



The Power of Statistical Thinking: Improving Industrial Processes

By *Mary G. Leitnaker, Richard D. Sanders, Cheryl Hild*

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Explains the fundamentals of SPC and then goes far beyond to give an in-depth understanding of how these tools work. Case studies included. DLC: Process control - Statistical methods.

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The Power of Statistical Thinking: Improving Industrial Processes By Mary G. Leitnaker, Richard D. Sanders, Cheryl Hild Bibliography

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Editorial Review

From the Inside Flap

The objective of this book is to provide present and future managers and engineers of industrial organizations with the knowledge and information needed for the statistical study of the processes of an organization. To remain viable in an increasingly competitive world marketplace, organizations must be continually engaged in the study and improvement of the effectiveness and efficiency of their operations. It is the premise of this book that knowledge of variation is and will continue to be critical to the effective execution of these responsibilities. Crucial competencies required of managers and engineers in the future will be the ability to characterize the organization's processes with performance indicators that serve as guidance for improvement and to direct the organization in improvement of these measures. A conscious recognition of variation, an informed interpretation of the messages it contains, and an understanding of the effects variation has on process performance will help define the different behaviors and decisions that will characterize the future role of the manager and engineer.

The topics in this book are intended to provide the statistical background necessary for the manager or engineer to assume these responsibilities. Presentation of the statistical methods and tools is supported by demonstration of correct use, practice, interpretation, and guidance for implementation. Clearly, a knowledge of statistics is insufficient by itself to provide the type of knowledge and guidance needed for process improvement. A critical component of improvement work is the management and technical knowledge brought to bear on determining where and how to employ the statistical techniques. The required knowledge of chemistry, physics, and of a host of applied engineering methods are not covered in this book. There is nothing directly on "people management skills." Instead, the book contains advice, based on observation and experience, as well as numerous case studies on the integration of statistical methods with management and engineering knowledge, which can lead to organizational improvement.

Just as the roles of managers and engineers are changing in organizations, so are the uses of statistical methods in organizations. This change in the manner in which statistical methods are being used is reflected in recent writings by W. E. Deming (1986) and Ronald D. Moen, Thomas W. Nolan, and Lloyd P. Provost (1991) on enumerative and analytical methods in statistics. Enumerative methods, although primarily intended for studying a fixed population of items, have formed the bulk of statistical techniques taught at the undergraduate and graduate levels in statistics courses for managers and engineers. A perusal of the table of contents of most statistical textbooks designed for these audiences would verify this statement. Analytical statistical methods, on the other hand, are intended to provide insights into the causal mechanisms affecting the outcomes of ongoing processes. Processes occurring over time are subject to changes in environment, materials, methods, equipment, and other circumstances. It is the study of process behavior and how it is affected by these changing circumstances that is addressed by analytical studies.

The demands for increased statistical skills for process investigation in the industrial world has had an effect on the content of statistical courses in universities and colleges and on professional education. There are a growing number of competent statistical books that present the basic formulas of statistical process control. In general, those books focus on the use of statistics as strict control or feedback mechanisms; they provide little demonstration of the use of these methods for the analytical studies required for identifying sources of variation. This book is intended not only to teach statistical techniques useful in such analytical studies, but also to illustrate how these techniques can be used in practice to understand the causal mechanisms that determine the output characteristics of processes and provide insights into the improvement of these

processes. Some statistical theory is covered in an appendix. When used as a course text, the instructor can increase the value of the book by demonstrating the utility of theory in approaching a new situation, in searching for the correct technique, and by demonstrating and discussing the constraints often found in unspoken mathematical and process-based assumptions.

AcknowledgmentsThe examples and ideas in this textbook are primarily the result of the authors' association with the University of Tennessee's Management Development Center. Although too numerous to name, managers and engineers from industry who have attended U.T.'s executive education courses have provided numerous ideas, insights, and critiques of the thoughts in this book. The authors would like to express their appreciation to John Riblett, the center's director, for his considerable efforts in supporting the growth of faculty and ideas through his management of the center. Also, without the advice, support, and insights from our faculty colleagues at the center this book would not have been possible.

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From the Back Cover

Every engineer and manager of industrial processes is now aware that, in order to maintain a competitive advantage, there must be a conscious and constant effort to improve efficiency and quality. The field of statistics has proven a highly effective-and now essential-means of measuring, evaluating, and improving performance.

Written in clear and readable language, this book explains the fundamentals of SPC (Statistical Process Control), but then goes far beyond to give an in-depth understanding of how these tools work, not just as feedback mechanisms, but also as a means of analyzing the sources and root causes of variation.

The book's hallmarks are its case studies; in example after example it demonstrates how and where these concepts and techniques can be applied to real-life situations for significant improvements in efficiency and quality.

You will find detailed information on constructing numerous kinds of control charts-including charts for attributes and variables data. The book also provides in-depth coverage of sampling, the principles of rational subgrouping, the components of variation, and measurement processes. An entire chapter is devoted to the role of designed experiments in process study. Each chapter includes a case study describing how various organizations have actually applied the techniques presented.

With these clear explanations and numerous examples, you will gain the understanding and skills you need to successfully apply statistical thinking in your work and make significant improvements within your own organization.

"Finally, a one-step reference (**The Power of Statistical Thinking**) which links statistical methodology with practical applications in the workplace. The authors have succinctly revealed that success will come through knowing your processes and using them to provide the customer value demanded by customers today. Statistical methods provide that knowledge."

-Mary D. Dolan, Director-Quality Improvements, Campbell Soup Company

"The strength of the book (**The Power of Statistical Thinking**) is the use of case studies that illustrate applications of statistical thinking using tools the author has introduced."

-James L. Hess, Ph.D., Leader, Board for Quality & Process Control, DuPont Engineering

"The authors (of **The Power of Statistical Thinking**) distinguish themselves from others by writing from

the perspective of those who have been there. After having taught and worked with companies in virtually every industry the authors are able to offer advice which is not only statistically correct, but also helpful!"
-Jeff Peters, Vice President and General Manager, Harris Corporation

"The book's (**The Power of Statistical Thinking**) strength is in documenting the methods of application which could aid managers and technical people in making better and more appropriate application of control charts for process improvement. It talks directly to issues through examples."
-William F. Fulkerson, Staff Analyst, John Deere & Company

"I am convinced the ability of an organization to survive and serve its customers with increasingly better products and services will depend on the 'power of statistical thinking.' This book (**The Power of Statistical Thinking**) effectively communicates statistical and process knowledge needed by managers and technicians."
-David L. Beal, Operations Manager, Lake Superior Paper Industries, A Company of Consolidated Papers, Inc.

"This book (**The Power of Statistical Thinking**) does an excellent job of teaching the fundamentals of continuous improvement tools. The recommended approach has been proven effective over and over again in various types of organizations. I particularly appreciated the extensive use of real case studies."
-Roger Hoerl, Manager of Quality Methods and Information, Scott Paper Company

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About the Author

Mary G. Leitnaker (biography) is a professor in the Statistics Department at the University of Tennessee.

Richard D. Sanders (biography) is a professor in the Statistics Department at the University of Tennessee.

Cheryl Hild (biography) is a research associate with the Management Development Center.

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Users Review

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William Rockwood:

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