2ND EDITION

the IMPROVEMENT GUIDE

A PRACTICAL APPROACH to ENHANCING ORGANIZATIONAL PERFORMANCE

GERALD J. LANGLEY, RONALD D. MOEN, KEVIN M. NOLAN, THOMAS W. NOLAN, CLIFFORD L. NORMAN, LLOYD P. PROVOST

More praise for *The Improvement Guide*

"We have used the work of these authors since 1994 to successfully operate, improve, and build a customer-focused and employee-oriented company. We owe them a great debt of gratitude. The improvements made to this edition, specifically about the role of leadership in improvement, make it a great resource for businesses of all sizes."

—O. Joseph Balthazor, president and
CEO, Hallmark Building Supplies, Inc.

"*The Improvement Guide* has opened my eyes regarding the science of improvement. In my role as a healthcare leader, I use the methods of systems understanding on a daily basis. The methods presented in the book have resulted in better outcomes and more integrated care for our patients."

—Mats Bojestig, M.D., Ph.D., chief medical officer,
Jönköping County Council (Sweden)

"If you're frustrated by significant investments in improvement not adding up to better sustained performance of your business, you'll find *The Improvement Guide* to be of enormous help."

—Ian Bradbury, president and
CEO, Peaker Services, Inc.

"The methods described in *The Improvement Guide* have been instrumental to our efforts to continually improve quality and productivity. The second edition is a must-study for any organization wanting to sustain profitability in a challenging business environment."

—A. Kim Brittingham, site manager,
Lewes DE Plant, SPI Pharma

"If you are in a fast-moving and rapidly changing sector, whether not-for-profit or commercial, the technology taught in this book is organizationally transforming. It includes but goes far beyond 'lean.' We've incorporated these methods into our health insurance business and created a network of 'collaborations' with our doctor, clinical, and hospital partners to mutually transform a broken medical system together. Our experience found that these methods were enthusiastically accepted: the impact is profound and rapid. This book and the sets of methods taught here are robust and foundational to tactically and strategically being a rapid, continuously adapting, world class firm."

—David Ford, CEO, CareOregon

"The authors have successfully turned Dr. W. E. Deming's 'what to do' into 'how to do' in a simple yet effective and pragmatic way. We have used *The Improvement Guide*'s Model for Improvement at Unicard since 2001. Besides the results, the organization's great new ability to mobilize and transform itself has greatly impressed me. These characteristics bring a built-to-last capability to the company and renew our expectations regarding future results."

—Carlos R. Formigari, general director,
Unicard Unibanco (Brazil)

"Health care is a values-based system and must be part of a continuing learning process. The Model for Improvement provides ways for articulating, agreeing on, and inculcating values that focus on the patient, and it creates methods that have energy, so that we can be refueled in our own efforts."

—Göran Henricks, director of
development, Jönköping (Sweden)

"*The Improvement Guide* was instrumental in helping Armstrong World Industries win the Malcolm Baldrige National Quality Award and in helping HP reach industry-leading levels of customer satisfaction and loyalty. Combined with the expertise API provides in teaching and guiding, this has proven to be a very powerful approach to achieving performance excellence."

—Bo McBee, vice president of total customer
experience and quality, Hewlett-Packard

"Dr. W. Edwards Deming provided a timeless theory for management and transformation through the application of his system of profound knowledge. The authors have masterfully answered the question, 'How do I apply the lens of profound knowledge in my business or organization?' We have used the methods and tools from *The Improvement Guide* to make improvement part of every employee's job, with terrific results."

—Roger B. Quayle, senior vice president,
CH2M HILL OMI; Malcolm Baldrige
National Quality Award Recipient, 2000

THE IMPROVEMENT GUIDE

A Practical Approach to Enhancing Organizational Performance

Second Edition

Gerald J. Langley
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Thomas W. Nolan
Clifford L. Norman
Lloyd P. Provost

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FOREWORD

I am not sure what makes a "classic," but I am sure this book is one. It is, overall, the most useful text I know for the student of the modern approach to system improvement—accessible, sensible, systematic, and remarkably complete.

My journey into the world of quality improvement began in the mid-1980s. I was responsible for reporting on the quality of health care in the largest health maintenance organization in New England, the Harvard Community Health Plan. I was classically trained as a physician and as a health services researcher and was teaching both pediatrics and health care evaluation (statistics, decision theory, cost-effectiveness analysis, and such) at Harvard Medical School and the Harvard School of Public Health. I thought that I understood quality in health care, that I knew how to assess it, and that I knew how to improve it. I was wrong on every count.

Like most people with my training, I actually knew far more about fragments than about the whole; my understanding of approaches to quality of care came from what health care experts called "quality assurance," and what W. Edwards Deming would have called (as I would soon thereafter find out) "reliance on inspection to improve." The foundational sciences of modern quality management outside health care, such as systems theory, analytical studies and the study of variation, human psychology in production systems, and the epistemology of cycles of change and learning (especially *local* cycles), were not well understood or highly honored in the world of health care. Few of us were systems thinkers and

fewer still had any theoretically grounded approach to the improvement of care beyond inspection and accountability. Health care leaders generally assumed that the growth of subject-matter expertise and scientific knowledge were sufficient for the growth of systemic capability.

Serendipity brought me under the wing of generous improvement scholars patient enough to teach me. My friend Paul Batalden started me on the path. Paul, so far as I know, was the first medical leader who really came to understand and value what Deming had to teach. Deming's four-day seminar followed (at Paul's suggestion), along with visits to world-class corporations outside health care. Most crucially for me, I formed what has since become a deep professional tie with A. Blanton Godfrey, who, when I met him, was the head of Quality Systems and Theory at AT&T Bell Laboratories. Soon thereafter he became Joseph Juran's hand-picked choice to lead the Juran Institute. In 1986, with a small grant from the John A. Hartford Foundation, Blan Godfrey and I started a National Demonstration Project on Quality Improvement in Health Care, and NDP remained for four more years the generative center of my own personal learning about improvement. I also served between 1989 and 1991 as a member of the panel of judges of the then-new Malcolm Baldrige National Quality Award, a cat-bird seat if ever there was one from which to study the best of the best in detail, in the company of some of the most capable improvement scholars and practitioners in the world.

As my network of mentors and my shelf of books grew, the field of quality management became, for me, first a country and then a continent. To this day, I remain excited by the vastness of the field and by its endlessly challenging intellectual texture. Deming's formulation of the four areas of "profound knowledge" (knowledge of systems, knowledge of variation, knowledge of psychology, and knowledge of how knowledge grows) is deceptively efficient, for it encodes more topics and more sciences than any reasonable human being is likely to master in a lifetime.

The problem is that managing quality is not just an intellectual endeavor; it is a pragmatic one. The point is not just to know what makes things better or worse; it is to make things *actually better.* In the world of manufacturing or service industries, it is organizational survival, jobs, and the fate of the consumer that all hang in the balance. In health care, it is all of that plus (sometimes) life and death. Modern quality management stands in the same relationship to the scientific disciplines of "profound knowledge" as modern medical care does to biomedical science. It is an applied field tethered to strong, formal science. Practitioners who lose touch with the science run aground; scientists who lose touch with applications fly off into irrelevance.

Moving from theory to application is so difficult that it tempts one to reach for what Deming called "instant pudding," by which I think he meant the quick and memorable formula that makes deep thought unnecessary and that takes uncertainty out of the picture. Countless consultants and airport-bookstore authors make a good living on instant pudding. It is attractive because it is easier than thinking. It is also, usually, unhelpful, at least for the long haul.

Finding the alternative to instant pudding is a daunting task: to build a bridge from the sciences of improvement to the practice of improvement without either claiming too much or collapsing too much. I wish that system improvement were simple, but it is not. Getting around is more like navigating Paris than like flying from Boston to Los Angeles.

Enter *The Improvement Guide*. I don't know how the authors did it, but they managed in this book to make proper improvement methods accessible without robbing them of their needed depth. They have neither oversimplified nor given way to the arcane. They put tools in our hands without claiming that the tools are magic.

The best of the tools is the Model for Improvement. With humility, the authors share their premise that the three questions ("What are we trying to accomplish?" "How will we know that a change is an improvement?" and "What change can we make that will result in improvement?") linked to learning through testing—the "Plan-Do-Study-Act" cycle—embed a significant proportion of the pragmatic tasks that can link system knowledge to effective redesign. This model is not magic, but it is probably the most useful single framework I have encountered in twenty years of my own work on quality improvement. It can guide teams, support reflection, and provide an outline for oversight and review; it is thoroughly portable, applying usefully in myriad contexts. The model gets even more traction with the use of the rich family of change concepts these authors have harvested from their collective experience, and that they summarize in their stunningly helpful Appendix A.

For more than a decade, I have had the privilege of working hand-in-hand with the authors of this book. They have become, and they remain, my teachers and my guides. No day in the year gives me as much professional satisfaction as a day spent with them individually or as a group, delving together into new problems at new frontiers, or, even better (when I muster the self-restraint), just standing aside quietly and watching them at their work. Encountering novices, they are patient and nurturing with the first steps of discovery; encountering journeymen, they coach with respect and joy; encountering experts, they remain ever open to the real dialogue that marks true scholars; and when they are meeting somewhere off on their own they share the thrill and camaraderie of the best

of expeditions into the uncharted. The authors are not into catechisms; they are learners, and they have never met a doctrine that they weren't willing to question every single day.

This second edition of the book is a gift to anyone in the journey to the practice and leadership of improvement. It is the mainstay text for my own teaching, and its usefulness and clarity speak to the commitment to knowledge and to open-minded inquiry that its authors model for us all.

February 2009

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PREFACE

This book is for people who want to make improvements—or more specifically, those who realize that making effective changes in how businesses are run is a matter of survival. Change is occurring so rapidly in our society that we have no choice but to embrace it and make it work in our favor. We all have a choice to make: to accept passively the changes that are thrown at us, or to use our resources to create our own changes resulting in improvement. This book should be viewed as a survival guide for people who realize the importance improvement plays in keeping an enterprise viable. It is our hope that the ideas and methods presented in this book will guide you in increasing the rate and effectiveness of your improvement efforts.

As statisticians involved in improvement since the early 1980s, we have seen many tools, methods, and techniques presented as the one best way to achieve results. Many of these approaches indeed have merit. The overall effect, however, has lacked integration. Results have been mixed. In this book we hope to provide a fundamental approach to improvement that promotes integrated improvement activities that deliver more substantial results in less time.

Since the dawn of the twentieth century, a science of improvement has emerged. The intellectual foundation for this science was recognized by W. Edwards Deming and articulated in his "System of Profound Knowledge." Practical, pragmatic examples of the application of this science have been seen in industries throughout the world. Dramatic results have been obtained. However,

this science has been applied in only a small fraction of the circumstances in which it is applicable. The purpose of this book is to describe a system of improvement based on this science that will increase substantially the number of successful applications.

In preparation for the first edition of this book, we studied the needs of people who were attempting to make improvements in quality and productivity in many diverse settings in the United States and abroad. They included manufacturing plants (for computers, food, and pharmaceuticals), hospitals, clinics, trucking firms, construction companies, law offices, government agencies, landscape architecture and maintenance firms, schools, and industry associations. As we observed or participated in these improvement efforts, we asked ourselves what methods would help increase the effectiveness and results of these efforts.

Given this context, we eagerly absorbed, enhanced when we were able, and integrated a variety of methods and approaches. In the United States, many of these approaches were introduced with much fanfare and in a way that implied the method replaced what had come before. For example, in the early 1980s the emphasis was on continuous improvement of processes throughout the organization. The idea was that everyone should have a chance to improve his or her work. This was a positive approach. The emphasis had two weaknesses, however: major subsystems—in particular, business subsystems—were not improved holistically, and the changes that were made were relatively small and produced only incremental improvement. When reengineering (major innovation in large subsystems) was introduced, it addressed those weaknesses. But it came to be seen as replacing the incremental approach to improving process rather than as supplementing it. Our approach integrates these ideas, and other worthwhile approaches, into a complete system.

Second Edition

Since the release of the first edition, we have continued to work with our customers to research the crossroads of the theory underlying improvement and the pragmatic application of fundamental improvement methods. They are the ones who kept us grounded, who helped us take a pragmatic approach to improvement. They learned and we learned. With this second edition of the book, although the underlying concepts have not changed, we feel that we have presented a much more complete and effective set of methodologies for guiding improvement efforts.

We made the following changes to the second edition on the basis of many ideas for improving the book from readers of the first edition and reviewers of the manuscript: strengthened the focus on business operations (throughout the book); laid a foundation for the science of improvement in developing, testing,

and implementing changes (Part Two); added chapters on spreading changes and improving large systems (Part Two); expanded the concepts for working with people in improvement (Parts Two and Three); provided more insight into the role and methods for leadership of improvement (Part Three); redesigned Appendix A (Change Concepts) to be more user-friendly; and added an appendix on improvement tools (Appendix B) and one for other improvement approaches (Appendix C).

ACKNOWLEDGMENTS

Many people have helped us with this work or inspired new ideas. We wish to acknowledge our clients who have shown the applicability of the ideas and methods described in this book. Their willingness to test new methods contributed greatly to the material.

Noriaki Kano first introduced us to the ideas that led to the three categories of improvement covered in Part Three. Edward de Bono's work on methods for creativity provoked some new ideas that eventually led to the list of change concepts. We were also influenced by Brian Joiner's book *Fourth Generation Management* to use stories and examples to convey substantive concepts and methods.

Ultimately, it was Deming who, in the 1980s and early 1990s, gave the world the theoretical foundation for a science of improvement with his development of the System of Profound Knowledge and who inspired us to write this book. To him we owe our deepest debt, and to his memory we once again dedicate this second edition of the *Improvement Guide*.

Finally, we heartily express our appreciation to our families for their sacrifices, which allowed us time to do our research and to write the many drafts of both editions of the book.

February 2009

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All of the authors are part of a unique professional collaboration called Associates in Process Improvement (API). The aim of the collaboration is to develop and apply methods for the improvement of quality and value. The collaboration within API has benefitted individual organizations on six continents, in many industries, and the field of quality improvement in general. The collaboration has resulted in four books, numerous articles, and thousands of presentations. Three of API's current or former clients have been recipients of the Malcolm Baldrige National Quality Award. API's roots are in the theory and philosophy of W. Edwards Deming. Members of API assisted Deming at his pioneering and influential Four Day Seminar from 1980 to 1993. API's Model for Improvement is based on Deming's body of work.

Gerald J. Langley is a statistician, author, and consultant whose main focus in both his consulting work and his research is helping organizations make improvements more rapidly and effectively. His expertise with data and computers plays a key role in this work. As a Senior Fellow of the Institute for Healthcare Improvement (IHI), Langley has served on the faculty of numerous improvement initiatives in areas such as improving medication safety, innovations in planned care, and improving service in health care, but much of his work has been focused on helping reduce health disparities in underserved populations. He earned his BS degree (1973) in mathematics at the University of Texas at Austin and his MS degree (1975)

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Ronald D. Moen is a statistician, consultant, and teacher to industry, government, health care, and education. He has MS degrees in mathematics and statistics and has given over eighty presentations and technical papers throughout the United States, Canada, Mexico, Europe, Africa, and Asia over the last thirty-five years. He is coauthor of the book *Quality Improvement Through Planned Experimentation,* 2nd edition (McGraw-Hill, 1998) and *Quality Measurement: A Practical Guide for the ICU* (HCPro, 2003). He is the 2002 recipient of the Deming Medal.

Kevin M. Nolan is a statistician and consultant with API. He earned a BS degree in mechanical engineering from the Catholic University of America and MA degrees in measurement and in statistics from the University of Maryland. Nolan has assisted manufacturing, service, and health care organizations to accelerate their rate of improvement. As a Senior Fellow of the Institute for Healthcare Improvement (IHI), he has served on the faculty of numerous improvement initiatives, including improving hospitalwide patient flow and improving performance in emergency departments. He has also supported a number of large-scale spread projects. He is the co-editor of the book *Spreading Improvement Across Your Healthcare Organization* (Joint Commission Resources, 2007).

Thomas W. Nolan is a statistician, author, and consultant. Over the past twenty years, he has assisted organizations in many industries in the United States, Canada, and Europe, including chemical and automotive manufacturing, distribution, health care, and social services. Among his clients is a recipient of the Malcolm Baldrige National Quality Award. Nolan holds a doctorate in statistics from George Washington University. He has published articles in a variety of peer-reviewed journals as diverse as the *Noise Control Engineering Journal* and the *British Medical Journal.* He was the year 2000 recipient of the Deming Medal awarded by the American Society for Quality.

Clifford L. Norman, an author and international consultant with API, earned both his BS degree (1975) in police science and business administration and MA (2002) in behavioral science from California State University. He has held management positions for more than fifteen years in manufacturing and quality positions with Norris Industries, McDonnell Douglas, and Halliburton. Since 1986, Norman has worked internationally in computer, health care, and manufacturing industries using improvement as a business strategy while developing internal consultants for these organizations. Norman helps organizations build productive relationships while viewing the organization as a system, and helps to develop their use and understanding of analytic statistical methods following the Model for Improvement. As an improvement advisor and faculty member for

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Lloyd P. Provost is a statistician, advisor, teacher, and author who helps organizations make improvements and foster continuous learning and improvement. His experience includes consulting in planning, management systems, planned experimentation, measurement, and other methods for improvement of quality and productivity. He has consulted with clients worldwide in a variety of industries, including health care, chemical, manufacturing, engineering, construction, automotive, electronics, food, transportation, professional services, retail, education, and government. Much of his current work is focused on health care improvement in developing countries. He has a BS in statistics from the University of Tennessee and an MS in statistics from the University of Florida. He is the author of several papers relating to improvement and coauthor of *Quality Improvement Through Planned Experimentation,* 2nd edition (McGraw-Hill, 1998). He was awarded the American Society for Quality's Deming Medal in 2003.

INTRODUCTION

THE IMPROVEMENT GUIDE, SECOND EDITION

Because of interest in creating better continuity between patients and providers, a rural health care organization held a meeting to explore ways to increase continuity. (*Continuity* here means the percentage of times that a patient sees his or her own doctor, as opposed to another provider.) The organization had a small hospital with an emergency room (ER), a drop-in urgent care (UC), and an appointment-based day clinic. The organization for many years used a system of rotating providers through all four services (hospital, ER, UC, and three day-clinics).

At the meeting, one of the new doctors asked if it would be possible to not rotate providers through all four services, but rather have assigned providers for each service type. The idea was not well received by the leadership at the meeting: "We will lose providers if we do that. They all want the diverse experience. Patients are better served by well-rounded providers. It would not be fair for those assigned to the ER, because of the on-call nature of that work and the long weekend hours. This burden should be shared by all."

Someone else at the meeting said, "Didn't Dr. Shear quit last year because he wanted to be a full-time ER doc?" The new doctor followed that with, "My patients cannot get in to see me in the clinic because my schedule fills up so fast. I'm only in clinic four days per month. Instead, many of my patients try to see me at urgent care on the days I'm there, even though the wait is usually many hours. They do this because they know they can see me there. To get a

scheduled appointment at the clinic, they normally have to accept an appointment with another provider."

Leadership responded: "We should be able to improve the situation by telling the schedulers to focus more on putting patients with their assigned providers when an appointment at the clinic is being scheduled. Also, we can send a notification to all patients encouraging them to schedule appointments in advance so that they can see their provider."

Much discussion ensued, and it became obvious that the issues could not be fully resolved at the meeting. So, when the medical director suggested that they try the idea in a very small trial, everyone agreed. They decided to ask for two providers to volunteer to be assigned full-time to one of the three clinics for one month. In addition, it was decided to survey all the providers to see if they had a preference for rotating versus not, and if not, which of the four service areas they would prefer.

At the end of the month, they held another meeting and discussed the results. They had collected data on several important aspects of the clinic: continuity, no-show rate, patient reaction/satisfaction, staff satisfaction, and several clinical measures, among them screening rates for depression, smoking status, follow-up on referrals and so on. Although the time period was short at just one month, the results were already overwhelmingly positive. It was clear that for the two providers in the test fewer of their patients went to urgent care during the month and their patients commented that they were able to get appointments in the clinic that were convenient for them and with their provider.

How can you make changes that will lead you in a new direction? With the small hospital in this case, the desired change was patients being able to see their primary care provider in the day clinics, so that patients could have better continuity with their provider. All improvement requires change, but not all change will result in improvement. The application of the concepts and methods described in this book is meant to increase the chance that a change will actually result in sustained improvement from the viewpoint of those affected by the change. Because of the central role of change in improvement, it is useful to contemplate what is meant by change and how it comes about.

People use the word *change* all the time, but it can mean many things. We change our clothes. We change a tire on our car when we have a flat, and the oil in the engine when it is dirty. We change a light bulb after it burns out. All of these changes are really reactions to things wearing out or breaking, reactions to problems. It is important to react to special situations when they happen, but this is not usually a source of improvement.

The provider scheduling case illustrates some common reactions to problems. The leadership's first reaction was to defend the status quo. The system is running

the best it can, given the external limitations that are present. They were sure a change would make the situation worse.

The leadership's second reaction was to simply exhort the schedulers and patients to do better. They hoped for improvement without real change. Somehow, the situation would just get better on its own. One can easily imagine the undesirable consequences had they continued this behavior. Bad situations left unchanged usually do not stay the same; they get worse.

Despite these reactions, an idea was finally developed and tested that resulted in a very successful change to the provider scheduling. The characteristics of this development illustrate some of the more useful ways of making improvements:

- The change was innovative (relative to the current system); it fundamentally changed the system for the better.
- The idea was tested first on a small scale for one month to increase the degree of belief among the participants that the change would be an improvement.
- The change did not require undue restrictions on providers, staff, or patients; nor did it add any requirements or resources.
- The change actually resulted in a simpler scheduling system, to the benefit of the organization and patients; it did not add additional complexity.

This book is primarily concerned with improvements in business and other work settings. The objective embraced by many organizations can be stated succinctly: make changes that result in improvement from the viewpoint of the customer. In nonbusiness settings, "customer" could be replaced with "beneficiary," "organization's purpose," "family," or "individual." What is so difficult about accomplishing this objective? Why the need for this book, and others about improvement? These are some of the difficulties that arise in putting this objective into practice:

- Taking the time to meet the objective—time that may currently be devoted to carrying out the day-to-day business and solving pressing problems.
- Thinking of a change that anyone would predict is an improvement. When trying to develop a change, people often have difficulty imagining how tasks could be done or results be accomplished differently from the way things are currently done.
- Motivating participation in change. Even when an innovative change is suggested and shows promise, it is difficult to get others to try the change and adapt themselves to the new situation.
- Recognizing when a change is an improvement. The goal of this book is not change for the sake of change. The goal is improvement. No matter how long you ponder a change and plan for its implementation, you cannot be absolutely

sure that improvement will result. Changes must be tested, preferably on a small scale, and even well-designed tests do not guarantee certainty.

- Satisfying diverse or changing viewpoints. Customers may have varying viewpoints about what constitutes an improvement. Customers are free to change their mind whenever they choose. What is desirable today may be undesirable tomorrow because of advances in competitors' products or services.

You can no doubt add to this list, and despair at the thought of trying to make significant progress. While these difficulties are real, they can be overcome. Helping people surmount these difficulties is a primary focus of this book.

Why Take the Initiative?

Why should you bother with making changes? Why not simply deal with problems as they arise and try to maintain the status quo? The theme of this book is making changes that (1) will not happen unless someone takes the initiative, and (2) will have a significant long-term positive impact. Change is happening all around us, in all aspects of our lives. Information is moving faster than ever. The skills needed to earn a living are rapidly changing. Many of the concerns that were important in our lives and businesses ten years ago have been replaced with new concerns. What are our choices in light of all this change?

In business, there is only one choice: change faster and more effectively than your competitors, or you are gone. As the U.S. automobile industry found out in the seventies and eighties, being the biggest on the block does not ensure success. Japanese auto manufacturers developed better cars more quickly than Detroit thought possible. The U.S. automakers had to learn how to make improvements. They are still learning.

Ultimately, the answer to the question "Why change?" is "You do not have a choice." Change is going to happen. The choice you have is to let the change happen to you, or be more proactive and make the changes. Once you have made this decision, the methods and skills described in this book will help make your efforts more successful.

How Is This Book Different?

Some practical, pragmatic approaches to the improvement of quality and productivity that rely heavily on the elements of knowledge in Deming's framework have been developed in Japanese and U.S. industries and in other countries throughout

the world. Kauro Ishikawa, Joseph Juran, and W. Edward Deming have been instrumental in documenting these approaches since the 1950s.

For an organization to be successful at improvement, it needs the will to improve, ideas for improvement, and the skills to execute the changes. This book focuses on the development of ideas for improvement and the skills and methods to execute change. Although our experience has shown that the act of making changes that result in improvement can also build will in an organization for change and improvement, the main responsibility for building the will for change belongs to the leadership of the organization. In Part Three of this second edition of the book, we have added material for leadership and building will.

The theory underlying the science of improvement (Chapter Four of Part Two) is interesting in itself. But improvement comes from action: from developing, testing, and implementing changes. These basic components of a system of improvement are dealt with in detail in this book. A brief introduction to the issues that will be addressed is given here.

Model for Improvement

The foundation of this system is a framework that we call the Model for Improvement. The model is based on three fundamental questions:

- What are we trying to accomplish?
- How will we know that a change is an improvement?
- What changes can we make that will result in improvement?

The questions define the endpoint. Any effort to improve something should result in answers to these questions. The answers could be obtained in a variety of ways depending on the complexity of the situation and the inclinations of those doing the work. These three questions are combined with the Plan-Do-Study-Act (PDSA) Cycle to form the basis of the model. We designed the model to be flexible and comprehensive, because we observed some of the inhibiting aspects of the rigid, step-by-step approaches to improvement that have been in use.

Change Concepts

Another aspect of our approach that makes this book different from others is our focus on change. Much of the book is concerned with developing, testing, implementing, and spreading changes. We recognized some time ago the fundamental relationship between improvement and change. By this we mean

specific, identifiable changes, not broad or vague organizational or cultural change. The rate and extent of improvement is directly related to the nature of the changes that are developed and implemented. It is through this focus on developing substantive change that the *art* of improvement is combined with the *science* of improvement.

Developing changes that are new, by definition, requires a creative effort. Just for clarification, we want to point out that in most cases the use of the singular word *change* could be replaced with the plural *changes*. This is because in almost every situation change is not a simple switching of only one characteristic but rather of a grouping of changed characteristics (expanded in Chapter Seven of Part Two). However, for the sake of simplicity we have attempted to use the singular *change* except in cases where the plural is needed to indicate discrete efforts.

To assist people in making changes, we have suggested a variety of methods. Particularly noteworthy is our list of seventy-two change concepts contained in Appendix A. Three examples of change concepts are smoothing the flow of work, scheduling into multiple processes rather than one, and building in consequences to foster accountability. This catalogue of change concepts, along with real-life examples, is a major contribution to the science and art of improvement. This list allows beginners to have at their disposal concepts of change that would, up to this point, only have been found in the heads of some of the world's most experienced practitioners in improvement.

Developing a Change

Some common approaches to developing a change, which are well intentioned but misguided, are making changes only in response to problems, developing changes that are "more of the same," and trying to develop the perfect change. The old saying, "If it ain't broke, don't fix it" is not a recipe for improvement. In a dynamic world, making changes only in reaction to problems leads to decline. To counteract or take advantage of forces in the market or changes in society, individuals and organizations must continuously look for different and better ways to accomplish their goals. Organizations that are averse to change are often slow to recognize a problem, and they may not recognize it until it is too late. Their inclination to avoid change, and their lack of practice in making real change, can cause them to deny the need for change even as a crisis approaches.

Many people who are unskilled in improvement react to the need for change by advocating more of the same: more people, more time, more money, more equipment. If crime increases, build more prisons. If sales decline, spend more on advertising. If profits decrease, work longer hours. If test scores decline, lengthen