Foreword

"*What problem are you trying to solve*?" Those are the most common words uttered by the most esteemed lean sensei and the words that author Art Smalley's first mentors in Toyota peppered him with repeatedly—over and over. Now Art asks you the same question, to consider the deeper meaning of it, and how you might address it in different situations.

Certainly, we have no shortage of problems today: serious problems, human problems, social problems, business problems—not to mention minor niggling problems of the sort that merely annoy. Every organization in every sector encounters problems daily that it confronts, avoids, or—the biggest problem—fails to recognize. Naturally, we want to solve each problem we face. There are many books and training programs on problem solving, and you have probably read many of the books and attended such training.

Problem solving as an organizational or human skill seems to be stuck in first gear, or worse, to have slipped into reverse. That's why we think it's time to step up and help others understand and coach the art and science of effective problem solving.

Why Problem Solving?

Problem solving may be the most fundamental of human activities. We breathe, we eat, we sleep. Breathing and sleeping just happen. Then we get hungry or we might get cold. Those are our first problems to solve—how to find something to eat or how to stay warm. Solving problems is how we learned to think. To be human is, quite literally, to solve problems. How to solve problems effectively is fundamental to the reality of our daily existence. And it is certainly fundamental to what it means for us as we organize ourselves for industrial endeavors.

For any company pursuing any form of improvement, problem solving is vital. An organization with only pockets of problem-solving ability will struggle in the long run. An organization with an army of problem solvers is much better suited to face the challenges of the competitive marketplace. For this book that's our starting point—problem solving as part and parcel of industrial endeavor.

Industrial problem solving has been around as long as industry. Seasoned problem solvers know that there is little new under the sun. Logic, critical thinking, mathematics, and quality tools have played large roles in the development of modern problem solving. The industrial revolution was in itself a problem-solving effort on a grand scale of how to be more productive. Humans came to live in ever-larger communities, producing goods that both satisfied demand and created more of it. Demand for ever-greater efficiency to make things better led directly to the need for problem solving on a very practical level.

> *You learn through solving problems, failing, reflecting on failure, and adjusting course.*
>
> – Steve Jobs[1]

The Intent of This Book

Our primary objective with this book is to present a comprehensive body of problem-solving knowledge in a format that is easy for beginners to grasp yet useful even for advanced practitioners. We have several specific goals in mind:

- *Create a problem-solving reference*: This is an "owner's manual" for individuals and teams working at solving problems. In every new car you will find an owner's manual in the glove box. You don't need to look at it every day, but when you are in trouble, it is a wonderful thing to have. Think of this as your quick and handy owner's manual for problem solving. It can help you understand your problem and find the means to solve it—or when truly in doubt about the course of action, make you more aware of the kind of problem you are trying to solve and reset your approach.
- *Develop problem-solving skills*: Problem solving must be an essential part of the DNA of any aspiring lean organization. It is a fundamental lean principle—anyone at any level should be able to think critically about work and solve problems on the job. All skill-intensive endeavors require practice and honing of technique over time—the same is true for the skill of problem solving.

1. Steven Levy interview of Steve Jobs, "Good for the Soul," *Newsweek*, Oct. 6, 2006.

- *Speed improvement*: We hope this book can speed you along your improvement journey. That's really what it's all about, right? Moving from any current state to an improved state is a transitional journey. Problems will arise. It is our duty to solve them effectively and efficiently to create better value-creating processes for our customers.

Content and Flow of This Book

The contents and perspectives of this book borrow considerably from Toyota Motor Corporation, where problem solving is truly core to the company's DNA. Employees who work there long enough eventually learn the thinking and most of the methods presented here. We'll highlight critical fundamental thinking and approaches, specific skills to be mastered, and some skills that go beyond the basics. Industrial problem solving has roots that formed long before Toyota. There are many styles of problem solving throughout history that continue to contribute to the methods of modern problem solving.

Your guide for this deep dive into problem solving is Art Smalley. Art has immersed himself into the intricacies of problem solving since 1988, when he joined Toyota at its Kamigo Engine Plant in Toyota City, Japan. Taiichi Ohno was plant manager at Kamigo and it was there that he conducted many of his famous experiments that led to the development of the Toyota Production System. Art learned directly about problem solving from Tomoo Harada, who led the maintenance activities that created the stability that enabled Ohno's innovations in flow to succeed on a large scale. Without basic stability there is no just-in-time; without problem solving there is no basic stability. It was Harada that first asked Art that fateful question: "What problem are you trying to solve?"

Art's study of problem solving continued from there, including apprenticeships with master problem solvers Russ Scaffede and Isao Kato, consulting work with clients including Sandia National Laboratories and Donnelly Corporation, and collaboration with Durward Sobek on *Understanding A3 Thinking*, an important resource for the lean movement. With this book, Art gives you a backbone and breadth of problem-solving concepts and ideas, as well as tactical tools to tackle the problems you encounter. (*Note*: The pronoun "I" is used in this book to relay Art's personal experiences; the "we" is used to describe the perspective of lean thinkers on problem solving.)

Types of Problem Solving

The many problems that confront us can be effectively approached through four types of problem solving. Some essential elements are common to any problem solving activity (grasping the true facts, identifying desired direction, seeking to understand causality). Capability in these four approaches enables an organization to attain stability, sustain gains, and advance steadily towards its goals and visions. The four types are:

1. *Troubleshooting*: a reactive process of rapidly (and often temporarily) fixing problems by quickly returning conditions to immediately known standards or normal conditions.

   → When you get a flat tire, change it.

2. *Gap-from-standard problem solving*: solving problems at root cause in relation to existing standards or conditions.

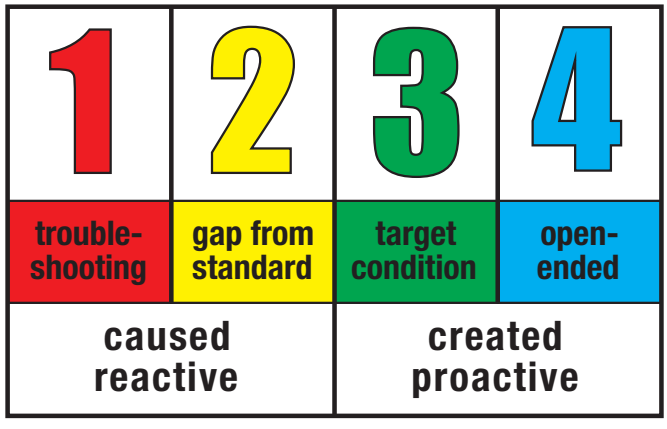
   → When you find you are suddenly getting flat tires every week, find out why.

3. *Target-state problem solving*: removing obstacles toward achieving a well-defined vision or new and better standards or conditions (i.e., kaizen or continuous improvement).

   → Determine that you are sick of getting flat tires and look for a better tire.

4. *Open-ended problem solving and Innovation*: open-ended pursuit of a (perhaps) vision or ideal conditions (new products, processes, services, or systems).

   → Ask why not make tires that run flat?



The four types didn't appear suddenly from nowhere: Similar to the laws of physics, many of the problem-solving concepts developed in the past have been proven out by decades of efficacy. They also are embedded in more modern problem-solving approaches. Knowing more about these influences (presented in the *Introduction)*, can help us understand and better leverage a variety of problem-solving tools.

Basic steps of fundamental problem solving: Two of the types—gap-from-standard (Type 2) and the target-state (Type 3)—account for a many business problems and can be approached using seven or eight common problem-solving steps. For these two types we dig deeper into standard problem-solving routines, offer a somewhat prescriptive approach, and help you to work through each step as you tackle real problems in your organization.

Is Problem Solving the Problem?

Are problems ever really solved? Problems, barriers, challenges or opportunities—whatever you typically call them—come at us continuously. Many are trivial; some are tragic. Many are simple, the cause and course forward are obvious. Many, especially in today's increasingly connected world, are extraordinarily complex. Everything is connected to everything else. Change one thing and you change the whole. Russell Ackoff taught us about addressing problems within the context of complex systems:

> Managers are not confronted with problems that are independent of each other, but with dynamic situations that consists of complex systems of changing problems that interact with each other. I call such situations messes. Managers do not solve problems, they manage messes. (They need the skill of) designing a desirable future and inventing ways of bringing it about. (1979)

Ackoff even offered his own four ways to go about solving problems, though his departure angle was quite different from the four types presented here. Ackoff encouraged an escalation of *absolution*, *resolution*, *solution*, *dissolution*—a gamut that runs from ignoring to preventing problems. Ackoff's fours ways of addressing problems could be applied to each of the four types of problems.

To add to the confusion, modern thought leaders, such as Margaret Wheatley and David Cooperrider, argue that old-fashioned root cause problem solving is worse than merely worthless in today's complex world—it is misleading and results in worsening most problem situations. Wheatley suggests that the aggressive cultures that pervade most modern organizations exacerbate problems as individuals retreat into self-protection, rather than join together to tap effectively into the collective power of the group. Noting that "Organizations today suffer from a severe disability when it comes to solving problems," Wheatley argues that humility, curiosity, and a willingness to listen are the keys to more effective problem solving for organizations dealing with complex situations.[2]

Cooperrider offers a process called *Appreciative Inquiry* to counter the phenomenon that problems today simply cannot be "solved" with traditional cause and effect thinking or any problem solving approach that departs from a negative perspective. Rather than solve problems looking backward, focus on what works well and focus efforts of optimizing those things. Allow problems to disappear as they are steadily replaced by the positive.

We fully appreciate these arguments that recognize the limitations of traditional root cause problem solving techniques. But rather than an *either–or*, isn't it more a matter of *both–and*? Don't these conditions call for us to embrace a multiplicity of approaches? One size doesn't fit all. With his CYNIFN framework, David Snowden offers a powerful argument that the world comes at us in fundamentally different ways, that call for different types of responses. There is a place for the old fashioned "fix-it-now" methods and for sophisticated approaches for complex situations. We don't solve problems, we address them—sometimes we manage them, sometimes we solve them. We apply countermeasures that invariably create a new situation that calls for its own assessment and countermeasures.

We think the four types framework is useful especially in context of the insightful observations of Ackoff and others. Author Art will show how old-fashioned cause and effect thinking is indeed still useful and has its place within the context of complex situations. But to expect simple root cause problem solving to be effective in eliminating socio-technical or political messes is misleading at best.

2. Wheatley, Margaret and Geoff Crinean, "Solving, not Attacking, Complex Problems" on margaretwheatley.com, 2004.

To help explore the challenges of addressing problems in more complex and uncertain environments, such as product development and innovation, Art calls on two lean community thought leaders, Durward Sobek and Matthew May, who offer structured approaches to the effective application of lean thinking in situations of high uncertainty and complexity.

What doesn't change with complexity and uncertainty is the need to observe for understanding, to take action with an eye to comprehending the effect of actions taken, and ceaselessly going through the cycle to learn and progress. Sometimes the cycle is quick with clear steps and results; other situations require ample time to work through, often mired in messiness until the breakthrough comes to light.

Using this Book

Even if you have years of problem solving experience and know many problem-solving approaches, read this book at least once end-to-end. I'm betting that you will learn things you did not previously know and that you may look at familiar concepts in a new light. Most importantly, please do not merely read this book and put it on a shelf, never to be touched again. Pull it out periodically, whenever you need:

- *Help when you are stuck*. We can't always readily remember every detail of how to best define a problem with rigor or how to conduct a thorough root-cause analysis. Think of this book as an "owner's manual" for reference in those occasions.

- *A team guide*: Keep a copy of this book in team rooms or any project area where problem-solving meetings occur. Each chapter includes questions for you and your colleagues to reflect upon and address. This is not a canned "problem solutions" book; no one can solve your problems except you and your team.

- *A coaching reference*: Try using this book to more effectively coach and mentor teams. Simply asking directly any old question (even the venerable "What problem are you trying to solve?") is not enough when coaching in difficult problem situations and mentoring to develop deep problem-solving skills.

Master problem-solving coaches are like good sports coaches or martial arts instructors: they know the what, how, and why to do activities and could readily demonstrate the craft when necessary. Such coaching includes asking very specific questions or providing very specific technical and social insights, as dictated by the situation. This interaction between mentor and mentee is highly situational and dependent upon the learner, the complexity of the situation, and the needs of the organization.This book provides knowledge for those who will be coaching others through problem solving, knowing that it takes time and effort to develop the necessary skills to address the multitude of situations that arise—no one size fits all in coaching or problem solving.

Most importantly, the *4 Types Framework* is a self-reflection structure for managers to assess and understand their organization's problem-solving capability. What we're really talking about is creating capability, the capacity of an organization to tackle anything that comes its way, any obstacle that comes between us and where we want to go. In fact, problems are never truly "solved" forever; having solved one problem or resolved the challenges of one situation, the newly created condition will bring its own problems or sets of issues.[3] Tackling them one-by-one is what gives an organization capability for deep adaptability. Indeed, we could call this entire practice *problem tackling* rather than problem solving.

Through observations and interactions with hundreds of companies, LEI has learned that "problem solving" is part and parcel of the very meaning of any lean organization. The *Lean Transformation Framework* (LTF) argues that addressing problems is fundamental to the very existence of any organization, and skill in problem solving at every level is key to meeting its purpose. This purpose is an existential question at the founding of any enterprise, and a practical question that informs every action, at every level going forward.

The LTF asks you to consider the following questions:

1. What is your purpose, your problem to be solved?
2. What is the work to be done, and how can you improve it?
3. What are the needed capabilities and how will you acquire or develop them?

3. See "Countermeasures vs. Solutions," page 65, *Managing To Learn.*

4. What is the management system (the operating system and leader behaviors) required?
5. What is the basic thinking, with its underlying assumptions and mind-sets, that informs the current and future of the enterprise?

The first question above addresses the fundamental problem directly (essentially the reverse of Clay Christiansen's "Job To Be Done"). Each subsequent question probes for deeper and deeper clarity of its own problem to be addressed. It is through tackling these LTF questions that enterprises survive and thrive.

With this book, LEI is addressing a fundamental problem of its own—how to support the development of better problem solving organizations and individuals. And so the problem-solving process at LEI includes a feedback loop from end users for us to learn what works, what does not work, and how certain tools actually get applied. We look forward to learning how you actually use this book, and learning how well we have addressed our problem.

John Shook
Cambridge, Massachusetts
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No one has more trouble than the man who claims to have no trouble.

Taiichi Ohno