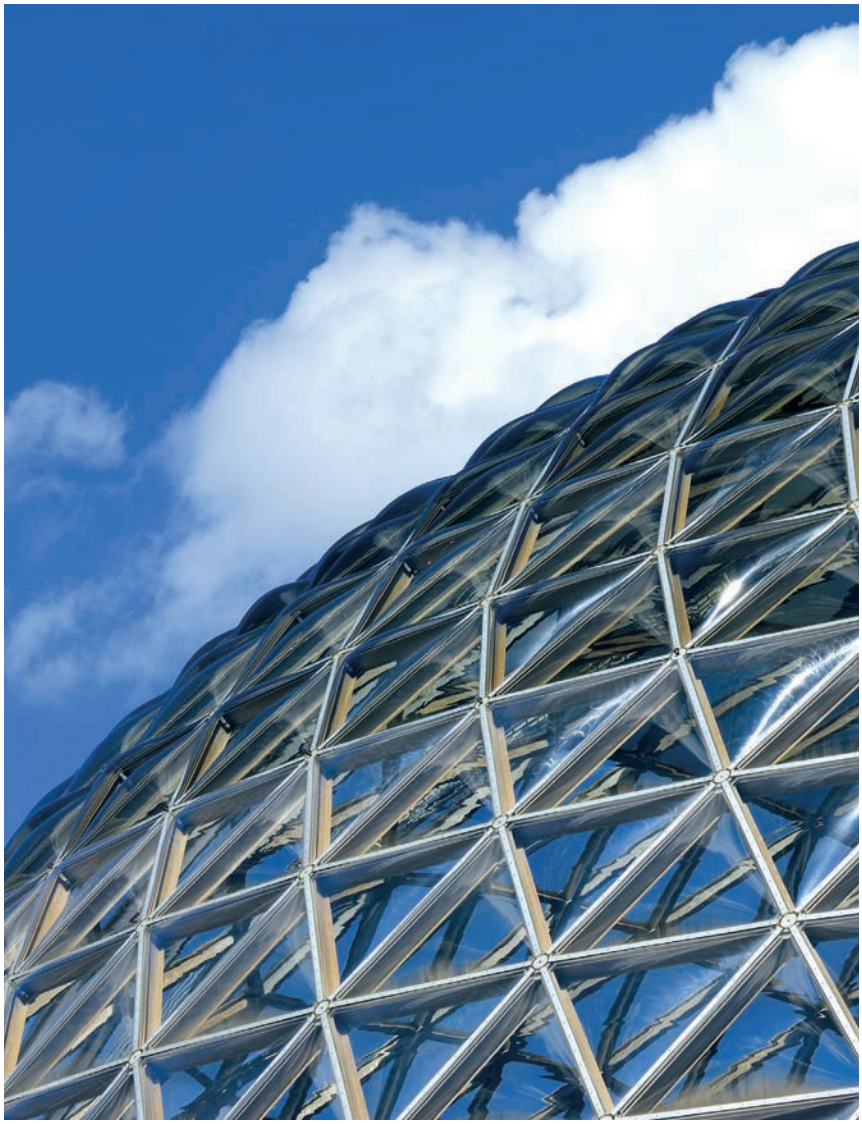
Volume 14, Number 1

Reflections

The SoL Journal
on Knowledge, Learning, and Change



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EXECUTIVE DIGEST 14.1

Putting Theory into Action: The Evolution and Practice of Structural Dynamics

David Kantor with Deborah Wallace; Sarah Hill and Tony Melville

This article gives a unique glimpse into both the development and the application of a key body of work by one of today's most important organizational theorists and practitioners. In Part One, David Kantor explains the evolution of his theory of Structural Dynamics, a model of how communication works—or doesn't work—in human systems. He also details how what he calls "communicative competency" can lead to more effective conversations—a key to creating healthy family and organizational systems. In Part Two, Sarah Hill and Tony Melville describe the application of Structural Dynamics to a client situation. These two complementary perspectives provide a window into the profound possibilities offered by translating Kantor's theory into practice.

Learning to Learn: Knowledge As a System of Questions

Michael Ballé, Jacques Chaize, and Daniel Jones

What is it about the Toyota Production System (TPS) that has allowed Toyota to achieve high levels of performance over time, despite occasional setbacks? The authors have found that instead of being a system of *best practices*, the TPS is a system of *interconnected questions*. As such, in TPS, knowledge does not involve applying a cookie-cutter method to get a desired result but rather posing the right questions to ultimately improve the system as a whole. The authors examine Toyota's five-step cycle for problem finding, framing, and solving. They show that as employees develop their problem-finding capabilities and problem-solving skills, they individually and then collectively enhance the organization's judgment in the long run.

Is Your Town in Transition?

Jessica Stites

Over the past decade, more than 1,000 municipalities in 43 countries have chosen to define themselves as "Transition Towns." Frustrated by the slow pace of change in response to challenges such as peak oil, climate change, and economic instability, people in these places have undertaken grassroots initiatives to build the resilience of their communities to survive sudden shortfalls of necessities such as food, oil, water, or money. These preparations take many forms, some infrastructural—such as establishing solar energy programs—and others interpersonal—like creating groups that encourage people to help each other in times of need. At its core, the Transition Movement seeks to build the "social technologies" required to achieve long-term sustainability.

The Triple Focus: Rethinking Mainstream Education

Daniel Goleman and Peter Senge

In *The Triple Focus: A New Approach to Education*, Peter Senge and Daniel Goleman examine the cognitive and emotional tools that young children need to navigate and thrive in today's environment. The authors identify three skill sets essential for navigating this world of increasing distractions and decreasing face-to-face communications: focusing on self, tuning in to other people, and understanding the larger world and how systems interact. This excerpt focuses on the third skill set and makes a strong case for capitalizing on the connections and synergies between Social and Emotional Learning (SEL) and systems thinking. The notion of transforming and replacing the traditional pedagogy that anchors our current curriculum with systems-based learning has already taken hold with impressive results that have surprised even the authors.

EXECUTIVE DIGEST 14.1

Reflections on the 2014 SoL Global Forum

Gitte Larsen and Vicky Schubert

On May 21–23, 2014, 450 participants from around the world gathered in Paris, France, to take part in the SoL Global Forum: "Investing in Emerging Futures: New Players, New Games—Welcoming Metamorphosis." Organized by SoL France, the event invited change leaders and organizational leaders to explore an urgent question together: "How can we facilitate and accelerate the metamorphosis of our organizations, firms, and society?" In this two-part article, Gitte Larsen, a newcomer to the Global SoL community, and Vicky Schubert, a long-time SoL contributor, share highlights from—and personal reflections on—the event. Their insightful commentary paints a picture of a community of people who are making the internal shifts necessary to lead profound changes in all those external systems that connect us.

FEATURE 14.1

Learning to Learn
Knowledge As a System of Questions

MICHAEL BALLÉ, JACQUES CHAIZE, AND DANIEL JONES

What is it about the Toyota Production System (TPS) that has allowed Toyota to achieve high levels of performance over time, despite occasional setbacks? The authors have found that instead of being a system of *best practices*, the TPS is a system of *interconnected questions*. As such, in TPS, knowledge does not involve applying a cookie-cutter method to get a desired result but rather posing the right questions to ultimately improve the system as a whole. The authors examine Toyota's five-step cycle for problem finding, framing, and solving. They show that as employees develop their problem-finding capabilities and problem-solving skills, they individually and then collectively enhance the organization's judgment in the long run.


Michael Ballé


Jacques Chaize


Daniel Jones

Some people feel they have all the knowledge they need to get ahead, and performance is a matter of using that knowledge well. Others realize they need to learn but feel confident they already know what knowledge they are missing. Other individuals are aware that they still must discover exactly what they need to learn and how to distinguish what is important from what isn't. They understand that they need to *learn how to learn*. But how can someone produce knowledge if they don't know what they're after? The trick to learning how to learn is in knowing where to look by asking the right questions.

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We have spent 20 years studying and practicing organizational improvement and learning systems. Based on our experience with a range of lean approaches, we would like to suggest that the Toyota Production System (TPS) is a tool for learning how to learn that has introduced a radical shift in the handling of knowledge. Its unique features separate it from its many copycats and explain its effectiveness and longevity. This system has had an impact far beyond the automotive industry and manufacturing sectors, reaching into healthcare and service industries. But often when it has been applied in different settings, the results have been disappointing. Why is this the case? We have found that, instead of being a system of *best practices* (which is the kind of learning one seeks if one already knows what to learn), the TPS is a system of *interconnected questions*. As such, in TPS, knowledge does not involve applying a cookie-cutter method to get a desired result but rather posing the right question to ultimately improve the system as a whole.

What Knowledge?

Before we make the case for the value of questions, bear with us as we backtrack and establish what we mean by "knowledge" in this context. We look at knowledge as a fundamental source of productivity: It is what enables us to make robust decisions and carry them out in the best way in order to reach our goals. From this point of view, knowledge has three main features:

First, the most common way of describing knowledge has been with us since the Greek philosophers. Plato and those who followed him saw knowledge as "justified true beliefs." To be counted as knowledge, the beliefs we have about the world must be considered true. If a long-held belief is discovered to be wrong, it cannot have been known. Therefore, if I discover that the human brain remains plastic and trainable throughout its lifespan, then my deeply held belief that it's unchangeable after the age of 20 is not knowledge but a fallacy. A belief is not knowledge unless I can justify or prove it.

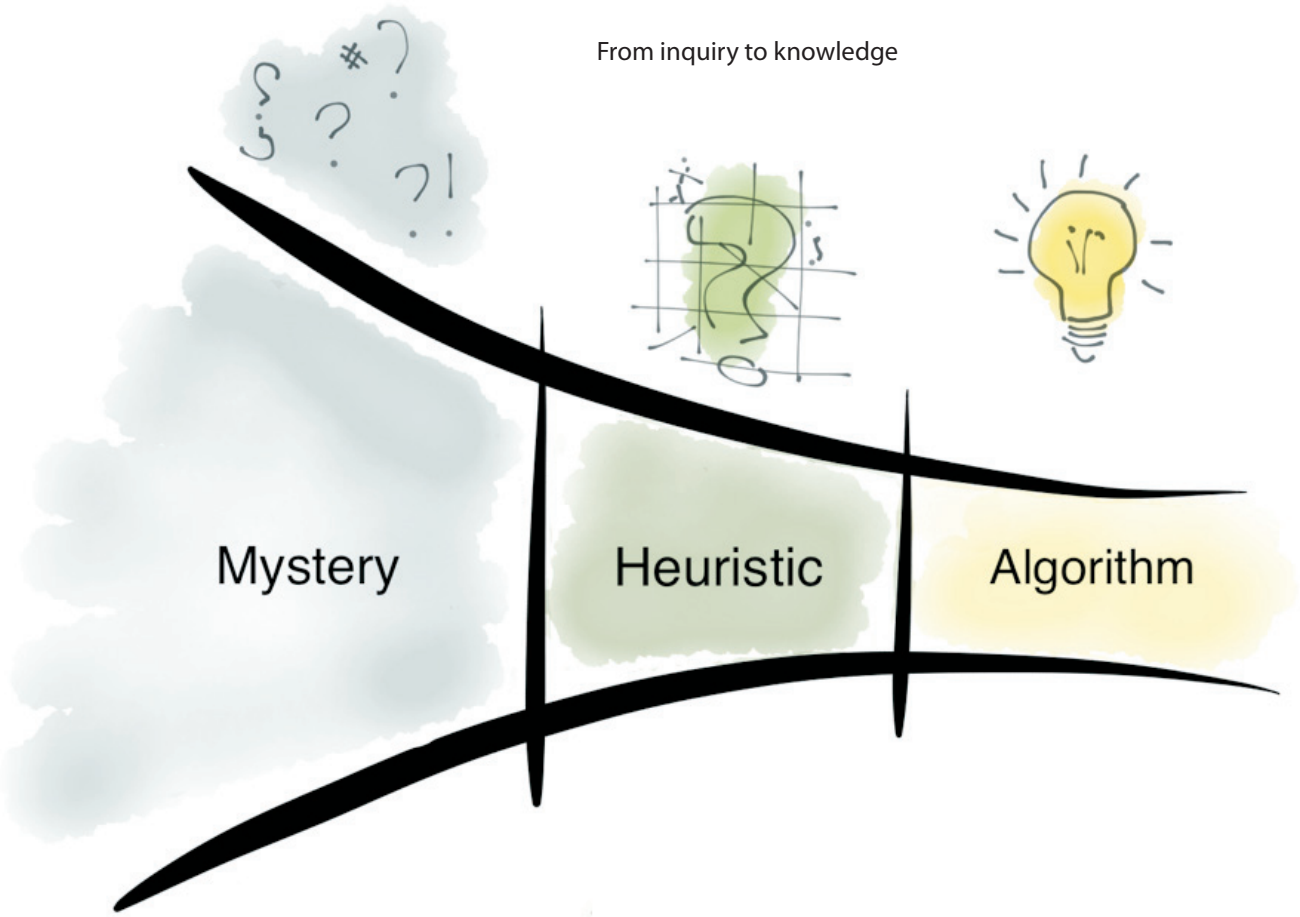
Second, we tend to organize our beliefs as lists of positive statements. These may be general statements such as "heavy rainfall causes flooding" or more conditional ones such as "heavy rainfall in coastal areas causes flooding if it coincides with high tides." But in any case, most of what we consider knowledge comes in the form of active, positive statements that "this is so."

Third, according to Michael Polanyi, we all "know more than we can tell"; that is, much of what we know is tacit rather than explicit knowledge. It's futile to try to codify all knowledge because so much of it is situational, context dependent, and potentially subject to obsolescence. Roger Martin[1] recently suggested that learning is a process of moving from *mystery* (exploration of the problem) to *heuristic* (creation of a rule of thumb to narrow the field of inquiry) to *algorithm* (documentation of an explicit formula) (see "The Knowledge Funnel" on p. 12). For instance, most executives would find it hard to assess the value of their companies. They rely on professionals who are familiar with the buying and selling of companies and have rule-of-thumb heuristics, such as a multiplier of earnings according to the industry or a multiplier of EBITDA *(earnings before interest, taxes, depreciation, and amortization)* minus capital expenditure. Equity firms whose job it is to purchase and sell companies have sophisticated valuation spreadsheets that take into account the various parameters of due diligence. Yet in many cases, our attempts to generate an algorithm fall short because conditions rapidly change. For this reason, leaders have to be ready to continuously question their assumptions and redesign their organizations.

Inquiry and Knowledge

Inquiry has always been an important part of learning and knowledge, predating Socrates as our ancestors sought to understand their world. We generally find questions at the frontier between the known and the unknown, either as a method of exploration or a teaching device to

FIGURE 1 **The Knowledge Funnel**



According to Roger Martin, learning is a process of moving from mystery (exploration of the problem) to heuristic (creation of a rule of thumb to narrow the field of inquiry) to algorithm (documentation of an explicit formula).

guide the flow knowledge from expert to novice. Questions typically probe the three parts of knowledge:

- How do we believe what we believe?
- Is this belief true?
- What is our method for justifying this belief?

The human mind naturally thinks in terms of questions and answers, problems and solutions, with a strong bias toward single, over-generalized responses.

In his action learning formula, Reginald Revans[2] provides a good description of how knowledge and questioning intuitively interact:

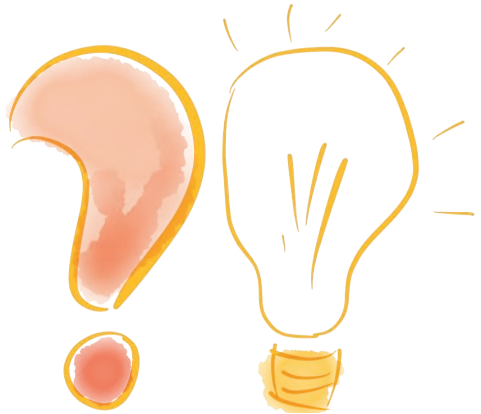
Learning = Programmed Knowledge + Insight Questioning

First, there are a certain number of rote-learning facts to know (constituting an established body of explicit knowledge/experience). Second, these facts are assimilated or accommodated by questioning, which triggers insights in what you see, hear, or feel.

The human mind naturally thinks in terms of questions and answers, problems and solutions, with a strong bias toward single, over-generalized

responses. The brain evolved to organize thoughts, through language, into statements about what things are, whether they are good or bad, how they can be handled, and what consequences different actions may have. The questioning process is essential to counteract our tendency to form stereotyped descriptions and schemata. It also helps us better apprehend reality through the realization that there is no single narrative: What we experience is a matter of perspective, and consequences change from one situation to the next.

We can't avoid instinctively feeling that knowledge is a list of what we know in terms of how to describe things, solve specific problems, or anticipate how situations will evolve. Nowhere is this set of assumptions more at play than in organizations. Arie de Geus, co-founder of SoL, stated a few decades ago, "The ability to learn faster than your competitors may be the only sustainable competitive advantage." Many executives accept that learning is an important source of value and therefore they seek best practices: They want to identify "better" knowledge on the market to replace the "obsolete" knowledge in their own organizations. Companies recognized as having superior track records are studied and copied endlessly, none more so than Toyota, whose practices have permeated the automobile industry over the last three decades and have spread to fields such as healthcare and banking. Yet although the spillover of Toyota's approach has as a whole been spectacular, the road hasn't been smooth, and failures and misunderstandings have been far more frequent than clear-cut success stories.



Learning How to Learn

What, How, Where, and When

Many organizations seeking to improve will latch on to what they recognize is a Toyota-like practice and then try to apply it in-house. This process is made easier by the fact that Toyota itself has provided an explicit description of its system, the "what, how, where, and when" of its own learning how to learn approach, which involves:

- Customer satisfaction (quality, cost, lead-time) and employee satisfaction (safety, morale)
- Just-in-time (what is needed, when it is needed, in the quantity needed) and *Jidoka* (stop at first defect)
- Standardized work and *kaizen* (continuous improvement)
- Employee engagement and mutual trust

Based on this model, a large number of corporations have come up with their own production systems, drawing on what they see as Toyota's essential best practices to achieving high performance. Unfortunately, for a number of structural reasons, the effects of such efforts are far from clear. First, the ecological validity problem is very real: Why would automotive practices apply outside the company or, even further, the industry? Second, identifying Toyota's best practices is not easy. The company's plants—and thus practices—differ greatly from one other, according to their local context and specific history.

Having studied Toyota's use of its own system within its plants and at suppliers, we have come to realize that the real value for other organizations lies in the specific set of instructions for *how to learn it* (as we have described in "The Lean Leap"[3]). They are:

1. **Go and see firsthand** at the real place *(genchi genbutsu)*. The TPS is not supposed to operate in absolutes but rather as a guide to observation and discussion in real, contextualized situations.
2. **Work with a master**—a sensei, coordinator, or trainer whose job is to help you make sense of the system in your own local situation.

3. **Apply *kaizen,*** or small-step improvement, before making large-scale changes.

Best practices clearly exist within TPS, as do libraries of local standards (detailed descriptions of the best-known way of doing an operation at the time), but within Toyota, these are used for inspiration not rote application. The basic instruction is to copy and apply kaizen: Gain inspiration from an idea but improve it to meet your own local conditions.

Best practices clearly exist within TPS, but within Toyota, these are used for inspiration not rote application.

A System of Questions to Produce Knowledge

The founders of TPS had a clear idea of the kind of knowledge they were seeking. Taiichi Ohno, considered the founder of the methodology, taught members of his group to "look with your feet and think with your hands." His aim was to teach his direct reports to realize their "misconceptions"—wasteful errors in thinking—through hands-on learning activities. For TPS practitioners, the most common answer to any direct question is "it depends." Generic answers are discouraged, as the system is aimed toward helping every person develop tacit understanding of specific situations.

In this sense, the TPS is not a system of best practices but rather a structured system of questions that, once you master it, will allow you to correctly learn about any given situation. The knowledge is in the questions themselves, not in the answers. For instance:

- What is your current level of customer satisfaction in terms of quality, cost, and lead-time and how can you improve it? What is your current level of employee satisfaction in terms of safety and morale and how can you improve it?
- What is your current level of just-in-time production in terms of whether you can deliver exactly what was ordered within the month, week, day, hour, minute, etc. and how can you improve it?
- What is your current level of *Jidoka* in terms of spotting defects at customer delivery, at final inspection, at line inspection, within the line, at each technical operation, during the operation, etc. and how can you improve it?
- What is your current level of employee engagement in terms of "presentism," improvement ideas, suggestions, and mutual trust and how can you improve it?

It's a system because each of these questions leads to a Russian doll-like architecture of further questions. For instance, "How can I improve my level of just-in-time production?" leads to the following questions:

- How close is the production pace to the sales pace?
- How leveled is production loading?
- How continuous is the production flow?
- How good is logistics at pulling?

Each of these questions can in turn drive further questions. For example, "How leveled is production loading?" leads to:

- How fractioned are production batches?
- How mixed is the production sequence?
- How flexible are the production lines? In volume? In mix?

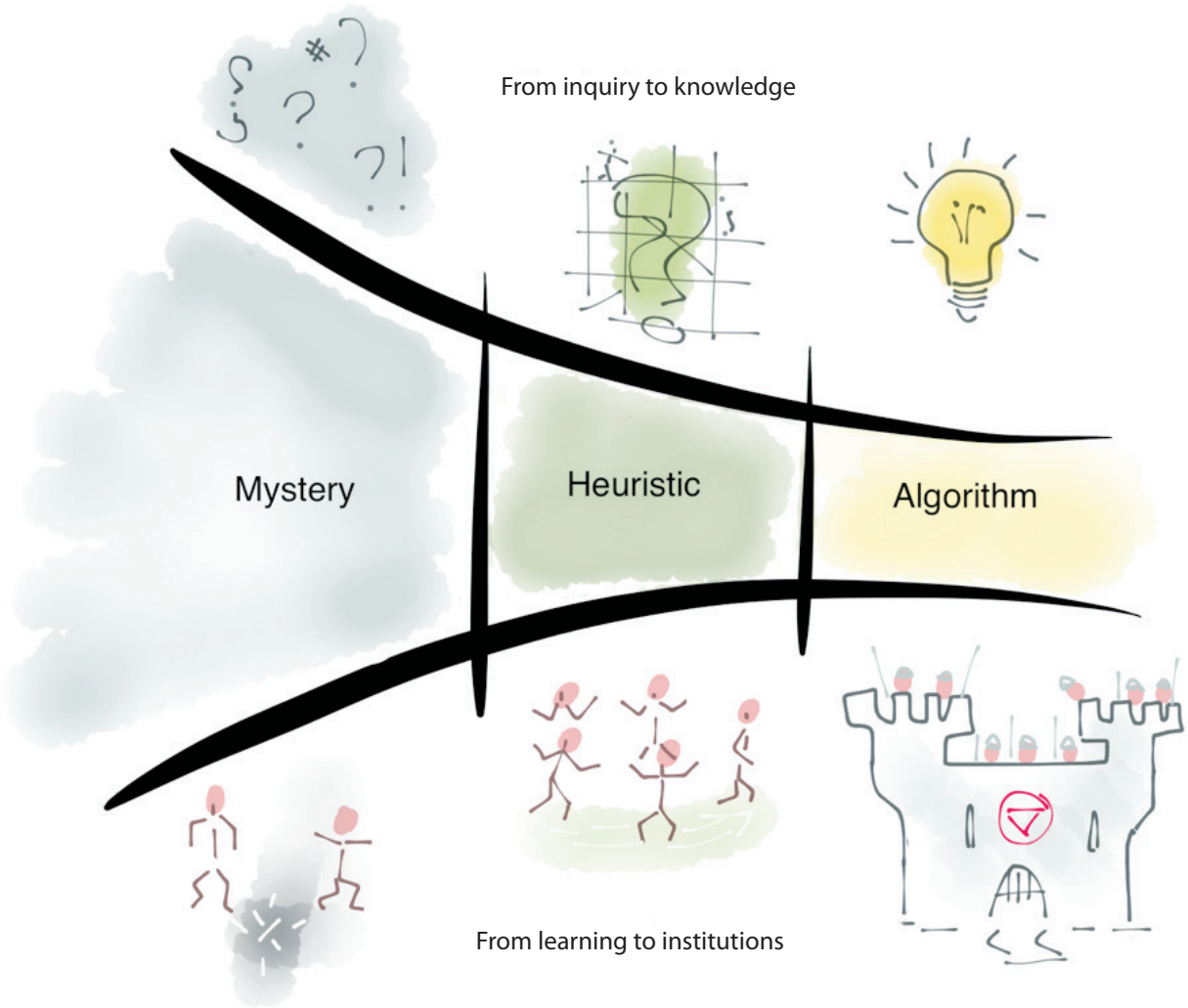
All of these questions are interrelated. For instance, the question of better production flow leads to the question of spotting defects within the flow, which links to the question of correctly following work instructions, and so on. The point of these questions is not to find immediate answers but to steer you to discovering *what* you need to learn. Once what you need to learn emerges, actual learning then occurs through learning-by-doing: Try and see, try and see (In Toyota's language, this process is called the Plan-Do-Check-Act cycle).

Socratic inquiry involves asking mostly high-level questions to help students clarify their thinking, state their evidence, and follow through on the potential consequences of their thoughts. There is clearly an element of this process in TPS questioning, something that western observers pick up on right away. Our contention, however, is that TPS questions seek far more specific knowledge about technical processes than a more general inquiry would provide. These questions guide observation and discovery far more than they serve to clarify previously held knowledge. In essence, they are applied to a situation to produce knowledge as opposed to clarifying existing knowledge. The knowledge starts with the questions themselves.

The Role of the Institution

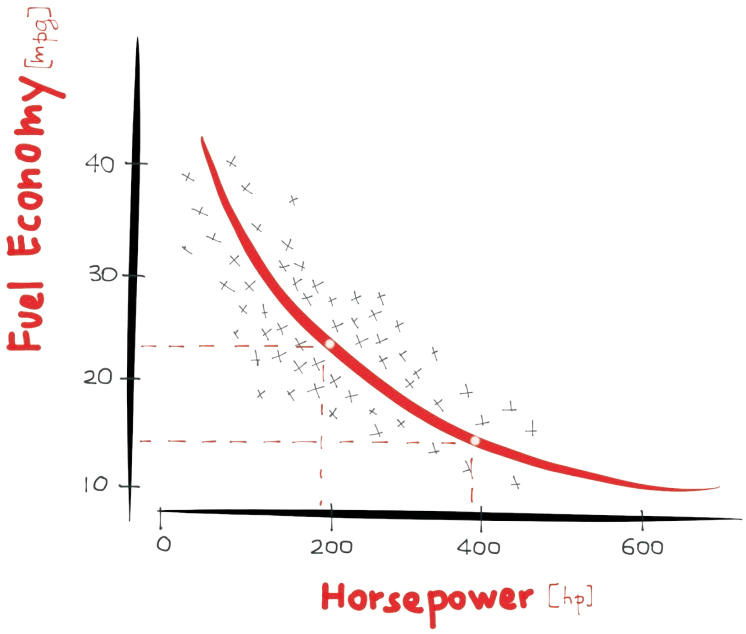
If we pursue Roger Martin's knowledge lifecycle, what happens when knowledge has matured to the algorithmic—or formulaic—stage? If it's algorithmic, it can be reproduced (that's the whole point). Typically at this stage, an institution will in some way maintain and protect this knowledge (see "From Learning to Institutions"). For instance, Renaissance thinkers[4] invented the double-entry accounting "rule of thumb" in the fifteenth century, and by the 1800s, professional organizations for accountants started to appear. Accountancy practices are now established, maintained, and expanded by a number of official bodies. But as the lean accounting movement has shown, many

FIGURE 2 **From Learning to Institutions**



When knowledge has matured to the algorithmic—or formulaic—stage, an institution will in some way maintain and protect this knowledge.

FIGURE 3 **Sample Trade-off Curve**



The trade-off curve is a graph that illustrates what happens to the performance of one variable when another variable changes.

current accounting rules misrepresent today's business realities. The most obvious example is the view of inventory as an asset rather than as waste. This "zombie knowledge" (long dead, still walking around and attacking people) is profoundly built into the system and defended by the accounting profession. When people commit themselves to preserving algorithmic knowledge through institutions, those algorithms become dogma.

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This perspective shows why collective learning is so arduous and slow. First, institutions need to convince a critical mass of people to adopt a piece of algorithmic knowledge, which takes time and effort. At the same time, the existing dogma lives on way beyond its actual relevance precisely because so many people have committed to it and institutions exist to preserve and maintain it.

Even in science, which is designed to be the fastest evolving field of knowledge, progress is said to happen one funeral at a time.

Institutional knowledge generally forms around solutions. Leaders fixate on those solutions and then create bodies of people to support others in adopting these solutions, whether Taylorist expert groups to train individual workers or power lobbies to impose certain norms. Solutions, in this sense, are "applied" to people, irrespective of local context, and compliance becomes more important than competence (or even performance).

On the other hand, the idea of knowledge as a system of questions has the huge advantage that although questions can be set and context-free, their answers are local and thus context-adapted. The expectation that you shouldn't just apply existing practices but rather take inspiration from them to improve the local situation (what in TPS terms is called *yokoten*) creates a flexible learning environment that is both tight in that no one needs to reinvent the wheel and loose in that each person is asked to seek a better fit-to-fact answer to the given question.

In this scenario, the institution's role is no longer to preserve a solution but to explore and collect all variants of solutions according to context. This approach leads to a fundamental and little-known aspect of knowledge capture within TPS known as the "trade-off curve"—a graph that illustrates, instance by instance, what happens to the performance of one variable when another variable changes (see "Sample Trade-off Curve"). Toyota technical experts are far more interested in capturing boundary conditions—that is, exploring the boundaries of knowledge when known facts become uncertain—than justifying dogma by finding striking illustrations of what is already known. By institutionally capturing knowledge in the form of trade-off curves, the speed of collective learning is vastly increased, as the institution follows step-by-step innovation rather than defends zombie knowledge.

Conclusion: Problem Finding, Framing, and Solving

Seeing knowledge as a system of questions solves yet another vexing puzzle in researching Toyota's approach to knowledge and performance. To be certain, Toyota trains vast numbers of its employees in problem solving, but in reality the old-time TPS masters seemed less interested in how you *solved* the problem than in whether or not you *saw* it. You were supposed to look at a situation for hours (stand in the infamous "chalk circle" on the shop floor) until you could explain the problem to your master. He would then task you to solve it, but to the immense frustration of many learners, he would never show much interest in the actual solution, instead moving on to the next issue. To the TPS masters, true productivity lay in *effectiveness*—solving the right problem—rather than in *efficiency*—solving a problem the right way.

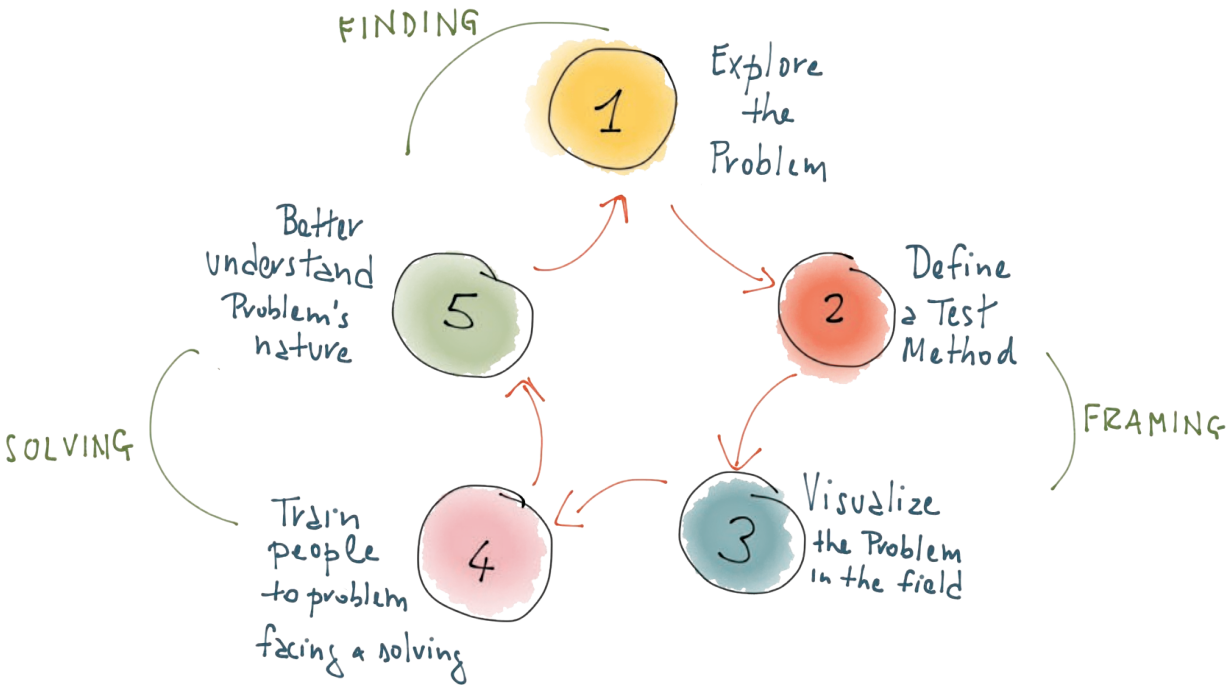
Indeed, the founders of the TPS insisted that higher efficiency did not necessarily lead to lower costs. Problem solving may be about efficiency, but problem finding is the key to effectiveness. In any given situation, problem finding determines how goals are set, how the problem is framed and visualized, how progress will be evaluated, and what is an acceptable solution as opposed to what is not (see "Problem Finding, Framing, and Solving). Basically:

- If you feel you already know what to do, then go straight to the action plan.
- If you feel you need to learn something and you know what that is, then identify the best practice and learn to apply it.

Five-Step Cycle for Problem Finding, Framing, and Solving

1. Explore the problem
2. Define a test method
3. Visualize the problem in the field
4. Train people to "problem face" and "problem solve"
5. Better understand the nature of the problem

FIGURE 4 **Problem Finding, Framing, and Solving**



Toyota's approach to knowledge and performance involves an an ongoing five-step cycle.

To the TPS masters, true productivity lay in *effectiveness*—solving the right problem—rather than in *efficiency*—solving a problem the right way.

- If you feel you need to learn what is important to learn, then ask the right questions to discover what is important to know, investigate and experiment in order to explore, and produce specific knowledge in doing so.

Thus, the overall aim of a system of questions is to develop employees' problem-finding capabilities and problem-solving skills, which individually and then collectively enhance the organization's good sense and better judgment. We suggest then that the true value of the Toyota Production System is that it shows us another way to see knowledge in a world with plentiful information but a dearth of meaning.

What is the system of questions that corresponds to your field? Can you put those questions in a hierarchy and link them in a coherent way that steers the eye of the questioner to focus on high pay-off problems and so truly learn? ■

Glossary

Genchi genbutsu: the real place
Kaizen: small-step improvement
Jidoka: stop at first defect
Sensei: coordinator, trainer, master
TPS: Toyota Production System
Yokoten: copy and improve

RESOURCES

Ballé, M., Chaize, J., Fiancette, F., & Prévot, E. (September 2010). "The Lean Leap: Lean As an Accelerator." *Reflections,* Volume 10 Number 3.

Martin, R. L. (2009). *The Design of Business.* Harvard Business Review Press.

ENDNOTES

1 Martin, R.L. (2009). *The Design of Business.* Harvard Business Review Press. Chapter 0ne, "The Funnel of Knowledge."

2 Revans, R. (1980). *Action Learning: New Techniques for Management.* Frederick Muller Ltd.

3 Ballé, M., Chaize, J., Fiancette, F., & Prévot, E. (September 2010). "The Lean Leap: Lean As an Accelerator." *Reflections,* Volume 10 Number 3.

4 The double-entry accounting system was described in 1494 by Fra Luca Pacioli in "Summa de arithmetica, geometria, proportioni et proportionalità."

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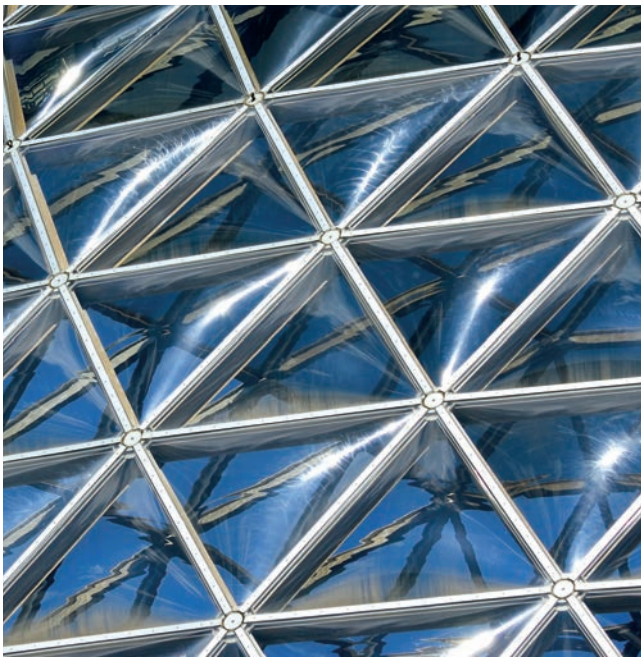

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