"How any organization in any industry can progress from old-fashioned management by results to a strikingly different and better way."

—James P. Womack, Chairman and Founder, Lean Enterprise Institute

TOYOTA KATA

MANAGING PEOPLE FOR IMPROVEMENT, ADAPTIVENESS, AND SUPERIOR RESULTS

MIKE ROTHER

Bestselling coauthor of *Learning to See*

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Foreword

Mike Rother's *Toyota Kata* is a rare and exciting event — a book that casts entirely new light on a much heralded set of management practices, giving those practices new significance and power. Countless people in the past 20 or more years have studied and written about Toyota's wildly successful management thinking and practice. But paradoxically, despite the vast amount of knowledge presented in these works, no organization outside Toyota's family of companies has ever come close to matching Toyota's stellar performance. There is a widespread feeling that something Toyota does is still not understood and put into practice by non-Toyota companies.

Toyota Kata will change all that. In this book, Mike Rother penetrates Toyota's management methods to a depth never before reached. In doing so, he offers a set of new ideas and practices that enables any organization, in any business, to do what it takes to match Toyota's performance.

This is not the first book in which Mike Rother presents path-breaking insights into Toyota. He advanced the business world's understanding of Toyota's methods light-years in his 1998 book *Learning to See*, coauthored with John Shook. A brief look at the message of

Learning to See explains how *Toyota Kata* advances that understanding yet another order of magnitude.[1]

Learning to See describes and explains a mapping tool Toyota uses to "see" how work moves from the start of production to delivering finished product to the ultimate customer. Known inside Toyota as "material and information flow mapping," Rother, Shook, and publisher Jim Womack renamed Toyota's tool "value-stream mapping" and explained it for the first time in their book. Thanks to the enormous success of *Learning to See*, value-stream mapping became one of the most widely used tools to teach and practice Toyota's vaunted production system.

With the value-stream mapping tool, Rother and Shook show how to use many of Toyota's well-known techniques systematically to change a conventional batch-oriented mass-production factory flow — replete with countless interruptions and massive delays—into a flow resembling what one finds in a typical Toyota factory. Familiar names for some of these techniques are *takt time, andon, kanban, heijunka,* and *jidoka.* For most students of Toyota, *Learning to See* was the first extensive and clear explanation into how to use Toyota's techniques to improve across an entire facility.

That book, however, does not explore why and how these techniques evolved, and continue to evolve, at Toyota. Although *Learning to See* provides a monumental step forward in understanding how Toyota achieved the remarkable results it has enjoyed for over 50 years, it does not reveal why others, after implementing Toyota-style techniques, still seem unable to emulate Toyota's performance. How does Toyota develop its solutions? What specific process do they use? Now, in *Toyota Kata: Managing People for Improvement, Adaptiveness, and Superior Results*, Mike Rother shows us this next vital layer of Toyota practice.

The central message of *Toyota Kata* is to describe and explain Toyota's process for managing people. Rother sets forth with great clarity and detail Toyota's unique improvement and leadership routines, or *kata*, by which Toyota achieves sustained competitive advantage. The transformative insight in *Toyota Kata* is that Toyota's "improvement

kata" and "coaching kata" both transcend the results-oriented level of thinking inherent in the management methods still used in most companies in the Western world.

The findings in *Toyota Kata* confirm my own interpretation of what I observed so often in Toyota operations since my first study mission to Toyota's giant facility (TMMK) in Georgetown, Kentucky, in 1992.[2] What distinguishes Toyota's practices from those observed in American and other Western companies is their focus on what I call "managing by means," or MBM, rather than "managing by results," or MBR. As far back as 1992, I learned from President Fujio Cho and members of his management team at Georgetown that Toyota steadfastly believes that organizational routines for improvement and adaptation, not quantitative/financial targets, define the pathway to competitive advantage and long-term organizational survival.

In this era, business organizations also have a great influence on the nature of society. How these organizations operate and, especially, the ways of thinking and acting they teach their members define not only the organizations' success but great swaths of our social fabric as well. While a rapid advance of knowledge about human behavior is now under way, those scientific findings are still too far removed from the day-to-day operation of our companies. Business organizations cannot yet access and use them to their benefit in practical ways. Because *Toyota Kata* is about developing new patterns of thinking and behavior in organizations, it provides a means for science to find application in our everyday lives. The potential is to reach new levels of performance in human endeavor by adopting more effective ways of working, and of working together.

In my opinion, the greatest change Mike Rother's *Toyota Kata* can bring to the non-Toyota business world is to replace traditional financial-results-driven management thinking with an understanding that outstanding financial results and long-term organization survival follow best from continuous and robust process improvement and adaptation —not from driving people to achieve financial targets without regard for how their actions affect processes. What has prevented this change from happening before now is the lack of a clear and comprehensive

explanation of how continuous improvement and adaptation occur in Toyota, the only company I know in the world that truly manages by means, not by results. That explanation is now available to anyone who studies Mike Rother's findings and message in *Toyota Kata*.

H. Thomas Johnson
Portland, Oregon
Spring 2009

Notes

1 Mike Rother and John Shook, *Learning to See: Value Stream Mapping to Add Value and Eliminate Muda* (Cambridge, Massachusetts: Lean Enterprise Institute, 1998).
2 I recount my findings from these study missions in Chapter 3 and other parts of H. Thomas Johnson and Anders Broms, *Profit Beyond Measure: Extraordinary Results Through Attention to Process and People* (New York: The Free Press, 2000; and London: Nicholas Brealey Publishing, 2000 and 2008).

Acknowledgments

Thank you to the many dozens of people who have given me access to their companies and factories, who worked with me or in parallel in testing ideas, engaged in discussion about what we were learning, critiqued my thoughts, and were happy to keep going.

This book also reflects an ongoing dialogue with an ardent group of fellow experimenters, whom I count as colleagues, mentors, and friends. Thank you to: John Shook (who was coincidentally preparing a book on a related topic), Professor H. Thomas Johnson (Portland State University), Dr. Ralph Richter (Robert Bosch GmbH), Gerd Aulinger (Festool), Jim Huntzinger, Professor Jochen Deuse (Technical University Dortmund), Dr. Andreas Ritzenhoff and Dr. Lutz Engel (Seidel GmbH & Co. KG), Tom Burke and Jeff Uitenbroek (Modine Manufacturing Company), and Keith Allman (Delta Faucet Company).

Thank you also to a few exceptional people who over the years have given me support, input, or guidance that opened doors, moved my horizons, and created new possibilities: my wife, Liz Rother, Dr. Jim Womack (Lean Enterprise Institute), Professor

Daniel T. Jones (Lean Enterprise Academy), Mr. Kiyoshi Suzaki, Professor Jeffrey Liker (University of Michigan), and my daughters, Grace and Olivia.

And, last but not least, a deep bow to Toyota for giving us such an interesting subject about which to learn.

Introduction: Transforming Our Understanding of Leadership and Management

Imagine you have a way of managing that generates initiative among everyone in the organization to adapt, improve, and keep the organization moving forward. Imagine that although this method is different from how we currently manage, it is ultimately not difficult to understand. That is the subject of this book, which describes a way of bringing an organization to the top, and keeping it there, by influencing how everyone in it, yourself included, thinks, acts, and reacts.

In many organizations there is an unspoken frustration because of a gap between desired results and what really happens. Targets are set, but they are not reached. Change does not take place.

The music industry's major labels, for example, were broadsided by digital music downloads, even though the widespread popularity of compiling homemade mix cassettes, starting over 30 years ago, indicated that the market was there. For several decades Detroit's automakers chose not to focus on developing smaller, more efficient vehicles for their product portfolios, despite repeated signals since the 1970s that there was a growing market for them. More recently, PC industry giants were late to develop compact, Internet-oriented laptops tailored for Web surfing, e-mail, sharing photos, downloading music, and watching videos, even though many people, sitting in plain view in coffeeshops, use their laptop primarily for these tasks.

Our reaction to the fate of the music industry, the automakers, the PC companies, and hundreds of organizations like them is predictable: we blame an organization's failure to adapt on poor decision making by managers and leaders, and we may even call for those leaders to be replaced. Yet can there really be so many managers and leaders who themselves are the problem? Is that the root cause? I can assure you that we are on the wrong path with from-the-hip assertions about bad managers, and that hiring new ones, or more MBAs, is not going to solve this problem.

So what is it that makes organizations fall behind and even totally miss the boat, and what can we do about it? What should we change, and *to* what should we change it? Once you know the answers to these questions, you will be even more capable of leading and managing people, and of ensuring that your organization will find its way into the future.

Most companies are led, managed, and populated by thoughtful, hardworking people who want their organization, their team, to succeed. The conclusion has become clear: it is not the people, but rather the prevailing *management system* within which we work that is a culprit. A problem lies in how we are managing our organizations, and there is a growing consensus that a new approach is needed. But we have not yet seen what that change should be.

Business authors sometimes suggest that well-established, successful companies decline, while newer companies do well, because the new companies are not encumbered by an earlier, outmoded way of thinking. On the surface that may seem true, but the important lesson actually lies one step deeper. The problem is not that a company's thinking is old, but that its thinking does not incorporate constant improvement and adaptation.

Drawing on my research about Toyota, I offer you a means for managing people, for how leaders can conduct themselves, that is demonstrably superior to how we currently go about it. I am writing for anyone who is searching for a way to lead, manage, and develop people that produces improvement, adaptiveness, and superior results. You may be an experienced manager, executive, engineer, or perhaps you are just starting to learn about or practice management. Your organization

may have only a few people or it may have thousands. You are successful, but you want to be better and still relevant tomorrow.

With that in mind, here is my definition of *management*:

> *The systematic pursuit of desired conditions by utilizing human capabilities in a concerted way.*

Since we cannot know the future, it is impossible to say what sort of management systems we will be using then. However, precisely because we cannot see ahead we can argue the following: that an effective management system will be one that keeps an organization adjusting to unpredictable, dynamic conditions and satisfying customers. Situations may always be different from place to place and time to time, so we cannot specify in advance what should be the content of people's actions. Leading people to implementing specific solutions such as assembly cells, Six Sigma tools, *kanban*, diesel or hybrid power trains, today's high-margin product, and so on will not make an organization adaptive and continuously improving. Of greater interest is how people can sense and understand a situation, and react to it in a way that moves the organization forward.

One of the best examples we currently have of an adaptive, continuously improving company is Toyota. Of course, Toyota makes mistakes too, but so far no other company seems to improve and adapt—every day in all processes—as systematically, effectively, and continuously. Few companies achieve so many ambitious objectives, usually on time and within budget.

How Does Toyota Do It?

We have known for a long while that Toyota does something that makes it more capable of continuously improving than other companies, and by now we have recognized that it lies in its management approach. But how Toyota manages from day to day and thereby embeds continuous improvement and adaptation into and across the organization has not yet been explained.

That is about to change.

In the ongoing effort to understand and describe what Toyota is doing, most books provide lists of the organization's practices or principles. The individual points may all be correct, yet making lists circumvents explaining how Toyota manages people, and as our now 20 years of unsuccessfully trying emulate Toyota's success shows, such lists are not actionable. This is because an organization's collection of practices and principles at any point in time is an *outcome* that springs from its members' routines of thinking and behavior. Any organization's competitiveness, ability to adapt, and culture arise from the routines and habits by which the people in the organization conduct themselves every day. It is an issue of human behavior.

The evidence of the last 20 years indicates that trying to copy or reproduce another company's tools, techniques, or principles does little to change an organization's culture, its way of doing things. For example, how do you get people to actually live principles? On the other hand, focusing on developing daily behavior patterns *is* a leverage point because, as the field of psychology shows us, with practice, behavior patterns are changeable, learnable, and reproducible.

What has been missing, and the gap that *Toyota Kata* fills, is a look inside the engine room, that is, a clear explanation of daily behavior patterns at Toyota and how they are taught. By describing these underlying thinking and behavior routines, *Toyota Kata* establishes the context within which the Toyota practices previously observed and written about are developed and function. This gives us new power.

This book describes two particular behavior routines, habits or patterns of thinking and conducting oneself, that are practiced over and over every day at Toyota. In Japan such routines are called *kata*. These behavior patterns are not visible, are not described in Toyota documents, and it takes a long time to recognize them. Yet they are how Toyota leads and manages its people. These two kata are taught to all Toyota employees and are a big part of what propels that company as an adaptive and continuously improving organization. If you want to understand Toyota and emulate its success, then these kata, more

than the company's techniques or principles, are what you should be studying. Toward that end, they are presented here for you.

Toyota's intention in using these kata is different enough from our management style that, from the perspective of our way of doing things, we do not immediately understand or see it. However, I think we are now close to a eureka or "lightbulb" moment, a different way of viewing, interpreting, and understanding what Toyota is doing. Once we understand how Toyota uses the two kata described in this book, there can be a shift in our perception that will enable us to progress further, because once we recognize the underlying pattern in how something works, the subject becomes easier to grasp. "The penny finally dropped and now I understand it." The kata presented here cannot be explained in just one chapter, but the penny eventually drops, and once you get it they are not so difficult to comprehend. This makes sense too, since Toyota would like everyone in the organization to practice and utilize them.

This Book Will Help You Get It

The new information that is presented here does not supplant what has already been written about Toyota, although it will require some adjustment in how we have thus far approached adopting "lean manufacturing." The objective is that you will gain a much more useful understanding of how Toyota manages to achieve continuous improvement and adaptiveness, which will tell you a lot about Toyota as a whole, and a clearer view of what it will take to develop such behavior patterns in a non-Toyota organization. To do that, we'll tackle two overarching questions:

1. What are the unseen managerial routines and thinking that lie behind Toyota's success with continuous improvement and adaptation?
2. How can other companies develop similar routines and thinking in their organizations?

This book presents behavior patterns at Toyota at a level where we are talking about psychology in organizations rather than just Toyota. Although the behavior routines presented here were discovered

through research in production settings, they are universal and applicable in many different organizations, old or new, manufacturing or otherwise, from top to bottom. This is about a different and more effective way of managing people.

How I Learned

I have never been a Toyota employee and I have not worked in a Toyota facility. In retrospect this handicap turned out to be an advantage for two reasons:

1. I had to figure things out myself by trying them, by experimenting, in real factory and managerial settings.
2. After numerous iterations of experimentation I began to notice patterns of thinking and behavior that are different from our prevailing managerial routines. These are the differences that Toyota insiders tend to overlook because they lack points of comparison, and that Toyota visitors, observers, benchmarkers, and interviewers will not see at the surface.

Most of the findings in this book are based on hands-on experimentation and firsthand observation working with a great many organizations. This iterative "test it yourself" approach takes a lot of time but provides considerably deeper understanding and insight than can be gained through benchmarking or interviewing alone. The lessons here come from several years of:

- Applying certain technical and managerial Toyota practices in non-Toyota factory settings. This involved iterative trials, with particular attention paid to what did *not* work as intended, investigating why, adjusting accordingly, and trying again. This experimentation approach is referred to as Plan-Do-Check-Act (PDCA).
- Periodically visiting Toyota group sites and suppliers, and meeting with a variety of Toyota employees and former employees, in order to make observations and discuss recent findings.

The work involved a regular interplay between these two aspects of the research, with one potentially influencing the direction of the

other as I went back and forth between them. To facilitate and support this reciprocation, I maintain and regularly update a written document, to reflect on what is being learned and what the next questions are. This document not only captures learning, it also ensures that communication is focused on facts and data as much as possible. You are, essentially, holding the current, civilian version (as of this writing) of that document in your hands. This is how I have been distilling out fundamental but not immediately visible aspects of Toyota's approach, what is behind the curtain, so to speak.

Note that Toyota does not utilize some of the terminology that is introduced here. To help us understand the way that Toyota people think and operate, I had to create some new terms. A Toyota employee may respond to a particular terminology with, "I don't know what that is," but they will work and behave as described here.

The five parts of this book mirror how the research unfolded.

- Part I sets the challenge of long-term organizational survival.
- In Part II we use that lens to examine how we are currently managing our organizations. This is important as preparation, because to comprehend what is different about Toyota's thinking and behavior routines, we first have to understand our own.
- This then leads to the next question: How should people in an organization act so that it will thrive long term? A big part of Toyota's answer to that question is what I call the "improvement kata," which is examined in detail and is the heart of the book. The penny should drop for you in Part III.
- But the improvement kata does not come to life in an organization simply because it is a good idea. The next logical question was: How does Toyota teach people improvement kata behavior? The answer is what I call Toyota's "coaching kata," which is described in Part IV.
- Finally, after presenting these two Toyota kata the question becomes: How do we develop improvement kata behavior in non-Toyota organizations? That is the subject of Part V, how other companies can develop their own kata to suit their own organizations, and of most of my current research.

The research cycle never ends, of course, which means this book reflects a level of understanding at a point in time. There is more to learn and there are undoubtedly some mistakes here. It is an interim report, as is any book, because nothing is the last word.

A final comment: The way of thinking and acting described here has a potential beyond the business world. It shows us a scientifically systematic and constructive way of dealing with problems, uncertainty, and change, in other words, how we can work together and achieve beyond what we can see. The more I studied Toyota, the more I became intrigued by the broader possibility of such life lessons, and I invite you to think about them too as you go through this book.

M.R.
Spring 2009
Ann Arbor, USA/Cologne, Germany

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Part I

The Situation

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Chapter 1

What Defines a Company That Thrives Long Term?

The applause dies down as the next conference speaker approaches the podium. The presentation is going to be about Toyota, and in his first slide the speaker presents some impressive statistics that demonstrate Toyota's superior performance. The audience is nodding appreciatively.

For about two decades now this scene has been repeated countless times. So many books, articles, presentations, seminars, and workshops have begun with statistics about Toyota just like these:

- Toyota has shown *sales growth* for over 40 years, at the same time that U.S automakers' sales reached a plateau or decreased.
- Toyota's *profit* exceeds that of other automakers.
- Toyota's *market capitalization* has for years exceeded that of GM, Ford, and Chrysler; and in recent years exceeded that of all three combined.
- In *sales rank,* Toyota has become the world leader and risen to the number two position in the United States.

Of course, such statistics are interesting and useful in only one respect: they tell us that something different is happening at Toyota. The question then becomes: What is it?

How have we been doing at answering that second question? Not so well, it seems. Books and articles about Toyota-style practices started appearing in the mid 1980s. Learning from such writings, manufacturers have certainly made many improvements in quality and productivity. There is no question that our factories are better than they were 20 years ago. But after 15 to 20 years of trying to copy Toyota, we are unable to find *any* company outside of the Toyota group of companies that has been able to keep adapting and improving its quality and cost competitiveness as systematically, as effectively, and as continuously as Toyota. That is an interesting statistic too, and it represents a consensus among both Toyota insiders and Toyota observers.

Looking back, we naturally put Toyota's visible tools in focus first. That is where we started—the "door" through which we entered the Toyota topic. It was a step in the learning process (which will also, of course, continue after this book). Since then I went back to the research lab—several factories—to experiment further, and present what I learned in this book. The visible elements, tools, techniques, and even the principles of Toyota's production system have been benchmarked and described many times in great detail. But just copying these visible elements does not seem to work. Why? What is missing? Let's go into it.

We Have Been Trying to Copy the Wrong Things

What we have been doing is observing Toyota's current visible practices, classifying them into lists of elements and principles and then trying to adopt them. This is *reverse engineering*—taking an object apart to see how it works in order to replicate it—and it is not working so well. Here are three reasons.

1. Critical Aspects of Toyota Are Not Visible

Toyota's tools and techniques, the things you see, are built upon invisible routines of thinking and acting (Figure 1-1), particularly in management, that differ significantly from those found in most

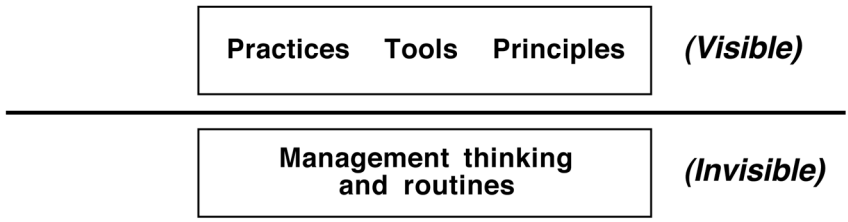

Figure 1-1. Toyota's visible tools and techniques are built upon invisible management thinking and routines

companies. We have been trying to add Toyota Production System practices and principles on top of our existing management thinking and practice without adjusting that thinking and practice. Toyota's techniques will not work properly, will not generate continuous improvement and adaptation, without Toyota's underlying logic, which lies beyond our view.

Interestingly, Toyota people themselves have had difficulty articulating and explaining to us their unique thinking and routines. In hindsight this seems to be because these are the customary, pervasive way of operating there, and many Toyota people—who are traditionally promoted from within—have few points of comparison. For example, if I ask you what you did today, you would tell me many things, but you would probably not mention "breathing." As a consequence, we cannot interview people at Toyota and expect to gain, from that alone, the deeper understanding we seek.

2. Reverse Engineering Does Not Make an Organization Adaptive and Continuously Improving

Toyota opens its factory doors to us again and again, but I imagine Toyota's leaders may also be shaking their heads and thinking, "Sure, come have a look. But why are you so interested in the solutions we develop for our specific problems? Why do you never study how we go about developing those solutions?" Since the future lies beyond what we can see, the solutions we employ today may not continue to be

effective. The competitive advantage of an organization lies not so much in the solutions themselves—whether lean techniques, today's profitable product, or any other—but in the ability of the organization to understand conditions and create fitting, smart solutions.

Focusing on solutions does not make an organization adaptive. For example, several years ago a friend of mine visited a Toyota factory in Japan and observed that parts were presented to production-line operators in "flow racks." Wherever possible the different part configurations for different vehicle types were all in the flow racks. This way an operator could simply pick the appropriate part to fit the particular vehicle passing down the assembly line in front of him or her, which allows mixed-model assembly without the necessity of changing parts in the racks. Many of us have been copying this idea for several years now.

When my friend recently returned to the same factory, he found that many of the flow racks along that Toyota assembly line were gone and had been replaced with a different approach. Many of the parts for a vehicle are now put into a "kit" that travels along with the vehicle as it moves down the assembly line. When the vehicle is in an operator's workstation, the operator only sees those parts, and she always reaches to the same position to get the part.

My friend was a little upset and asked his Toyota hosts, "So tell me, what is the right approach? Which is better, flow racks or kitting?" The Toyota hosts did not understand his question, and their response was, "When you were in our factory a few years ago we produced four different models on this assembly line. Today we produce eight different models on the same line, and keeping all those different part variations in the flow racks was no longer workable. Besides, we try to keep moving closer to a one-by-one flow. Whenever you visit us, you are simply looking at a solution we developed for a particular situation at a particular point in time."

As we conducted benchmarking studies in the 1980's and 90's and tried to explain the reasons for the manufacturing performance gap between Toyota and other automobile companies, we saw at Toyota the now familiar "lean" techniques such as kanban, cellular manufacturing, short changeovers, andon lights, and so on. Many concluded—and

I initially did too—that these new production techniques and the fact that Western industry was still relying on old techniques were the primary reasons for Toyota's superior performance.

However, inferring that there has been a technological inflection point is a kind of "benchmarking trap," which arises because benchmarking studies are done at a point in time. Our benchmarking did not scrutinize Toyota's admittedly less visible inner workings, nor the long and gradual slope of its productivity improvement over the prior decades. As a result, those studies did not establish cause and effect. The key point was not the new production techniques themselves, but rather that Toyota changes over time, that it develops new production techniques while many other manufacturers do not. As Michael Cusumano showed in his 1985 book, *The Japanese Automobile Industry,* Toyota's assembly plant productivity had already begun to inch ahead of U.S. vehicle assembly plant productivity as far back as the early 1960s! And it kept growing.

Beyond benchmarking, a deeper look inside Toyota did not take place until Steven Spear conducted research at Toyota for his Harvard Business School doctoral dissertation, which was published in 1999. It describes how Toyota's superior results spring more from routines of continuous improvement via experimentation than from the tools and practices that benchmarkers had seen. Spear pointed out that many of those tools and practices are, in fact, countermeasures developed out of Toyota's continuous improvement routines, which was one of the impulses for the research that led to this book.

3. Trying to Reverse Engineer Puts Us in an Implementing Mode

Implementing is a word we often use in a positive sense, but—believe it or not—having an implementation orientation actually impedes our organization's progress and the development of people's capabilities. We will not be successful in the Toyota style until we adopt more of a do-it-yourself problem-solving mode. Let me use an example to explain what I mean by an implementation versus a problem-solving mode.

During a three-day workshop at a factory in Germany, we spent the first two days learning about what Toyota is doing. On the third day we then turned our attention to the subject of how do we wish to proceed? During that part of the workshop, a participant raised her hand and spoke up. "During the last two days you painted a clear picture of what Toyota is doing. However, now that we are trying to figure out what we want to do, the way ahead is unclear. I am very dissatisfied with this."

My response was, "That is exactly how it is supposed to be." But this answer did not make the workshop participant happy, which led me to drawing the diagram in Figure 1-2.

There are perhaps only three things we can and need to know with certainty: where we are, where we want to be, and by what *means* we should maneuver the unclear territory between here and there. And the rest is supposed to be somewhat unclear, because we cannot see into the future! The way from where we are to where we want to be next is a gray zone full of unforeseeable obstacles, problems, and issues that we can only discover along the way. The best we can do is to know the approach, the means, we can utilize for dealing with the unclear path to a new desired condition, not what the content and steps of our actions—the solutions—will be.

That is what I mean in this book when I say *continuous improvement and adaptation*: the ability to move toward a new desired state

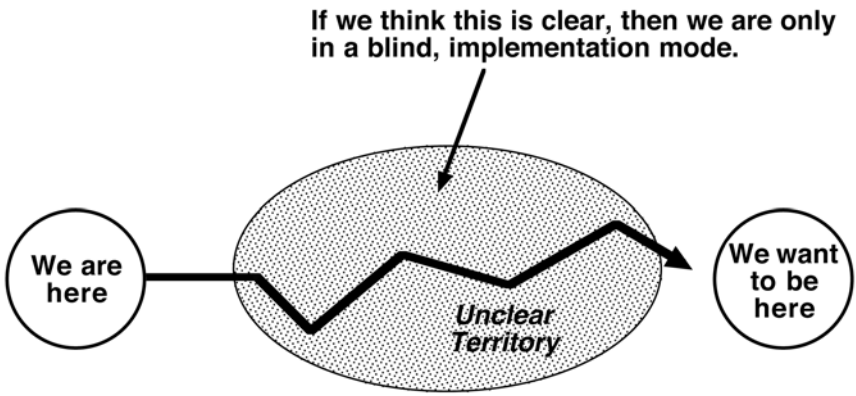

Figure 1-2. The implementation mode is unrealistic

through an unclear and unpredictable territory by being sensitive to and responding to actual conditions on the ground.

Like the workshop participant in Germany, humans have a tendency to want certainty, and even to artificially create it, based on beliefs, when there is none. This is a point where we often get into trouble. If we believe the way ahead is set and clear, then we tend to blindly carry out a preconceived implementation plan rather than being sensitive to, learning from, and dealing adequately with what arises along the way. As a result, we do not reach the desired destination at all, despite our best intentions.

If someone claims certainty about the steps that will be implemented to reach a desired destination, that should be a red flag to us. Uncertainty is normal—the path cannot be accurately predicted—and so how we deal with that is of paramount importance, and where we can derive our certainty and confidence. I can give you a preview of the rest of this book by pointing out that true certainty and confidence do not lie in preconceived implementation steps or solutions, which may or may not work as intended, but in understanding the logic and method for how to proceed through unclear territory.

How do we get through that territory? By what means can we go beyond what we can see? What is management's role in this?

What Is the Situation?

As most of us know, the following describes the environment in which many of our organizations find themselves.

- *Although they may seem steady state, conditions both outside and inside the organization are always changing.* The process of evolution and change is always going on in your environment, whether you notice it or not. The shift may at times be so slow or subtle that your way of doing things does not show up as a problem until it is late. Try looking at it this way: if your working life was suddenly 100 years long instead of 35, would you still expect conditions to remain unchanged all that time?
- *It is impossible for us to predict how those conditions will develop.* Try as we might, humans do not have the capability to see the future.

The future is fundamentally different than it appears through the prospectiscope.

—Daniel Gilbert, *Stumbling on Happiness*

- *If you fall behind your competitors, it is generally not possible to catch up quickly or in a few leaps.* If there was something we could do, or implement, to get caught up again quickly, then our competitors will be doing that too.

The implication is that if we want our organization to thrive for a long time, then how it interacts with conditions inside and outside the company is important. There is no "finish line" mentality. The objective is not to win, but to develop the capability of the organization to keep improving, adapting, and satisfying dynamic customer requirements. This capability for continuous, incremental evolution and improvement represents perhaps the best assurance of durable competitive advantage and company survival. Why?

Small, incremental steps let us learn along the way, make adjustments, and discover the path to where we want to be. Since we cannot see very far ahead, we cannot rely on up front planning alone. Improvement, adaptation, and even innovation result to a great extent from the accumulation of small steps; each lesson learned helps us recognize the next step and adds to our knowledge and capability.

Relying on technical innovation alone often provides only temporary competitive advantage. Technological innovations are important and offer competitive advantage, but they come infrequently and can often be copied by competitors. In many cases we cannot expect to enjoy more than a brief technological advantage over competitors. Technological innovation is also arguably less the product of revolutionary breakthroughs by single individuals than the cumulative result of many incremental adaptations that have been pointed in a particular direction and conducted with special focus and energy.

Cost and quality competitiveness tend to result from accumulation of many small steps over time. Again, if one could simply implement some measures to achieve cost and quality competitiveness, then every

company would do it. Cost and quality improvements are actually made in small steps and take considerable time to achieve and accumulate. The results of continual cost reduction and quality improvement are therefore difficult to copy, and thus offer a special competitive advantage. It is highly advantageous for a company in a competitive environment to combine efforts at innovation with unending continuous improvement of cost and quality competitiveness, even in the case of mature products.

Relying on periodic improvements and innovations alone—only improving when we make a special effort or campaign—conceals a system that is static and vulnerable. Here is an interesting point to consider about your own organization: in many cases the normal operating condition of an organization—its nature—is *not improving*.

Many of us think of improvement as something that happens periodically, like a project or campaign: we make a special effort to improve or change when the need becomes urgent. But this is not how continuous improvement, adaptation, and sustained competitive advantage actually come about. Relying on periodic improvement or change efforts should be seen for what it is: only an occasional add-on to a system that by its nature tends to stand still.

The president of a well-known company once told me, "We are continuously improving, because in every one of our factories there is a *kaizen* workshop occurring every week." When I asked how many processes there are in each of those factories he said, "Forty to fifty." This means that each process gets focused improvement attention approximately once a year. This is not bad, and Toyota utilizes kaizen workshops too, but it is not the same thing as continuous improvement. Many companies say, "We are continually improving," but mean that every week some process somewhere in the company is being improved in some way. We should be clear:

Projects and workshops ≠ continuous improvement

Let's agree on a definition of continuous improvement: it means that you are improving all processes every day. At Toyota the improvement process occurs in every process (activity) and at every level of the company every day. And this improvement continues even if the

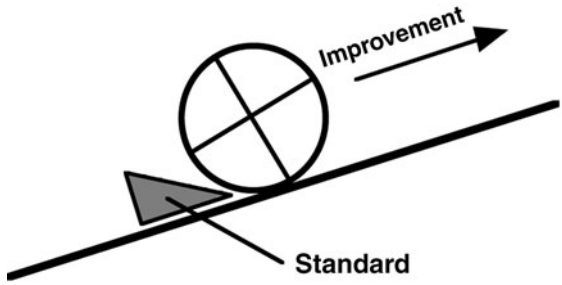

Figure 1-3. Standards depicted as a wedge that prevent backsliding. It doesn't work this way.

numbers have already been met. Of course, from day to day improvement may involve small steps.

We cannot leave a process alone and expect high quality, low cost, and stability. A popular concept is that we can utilize standards to maintain a process condition (Figure 1-3).

However, it is generally not possible simply to *maintain* a level of process performance. A process will tend to erode no matter what, even if a standard is defined, explained to everyone, and posted. This is not because of poor discipline by workers (as many of us may believe), but due to interaction effects and entropy, which says than any organized process naturally tends to decline to a chaotic state if we leave it alone (I am indebted to Mr. Ralph Winkler for pointing out to me the second law of thermodynamics). Here is what happens.

In every factory, small problems naturally occur every day in each production process—the test machine requires a retest, there is some machine downtime, bad parts, a sticky fixture, and so on—and the operators must find ways to deal with these problems and still make the required production quantity. The operators only have time to quickly fix or work around the problems, not to dig into, understand, and eliminate causes. Soon extra inventory buffers, work-arounds, and even extra people naturally creep into the process, which, although introduced with good intention, generates even more variables, fluctuation, and problems. In many factories management has grown accustomed

to this situation, and it has become the accepted mode of operating. Yet we accuse the operators of a lack of discipline. In fact, the operators are doing their best and the problem lies in the system—for which management is responsible.

The point is that a process is either slipping back or being improved, and the best and perhaps only way to prevent slipping back is to keep trying to move forward, even if only in small steps. Furthermore, in competitive markets treading water would mean falling behind if competitors are improving. Just sustaining, if it were possible, would in that case still equal slipping.

> *Quality of a product does not necessarily mean high quality. It means continual improvement of the process, so that the consumer may depend on the uniformity of a product and purchase it at a low cost.*
>
> —W. Edwards Deming, 1980

Finding Our Way into the Future

By What Means Can Organizations Be Adaptive?

While nonhuman species are subject to natural selection—that is, natural selection acts upon them—humans and human organizations have at least the potential to adapt consciously. All organizations are probably to some degree adaptive, but their improvement and adaptation are typically only periodic and conducted by specialists. In other words, such organizations are not by their nature adaptive. As a consequence, many organizations leave a considerable amount of inherent human potential untapped.

How do we achieve adaptiveness? What do we need to focus on?

Although we have tended to believe that production techniques like cellular manufacturing and kanban, or some special principles, are the source of Toyota's competitive advantage, the most important factor that makes Toyota successful is the skill and actions of all the people in the organization. As I see it now, this is the primary

differentiator between Toyota and other companies. It is an issue of human behavior.

So now we arrive at the subject of managing people.

Humans possess an astounding capability to learn, create, and solve problems. Toyota's ability to continuously improve and adapt lies in the actions and reactions of the people in the firm, in their ability to effectively understand situations and develop smart solutions. Toyota considers the improvement capability of all the people in an organization the "strength" of a company.

From this perspective, then, it is better for an organization's adaptiveness, competitiveness, and survival to have a large group of people systematically, methodically, making many small steps of improvement every day rather than a small group doing periodic big projects and events.

> *Toyota has long considered its ability to permanently resolve problems and then improve stable processes as one of the company's competitive advantages. With an entire workforce charged with solving their workplace problems the power of the intellectual capital of the company is tremendous.*
>
> —Kathi Hanley, statement as a group leader at TMMK

How Can We Utilize People's Capabilities?

Ideally we would utilize the human intellect of everyone in the organization to move it beyond forces of natural selection and make it consciously adaptive. However, our human instincts and judgment are highly variable, subjective, and even irrational. If you ask five people, "What do we need to do here?" you will get six different answers. Furthermore, the environment is too dynamic, complex, and nonlinear for anyone to accurately predict more than just a short while ahead. How, then, can we utilize the capability of people for our organization's improvement and evolution if we cannot rely on human judgment?

If an organization wants to thrive by continually improving and evolving, then it needs systematic procedures and routines—methods—that channel our human capabilities and achieve the potential. Such routines would guide and support everyone in the organization by

giving them a specific pattern for how they should go about sensing, adapting, and improving.

Toyota has a method, or means, to do exactly that. At Toyota, improvement and adaptation *are* systematic and the method is a fundamental component of every task performed, not an add-on or a special initiative. Everyone at Toyota is taught to operate in this standard way, and it is applied to almost every situation. This goes well beyond just problem-solving techniques, to encompass a firm-specific behavior routine. Developing and maintaining this behavior in the organization, then, is what defines the task of management.

My definition of *management:*

The systematic pursuit of desired conditions by utilizing human capabilities in a concerted way.

Upon closer inspection, Toyota's way, as it is sometimes called, is characterized less by its tools or principles than by sets of procedural sequences—thinking and behavior patterns—that when repeated over and over in daily work lead to the desired outcome. These patterns are the context within which Toyota's tools and principles are developed and function. If there is one thing to look at in trying to understand and perhaps emulate Toyota's success, then these behavior patterns and how they are taught may well be it.

Kata

In Japan such patterns or routines are called *kata* (noun). The word stems from basic forms of movement in martial arts, which are handed down from master to student over generations. Some common translations or definitions are:

- A way of doing something; a method or routine
- A pattern
- A standard form of movement
- A predefined, or choreographed, sequence of movements

- The customary procedure
- A training method or drill

Digging deeper, there is a further definition and translation for the word:

- A way of keeping two things in alignment or synchronization with one another

Eureka! This last definition is of particular interest with regard to the dynamic conditions that exist outside and inside a company (Figure 1-4). It suggests that although conditions are always changing in unpredictable ways, an organization can have a method, a kata, for dealing with that. This is an interesting prospect. Such a method would connect the organization to current circumstances in the world, inside the organization, and in its work processes, and help it stay in sync—in harmony—with those circumstances. A key concept underlying kata is that while we often cannot exercise much control over the realities around us, we can exercise control over—manage—how we deal with them.

Kata are different from production techniques in that they pertain specifically to the behavior of people and are much more universally applicable. The kata described in this book are not limited to manufacturing or even to business organizations.

Kata are also different from principles. The purpose of a principle is to help us make a choice, a decision, when we are confronted with

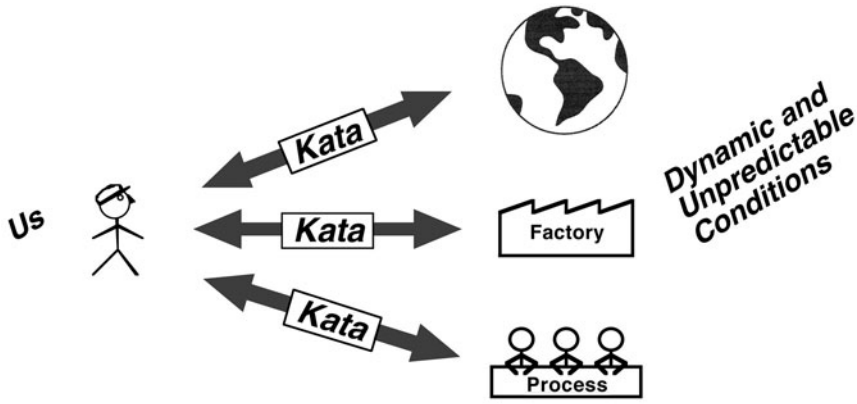

Figure 1-4. A kata is a means for keeping your thoughts and actions in sync with dynamic, unpredictable conditions

options, like *customer first,* or *pull, don't push*. However, a principle does not tell us how to do something; how to proceed, and what steps to take. That is what a kata does. Principles are developed out of repeated action, and concerted repeated action is what a kata guides you into. Toyota's kata are at a deeper level and precede principles.

What, then, might be some attributes of a behavior form, a kata, that is utilized for continuous improvement and adaptation?

- The method would operate, in particular, at the process level. Whether in nature or in a human organization, improvement and adaptation seem to take place at the detail or process level. We can and need to think and plan on higher levels, like about eliminating hunger or developing a profitable small car, but the changes that ultimately lead to improvement or adaptation are often detail changes based on lessons learned in processes.

> It is finally becoming apparent to historians that important changes in manufacturing often take place gradually as the result of many small improvements.
>
> Historians of technology and industrial archeologists must look beyond the great inventors and the few revolutionary developments in manufacturing; they must look at the incremental innovations created year after year not only in the drafting room and the mind of the engineer but also on the shop floor and in "the heart of the machinist." Maybe then we will begin to learn about the normal process of technological change.
>
> —Patrick M. Malone, Ph.D., Brown University[1]

- If the objective is to improve in every process every day, then the kata would be embedded in and made inseparable from the daily work in those processes. The kata would become how we work through our day.
- Since humans do not possess the ability to predict what is coming, the method that generates improvement and adaptation

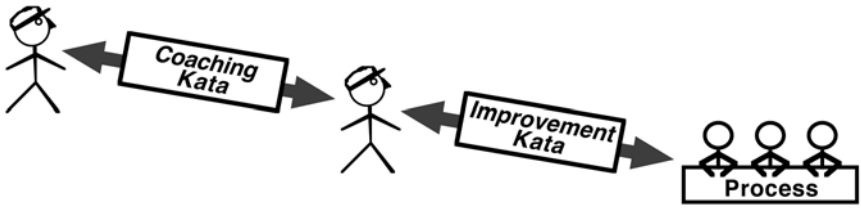

Figure 1-5. Two fundamental Toyota kata

would be content neutral; that is, it would be applicable in any situation. The method, the procedure, is prescribed, but the content is not.

- Since human judgment is not accurate or impartial, the method would, wherever possible, rely on facts rather than opinions or judgments. In other words it would be depersonalized.
- The method for improvement would continue beyond the tenure of any one leader. Everyone in the organization would operate according to the method, regardless of who is in charge at the moment.

In this book we will examine in detail what are perhaps Toyota's two most fundamental kata (Figure 1-5). One I call the *improvement kata* (Part III), which is the repeating routine by which Toyota improves, adapts, and evolves. The improvement kata exactly fits the attributes spelled out above and provides a highly effective model for how people can work together; that is, how to manage an organization. The second I call the *coaching kata* (Part IV), which is the repeating routine by which Toyota leaders and managers teach the improvement kata to everyone in the organization.

The Management Challenge

Based on what I have been learning, the challenge we face is not to turn the heads of executives and managers toward implementing new production or management techniques or adopting new principles, but to achieving systematic continuous evolution and improvement

across the organization by developing repeatedly and consistently applied behavioral routines: kata. Note that this challenge is significantly different than what we have been working on so far in our lean implementation efforts, and is primarily an issue of how we manage and lead people. Some adjustment in how we have been trying to adopt "lean manufacturing" will be necessary.

Before we go on I should mention that the idea of standardized behavioral routines often generates a prognosis that they will disable our creativity and limit our potential. What if, however, we can be even more creative, competitive, smart, out-of-the-box, and successful precisely *because* we have a routine that does a better job of tapping and channeling our human capabilities? A difference lies in what we define as the routine. Notably, Toyota's improvement kata does not specify a content—it cannot—since that varies from time to time and situation to situation, but instead only the form that our thinking and behavior should take as we react to a situation.

Humans derive a lot of their sense of security and confidence—what psychologist Albert Bandura calls "self-efficacy," from predictable routines: from doing things the same way again and again. However, it's not possible for the content of what we do to stay the same, and if we try to artificially maintain it, it causes problems, because we are then adjusting to reality far too late and in a jerky manner. Any organization whose members can face unpredictable and uncertain situations (which are the norm) with confidence and effective action, because they have learned a behavioral routine for doing that, can enjoy a competitive advantage.

Toyota's improvement kata is an excellent example of this second kind of routine. It tells us how to proceed, but not the content, and thus gives members of the organization an approach, a means, for handling an infinite variety of situations and being successful. We may be standing before a different way of operating our organizations, which can take us toward nearly any achievement we might envision.

But to see that, we have to grasp the current situation: how we are managing our organizations today.

Notes

1. Patrick M. Malone, Ph.D. (Associate Professor, American Civilization and Urban Studies, Brown University), "Little Kinks and Devices at Springfield Armory, 1982–1918," *Journal of the Society for Industrial Archeology*, vol. 14, no. 1, 1988.

Part II

Know Yourself

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Introduction to Part II

One of the most difficult things to see is our presuppositions, our instincts and reflexes, and the contexts within which we operate that create them. What is our current thinking? Where does it come from? How do we tend to act as a result? What are the effects?

Understanding this gives us a point of comparison, a contrast, that puts us in a better position to perceive what Toyota is doing and to be more conscious designers of how we want our organizations to function. That is the purpose of Part II.

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Chapter 2

How Are We Approaching Process Improvement?

As mentioned near the end of the last chapter, improvement and adaptation are critical success factors and tend to take place at the process level. How, then, are we currently trying to improve our processes? Based on observations in many factories, I currently find these main approaches: workshops, value-stream mapping, and, above all, action-item lists.

Workshops

Improvement workshops are special improvement efforts that temporarily bring together a team of people to focus on a particular process. The duration of a workshop is typically one to five days. Workshops are used extensively and do have their place. Toyota utilizes workshops too, for example, but not as its primary means of improving and adapting.

As discussed in Chapter 1, project-style improvement efforts only occur at any one process occasionally, not continuously, and involve a specially formed team. Thus, by definition, workshops are not at all

the same as continuous improvement. In regard to workshops, it is also interesting to note that:

- Conducting a one- to five-day improvement workshop does not require any particular managerial approach. You can easily run a kaizen workshop without having to adjust the prevailing custom. This may explain some of the popularity of workshops.
- Since the workshop team moves on or is disbanded after a workshop ends, we have to expect that entropy will naturally begin eroding the gains that have been made.

Value-Stream Mapping

This highly useful tool looks at the flow of material and information, and the associated lead time, across multiple processes. However, the lead time through a value stream is an *outcome* that is correlated with inventory, and inventory in turn is an *outcome* that results from performance attributes of the individual processes in the value stream. Therefore, if you want to reduce lead time, you should improve processes.

As mentioned in the previous chapter, much of the mechanism of continuous improvement and adaptation takes place at individual processes. For example, applying the improvement kata at the process level—one level deeper than the value stream—is something you would do after drawing a value-stream map (see Figure 2-1).

Value-stream mapping is not intended to be a method for process improvement, but rather a method to help ensure that process-level improvement efforts:

- Fit together from process to process so that a flowing value stream is developed
- Match with the organization's targets
- Serve the requirements of external customers

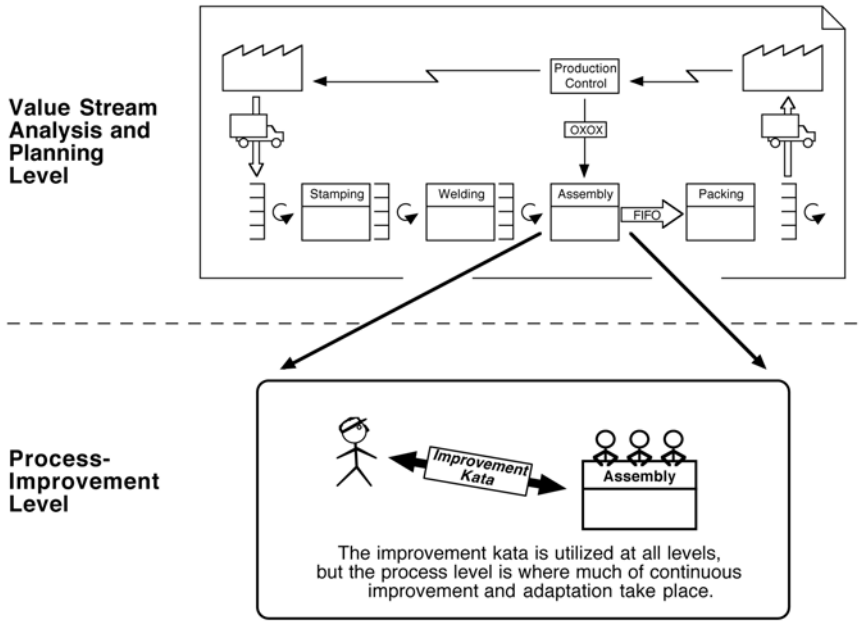

Figure 2-1. Value stream and process levels

If we try to rely on value-stream mapping as a method for process improvement, then the following negative effects may arise:

- A value-stream map can reveal so many improvement potentials at so many places that it is hard to know what needs to be done. Attacking problems here and there in the value stream, rather than focusing on and pursuing specific process-level target conditions, dilutes our improvement capacity by scattering it piecemeal across the value stream.
- As useful and necessary as value-stream maps are, they still focus more on the surface and thus do not develop our capability to see deeply into the real situation at the processes.

It is more effective to use value-stream mapping for keeping an eye on the overall picture, and to step into the process level with the improvement kata as described in Part III.

What happened to suggestion systems? Enthusiasm around suggestion systems seems to have died down. I currently do not find much going on with them at manufacturing facilities.

We often hear about the relatively high number of suggestions per employee and high number of implemented suggestions at Toyota, but we are not comparing apples to apples. Toyota production operators work with a team leader who follows the improvement kata. Within that framework, team leaders are also expected to actively obtain a certain number of suggestions from their team members. Furthermore, the team leader also helps team members fine-tune their suggestions, via mentoring, before they are submitted. This is very different from simply installing a suggestion box, so to speak, and actually has a different purpose. More on this in Chapter 7.

The Action-Item List

Based on my observations, the action-item list is currently *by far* our most widely used approach for process improvement. You find managers and engineers relying on them in nearly every factory. The approach is so widespread that it needs almost no explaining, although many of us have probably not yet realized that we are using such lists as an *approach*.

An action-item list is a listing of multiple improvement ideas and action items to be implemented at a process. The lists are sometimes called "open points lists" and appear in various forms, such as on flip-chart sheets, cards, or on whiteboards (see Figure 2-2). The action items on the lists originate from recording process problems, brainstorming, problem-solving activities, waste walks, value-stream mapping, and so on. Although we may believe that those uptake activities—like waste walks or problem-solving activities—constitute our improvement approach, all of them merge into the same thing: a list of action items. And it is with those lists that we actually try to manage the improvement process.

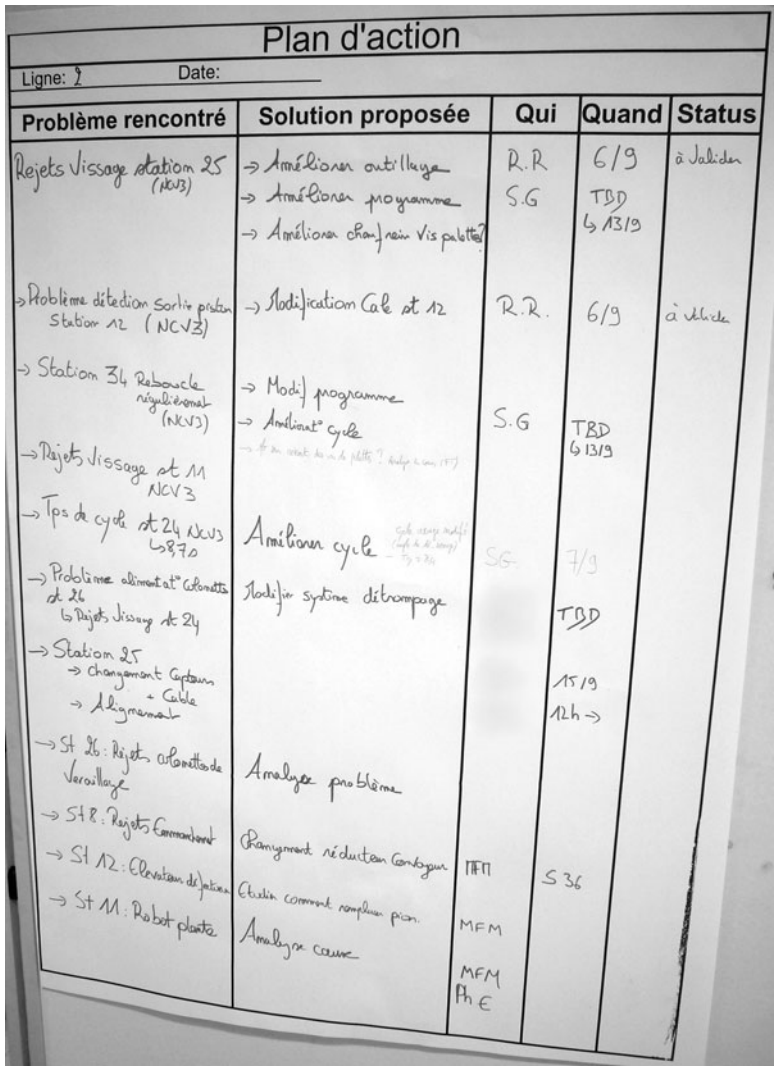

Figure 2-2. An action-item list on a factory floor in France

In short, the list approach is done as follows:

1. When people visit a production process, they make good point observations. We have clearly internalized what is waste and are able to spot plenty of problems, wastes, and opportunities for improvement.

2. With few exceptions we turn such observations into lists of several action items.
3. There may be a prioritizing or ranking of items by, for example, voting or estimating benefits.
4. Action items are assigned to persons or teams, and due dates are established.
5. The manager then focuses on who is to do what by when. Regular review meetings are scheduled, for example on a weekly or biweekly basis, to check if people are carrying out on time the action items for which they are responsible.

To convince yourself of the truth of these observations, this may be a good point to walk through your own factory.

What Are the Results of Working with the Action-Item List Approach?

1. *It doesn't work very well.* The underlying thinking with the list approach appears to be that *the more action items we have, the more the process will be improved*. The longer the lists of action items and the more improvement projects under way, the more we feel like something positive is happening. In many cases, however, the opposite is true. There may appear to be a lot of motion, but there is little progress.

   Once you finish Part III of this book you will be able to see that the list approach is an unscientific and ineffective method for process improvement. It is in actuality a scattershot approach: multiple action items are initiated in the hope of hitting something. Although few people admit it, surprisingly little cost and quality improvement is generated via the list approach. The negligible results it produces can be observed in the lack of progress—in the wasteful and unstable processes that persist on factory floors everywhere. In many cases the scattershot list approach creates even more, not less, variability and instability in a process.

Upon closer inspection, many of the cost reductions companies talk about come from cutting resources or moving production to low-wage locations rather than truly improving the way a process operates; that is, improving how things are done. And many of the quality improvements people talk about are improvements in *delivered* quality, achieved by increasing inspection and sorting out more defects rather than improving the process to reduce the number of defects created.

2. *We are in the dark.* Defining and introducing several action items simultaneously, and sometimes even voting to prioritize them, indicates that we don't know what we need to do to improve. It would be better to simply stop and say *we don't yet know what exactly to do*. "I don't know" is a completely acceptable answer and much preferable to pretending we do know, but this seems to be one of the hardest things to say.
3. *We are asking ourselves the wrong question.* When we hunt for wastes or opportunities to improve and make a list of action items, we are focusing on the question, "What *can* we do to improve?" That question is actually too easy, and it automatically leads us to lists and a scattershot approach. The more focused question is, "What do we *need* to do to improve this process?" Admittedly, this is a more difficult question.

   Here's an example of what I mean. A large auto-parts manufacturer was training four young engineers to begin work in the company's supplier development department. As part of this training, each engineer was sent to a different supplier factory to conduct an analysis and make a report.

   Three of the engineers returned with lists of 30 to 40 improvement ideas to implement at the factory they visited. The fourth engineer, however, returned with only 8 suggestions for improvement. The head of the supplier development department was angry with the fourth engineer, saying, "Your colleagues found 30 to 40 opportunities for improvement and you only have 8? I think you need to go back and look again."

Interestingly, the better response by the boss would have been exactly the opposite. He would say to the three engineers: "Anyone can make a long list of things we can improve and hope that something in that list will work. Please go back, look again, and tell me just the one, two, or three things that we need to do now to begin the improvement process at the supplier site."

It is much more difficult to see deeply and understand what we *need* to do.

4. *We are jumping to countermeasures too soon.* A weakness in the list approach is a tendency to jump to countermeasures before we understand a situation (Figure 2-3). Generating a list of action items and implementing several countermeasures, often simultaneously, reflects an unspoken goal of, essentially, *just shut off the problem!* People are rewarded for fixing a problem, for firefighting, not for analyzing, even though the problem may recur later because it was not yet sufficiently understood.

   In contrast, Toyota's goal in process improvement is to learn; to develop an ever deeper understanding of the work process and to improve the process from that basis.

   When you throw several countermeasures at a process, the problem sometimes does go away. This is often not because the causes have been discovered and eliminated, but because of the extra attention the process has received. Sometime later the same problem returns—well after the improvement success was celebrated.
5. *We are not developing our people's capabilities.* The list approach does not harness or grow our problem solving and improvement capability in a very effective manner.

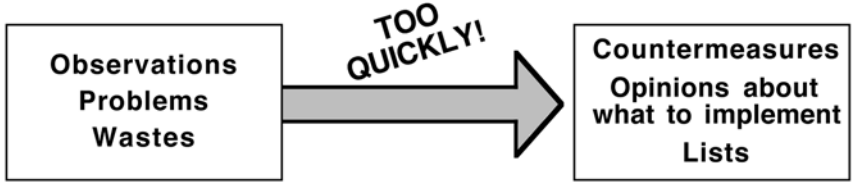

Figure 2-3. The tendency is to jump right from a problem to possible solutions

Why Does the List Approach Persist?

The bottom line is that we are wasting a lot of time with the action-item list approach. Yet if it is not very effective as a method for managing process improvement, why does it persist? Why do we tend to create such lists again and again?

One probable reason, already mentioned, is the erroneous feeling that the more action items we have, the more improvement we have. Another reason may be that managers find it convenient to fit the list approach and regularly scheduled reviews of action-item assignments into existing work schedules. For everyone involved, the list approach provides a way to feel engaged in improvement activity without having to alter their current work routines very much.

The list approach also provides a way to avoid receiving blame. We can say, "I completed my action items on time," and thereby fulfill our obligations without necessarily having to generate real process improvement. The objective becomes to carry out the action items for which I am responsible, not the improvement itself. If the desired results do not come, it is not my fault, because I did what I agreed to do.

It has also been suggested to me that long lists of opportunities or action items may be regarded as a reflection of how observant or smart we are.

There Is a More Effective Way to Improve

Not only is the list-oriented improvement approach not very effective, it also makes improvement too complicated and difficult.

To see what I mean, consider that Toyota teaches people to try to change only one thing at a time, and then to check the result against the expected result. You may work on several things simultaneously, but if possible do not change more than one thing at any one time in a process. Such "single-factor experiments" are preferred because Toyota wants its people to see and understand cause and

effect, which helps to develop a deeper understanding of the work processes. Studying this Toyota improvement tactic leads to some interesting discoveries:

- Whenever we alter any one thing in a process, we create, in effect, a new process with possibly new and different characteristics. This means that once we have implemented one or two items from an action-item list, then the rest of the items on that predefined list *may no longer suit the new situation and new priorities at the process*. Are you beginning to see how making scattershot lists of action items is a waste of time?
- Multifactor experiments (known as Design of Experiments, or DOE) where multiple variables are changed at once are sometimes necessary, but only a small group of specialists is qualified to conduct them. Ideally we want everyone in the organization involved in continuous improvement, and single-factor experiments are something that anyone can understand and carry out.
- If I tell you that you should, if possible, only change one thing at a time in a process, how does that make you feel?
  - Yes, it seems way too slow.

  Yet we know that Toyota is improving faster than other companies. So what does this mean for our cycles in an only-change-one-thing-at-a-time approach?
  - They must be fast!

  In other words, with Toyota's approach, we cannot wait for the next scheduled weekly or biweekly review cycle to come around. If we wait that long to check, then our progress will be too slow. By the time we do check the process, the parameters may have shifted. We should check the results of a change as soon as possible and then, based on what we learn, consider the next steps. Unlike our current workshop and list-oriented approach to process improvement, this one does have implications for how managers, engineers, and executives slice up their work days.

Improvement is hard work, but it doesn't have to be too complicated. After studying Toyota's improvement kata in Part III, you are likely to call a stop to and reorient any improvement effort that relies on the list approach. Instead you will know that there is a better way to proceed and lead.

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Chapter 3

Philosophy and Direction

To understand Toyota's improvement kata and coaching kata we need to consider two aspects of the context within which they operate: the business philosophy, or purpose, of the company; and its overall sense of direction.

The Company's Business Philosophy

The business philosophy of a company does much to define the thoughts and actions of everyone in the organization. However, by "business philosophy" I do not mean those nice, generic statements printed on the poster in the lobby. I mean if you stood in the factory for a day and observed what people do—what is important to them, what gets measured—then what would you conclude is important to this company? As they say at Toyota, "The shop floor is a reflection of management."

For many manufacturers the company philosophy or purpose would boil down to something like the statement in Figure 3-1.

Many manufacturers:

"Make good products for the customer."

Figure 3-1. A typical company philosophy

Toyota:

"Survive long term as a company by improving and evolving how we make good products for the customer."

Figure 3-2. Toyota philosophy

And this is not bad by any means. But consider Toyota's philosophy in comparison (Figure 3-2).

While this sounds similar to the first philosophy, there is a significant difference. Notice the position of improvement and adaptation in each case. In the first philosophy, improvement and adaptation are an add-on; something we do when there is time or a special need. In the second philosophy, improvement and adaptation move to the center. They are what we do.

Along these lines, here are a few questions to help you think about the position of improvement in your organization. Only you can answer them for yourself:

- Do I view improvement as legitimate work, or as an add-on to my real job?
- Is improvement a periodic, add-on project (a campaign), or the core activity?
- Is it acceptable in our company to work on improvement occasionally?

The last question, in particular, can make things clear. Imagine you were to walk into a manager's office and say, "We made a nice improvement in process X . . . and next month we will take another look at improving that process further." That would probably be acceptable. Now imagine that you said, "We produced 400 pieces of product at process X today . . . and next month we will take a look at producing some more product at that process." That would not be acceptable at all! And so we can see the relative position that improvement has in our company. If your business philosophy is to improve, then periodic improvement projects or kaizen workshops are okay but not enough. You would only be working on your organization's core objective occasionally, during periodic events.

At Toyota, improving and managing are one and the same. The improvement kata in Part III is to a considerable degree how Toyota manages its processes and people from day to day. In comparison, non-Toyota companies tend to see managing as a unique and separate activity. Improvement is something extra, added on to managing.

Non-Toyota thinking:	normal daily management + improvement
Toyota thinking:	normal daily management = process improvement

An interesting point is that many of us would probably be afraid to focus so heavily on the second philosophy, improvement, at the expense of the first philosophy, make production. We would feel we were letting go of something we currently try very hard to control, because we're accustomed to focusing on outcomes, not process details. In our current management approach we concentrate on outcome targets and consequences. In contrast, as depicted in Figure 3-3, Toyota puts considerable emphasis on how people tackle the details of a process, which is what generates the outcomes.

Outcome targets, such as the desired production quantity, are of course necessary. But if you focus on continuously improving the process—systematically, through the improvement kata, rather than

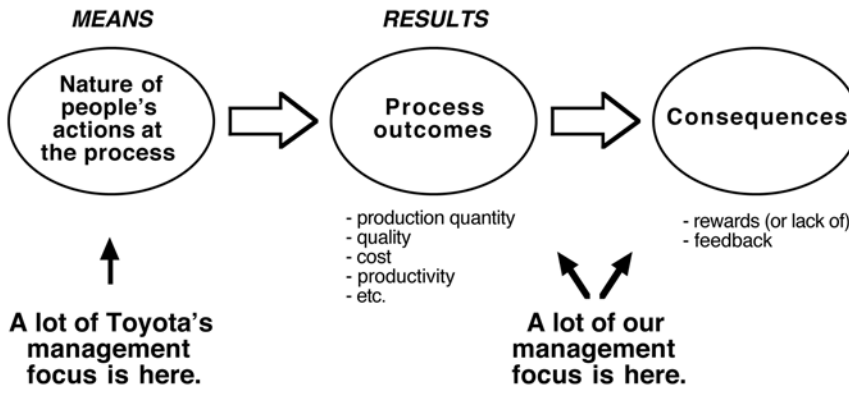

Figure 3-3. Focusing on means in order to achieve desired results

just random improvement—then the desired outcomes will come. Making the desired production quantity, for example, will happen automatically when you focus on the details of a process through correct application of the improvement kata.

The following story from before the Second World War, when Toyota made weaving looms, provides an example of this way of thinking. It comes from a Toyota booklet about the spirit and ideas that created the company, and relates how Kiichiro Toyoda (1894–1952), founder of the Toyota Motor Corporation and son of Toyoda Automatic Loom Works founder Sakichi Toyoda, supposedly responded when someone once stole the design plans for a loom from the Toyoda loom works:

> *Certainly the thieves may be able to follow the design plans and produce a loom. But we are modifying and improving our looms every day. So by the time the thieves have produced a loom from the plans they stole, we will have already advanced well beyond that point. And because they do not have the expertise gained from the failures it took to produce the original, they will waste a great deal more time than us as they move to improve their loom. We need not be concerned about what happened. We need only continue as always, making our improvements.*[1]

Does a lean value stream equal lean manufacturing?

Many years ago I visited a small automobile-component factory that ostensibly operated with a lean strategy. And, in fact, the plant sported a fairly short lead time through its value stream. Its strategy involved the following elements:

- Hire recent high school graduates. The turnover rate was high, but the labor was young and inexpensive.
- Staff processes with about 40 percent extra operators, which was possible because of the low hourly wage. This was done so that despite problems and stoppages, each process could still produce the required quantity every day

with little or no help from indirect staff or management. With extra operators in the line, the operators could dispense with problems themselves (but not eliminate the causes) and still achieve the target output. Autonomous teams, if you will.

- A flat organization, that is, one with few levels of management.
- Inventory levels were kept low, since each process was generally able to produce the required quantity, which is why the lead time through the value stream was short. Only a little over one day of finished goods, for example, was kept on hand.

The low inventory levels, flat organization, and short value stream, sound "lean," but here's the problem: from day to day and week to week the same problems would arise and the operators would simply work around them. This meant that the plant was standing still—not continuously making progress or improving—and that is quite possibly what Toyota fears most of all.

Honesty Required

We are considering business purpose or philosophy early in this book because this is where many companies trying to copy Toyota are, from the start, already on a different path. At this point some honesty is required from you. *What is the true business philosophy of your company?*

While we talk about the importance of providing value for the customer and continuous improvement, more than a few of us are, in truth, focused narrowly on short-term profit margin. The unspoken business philosophy at some companies is simply to produce and sell more. Or it is about exercising rank and privilege, and thus avoiding mistakes, hiding problems, and getting promoted, which become more important than performance, achievement, and continuous improvement.

Direction

Having an improvement philosophy and an improvement kata is important, but not quite enough. Ideally, action would have both form (a routine or kata) and direction. For example, many of us would say that improvement—or "lean"—equals "eliminating waste." Although this popular statement is basically correct, it is by itself too simple. The negative result of "improvement equals eliminate waste" thinking is twofold: we cannot discern what is important to improve, and we tend to maximize the efficiency of one area at the expense of another, shifting wastes from one to another rather than optimizing and synchronizing the whole.

A classic example of this involves material handling. In the quest to eliminate waste, we often come upon the idea of presenting parts and components to production operators in small containers. The small containers reduce waste at the process because they can be placed close to the operator's fingertips (less reaching and walking to get parts), and more part varieties can be kept within the operator's reach (no changeover is necessary for producing different products). Of course, those parts currently arrive from the supplier in large containers on pallets, which are dropped off in the general vicinity of the production operators with a fork truck.

At this point a logistics manager will usually speak up and say, "Wait a minute, let me get this straight. My department is evaluated on its productivity, and you want my people to take parts out of the large containers and repack them into small containers. Then you want my people to get off the fork truck and place those containers near the operator's fingertips. And since the quantity of delivered parts will now be smaller—because fewer parts can be stored so close to the operator—my people will have to deliver several times a shift, rather than only once or twice per shift. Now we all know that 'lean' means eliminating waste. All those extra non-value-added activities would obviously be waste, so this cannot be the right solution."

I have observed this type of debate many times, and it always goes around and around the same way. Whoever is most persuasive wins and

sets the direction *for a while*, until someone else brings up a different persuasive argument or idea. Or we use a voting technique to make it seem that we're being systematic and scientific about choosing the direction. What in fact is happening is that the organization is essentially flailing about and frequently shifting direction as it hunts for the "right" solution to implement, and jumps from one potential solution to another. Sometimes an external consultant will be brought in to provide a seemingly clear answer and be the tie breaker, or to be the person to blame in case the choice does not work out.

So who is correct in this situation: the production manager who wants small containers, or the logistics manager who wants to avoid extra handling? Under the simple concept of lean equals eliminate waste, everyone is. What is missing here is a sense of direction. Although we may think of adaptation as essentially a reactive activity, it is actually what happens on the way to somewhere. Evolution in nature may not be heading in any particular predefined direction or have any particular boundaries, but for a human organization to be consciously adaptive, it helps to have a long-range vision of where we want to be. That is something we can choose or define, while the adaptation that will take place between here and there is not. By long range I mean a vision that may extend beyond one working lifetime, perhaps even to 50 years or more (Figure 3-4).

Note that a vision, or direction giver, is not simply a quantitative target. It is a broad description of a condition we would like to have achieved in the future. To repeat, the definition of continuous improvement and adaptation I am using in this book is: *moving toward a desired state through an unclear territory by being sensitive to and responding to actual conditions on the ground*.

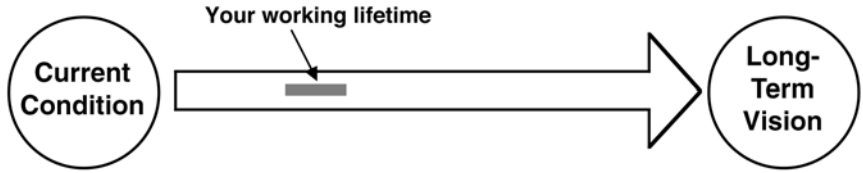

Figure 3-4. A vision is a direction-giver

You've got to think about big things while you're doing small things, so that all the small things go in the right direction.

—Alvin Toffler

A long-term vision or direction helps focus our thinking and doing, because without it proposals are evaluated independently, instead of as part of striving toward something.

Defining longer-term direction/vision can be tricky, and even dangerous, however. For example:

- Although we cannot see what is coming, a vision based exclusively on current paradigms, competencies, products, or technologies can limit the future range of our adaptation too much. Toward that end, a vision should probably focus more on the customer, and broad-scale customer needs, than on ourselves.
- Visions developed in a way that seeks to protect current sacred cows are often so watered down that they are essentially useless for providing direction.

An example of a useful but not overly confining long-term vision is Toyota Motor Corporation's early vision of "Better cars for more people."[2] What would this vision, this direction, lead an automobile manufacturer to do? Consider Toyota's current market position, global presence, and product mix with this old vision statement in mind.

Toyota's Vision for Its Production Operations

As depicted in Figure 3-5, in its production operations, Toyota has for several decades been pursuing a long-term vision that consists of:[3]

- Zero defects
- 100 percent value added
- One-piece flow, in sequence, on demand
- Security for people

Toyota sees this particular ideal-state condition—if it were achieved through an entire value stream—as the way of manufacturing with the

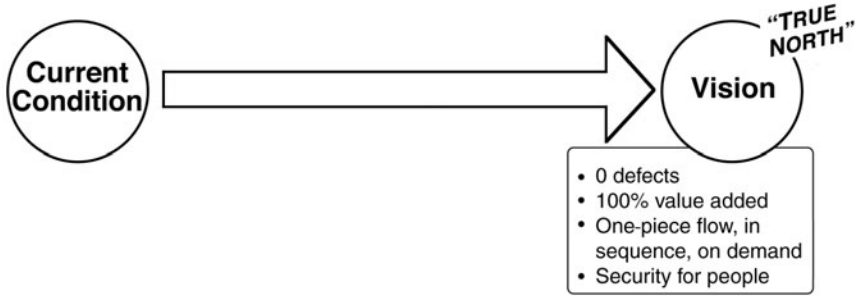

Figure 3-5. Toyota's vision for production operations

highest quality, at the lowest cost, with the shortest lead time. In recent years Toyota began referring to this as its "true north" for production. You can think of this production vision as "a synchronized one-by-one (1x1) flow from A to Z at the lowest possible cost" or as "one contiguous flow." Note that Toyota's production vision also describes a condition, not just a financial or accounting number.

What is a one-piece flow? In its ideal, one-piece flow means that parts move from one value-adding processing step directly to the next value-adding processing step, and then to the customer, without any waiting time or batching between those steps. For many years we called this "continuous flow production." Toyota now refers to it as "one-by-one production," perhaps because many manufacturers will point to a moving production line with parts in queue between the value-adding steps and erroneously say, "We have continuous flow, because everything is moving." Such a misinterpretation is more difficult to make when we use the phrase "one-by-one production."

Toyota's production vision, which will be the example of a vision that we use throughout this book, is actually an old concept and it does not come from Toyota or Japan. The advantages of sequential and 1x1 flows have been known for a long time, and in one form or

another the flow ideal has been pursued on and off again for centuries. Some examples:

- During the mid-1500s the Venetian arsenal developed a system for mass production of warships, and could produce nearly one ship a day with standardized parts on a sequential, production-line basis.
- In the late 1700s Oliver Evans developed a sequence of machines and conveyance devices that connected all parts of the flour milling process into one continuous system. Grain was poured in at one end of the mill and flour came out the other, without sacks of material (batches) being moved around between the processing steps inside the mill.
- In the 1820s at the Springfield Armory in Massachusetts, Thomas Blanchard developed a sequence of 13 or 14 machines to process gun stocks.

My colleague Gerd Aulinger takes a perhaps even more insightful and universal view on the quest to move closer to 1x1 flow, with examples such as the following:

- In the nineteenth century if you wanted to hear Strauss play a waltz, you had to invite him to your court. Later we could go to the store to buy records and CDs. Today, music plays on your mp3 player, downloaded from the Internet. Payment for that music file is made without paper money through an automatic charge to your credit card.
- Prior to the fifteenth century if you wanted a book, someone had to write it out by hand. Then Gutenberg began printing them. Eventually publishing companies were born and you could buy a book at the store, during business hours. Now you order the book online anytime, and perhaps it is even downloaded to your reading device or printer.
- At one time we sent letters by horse rider. Then came mail coaches. Following that came once-daily delivery to your doorstep. Today we communicate at any time, via telephone, e-mail, and Skype.

Remarkably, we still find plenty of organizations that argue internally about whether to accept this endless trend toward 1x1 flow—as if it were something we have the power to control.

When I first came across Toyota's true north vision, I thought I had caught a mistake, and indicated as much to a Toyota person. "One hundred percent value added is probably not even achievable," I said. "If you just move the product from one spot to the next then there is waste!" The response was, "Well, it could be that our production true north is theoretical and not achievable, but that does not matter. For us it serves as a direction giver, and we do not spend any time discussing whether or not it is achievable. We do spend a lot of effort trying to move closer to it."

In other words, it is acceptable and perhaps even desirable for the vision to be a seeming dilemma and thus a challenge.

The Toyota person's comments reminded me of the story about two people being chased by a hungry tiger. When one of them stops to put on some running shoes, the other says, "What are you doing? Do you not see the tiger coming?" The first person replies, "Yes I do, but as long as I am ahead of you I'll be fine." In a way, this is part of Toyota's strategy. Toyota is by no means perfect and is still a long way from its ideal state condition. But as long as the product is what the customer wants, whoever is ahead on the way there will essentially get the money and survive. A trick for manufacturers is to stay ahead of your competitors in this direction.

The striving for improvement in this direction, in all work activity, is a guiding light in Toyota's manufacturing operations, and apparently does not change. Both the company's philosophy of survival through improvement plus this direction giver have remained consistent beyond the tenure of any one leader.

> *As production expanded during the 1950s, Toyota shifted its priorities from improving capacity and basic manufacturing technology to developing an integrated, mass-production system that was as continuous as possible from forging and casting through final assembly.*
>
> —Michael A. Cusumano, *The Japanese Automobile Industry*

Toyota's progress toward this true north condition is by no means linear, but due in part to this consistent focus for over 50 years, Toyota has achieved a lead in eliminating waste and improving the flow of value. And it continues to move forward.

Vision as an Overall Direction Giver, but Not Much More

Toyota's production system seeks to reduce cost and improve quality by moving ever closer to a total, synchronized, waste-free, one-by-one flow. But how do we get an organization of hundreds or thousands or tens of thousands of people to work continuously and effectively in the direction of a vision? We cannot simply move from where we are today to a low-cost, synchronized one-by-one flow from start to finish. In fact, it is dangerous to jump too far too fast; to cut too much inventory and closely couple processes too soon. A vision is far away, and the path to it is long, unclear, and unpredictable (Figure 3-6). How do we find and stay on that path?

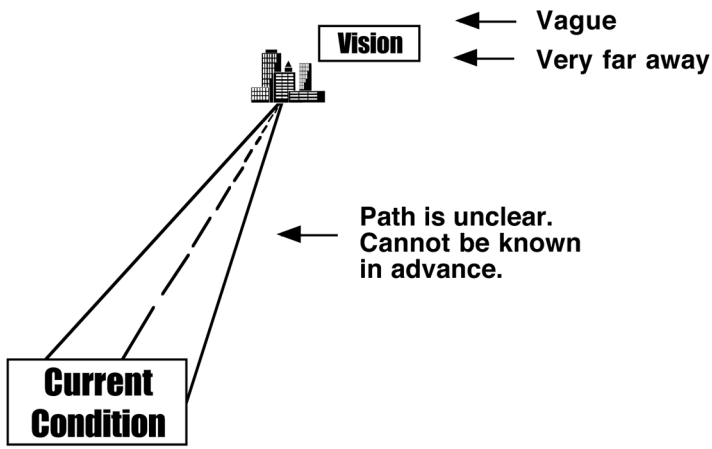

Figure 3-6. A vision serves primarily as a direction giver

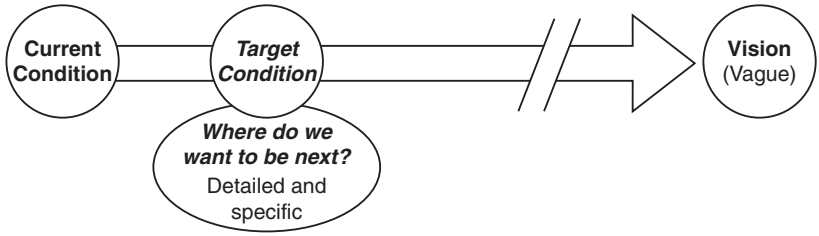

Figure 3-7. Target conditions are where the action is

Target Conditions

Toyota moves toward a vision by working with something I call "target conditions." Across the organization Toyota people learn to set and work toward successive target conditions in the direction of whatever vision is being pursued (Figure 3-7). This condition typically represents a step closer to the vision and a challenge that goes somewhat beyond current capability. You can think of a target condition like a much shorter-term desired state that is more clearly defined than the distant vision. Like the vision, an interim target condition is also not a financial or accounting target, but a description of a condition.

Once a target condition is defined, it is not optional nor easily changeable. It stands. *How* to achieve that target condition *is* optional and can tap into what humans are good at: roll-up-your-sleeves effort, resourcefulness, and creativity to achieve new levels of performance. That is, if they have a kata and are well-managed. Target conditions are a component of Toyota's improvement kata, and we will look at them closely in Chapter 5.

Utilizing the Sense of Direction to Manage People

How does Toyota utilize its production vision to help manage people? A couple of examples will clarify this.

Example 1: Sensor Cables

In visiting the assembly area of a factory that produces automotive ABS-sensor cables (wires with a connector at one end and a sensor at the other), we found that the batch size in the assembly processes was one week. That is, a five-day sales quantity of one sensor-cable type is produced, and then the assembly process is changed over to produce a five-day batch of a different type. A quick calculation showed, however, that there was enough free capacity to permit more changeovers and smaller assembly batch sizes. The assembly area could set a target condition of a one-day batch size, rather than the current five days, and achieve that without even having to reduce the already short changeover time.

In the conference room, we pointed out the potential for smaller batch sizes to the management team. The benefits of smaller lot sizes are well known and significant: closer to 1x1 flow, less inventory and waste, faster response to different customer requirements, less hidden defects and rework, kanban systems become workable, and so on.

Almost immediately the assembly manager responded and said, "We can't do that," and went on to explain why. "Our cable product is a component of an automobile safety system and because of that each time we change over to assembling a different cable we have to fill out lot-traceability paperwork. We also have to take to the quality department the first new piece produced and delay production until the quality department gives us an approval. If we were to reduce the assembly lot size from five days to one day we would increase that paperwork and those production delays by a factor of five. Those extra non-value-added activities would be waste and would increase our cost. We know that lean means eliminate waste, so reducing the lot size is not a good idea."

The plant manager concurred, and therein lies a significant difference from Toyota. A Toyota plant manager would likely say something like this to the assembly manager: "You are correct that the extra paperwork and first-piece inspection requirements are obstacles to achieving a smaller lot size. Thank you for pointing that out. However, the fact that we want to reduce lot sizes is not optional nor open for

discussion, because it moves us closer to our vision of a one-by-one flow. Rather than losing time discussing whether or not we should reduce the lot size, please turn your attention to those two obstacles standing in the way of our progress. Please go observe the current paperwork and inspection processes and report back what you learn. After that I will ask you to make a proposal for how we can move to a one day lot size without increasing our cost."

Using Cost/Benefit Analysis in a Different Way

As the sensor cable example illustrates, without a direction we tend to evaluate proposals individually on their own merits, rather than as part of striving toward something. This creates that back-and-forth, hunting-for-a-solution, whoever-is-currently-most-persuasive effect in the organization.

Specifically, without a sense of direction we tend to use a short-term cost/benefit analysis to decide and choose on a case-by-case basis whether or not something should be done—in which direction to head and what to do—rather than working through challenging obstacles on the way to a new level of performance. How many times have you witnessed a potentially interesting though still unformed idea quickly torpedoed and killed with the question, "Is there a financial benefit to that?"

Toyota uses cost/benefit (CBA) analysis too, but differently than do we. While we have learned to utilize CBA to determine *what* to do, at Toyota one first determines where one wants or needs to be next—the target condition—and then cost/benefit analysis is utilized to help determine *how* to get there. At Toyota, CBA is used less for deciding whether something should be done, and more for deciding *how* to do it.

Traditional: CBA determines direction; that is, whether we do something or not. "This proposal is too costly? Then we must do something else."

Toyota: CBA helps define what we need to do to achieve a predefined target condition. "This proposal is too costly? Then we must develop a way to do it more cheaply."

Do not think, however, that Toyota's approach is about achieving target conditions at any cost. Toyota has strict budgets and target costs. The idea is to first determine where you want to go, and then how to get there within financial and other constraints. This is where the sense of direction from the vision plays its role. Do not let financial calculations alone determine your direction, because then the organization becomes inward-looking rather than adaptive, it oscillates on a case-by-case basis rather than striving toward something, and it seeks to find and implement ready solutions rather than developing new smart solutions. An economic break-even point is a dependent variable, not an independent constraint that determines direction.

Example 2: New Production Process

When a new assembly process is being designed, there are usually a few different process options from which to choose. For example, there may be a fully automated line concept, a partially automated version, as well as a manual line concept. When we run these options through a cost/benefit analysis—a return-on-investment, or ROI, calculation—more often than not the fully automated option wins and is what we select. Later, when the line is in place, there are complaints that the automated line does not fit well with the situation.

To follow Toyota-style thinking, we would take a different approach. First we would determine where we want to be. In this case that means determining what type of assembly process is most appropriate for the particular situation. Fully automated, partially automated, and manual lines all have their place, depending on the situation, and all of them can be a "lean line." In the early start-up phase of production for a new product, the product's configuration is still apt to change and the sales volume ramp-up may be different than expected. In this situation it can make sense to begin with a flexible, easily altered manual line and move to higher levels of automation when the product matures and sales volume increases.

Now comes the cost/benefit analysis, which, let's say, shows that the manual line design is too expensive. In the Toyota way of thinking, this does not mean that the manual line option is dropped. The target condition, a manual line, has already been defined and stands. What the negative outcome of the cost/benefit analysis tells a Toyota manager is that more work is needed on the design of the manual line, in order to bring it into the target cost objective. The manager will ask his engineers to sharpen their pencils and go over the design again, and this will continue iteratively until the target condition is reached within budget constraints. The sense of direction was used to manage people—in this case the engineers who were charged with developing a new production process.

Stay Home

One lesson implicit in this discussion is that we should not spend too much time benchmarking what others—including Toyota—are doing. *You yourself are the benchmark*:

- Where are you now?
- Where do you want to be next?
- What obstacles are preventing you from getting there?

For example, if you find that your technical support staff cannot respond quickly enough to machine problems, you might think, "I wonder how Toyota handles this?" Or you could stay home and ask, "How fast do we want our technical support to respond? What is preventing that from happening? What do we need to do to achieve the desired condition?"

Remember, the ability of your company to be competitive and survive lies not so much in solutions themselves, but in the capability of the people in your organization to understand a situation and develop solutions.

And you don't have to be perfect, just ahead of your competitors in aspects of your product or service.

Notes

1. "Open the Window. It's a Big World Out there! The Spirit and the Ideas That Created Toyota," pamphlet published by Toyota Kaikan, Toyota Motor Corporation, October 1993.
2. Note that this may no longer be an effective vision for an organization in the transportation business in the twenty-first century.
3. In early years this production vision was referred to as "Highest quality, lowest cost, shortest lead time."

Chapter 4

Origin and Effects of Our Current Management Approach

Much of our current managerial template comes out of the United States automobile industry of the 1920s, and a short, focused look back at the early history of its two giants, the Ford Motor Company and the General Motors Corporation, sheds light our current thinking.[1]

The Ford Motor Company Approach (1906–1927)

In regard to pursuing the 1x1 flow ideal state, Toyota was clearly preceded by the Ford Motor Company, which undertook, arguably, Western manufacturing's last focused and sustained pursuit of the contiguous flow vision early in the twentieth century. (Note that I am intentionally using the word *contiguous* rather than *continuous*.)

Flow Experiments in Fabrication Processes

Everyone has heard about Ford's 1913 moving-conveyor final assembly line for the Model T automobile at the Highland Park, Michigan, factory. But Ford's flow experiments had already begun before the Model T was introduced in 1908.

In 1906, to meet expanding sales of the Model N automobile, Ford engineers began arranging machine tools for the fabrication of engine and transmission parts in the sequence of processing steps, rather than grouping them by machine type, as was then common practice. For example, if a heat treatment was required, then the heat-treat oven would be located directly between the previous and next machining steps, rather than in a separate oven area. The result was considerably higher productivity. Over the next few years, Ford strove to apply this sequential processing concept to the production of many different fabricated parts.

At that time, Ford's various *assembly* processes (engine, transmission, axle, magneto, dashboard, final assembly, and so on) were still set up as stationary tables or stands on which a whole item was assembled, typically by a single person who fit all the parts together. Even when Ford moved its parts fabrication and assembly processes to the Highland Park factory in 1910, the primary assembly approach remained stationary tables and stands.

Sequential Flow Assembly Line

By 1913 the Highland Park factory still could not meet the runaway demand for the Model T; more orders were coming in than cars going out. Ford engineers, seeking ways to fill those orders, established their first sequential and moving assembly line for subassembly of the flywheel magneto. After a few weeks of experimentation and fine-tuning, the productivity of this process was increased fourfold.

You can imagine the enthusiasm with which Ford's engineers then worked to spread this sequential, flowing, and often moving-conveyor based assembly approach to the many other assembly processes at Highland Park, including the famous final vehicle assembly lines.

Putting It All Together

By the end of 1913, Ford had more or less the following situation in its Highland Park factory. The upstream parts-making processes (stamping, machining, etc.) had been arranged in the order of processing steps for some time. As indicated in Figure 4-1, the various downstream assembly

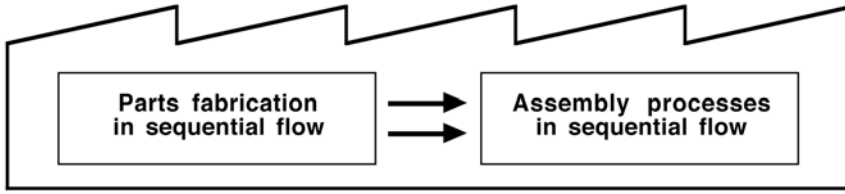

Figure 4-1. Fabrication and assembly

processes (engine, final, etc.) were now also being put into sequentially flowing line arrangements.

Furthermore, there was also only one product being produced, the Model T, which meant that no changeovers were required. Except for a few different body types, all other parts on every Model T in production were the same.

What would Ford's next step be in this situation?

With their successes in making both fabrication and assembly processes flow, and since they were only manufacturing one product, Ford engineers tried to take flowing production to its logical conclusion: Why not connect all processes in one contiguous flow from raw material to finished product (Figure 4-2)?

We were not there and we cannot interview the Model T era Ford engineers to ask them about this, but they did leave us an exoskeleton of their thinking with the unusual, still-standing six-story buildings at Highland Park. These buildings (one of which is depicted in Figure 4-3 in its original elevation drawing)[2] were added to the Highland Park factory complex in 1914, and Model T–related production took place there until 1919.

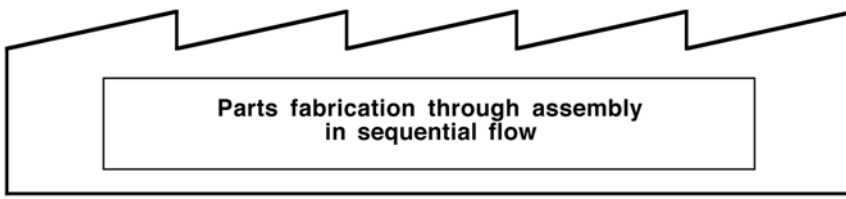

Figure 4-2. Connecting it all into a single flow

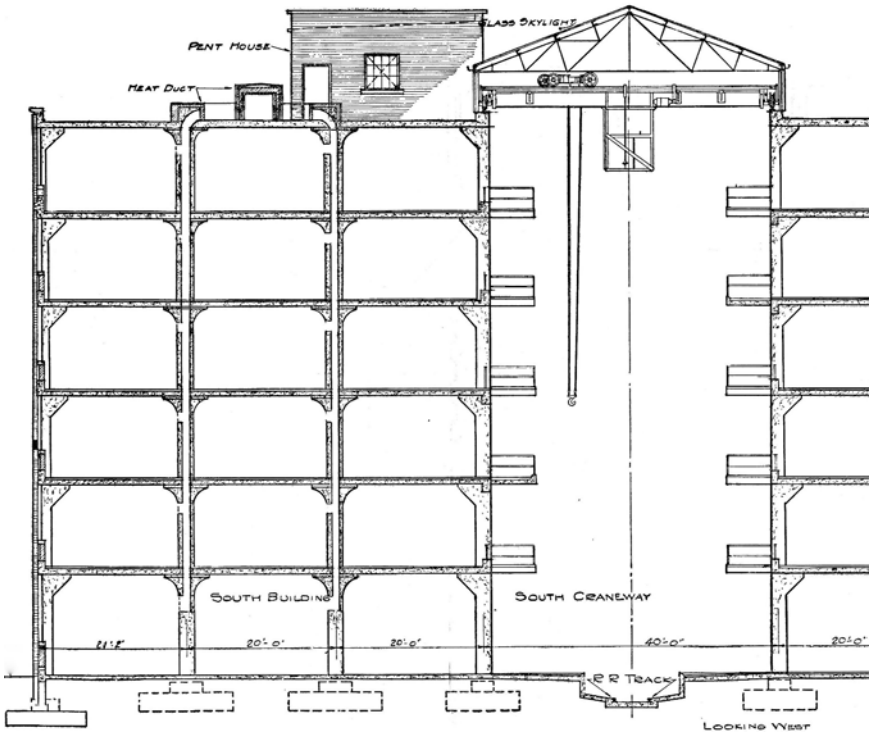

Figure 4-3. Cross section of Ford Highland Park six-story buildings, 1914

The concept behind these unique buildings was that final assembly is on the ground floor, and subassembly and parts fabrication processes are on the upper floors. In those days, materials were brought to factories by rail, and as you can see in the elevation drawing, railroad tracks went down the center craneway of the building. In the craneway, material would be hoisted from the railcars onto balconies that opened to the appropriate floors.

At this point I'll let Mr. Edward Gray, Ford's chief construction engineer at the time, describe the rest of the material flow in these buildings, which he designed:

> *There are thousands of holes cut through the various floors of those buildings, so that the parts that started in the rough on the top floor gravitated down, possibly through chutes or possibly through*

conveyors or tubes, and finally became a finished article, well down on the ground floor; landed on the conveyor at the ground floor.[3]

In doing some secondary research for this book, my colleague, Jim Huntzinger, and I became fascinated with Ford's six-story buildings at Highland Park, and this statement in particular. Once we had read Edward Gray's testimony in the Ford Tax Case files at the Detroit Public Library, it seemed that the assertion of Ford's Model T era engineers striving for one contiguous flow could only be confirmed by seeing for ourselves the holes in the floors of the six-story buildings.

Imagine how disappointed we were when we could not find even one hole in the floors as our Ford hosts kindly walked us through the now-unused six-story buildings. Fortunately, we had an astute University of Michigan Ph.D. student with us, Eduardo Lander, who suddenly realized, "These floors are 90 years old and have probably been resurfaced many times. We should be looking at the ceilings, not the floors." And as we looked up, there they were, plain as day, lots of patched holes.

Ford's six-story building experiment was ultimately not a success and the concept did not spread. We can speculate that the two cranes in each craneway—for unloading materials from the railcars—would have been a serious flow bottleneck. Transferring parts through holes in a reinforced concrete floor must also have been quite inflexible, since changing a machine layout could mean having to patch one hole and jackhammering open a new one.

There was also still plenty of work-in-process inventory in the Highland Park value streams; in all the different conveyors, chutes, slides, barrels, etc., transferring components between processes, and often between individual processing steps within one process too. Ford was still a long way from the ideal of a 1x1 flow from A to Z, but that misses this key point: *whether consciously or not, by striving to continuously improve the production flow toward an ideal of one connected flow, the early Ford Motor Company was utilizing a vision and interim target conditions in a way that highlights critical obstacles and makes them something to be worked through rather than circumvented.* This is surprisingly similar to how Toyota's improvement kata utilizes a long-term vision

and interim target conditions to manage people and move the organization forward (Figure 4-4). Ford's story has been told many times, but from a management and organization behavior perspective, we have missed this point.

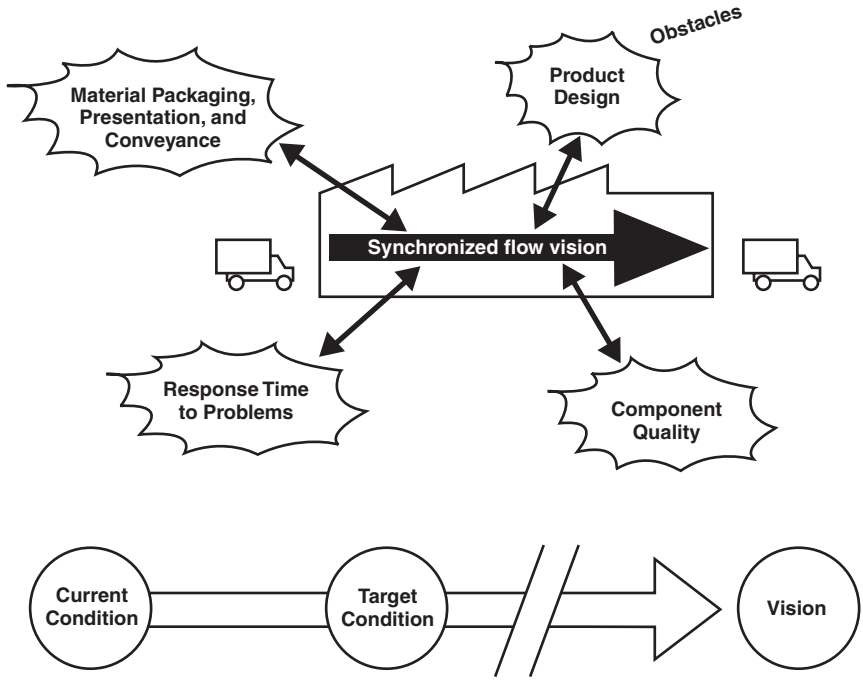

Figure 4-4. Early Ford utilized a vision and target conditions similar to the way that Toyota does

End of the Flow Experiments

After the six-story buildings Ford made one more big attempt to connect all processes from raw material to finished product, at the integrated, horizontal layout River Rouge factory complex. The Model T completed its production run there from 1919 to 1927. But by the mid 1920s customers were less willing to keep buying the same Model T. The number of different product variations began increasing, while the lifespan of any one model decreased.

These two new demands on the factories—higher variety and shorter product life span—made it much more difficult to try to synchronize the production flow compared to the one-product Model T days. Some processes in the value stream now had to produce different versions of an item and change over between them. Say, for example, a crankshaft machining process that had produced only one crankshaft for the Model T would now have to produce a few different crankshafts for a few different engine variants. Ideally this machining process would change over at the same time the engine assembly process changes over, in sync, but this is difficult because a machining area often feeds more than one assembly process and has significantly longer changeover times.

In this situation there are two basic options. The challenging option is to continue pursuing the "one contiguous flow" vision. This requires tackling and working through the admittedly difficult obstacles to a connected, synchronized flow and developing new solutions. The easier and quicker option, on the other hand, is to move away from the synchronized flow ideal, decouple the processes in the value stream from one another and operate them as islands.

Generally speaking, after the Model T, manufacturers increasingly chose the decoupling option. Besides the increasing product variety, another reason for the move away from pursuing the flow ideal may have been that, around 1924, the production capacity of the U.S. automobile companies finally began to match the demand level. Orders were no longer outpacing capacity, and this conceivably reduced the urgency to keep striving for further flow and productivity improvements.

Another reason was that General Motors struck out in a new direction with its new management approach, and it, no longer Ford, became the company to emulate. As the Model T era came to a close, it seems that so did focused experiments to keep improving factory flow, and the associated improvement kata style behavior. Pursuit of the one contiguous flow ideal went dormant again, until Toyota took up the mantle in the 1950s.

The General Motors Approach (1920s to Present)

A New Direction in Management

Early Ford put emphasis on and effort toward a vision that described a condition—the production flow ideal—but ultimately focused too little on product development and on organizing and managing the company in systematic ways. In contrast, General Motors (GM) put a lot of attention on developing systematic management and structuring the organization. Three concepts from GM's then new management approach pertain in particular to our discussion here. They should look familiar to anyone who has worked in a medium- or large-sized company.

Rate-of-Return for Decision Making

The GM financial committee relied on a rate-of-return analysis (cost-benefit analysis or return-on-investment calculation) for decision making on investments. The predicted return determined the choices that were made, as opposed to early Ford's idea to do what is necessary to pursue an ideal.

In other words, *make money* became the guiding vision or overall direction for further development of the business or the factory. We were now not moving in a particular direction (aiming at successive target conditions on the way to a vision) but rather judging and selecting options independently based on their rate of return.

> *No other financial principle with which I am acquainted serves better than rate of return as an objective aid to business judgment. . . .*
>
> *We are not in the business of making cars, we are in the business of making money.*
>
> —Alfred P. Sloan, Jr., President of General Motors, 1923–37; Chief Executive, 1937–46; Chairman of the Board, 1937–56[4]

Maximizing the Output of Individual Processes

Early GM seems to have concluded that low costs are achieved when large quantities are produced with high machine utilization. Management began to think of the production value stream in terms of separate segments or departments, viewing each as an island, and created incentives that led those departments to produce as much as possible as fast as possible in order to reduce cost according to managerial accounting calculations (pieces per man hour per department or segment of the value stream).

Centralized Planning and Control Based on Managerial Accounting Data

GM introduced a decentralized divisional operating organization, but, increasingly, with centralized operational decision making and control. That control was based on setting quantitative targets for the divisions and reporting back performance metrics from the divisions. Decision making was based heavily on analysis of reported managerial accounting data.

> Of course, GM also introduced well-known practices to influence the consumption side of the equation. These included segmenting the consumer market and providing each segment with a product line, an annual model change, segment-specific marketing, and providing credit to consumers. Since this book is about organization management, I will concentrate on changes GM introduced inside the company, on the management side of the equation.

Intended and Unintended Effects

The results of General Motors' new approach and practices were dramatic and positive. GM achieved phenomenal success, grew to be the world's largest corporation, and greatly influenced the nature of business management. Over the following decades GM's management approach was widely publicized and was adopted by countless other

companies. By the 1950s it had become general practice at U.S. corporations and at companies around the world. Today it is so pervasive that it is essentially invisible. It is simply how things are done.

I should add one qualification to the above paragraph however: GM's managerial approach achieved great success *in the market conditions that prevailed through the 1960s*. In later years, under different conditions, the same management approach no longer worked as successfully.

Let's take a look at some of the effects that those three GM concepts had on how companies are managed. Again, the following should look familiar to anyone who has worked in a manufacturing company.

Effect of Rate-of-Return for Decision Making

GM's formula-based rate-of-return decision-making approach is effective enough in a growing market when there are business opportunities from which to choose, but it becomes less so in the crowded or low-growth marketplaces we have today.

GM's approach involved, to a degree, selecting between options in the early days of the U.S. automobile industry, when there were multiple options from which to choose. But in a lower-growth market with many competitors, the immediately profitable opportunities—the low hanging fruit—will have been picked. In this situation, management's task becomes more one of nurturing promising processes, products, and situations into profitability than selecting ones that would be directly profitable.

The ROI approach of General Motors is more about making choices than about improving and adapting. For example, in the second half of the twentieth century, Detroit automakers opted repeatedly to not significantly enter the market for small cars, even as that market grew noteworthy, because from an ROI-selection perspective it was not profitable. The media has often criticized these decisions, but that denunciation is at least partially misplaced. Executives were making those decisions rationally and correctly, in accordance with the management system within which they worked.

In contrast, Toyota's approach is about getting people to work systematically and creatively at the detail level to do what is necessary to achieve ambitious target conditions, which at first pass may not make it through a rate-of-return calculation. As shown in the previous chapter, Toyota utilizes cost benefit analysis less as a means for determining direction or what to do, and more as a means for figuring out how to cost-effectively achieve a desired condition.

If we go even further with our ROI thinking and use it to evaluate individual decisions or steps, then the result is likely to be suboptimization. According to systems theory, trying to maximize the individual parts of something reduces the effectiveness of the whole.

As we make these comparisons between GM and Toyota, we should keep in mind that it is not a judgment. The two approaches represent reactions to different conditions at different points in time in the history of the automobile industry. What's most important is that we understand their long-term effects on an organization.

Effect of Maximizing the Output of Individual Processes

Seeking to maximize individual process output—for example, by measuring each process separately with a pieces per man hour calculation—generates the following effects on a value stream:

- A process or department becomes even more decoupled from the next process as it strives to produce as much as possible as fast as possible.
- Since changeovers interrupt production, there is a natural tendency to avoid them and produce large lots.
- The next process in the value stream does not yet need all those parts that were produced too soon, so the parts must be stored as in-process inventory. (Inventory which is, by the way, counted as an asset by the managerial accounting system.)
- When the next process finally does use the parts, it will discover defects among them. However, it is impossible to trace the root

causes of those defects because the parts were produced some time ago, and the conditions in the preceding process that caused the defects have long since changed.

This situation repeats over and over all the way through the value stream and results in a total lead time through the factory that is measured in days or weeks, whereas the total value added time is actually only minutes. Interestingly, when we speed up a process to improve its pieces-per-man-hour numbers, we only reduce the minutes of value-adding time and do nothing to reduce the days and weeks of lead time. You can observe these effects in factories around the world.

To keep inventory from swelling too much in this situation, we started placing limits on inventory buffers and set targets for inventory levels, without necessarily understanding the actual situation in the factory processes. The goal then became trying to schedule each individual segment of the value stream so accurately that items would be made not long before the next segment actually needs them. But this holy grail is not consistently attainable in the real world, even with sophisticated software, because process conditions up and down the value stream are constantly changing.

It takes a certain amount of inventory to hold a value stream together, and the quantity of inventory required depends on the current performance characteristics of the processes in that value stream. If we reduce inventory targets to below this level, then shortages, expediting, and emergency freight will increase. Every day's work in the factory then involves adjusting schedules and expediting. Such daily adjustments in turn cause even more volatility in the value streams, and soon everyone in the factory becomes almost completely occupied with trying to make the production quantities and shipments.

People in an organization act rationally in a way that maximizes their success. Putting the emphasis on departmental output maximization, rather than on optimizing the overall flow for the customer, means that the natural interests of the departmental manager may come into conflict with the long-term survival interests of the company. In the long run, overall cost will be higher and the organization will become so

involved in firefighting that it is standing still, even though the departmental manager is meeting and even exceeding his or her objectives.

Again, systems theory tells us that we cannot optimize a system by trying to maximize its individual parts.

Effect of Centralized Planning and Control Based on Managerial Accounting Data

As the above description of everyday life in a factory illustrates, with centralized decision making from a distance based on accounting data, management tends to lose connection with, and understanding of, the actual situation on the work floor. Trying to manage from a distance through data abstractions often results in managers making incorrect assumptions and inappropriate decisions, and trying to make adjustments and adaptations too long after the fact. In addition, on-site managers naturally try to make the numbers upon which they are evaluated look good, which means that even less accurate information is reaching the decision makers in the levels above.

Not only are the centrally controlled divisions unable to adapt autonomously and quickly, but the decision makers in the central office are basing their decisions on inaccurate, after-the-fact quantitative abstractions.

What Happened to Management By Objectives?

The original thinking behind management by objectives (MBO), as outlined by Peter Drucker in his 1954 book *The Practice of Management*, is not too distant from how Toyota is managing. Drucker even mentions, in a short case example, how what he calls "some of the most effective managers I know" go beyond only deploying quantitative targets downward. He briefly describes how these managers engage in a two-way dialogue with the level below them in order to develop written plans for the activities that will be undertaken to reach the targets. In other words, paying attention to the means that are utilized to achieve the results.[5]

It appears, however, that in subsequent actual business practice and education, MBO became something more like planning and control from above executed to a large degree by setting quantitative targets and assessing reports of metrics. Some call this "management by results." Unfortunately, there are plenty of different ways to achieve a quantitative outcome target, many of which have nothing to do with making real process improvement and moving the pieces of an organization in a common direction.

So why did a watered-down version of MBO work so well for us for so long? Here are some possible reasons:

- In the period of limited international competition and continued growth, which ran until the 1970s, occasional improvement was good enough. In such market conditions it is possible to make a good profit even if there is considerable waste in the system and we are not continually improving.
- In those market conditions, there were still some profitable choices available, and thus less need for nurturing products and situations into profitability.
- As the need for improvement and evolution became apparent in the mid- to late 1970s, it may have been possible to stay ahead for a while by simply cutting inventories and head count, which might have been bloated. Today, however, we might well be reaching the limits of improving by simply cutting.
- The competition was ramping up only slowly, which made it seem as if conditions were not changing all that much.

Interestingly, moving production to lower-cost countries in order to reduce cost—another form of cutting—does not change the underlying system or improve the production process. Some have called this "making waste cheaper," because it does not actually change the underlying way of doing things.

What Are the Lessons from This History?

Lesson 1

Simply put, after the Model T era the basic attributes of factory flow in the West barely changed during the rest of the twentieth century, as a consequence of the management system. There were, of course, many technological developments since the end of the Model T days, but as Michael Cusumano, in his early 1980s Ph.D. research, and the famous late 1980s IMVP study, both asserted, from 1930 to the 1980s there was little further development in productivity and factory flow (inventory turns) in Western automobile factories. The basic production techniques stayed about the same.

Toyota's way of moving forward, in contrast, is very much one of adaptation and continuous improvement; of nurturing processes, products, and businesses into profitability by doing what is necessary to achieve target conditions (Figure 4-5).

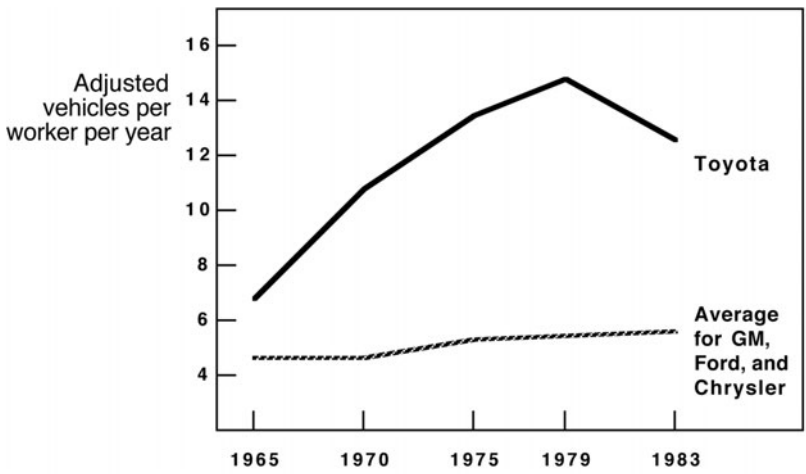

Figure 4-5. Productivity trends, Toyota and the Detroit Big Three
Source: Michael A. Cusumano, *The Japanese Automobile Industry: Technology & Management at Nissan & Toyota* (Cambridge, Massachasetts: The Harvard University Press, 1985).

Lesson 2

In the early 1950s the baton of continuous process improvement toward the ideal flow vision was picked up again, and this time by Toyota. In production, for example, Toyota decided to keep working step by step toward something like the early Ford Motor Company vision: a connected and synchronized flow with ever shorter lead time. In fact, both early Ford and Toyota have referred to the production ideal as "one long conveyor."

Toyota recognized that a main source of low cost is not high machine utilization by itself, but rather when parts flow uninterrupted from one process to the next with little waste in between. For Toyota, striving toward this kind of a synchronized flow meant taking on the challenge of eliminating or reducing the time required to change over between the different items required by the customer.

Lesson 3

The most important lesson to derive from this chapter is that many of us are managing our companies with a logic that originated in the 1920s and 1930s, a logic that might not be appropriate to the situation in which your company finds itself today.

GM's approach proved highly lucrative during the period of growth and oligopolistic isolation from global competition that extended until the 1970s. It became our model and accepted management practice, and is still taught in business schools today. That means, for many of us the way we currently manage our companies is built on logic that originated in the conditions faced by companies in the U.S. automobile industry during the late 1920s. The problem is not that the logic is old, but that it does not incorporate continuous improvement and adaptation. If our business philosophy and management approach do not include constant adaptiveness and improvement, then companies and their leaders can get stuck in patterns that grow less and less applicable in changing circumstances.

The solution is not to periodically change your management system or to reorganize, but to have a management system that can

effectively handle whatever unforeseeable circumstances come your way. The fact that Toyota has maintained much of its same management thinking for the past 60 years is a testament to this. Several of us are curious to see how Toyota's management system will maneuver and weather the next few decades.

Let us now take a look at that management system.

Notes

1. Keep in mind as you go through this chapter that in retrospect all history is revisionist, and despite my best efforts to dig deep and be impartial, that undoubtedly holds true for this history as well.
2. The elevation drawing is found in: Horace Lucien Arnold and Fay Leone Farote, *Ford Methods and the Ford Shops* (New York: The Engineering Magazine Company, 1915).
3. Testimony of Edward Gray, Ford Tax Cases, 1927, page 1241.
4. Alfred P. Sloan, Jr., *My Years with General Motors* (New York: McFadden-Bartell, 1965).
5. Peter Drucker, *The Practice of Management* (New York: HarperBusiness, 1993). Originally published in 1954.