of setting up experimental designs actually to do a repeated-measures study.

This overview is similar to an extended-length chapter in one of the recent handbooks of statistics, such as that of Wadsworth (1990). For a more complete treatment of repeated measures analysis, one could consider Crowder and Hand (1991).

REFERENCES


This is Volume 8 in the publisher's comprehensive, impressive, and expensive series, *Handbooks of Statistics*. All of the previous seven have addressed topical areas of statistics—analysis of variance, classification, time series, nonparametric methods, sampling, quality control, and reliability. Here the first volume devoted to application areas of statistics is reported.

These books are laid out in a textbook format. In this one, there are four sections, each with several chapters, sixteen in all. Each chapter has several sections and ends with its own set of references. These handbooks have tended to be more mathematical than application oriented. This volume, with its focus on an applications area, suffers less from mathematical emphasis than any of the others have.

The biology chapters, the first two sections, are varied, not particularly interrelated or interconnected, and not described especially well by the two section headings, genetics and epidemiology and anthropometry and evolutionary biology. These two sections contain two-thirds of the handbook. Topics for the first section are inheritance of qualitative traits, biases in biological surveys, path analysis in genetic epidemiology, linkage analysis, and design and analysis of epidemiological studies. In the second section, the largest, one finds chapters on robust classification applied to anthropometry, analysis of population structure, estimation of relationships from genetic data, genetic variation in evolutionary studies, phylogenetic tree reconstruction, and sex-ratio evolution.

The two medical sections are "Cancer Biology" and "Medical Statistics." The first has chapters on stochastic modeling for carcinogenesis and score methodology for one-hit curves. The second has a case study on kidney-survival analysis, a chapter on a theory for the relationship of confidence bands to decision analysis, and a chapter on sample size determination in clinical research.

More so than the subject-oriented statistics handbooks, a vast number of topics could be covered under the title of this handbook. I was disappointed not to find more coverage of environmental topics or toxicology, for instance. Maybe those are topics for a forthcoming handbook.


Any statistician whose clients work with chemicals probably has an occasional interaction with toxicologists nowadays. Environmental and health concerns make toxicology a critical application area for those industries involved with chemicals. So I decided to report on the most recent and specific book that I could find. Unfortunately, it is not very satisfactory.

The back cover promises that statistics will be clarified for toxicologists and toxicology will become clear to statisticians unfamiliar with the field. I am not sure that I know what toxicology is all about yet. There are only three toxicological topics here—estimating LD₅₀, subchronic toxicity studies, and chronic toxicity studies. Each topic has a three-chapter sequence—statistical methods, toxicity issues, and statistical theory. This, however, is not your typical statistics book. It is incredibly verbose and overly philosophical. There is not a lot of instruction on how to do anything in statistics, very little sample problem illustration, and no discussion of results from computing or calculations. The author has too much fondness for history.

Perhaps reading pages of wordy descriptions of theory is meaningful to some practitioners. I cannot envision recommending this book to the toxicologists, and I certainly did not find it very satisfactory to read. I am going to have to keep looking for my "statistics in toxicology" book.


In a really fine review of the first edition, Sarle (1989, p. 365) described the book as "concerned with models relating three or more quantitative random variables, at least one of which is a latent (unobserved) variable rather than a manifest (observed) variable." Concerning content, he noted that "theory is discussed only insular as it is of practical use or aids understanding." Overall, he concluded that "this book is strongly recommended for an elementary course or for self-study because of the quality of the explanations and examples."

This second edition is mostly the same as the first. The addendum to the Preface mentions "a certain amount of new material" and dealing with software by making the book "more helpful to those who are using programs other than LISREL." Sarle (1989) noted that "multidimensional scaling seems only marginally related," and that topic has been eliminated. The strong positive recommendation still seems reasonable, and now the book is available as an inexpensive paperback.

**REFERENCE**


This large and unbelievably expensive volume is the invited and contributed papers, submitted to an editorial review board, from a conference of the same name held in Bangalore, India, in January 1993, which is also when the book arrived. Thirty-four papers have been organized into seven chapters. The thrust of the book and conference immediately becomes apparent from finding that Genichi Taguchi is author of the first paper "Robust Technology Development."

Organizing an overview of 34 papers, no easy task, is made easier if we begin first by listing the seven chapter headings. These are

1. Conceptual and Methodological Design
2. Management Through Strategic Considerations of Design
3. Robust Design and Data Analysis
4. Statistical Approach and Reliability
5. Tolerances and Discrete Parts Design
6. Finite-Element Method for Design
7. Computing in Design

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An expectation of content can be formed by considering the author demographics for the collection of papers, which shows that nearly half are from the United States and Canada, though many of these authors do have India in their background. Fewer than a half dozen of the authors come from industry, and these are mostly from the research-laboratory environment.

In the first three chapters, which generally cover robust design topics, the papers generally tend toward theoretical expositions and review presentations. As samples, a selection of pertinent topics includes statistical quality-control methods, management of variation-reduction investigations, stratified replications in robust design, Grubb’s estimators in variance component estimation, and analyzing data from robust parameter designs. The latter four chapters, on the other hand, are more concerned with methods and are replete with some very specific application situations that are described in considerable detail. Typical statistics topical fare here are methods for accelerated testing, the use of reliability techniques, finite-element implementation of robust design, and optimal sampling for coordinate measurement. Among the many manufacturing applications that are the basis for these papers are electronic components, disc brakes, journal bearings, optical fibers, dry cells, ceramic materials, and power transmission systems.

As always with this publisher, printing, paper, cover, and binding are the very best that I receive. Certainly that is one reason for the high cost, as well as the unfavorable U.S. dollar exchange rate with the Netherlands. Both help relegate the book in this country to libraries with large acquisition budgets.


This is a nice little book with decent statistical content and a fine sense of perspective. For example, the author views the lab as a service organization that provides information that must meet accuracy, timeliness, and cost requirements. He sees quality assurance (QA) as a concern of clients, managers, regulators, and workers, each with a different perspective. He notes that management ultimately bears the responsibility for QA.

Following an overview chapter, Chapter 2 is about measurement error and elementary statistics and deals with the basic statistics, distributions, confidence intervals, and comparisons. The topic for Chapter 3 is control charts, including not only the X chart but also range and spiked-sample charts. Chapter 4 on sampling has some statistical considerations in dealing with nonhomogeneous materials. Analytical methods in Chapter 5 includes comparing variability and doing bias checks through curve-fitting for instrument validation using spiked samples. Chapter 6, about instruments, discusses calibration curves, and Chapter 12, on computing, briefly considers computing for charts and basic statistics.

The other 6 of the 13 chapters cover various topics concerned with setting up a laboratory QA program. The topics are documentation, organization, setting up the program, auditing, and laboratory accreditation. The book is recommended as a basic reference source, with good emphasis of the role and value of statistics in laboratory QA. It is much easier to peruse and read than the similar and more complete perspective offered by Taylor (1988).

REFERENCE


This is my pick as the best of the many similar books about which I have reported here in the past couple of years. Perhaps in part that is because the senior author and the material emanate from Exxon, the premier corporation in my industry. Perhaps also the effective integration of customer focus, process improvement, and total involvement, the key precepts of the three different quality processes of my corporation’s three major components, has caused me to be enthusiastic. In addition, the book’s emphasis “primarily for supporting functions within manufacturing companies” mirrors much of the effort on continuous improvement that is now occurring within my own corporation.

The book actually integrates much more than components of total quality. It very effectively assimilates material from many quality gurus and books, several of which have already been reported in this journal. There are five parts. First, there is an excellent historical overview in the first four chapters. Second, there are three chapters on customer focus. Third, there are four chapters on improving processes, including a chapter devoted solely to applications. These also occur effectively throughout the rest of the book and involve successes at other companies besides Exxon. Fourth, there are three chapters on total involvement, concerning leadership, empowerment, and suppliers as topics. Fifth, there are four chapters on developing the quality strategy, which includes organization, training, and management systems.

Though, as noted, many quality philosophies are interwoven, there is overall a Deming slant. Thus statistics is clearly established as having a role among some of the components of process improvement—understanding processes, developing and testing ideas, and evaluating solutions. This book does not, however, otherwise discuss specific statistical tools in any detail. Regardless, it is highly recommended for the completeness and generality that it develops for total quality management.


Titled like so many similar books, this one establishes its market with the subtitle The Primer for Middle Managers. That audience is very relevant to statisticians. Most of us have access to many of this ilk, whereas the top executives for whom many of the quality books are written are seldom among our contacts. On this basis, this book offers a useful perspective.

There are only six chapters, so here are the chapter headings:
1. Why I Look at Quality and the Middle Manager?
2. What Is Quality?
3. Tools for Improving Quality
4. Quality Enhancement and the HR Function
5. Choices in HR Management
6. Quality From External Relationships

There is recognition only of Juran and Deming among the quality gurus, and the book mainly reflects the latter’s perspective. For this reason there is good use of statistical concepts in defining targets, in assessing variability for products and processes, and in relating the voices of customer versus supplier in several contexts. Otherwise, except for some use of attribute charts as a tool for assessing the current process and some other overview information in discussing tools for quality, the authors do not pay much attention to statistical process control.

There are two case-study appendices. The book has a little too much laundry-list and cookbook style to be easy to pick up and use in a piecemeal manner. It is recommended only for its targeting of the middle-manager audience.