# The Role of Front-Line Ideas in Lean Performance Improvement

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*Companies are increasingly embracing lean production techniques in their efforts to improve performance. Yet the majority of these companies fail to tap the full potential of "going lean." By comparing a sample of successful lean initiatives with less successful ones (as defined by the rate of ongoing productivity improvement), this paper identifies a critical component that often is missing in underperforming initiatives—the ability to get large numbers of improvement ideas from front-line employees.*

*High-performing idea systems—which the authors define as those that implement 12 or more ideas per employee per year—were found to be a major factor in successful lean initiatives, for three reasons. First, they created a "lean culture" of daily improvement. Second, they addressed improvement opportunities that were difficult for managers to spot. Third, they promoted rapid organizational learning.*

*In addition to demonstrating the importance of high-performing idea systems for lean, this research provides insight into why such systems are relatively rare: 1) the predominance of the suggestion-box paradigm; and 2) they frequently require significant and difficult changes in operating practices.*

*Key words: idea system, lean, organizational learning, suggestion system*

## INTRODUCTION

Over the last three decades, an increasing number of manufacturing and service organizations have embraced lean principles as a way to improve performance (Chase and Stewart 1994; Schonberger 2007; Swank 2003; Womack and Jones 2005). But more recently, a number of experts have noted that other than Toyota, few companies have been truly successful at becoming lean (Womack and Jones 1996; Liker 2004; Liker and Hoseus 2007; Spear and Bowen 1999). The consensus explanation of this phenomenon seems to be that many leaders of companies that start lean efforts lack a real understanding of the principles involved and, therefore, focus on the short-term application of isolated tools rather than the deeper changes necessary.

One way this short-term emphasis has manifested itself is in the popularity in the United States of the "kaizen event" (also known as a "kaizen blitz" or "kaizen burst"). *The APICS Dictionary* defines a *kaizen* event as "a rapid improvement of a limited process area, for example, a production cell" (Cox and Blackstone 1999). For many companies, the kaizen event has become the primary, and in some cases the exclusive, vehicle for lean improvement (Burch 2008; Laraia, Moody, and Hall 1999; Nicholas and Soni 2005; Strategos 2009). The notion was originally developed by Taiichi Ohno in the late 1980s to demonstrate to Toyota suppliers the potential improvement that could be made through sustained application of the Toyota Production System. Its creators never intended this dramatic shock tactic to become a

company's primary ongoing approach to lean performance improvement. In practice, the improvements from them have proved hard to sustain (Bodek 2004; Burch 2008). Indeed, Veech (2004) noted that up to 90 percent of the benefits of kaizen events disappear within six months.

Toyota, almost from the outset, placed its emphasis on getting a continuous stream of front-line ideas rather than management-driven bursts of improvement (Liker 2004; Toyota Motor Corporation 1988; Tozawa and Bodek 2001; Yasuda 1990). In 1951, Eiji Toyoda, the new managing director of the fledgling Toyota Motor Company, visited the United States to learn more about automobile manufacturing. A highlight of his trip was a visit to Ford, where he was intrigued by the company's employee suggestion system (Toyoda 1987). Soon after his return to Japan, his company faced a serious financial crisis and was forced to look for low-cost ways to streamline operations. As Toyoda put it:

> *All we had to do was use our know-how. While at Ford, I had seen how considerable savings could be had in materials handling by judiciously making even minor changes, so we decided to begin there. That's how Toyota's suggestion system got started.* (Toyoda 1987, 114)

This focus on minor changes was reinforced when, in the early 1950s, like many Japanese companies, Toyota adopted the Training Within Industries (TWI) programs (Graupp and Wrona 2006; Nemoto 1983). These programs emphasized daily improvement through large numbers of small front-line improvement ideas (Graupp and Wrona 2006; Robinson and Schroeder 1993). During the 1950s and 1960s, front-line employee ideas grew into the primary driver of the Toyota Production System (Nemoto 1987; Yasuda 1990). By 1973, the company was getting more than a million ideas per year, an average of more than 10 ideas per person (Hall 1983).

The focus on front-line ideas became a distinguishing characteristic of Japanese management (Imai 1986). By 1990, the disparity between the Japanese and Western approaches had become quite apparent (see Table 1). The average Japanese company in the sample was getting more than 300 times the number of front-line ideas than the average U.S. firm. What is more, a much higher percentage of the Japanese ideas were being implemented. The idea gap was even greater in the automobile industry. Japanese automobile companies got an average of 61.8 ideas per employee per year, while U.S. and European counterparts averaged 0.4 ideas (Womack, Jones, and Roos 1990).

**Table 1** Comparative statistics at the national level, 1990.

| | United States | Japan |
|---|---|---|
| Ideas per employee | 0.11 | 32.5 |
| Implementation rate | 32% | 87% |
| Participation rate | 9% | 72% |
| Average reward | $491.71 | $2.50 |

**Source:** 1991 National Association of Suggestion Systems and Japan Human Relations Association Statistical Report (based on 336 reporting organizations in the United States and 696 in Japan).



Toyota has always been open about its emphasis on front-line ideas. The company even posted this fact on its Web site for a number of years. When users clicked on Toyota's tab "What Sets Us Apart?" they found the following brief summary:

> *Based on the concept of continuous improvement, or Kaizen, every Toyota team member is empowered with the ability to improve their work environment… Improvements and suggestions by team members are the cornerstone of Toyota's success.* (Toyota 2004)

# THE RESEARCH PROCESS

While a number of authors have noted Toyota's emphasis on front-line ideas (see, for example, Liker 2004; Liker and Hoseus 2007; Womack, Jones, and Roos 1990; Yasuda 1990), little research has been done to evaluate the specific nature of the relationship between front-line ideas and lean performance improvement. This relationship is the topic of this paper, which grew out of a stream of work on idea

systems that the authors have been conducting over the last 20 years. The purpose of this ongoing research has been to identify the principles that govern high-performing idea systems (defined as those implementing 12 or more ideas per person per year), by comparing them with low- and medium-performing ones.

One of the patterns they noticed in their sample was that there appeared to be a relationship between the performance of a company's idea system and the success of its lean effort, as defined by its rate of productivity improvement. In several companies they studied, the lean initiatives resulted in only limited productivity improvement until management adopted a high-performance idea system. The authors decided to delve more deeply into the cause of this relationship. Combining the findings reported by other researchers and authors with what they had been observing in their work, they developed their initial questions for this study. They sought first to identify the nature of the relationship between high-performance idea systems and lean performance improvement, and second to find out why, if high-performance idea systems are important for success with lean objectives, such systems are still so rare.

This research is exploratory and intended to build theory rather than to test hypotheses. As Richards and Morse (2006) emphasize, it is important to choose a research method that is consistent with the purpose of the research. Consequently, the authors selected a method that would provide the best opportunity to develop new insights and awareness (Vishnevsky and Beanlands 2004) while taking advantage of the rich database they had accumulated.

The data used in this study are derived from field research in more than 300 organizations in 25 countries; notes and recordings from more than a thousand interviews, supporting company documentation of processes and performance results, and observations made during the visits and post-visit debriefings. Thirty-six of the companies were identified as having high-performing systems. Twenty-seven of these were manufacturers, including five Toyota and two Honda units. All were applying lean principles with employee ideas as their primary continuous improvement tool. Additionally, four were recipients of the Malcolm Baldrige National Quality Award, two had received the European Quality Award, one had been named several times as running the most efficient plant in North America by *Industry Week,* and two had received the Shingo Prize.

Using an inductive approach (see, for example, the grounded theory approach in Strauss and Corbin 1998), the authors sought to determine the relationships between lean success and idea system performance in the companies in their sample, and examine the ensuing patterns to develop propositions. The propositions were then tested against other organizations in the sample, as well as new companies that were added to the study as it progressed. Whenever possible, they employed what Denzin (1970) called *data triangulation* (cross-checking information from interviews, supporting data, secondary data, and observations for internal consistency) and *investigator triangulation* (cross-checking the impressions and observations of the members of the research team) in order to verify and strengthen their findings (Nykiel 2007; Downward and Mearman 2007). Only the findings with the strongest and most consistent relationships were selected for discussion in this paper.

Because little has been written about high-performing idea systems, before talking about the findings, it is important to identify and describe some of the underlying principles that distinguish them from traditional suggestion systems.

## THE PRINCIPLES DISTINGUISHING A HIGH-PERFORMANCE IDEA SYSTEM

The goal of a high-performing idea system is to generate significant front-line involvement in identifying and implementing opportunities for improvement. Four of the primary principles that differentiate high-performing systems from low-performing ones include (Imai 1986; Robinson and Schroeder 2006; Savageau 1996; Tozawa and Bodek 2001):

- Ideas are integrated into everyday work
- The emphasis is on small ideas
- Front-line performance metrics focus ideas on what is important
- Both managers and workers are held accountable for their roles in the idea process

## Ideas Are Integrated Into Everyday Work

In traditional suggestion systems, ideas are voluntary. Management may welcome them, but employees are not required, or even expected, to offer them (recall the participation rate of 9 percent in Table 1). Because high-performance idea systems begin with the expectation that every employee can see many improvement opportunities, these systems are designed with the capability to process large numbers of ideas rapidly and efficiently. (Thirteen of the companies in the sample were implementing more than 50 ideas per employee per year.)

Take, for example, the Scania engine assembly plant in Södertälje, just outside of Stockholm, Sweden. Every Wednesday at 8:00 a.m. the production line is stopped for 26 minutes so every work team, generally consisting of 9 to 12 people, can hold its weekly improvement meeting around its idea whiteboard. Team members check the progress of each open idea, remove those that have been completed, and discuss the new problems and ideas that have been posted during the week. To ensure workers have enough time to implement the improvements, every team has built-in slack; it is deliberately "over staffed" by two positions. If additional resources or authority are needed for a specific idea, it is escalated up to the idea board of the next level of management. If necessary, an idea that needs the highest level of approval can move within a week from the team board to the supervisor group's board, to the management group's board, and finally to the plant manager's board. All boards are public. Top management's board is in the middle of the plant where everyone can see the ideas that it is working on.

The weekly process is aimed at improvement activities, but Scania also uses the same boards for daily corrective action of urgent problems. At 8:00 *every* morning, each team meets around its idea board for eight minutes to discuss the previous day's performance on the plant's three key performance indicators: safety, quality, and line stoppage. Performance issues that emerged the previous day are discussed and, if possible, ideas to correct them are proposed and implemented. If the team cannot resolve an issue, it is escalated to the next level and posted on the local supervisor group's idea board to be addressed at its 8:15 a.m. meeting. Each supervisor group has technicians and additional resources at its disposal. If the issue is beyond the scope of this group, it is escalated again, this time to the management group, and it is listed on its board for discussion at its 8:45 a.m. meeting. This group includes plant maintenance and still more support and authority. If further escalation is still needed, it is addressed at the 9:30 a.m. top management meeting, which includes the plant manager and all of his direct reports, including plant engineering.

According to the company's CEO, in order to stay competitive, Scania has to improve productivity by a minimum of 8 to 10 percent each year. In each of the last two years, the company has increased its manufacturing productivity by 15 percent.

## Emphasis on Small Ideas

Traditional suggestion systems focus on getting big ideas with major cost or revenue implications. But to generate more involvement, increase the rate of improvement, and achieve the greatest overall impact, high-performance idea systems target *small* ideas (Imai 1986; Japan Human Relations Association 1988; Robinson and Schroeder 2006; Tozawa and Bodek 2001). Not only can front-line workers come up with a lot of them, but small ideas are easier to implement, face little resistance, and don't need to go far up the hierarchy for approval. Small ideas can be a routine part of daily work, and employees can see their ideas making a difference. This creates an invigorating atmosphere of rapid ongoing improvement.

One of the surprising benefits of small ideas is that they create competitive advantage that is more *sustainable* (see, for example, Robinson and Schroeder 2006). While competitors generally

become aware of big ideas fairly quickly, and can copy or counter them, it is much harder for them to find out about small ideas. Because these remain effectively proprietary, they accumulate over time into a cushion of significant competitive advantage. Take Milliken & Company, a U.S.-based textile company, for example, whose idea system has consistently averaged around 100 implemented ideas per person per year. In Milliken Denmark, the managing director showed the authors a number of looms, each of which had several hundred small ideas applied to it, that collectively made them two to three times faster than they were designed to operate, and capable of making special weaves that their manufacturers had thought were impossible. Competitors could easily buy the same models of loom, but would find it much more difficult to come up with all of the ideas that would be needed to match this performance.

## Performance Metrics That Focus Ideas

A standard complaint about suggestion systems is that the ideas that come in are unfocused and of little value (see, for example, Savageau 1996). If ideas are to be integrated into the daily work, they must be tied to key companywide improvement goals. The case of Introduxi, a large Iberian electronics retail chain—and one of the high-performing companies in the authors' sample—illustrates this point.

In 2006, the company launched an idea system. The first year's results met the standard of a high-performing system—the company received 18 ideas per employee, with almost 100 percent participation. The authors were surprised when they met with the CEO to hear he was concerned about the system, because he thought the ideas were scattershot and of limited value. The authors spent several days in this company studying its idea system. They visited stores, interviewed employees and managers, and examined the kinds of ideas the employees had come up with. They found that the company did indeed have a well-designed process. Its problem, however, was that management had not told the employees what kinds of ideas it wanted.

The central warehouse was the one exception. The warehouse manager had translated the company's strategic goals into lean metrics that his front-line workers could understand and that they could affect directly with their ideas. He came up with three metrics:

- Shipments (in euros) per week per employee
- Percentage of orders shipped correctly and on the same day
- Inventory turnover

These three metrics encompassed the primary goals of the company for the shipping department: efficiency/productivity, quality/customer satisfaction, and flexibility and innovativeness. (In the electronics and software business, high inventory turnover is particularly important because of the rapid rate of product obsolescence.)

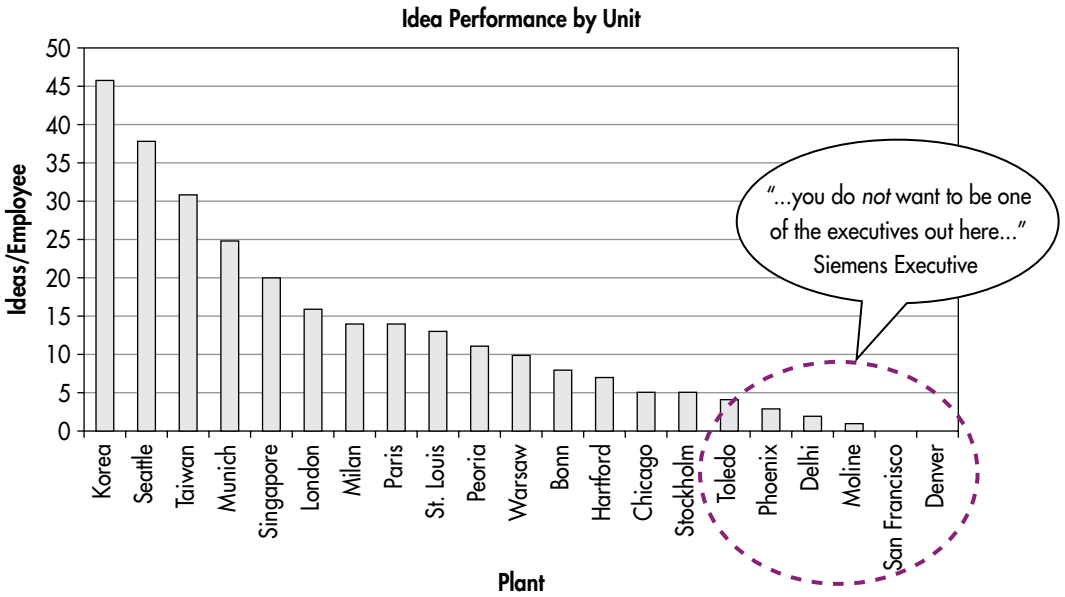
The warehouse manager believed that these prominently displayed performance measures played an important role in stimulating ideas in his area for three reasons. First, they emphasized the aspects of performance that were important. Second, they sensitized employees to problems and opportunities they might otherwise have ignored. Finally, keeping score added a bit of competitiveness and fun. As his workers saw the numbers reflecting the improvements from their ideas, they felt a sense of involvement and personal achievement.

The result of these employee ideas was that in just over a year, the shipping department was able to double the number of orders it shipped without adding any employees. The number of orders filled incorrectly dropped by 90 percent, and inventory turnover increased 30 percent.

## Holding People Accountable for Ideas

A number of researchers have observed that traditional suggestion systems have trouble with follow through and implementation. Generally, there are large backlogs of unevaluated and unimplemented ideas (Savageau 1996; Fairbank, Spangler, and Williams 2003). This was corroborated by the

**Figure 1** Siemens VDO idea accountability tracking.






organizations in the authors' sample. In those with traditional suggestion systems, backlogs of 18 months or more were common. The reason was that no one was held accountable for getting, processing, or implementing ideas.

To assure prompt action on ideas, high-performing systems have strong mechanisms for accountability. Idea performance often is included in annual reviews and taken into consideration when making decisions about pay raises and bonuses.

The mechanisms used to hold people accountable do not need to be complicated. Take, for example, the approach used by Siemens VDO (the global vehicle parts division with almost 100,000 employees, now Continental VDO). The CEO used a very simple chart to track his division managers' performance in getting ideas. Every month his staff prepared and distributed a chart (like the one in Figure 1, where for illustrative purposes the authors have curtailed the number of locations and changed their names) showing how many ideas per person each of his 98 plants had implemented that month. As one of his executives said, "When the CEO gets this chart, you do *not* want to be the executive in charge of one of these operations [pointing to the right end, where the poor performers were]."

# HIGH-PERFORMANCE IDEA SYSTEMS AND LEAN PERFORMANCE IMPROVEMENT

The three strongest relationships the authors' data showed between high-performing idea systems and lean performance improvement are as follows. A high-performing idea system:

- Creates a "lean improvement culture" by engaging the work force in daily improvement activity
- Taps improvement opportunities that are difficult for managers to spot
- Promotes rapid organizational learning

## Creating a Lean Improvement Culture by Engaging the Work Force

As a number of researchers have identified, a common reason lean initiatives perform poorly is that they fail to engage the work force in creating a culture of lean improvement (see, for example, Imai 1997; Liker 2004; Liker and Hoseus 2007; Spear and Bowen

**Table 2** Differences between high- and low-performing lean initiatives.

| Less successful lean initiatives | Successful lean initiatives |
|---|---|
| Improvement is management driven | Improvement is front-line driven |
| Improvement is done primarily through larger-scale events or projects | Small improvements are made on a daily basis |
| There are limited opportunities for front-line involvement | Front-line involvement is primary to improvement activity |
| Improvement activity is results focused | Improvement activity is process focused |



1999). Almost all the company leaders the authors interviewed stressed the importance of employee engagement, and the amount of training they provided to their employees was not a differentiator. But clear differences emerged in the nature and extent of employee involvement. These differences are summarized in Table 2.

Generally, in the less-successful lean initiatives, improvement efforts were management driven. They focused on larger-scale improvement projects—using tools such as kaizen events, *ad-hoc* task forces, or Six Sigma—intended to generate significant bottom-line results. Ongoing or regular opportunities for front-line people to engage in the improvement process were not emphasized. In the more successful lean initiatives, however, generating, processing and implementing ideas were integrated into the normal work of front-line workers. The high-performance idea system was the primary vehicle by which front-line employees drove the lean improvement process. It was this ongoing and regular engagement with daily problems and opportunities, and the companies' process-focused approaches (see Choi and Liker 1995), that built their lean cultures. The example of Pyromation shows how this happens.

In 2002, Pyromation, a medium-sized producer of high-temperature measurement and control devices located in Fort Wayne, IN, began implementing lean. The company launched the initiative with great fanfare, trained its people in the standard lean tools (such as 5S, poka-yoke, quick changeover, and value-stream mapping), created new work teams, and radically restructured reporting relationships on the production floor. But two years later, the lean effort was still struggling to gain traction. Morale was low. Since all the improvement projects had been dictated from above, the employees felt disconnected from the lean effort; indeed, they had become very cynical about it. All six production coordinators asked to be transferred to other jobs.

Management realized the company couldn't make any real progress with lean until the work force became more engaged in the improvement process. After some study and benchmarking, in late 2004, Pyromation decided to integrate problem-identification and idea-generation into the regular work of front-line employees. Idea boards were set up, supervisors were trained in idea-meeting facilitation, and weekly shop-floor idea meetings were scheduled. In this way, front-line workers were given the opportunity to use the tools and techniques of lean production that they had been taught.

The resulting stream of improvement ideas made an enormous difference. In two years, productivity increased by a third, lead-time was cut by 60 percent, and late deliveries were reduced by 70 percent. By 2008, Pyromation was getting an average of 47 implemented ideas per person per year. Dan Atkinson, the company's lean coordinator, observed that "the idea system was the turning point in our lean effort—it was what we had been missing all along."

## Improvement Opportunities That Are Hard for Managers to See

Managers deal primarily with information that has been aggregated—such as "profits are down," "market share is dropping," or "labor

as a percentage of costs is up" (Hayek 1945). Information in this form is helpful in identifying issues, but not so helpful in dealing with them. But, as Hayek also observed, front-line workers are the ones who have specific and detailed knowledge of how their organization's work actually gets done. As such, they are in much better positions than their managers to see many problems and opportunities. They also are in the best positions to develop ideas that will work to deal with these problems and opportunities. Consider the example of the Coca-Cola bottling plant in Stockholm, Sweden, the highest-performing corporate bottling plant in the Coca-Cola system.

A few years ago, Coca-Cola headquarters required all corporate-owned bottlers to implement Six Sigma. Each plant was expected to: a) train a cadre of Black and Green Belts; b) focus on Six Sigma improvement projects that generated large documented monetary savings; and c) strive for high plant capacity utilization. But unlike its peers, Coca-Cola Stockholm already had a high-performance idea system in place. In 2007, the company implemented 15 ideas per person.

The implementation of Six Sigma on top of an effective idea system provided interesting data on the relative impact of both approaches. In 2007, there were seven Six Sigma projects (both Green and Black Belt), which saved a total of 2.5 million Swedish Kronor (one U.S. dollar equals about seven Swedish Kronor). The idea system, however, generated 8 million in savings from a total of 1,720 front-line ideas. In 2008, Coca-Cola Stockholm increased its emphasis on the idea system. As a result, front-line ideas saved 9 million Swedish Kronor as compared to 1.5 million from Six Sigma projects.

One example of an idea that illustrated the advantage of the front-line perspective came from a worker on the high-speed, half-liter Coca-Cola bottling line. It solved what had been a tricky problem there. After being filled and capped, the bottles zoomed around a 90-degree curve before passing an electronic eye that scanned each bottle in order to assure it had been properly filled. If not, an air piston would automatically activate and push the defective bottle off the line. As long as the bottles were properly spaced, this process worked quite well. Unfortunately, the bottles often would bunch together as they rounded the corner. Then, when the air piston pushed a defective bottle aside, the next bottle (now in contact with the first one) sometimes would be shifted slightly, nick the corner, and tip over and block the line. Ten bottles of Coke per second would then slam into the fallen bottle and fly everywhere, creating a huge mess and many defective bottles before the line could be stopped. This disruption to production occurred two or three times per day.

Two Six Sigma Black Belt projects had failed to solve the problem, which was caused by friction between the bottles and the corner guide. The project teams had fiddled with many variables: the line speed, different kinds of lubricating strips along the curve guide, the spacing of the bottles—but with little success. The problem eventually was solved by an idea from one of the bottling-line workers. His simple solution was to reduce the contact surface area between the guide and the bottles. By using a standard washer as a spacer in between the guide and its lower mounting bracket, the guide was cocked inward slightly so only its upper edge now came in contact with the bottle. In this way, the friction was lowered enough to keep the bottles from bunching. The idea saved 91,000 kronor per year, not including the costs of damaged product.

Over the three-year period that the authors tracked this plant, it ranked first among Coca-Cola's corporate-owned bottlers around the world in productivity, quality, safety, environmental performance, and customer fulfillment. The only key metric in which the Stockholm bottler did not outperform its peers was plant capacity utilization. Managers said this was because the large number of front-line improvement ideas kept increasing plant capacity.

Notice that in 2007, 76 percent of the overall cost savings for Coca-Cola Stockholm came from its idea system. In 2008, the figure was 86 percent. Five other companies in the authors' sample with high-performing idea systems also measured bottom-line improvement by source. Each of these companies reported similar results—around 80 percent of

overall improvement came from front-line ideas. While the authors initially were surprised by these data, they clearly attest to the extent that front-line people see improvement possibilities that their bosses do not.

## Idea Systems Promote Rapid Organizational Learning

The purpose of adopting lean principles is to improve operations at a rapid rate. To do this, the organization must be capable of learning quickly. "Organizational learning" (see, for example, Argyris and Schon 1995) happens whenever an organization improves the way work is done in a manner that incorporates these changes into its standard work or the technology and equipment in use.

Organizational learning became popular with business leaders in the 1990s following the success of books such as Peter Senge's *The Fifth Discipline* (1990) and Thomas Stewart's *Intellectual Capital* (1997). Unfortunately, while the concept was generally sound, in practice the movement itself was short on examples and practical advice on how to create a learning organization. Because most improvement opportunities are seen by front-line workers (recall the 80/20 ratio above), it is not surprising that the high-performance idea systems in the authors' sample were facilitating rapid organizational learning. Some companies, including three of Autoliv's Utah air-bag production facilities and Scania's engine plant outside of Stockholm, were averaging 15 percent rates of annual productivity improvement.

To understand how a high-performance idea system can work as a tool of organizational learning, consider the example of Subaru Indiana Automotive (SIA). This company assembles almost 1000 automobiles each day, including 300 Camrys for Toyota. What makes SIA interesting in this context is the way it turned the focus of its lean initiative onto environmental improvement. It has been a zero landfill operation since May 2, 2004, putting less waste into landfills in a year than an average U.S. household does in a day.

SIA's "green lean" program is not driven by multimillion-dollar recovery systems, but by thousands of small environmental improvement ideas from front-line workers every year. Since 2000, these ideas have: a) reduced the amount of steel scrap generated by 102 pounds per vehicle; b) resulted in the reuse of more than 6 million pounds of packaging materials each year; c) lowered the consumption of electricity by 25 percent; and d) cut the waste generated per vehicle by more than 50 percent.

SIA began its green initiative in 1989, long before environmental sustainability became popular. Consequently, SIA has had to learn on its own how to identify and exploit green opportunities. Its kaizen idea system played a central role in this. Because the front-line workers are the ones who physically handle the parts, materials, packaging, and equipment, they are well positioned to spot ways to reduce consumption and reuse materials, and to identify waste that can be recycled. They also are in the best positions to implement reuse and recycling plans, in which the biggest challenge is usually that of separating out the various materials. This sorting process is most easily and economically done where the waste is actually generated. SIA managers told the authors that the company could not have reached its high level of environmental performance without the active participation of its front-line workers.

Front-line ideas not only helped SIA achieve its ambitious zero landfill goal two years early, but they also were the primary force for its ongoing organizational learning. Following are two examples that show how this worked:

### Distilling toxic solvent for reuse

One of the more toxic chemicals used in automobile manufacturing is the solvent used to flush the painting system between color changes (at SIA, this typically occurs every three or four vehicles). Previously, the used solvent was shipped offsite for processing as toxic waste, a costly affair that required special handling and special transportation procedures. An employee had the idea to develop an onsite distillation process to recover the solvent for reuse. When looking for vendors of such

technology, SIA found one that proposed an even more environmentally friendly approach. Since existing distillation processes could not separate out all the solvent and invariably left a toxic sludge of paint residue and solvent in the bottom of the still, the contractor suggested distilling the solvent in a vacuum. Vacuum distillation would make it possible to extract all of the toxic liquid and leave a solvent-free dry cake in the bottom of the still. Unfortunately, halfway through the project, the contractor, who was having difficulty getting the new technology to work as promised, went out of business, and the responsibility for completing the project fell onto the shoulders of front-line maintenance people. By the end of the project, these workers had come up with hundreds of small ideas that cumulatively solved the problem the vendor's engineers could not. With the new vacuum distillation process in place—the first of its kind in industry—the company's solvent use dropped from three to five truckloads a month to less than one every quarter, and the need to truck an almost equivalent amount of toxic waste offsite for processing was eliminated.

Once the distillation process was operational, additional front-line ideas built upon it. Rather than shipping the dry still-bottom residue to a special toxic-waste incineration plant almost five hundred miles away, an employee suggested a way to recycle it. She identified a company that could extract the organic elements from the still-bottom residue and reuse them. The char left over from the organic recovery process went to a local steel company, which used it as a coating to prolong the life of its ladles for handling molten steel.

Another idea involved the rags used to clean the painting equipment. As had been the case with the solvent-contaminated sludge, these solvent-soaked rags needed to be shipped as toxic waste to the special incineration plant. A worker suggested that the rags could be centrifuged to extract the solvent from them, and this solvent then could be distilled for reuse. Now, for every 34 barrels of rags that are centrifuged, one barrel of solvent is recovered. This, in turn, led to another idea. Since the polyester rags were no longer toxic, they too could be recycled. Today, they are sold to a company that uses them as raw materials for the plastic wheel-well linings it makes for other auto companies.

**Processing welding sparks**

Another set of ideas came from the welding department. If zero landfill was the goal, something had to be done with the residue constantly being swept up from the floor around the robotic welders used to assemble car bodies. This residue consisted of the remnants of sparks emitted during the welding process. These sparks are primarily small pieces of copper oxide blown off the welding tips by the arcing of the high-amperage electric current used to fuse the steel body components together. The first idea was to find a way to process this welding slag to recover the copper in them. After some searching, SIA found a company in Spain that could do this.

While processing the welding slag kept it out of the landfill, it was expensive to ship it to Spain (and the shipping added to the company's carbon footprint). A follow-up idea was to *reduce* the amount of sparks created in the first place. Because sparks are caused by arcing between the copper welding tips and the steel, the better the fit between the tip and the steel, the fewer the sparks that are generated. A new tip of the proper shape sparks very little. But with use, the copper welding tips heated up, softened and deformed, which degraded the fit and created more sparks. Because it is expensive to replace the copper tips as they start to deform, standard practice is to increase the amperage on the welder every two hours in order to assure a good weld. The extra power produces even more sparks and heat, creating more tip deformation, which requires even more amperage, and so on. Now, instead of turning up the electricity when the tips deform, a special device mounted on the welder quickly "dresses the tips," that is, machines them back to their original shape. This idea meant that fewer sparks were generated, shipping costs were reduced, less electricity was consumed, weld quality improved, and 58,000 fewer copper welding tips were used in the first five months, a 75 percent reduction. The reduced tip usage alone saved $23,000.

## WHY HIGH-PERFORMING IDEA SYSTEMS ARE SO RARE

If the findings associated with the authors' first research question—about the links between high-performance idea systems and lean performance improvement—are valid, and the strong relationships in their sample indicate that they are, then why are such systems so rare? Given that Toyota, whose lean practices are highly watched and emulated, has publicly and repeatedly identified front-line ideas as key to its improvement methodology, why aren't more companies adopting good idea systems as part of their lean initiatives? This was the authors' second research question. While the first question was relatively straightforward to answer through analysis of the relationships between ideas and improvement performance, addressing the second question requires a less structured approach. Here their findings derive less from observing direct relationships than from studying the perspectives of the leaders of companies that did not use high-performance idea systems and interpreting their answers to the interview questions. The authors also tracked the experiences of companies as they implemented, or attempted to implement, high-performance idea systems.

Their investigation identified two reasons for the scarcity of high-performance idea systems. The first is the dominance of the suggestion-box paradigm. The second is that the adoption of a high-performance idea system invariably requires significant changes in behaviors that challenge deeply held assumptions and norms.

For the leaders of companies without high-performing idea systems, "asking employees for ideas" was synonymous with "installing a suggestion box" (whether physical or electronic). This was the only approach they were aware of. The problem was that suggestion boxes are an ineffective process for collecting ideas (see, for example, Fairbank, Spangler, and Williams 2003; Schuring and Luijten 2001), and experience with them had taught these managers that seeking front-line ideas was rarely worth the time and effort.

The suggestion box has been the dominant paradigm for seeking employee ideas for more than a century. It was first used in industry in the late 19th century at companies such as William Denny Shipbuilders in Scotland (William Denny and Brothers 1932) and NCR in the United States (Crowther 1924). Schuring and Luijten (2001, 361) observe that "since the birth of suggestion systems, their structure has hardly changed." A standard process is as follows. Suggestions are written on special forms and dropped in boxes, or in many organizations today, submitted electronically via intranet or the Internet. The suggestions then go to an individual or a committee that gives them a preliminary assessment. If the idea is deemed worthy of further consideration, it is sent to one or more experts for evaluation. If the evaluations come back positive, then the suggester typically is given a reward that is a percentage of the revenue generated or money saved by the idea. (For a more complete discussion of the suggestion-box model, see Bassford and Martin (1996)). A review of two dozen peer-reviewed articles published over the last several decades confirms both Schuring and Luijten's observation and the dominance of suggestion-box thinking. All but one of the papers assumed the suggestion-box process as the model for getting employee ideas. Ironically, although each of these studies recognized various deficiencies in this model, and proposed and tested various changes to deal with these deficiencies, such as automation, enhanced reward systems, faster turnaround, more diplomatic and informative rejection letters, none of the authors questioned the underlying model.

Unfortunately, the suggestion box is a very poor tool for getting ideas. Employees, and even cartoonists, have poked fun at them for years. Suggestion-box type systems, even in their electronic manifestations, rarely get more than one idea per person per year. Even the best systems get no more than two. Worse, "a 10 percent to 25 percent adoption rate is considered good for a suggestion program" (Bassford and Martin 1996, 95).

The second reason why high-performing idea systems are so rare is that they usually require

fundamental changes in a company's operating practices and its managers' behavior. As part of this research, the authors chronicled more than a hundred successful and unsuccessful attempts to implement high-performing idea systems, and discovered that the process of implementation often required a transformational journey involving wrenching change. The unsuccessful companies were either incapable of making the necessary changes, or they decided that changes of that magnitude weren't worth making. For those companies both willing and able to make the profound changes, the benefits proved to be substantial. The case of Hickory Chair, a furniture manufacturer in North Carolina, illustrates this well.

The domestic furniture industry has been one of the hardest hit by low-cost foreign competition. Many of Hickory's domestic competitors have moved their production offshore or have gone out of business. In order to survive, President Jay Reardon realized his company had to dramatically lower its costs, dramatically improve quality, and dramatically increase responsiveness. But according to him, "I was the sales guy (he had been vice president of marketing before becoming president after the sudden death of his predecessor). I didn't know anything about making furniture. But the people who put the furniture together know a lot about it." Reardon's first act after being appointed president was to ask for everyone's help in consolidating Hickory's two underutilized manufacturing plants into one. He asked front-line workers to design the layout of their own departments before the move. After the move, Reardon was able to persuade Hajime Ohba, former head of the TSSC and then one of the most prominent lean production experts in the world, to look at Hickory's initiative and to provide guidance to his people on where to focus their efforts. Over the next eight years, employee ideas significantly increased the company's performance. Hickory Chair's quality, responsiveness, and innovativeness improved dramatically. Work-in-process inventory was cut more than 80 percent, and the company was able to improve its margins without a single price increase. Sales grew at double digit rates annually and the return on assets (ROA) increased to almost 50 percent.

Hickory Chair is one of America's great lean transformation success stories, only made possible through a very painful process. Over the transition period, 70 percent of the company's managers left, including two vice presidents. They found themselves unable to operate effectively in an environment where the majority of improvements were driven by their subordinates.

Generally, the required transition in leadership behavior (from directive to engaging) can be made less traumatic if the organization prepares for it. An example of how this can work comes from Pyromation (mentioned earlier), which experienced 100 percent turnover of its mid-level production managers, none of whom left the company. Senior leaders explicitly identified the behavioral changes they needed in their managers and discussed the reasons for these changes openly. They created meaningful staff positions for those managers who did not wish to make these changes. With its candid and unthreatening approach, Pyromation made the transition to a new management team much easier.

## CONCLUDING DISCUSSION

A great many lean initiatives have fallen short of what is possible, because they have failed to incorporate a critical component needed for success—a high-performing idea system. The authors research indicates that without such a system, a company may have a difficult time creating a lean improvement culture and could be ignoring as much as 80 percent of its improvement potential.

There are considerable opportunities for further research into the links between high-performing idea systems and lean performance improvement, both in further testing the propositions presented here and in identifying and testing new ones. The authors believe, however, that the more important future research will study why it is that so many organizations do not adopt high-performance idea systems

as part of their lean initiatives. Certainly Toyota, Daneher, Autoliv, Milliken, Scania, and other "lean leaders" have demonstrated the importance of such systems for lean success. The authors' work has identified what they believe to be two of the first-order barriers for any company in setting up such a system. First, most managers have experience with only the suggestion-box type of system—an outdated and ineffective process—and this causes them to shy away from any kind of initiatives to promote front-line ideas. To overcome this hurdle is primarily a matter of education, that is, demonstrating to managers the results they can expect from a high-performance idea system, and teaching them the principles involved in designing and operating one.

The second barrier is more subtle and difficult to overcome, as it requires a fundamental rethinking of the roles of both employees and managers, that is, a challenge to what Argyris and Schon (1996) refer to as a "theory in use." It is understandably hard for managers to confront the limitations of the very paradigm of behavior that led to their personal success. As Thomas Kuhn pointed out in his classic book *The Structure of Scientific Revolutions* (1996), whenever a significant shift in a paradigm occurs, it is very difficult for those who built their careers on the earlier paradigm to embrace the new one. This observation also may explain why so many lean initiatives focus on the tools of lean rather than the fundamental changes in management behavior and thinking that are needed to allow front-line employees to truly drive performance improvement.

It is the authors' belief that future research may well identify the high-performing idea system as the single most important, and the most intractable, part of a lean initiative to implement.

**REFERENCES**


Argyris, C., and D. Schon. 1995. *Organizational learning II: Theory, method, and practice.* New York: Prentice-Hall.

Bassford, R. L., and C. L. Martin. 1996. *Employee suggestion systems: Boosting productivity and profits.* Lanham: Maryland: Crisp Publications.

Bodek, N. 2004. *Kaikaku: The power and magic in lean.* Vancouver, Wash.: PCS Press.

Burch, M. 2008. Lean longevity: Kaizen events and determinants of sustainable improvement. Ph.D. diss. Amherst, Mass.: University of Massachusetts.

Chase, R. B., and D. M. Stewart. 1994. Make your service fail-safe. *Sloan Management Review* (Spring):35-44.

Choi, T. Y., and J. K. Liker 1995. Bringing Japanese continuous improvement processes to U.S. manufacturing: The roles of process orientation and communications. *Decision Sciences* 26, no. 5:589-620.

Cox, J. F., and J. H. Blackstone, eds. 1999. *The APICS dictionary.* Falls Church, Va.: The American Production and Inventory Control Society.

Crowther, S. 1924. *John H. Patterson—Pioneer in industrial welfare.* New York: Doubleday.

Denzin, N. K. 1970. *The research act in sociology.* Chicago: Aldine.

Downward, P. M., and A. Mearman. 2007. Retroduction as mixed-method triangulation in economic research: Reorienting economics into social sciences. *Cambridge Journal of Economics* 31, no. 1:77-99.

Fairbank, J. F., W. E. Spangler, and S. D. Williams. 2003. Motivating creativity through a computer-mediated employee suggestion management system. *Behavior and Information Technology* 22, no. 5:305-314.

Fuller, U., H. Helbling, and R. Cooley. 2002. Suggestion schemes as information and knowledge management systems. In I*nformation Systems Research, Teaching and Practice: Proceedings of the 7th Annual UKAIS Conference,* eds. B. Howell and G. Orange, 226-234. Leeds, United Kingdom: Leeds Metropolitan University.

Graupp, P., and R. Wrona. 2006. *The TWI workbook.* New York: Productivity Press.

Hall, R. W. 1983. *Zero inventories.* New York: McGraw-Hill.

Hayek, F. 1945. The use of knowledge in society. *American Economic Review* XXXV, no. 4: 519-30.

Imai, M. 1986. *Kaizen: The key to Japan's competitive success.* New York: McGraw-Hill.

Imai, M. 1997. *Gemba kaizen.* New York: McGraw-Hill.

Japan Human Relations Association. 1988. *The idea book.* Cambridge, Mass.: Productivity Press.

Kuhn, T. S. 1996. *The structure of scientific revolutions.* Chicago: University of Chicago Press.

Laraia, A. C., P. E. Moody, and R. W. Hall. 1999. *The Kaizen blitz: Accelerating breakthroughs in productivity and performance.* New York: John Wiley and Sons.

Liker, J. K. 2004. *The Toyota way.* New York: McGraw-Hill.

Liker, J. K., and M. Hoseus. 2007. *Toyota culture.* New York: McGraw-Hill.

Nemoto, M. 1987. *Total quality control for management.* Englewood Cliffs, N.J.: Prentice Hall.

Nicholas, J. M., and A. Soni 2005. *The portal to lean production.* New York: Auerbach Publications.

Nykiel, R. A. 2007. *Handbook of marketing research methodologies for hospital and tourism.* London: The Haworth Press.

Richards, L., and J. Morse. 2007. *README FIRST for a user's guide to qualitative methods.* Thousand Oaks, Calif.: Sage Publications.

Robinson, A. G., and D. M. Schroeder. 1993. Training, continuous improvement, and human relations: The U.S. TWI programs and the Japanese management style. *California Management Review* 35, no. 2:35-57.

Robinson, A. G., and D. M. Schroeder. 2006. *Ideas are free.* San Francisco: Berrett-Koehler.

Savageau, J. 1996. World-class suggestion systems still work well. *The Journal for Quality and Participation* 19:86-90.

Schonberger, R. 2007. *Best practices in lean Six Sigma process improvement.* New York: Wiley.

Schuring, R. W., and H. Luijten. 2001. Reinventing suggestion systems for continuous improvement. *International Journal of Technology Management* 22:359-372.

Senge, P. 1990. *The fifth discipline.* New York: Doubleday.

Spear, S., and H. K. Bowen. 1999. Decoding the DNA of the Toyota Production System. *Harvard Business Review* (September-October):1-12.

Stewart, T.A. 1997. *Intellectual capital: The new wealth of organizations.* New York: Bantam Doubleday Dell.

Strategos Inc. 2009. Available at: http://www.strategosinc.com/kaizen.htm, accessed June 23.

Strauss, A., and J. Corbin. 1998. *Basics of qualitative research: Grounded theory, procedures and techniques.* Newbury Park, Calif.: Sage Publications.

Swank, C. K. 2003. The lean service machine. *Harvard Business Review* 81, no. 10 (September-October):123-129.

Toyoda, E. 1987. *Fifty years in motion.* New York: Kodansha International.

Toyota Motor Company. 2004. What sets us apart. http://www.toyota.com/about/operations/manufacturing/index.html.

Tozawa, B., and N. Bodek. 2001. *The idea generator.* Portland, Ore.: PCS Press.

Veech, D. S. 2004. A person-centered approach to sustaining a lean environment job-design for self-efficacy. *Defense Acquisition Review Journal* (August-November):159-171.

Vishnevsky, T., and H. A. Beanlands. 2004. *Neurology Nursing Journal* 31, no. 2:234-8.

William Denny and Brothers. 1932. *Denny Dumbarton.* London: E. J. Burrow.

Womack, J. P., and D. T. Jones. 2005. *Lean solutions.* London: Simon and Schuster.

Womack, J. P., and D. T. Jones. 1996. *Lean thinking.* London: Simon and Schuster.

Womack, J. P., D. T. Jones, and D. Roos. 1990. *The machine that changed the world.* New York: Harper Perennial.

Toyota Motor Corporation, 1988. *Toyota: A History of the First 50 Years.* Toyota City, Japan: Toyota Motor Corporation.

Yasuda, Y. 1990. *Forty years, twenty million ideas.* Cambridge, Mass.: Productivity Press.

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