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It's in the System

INSTEAD OF TRYING TO IMPROVE THEIR EMPLOYEES, COMPANIES NEED TO EXAMINE THEIR SYSTEMS AND INTEGRATE PROBLEM SOLVING WITH A PHILOSOPHY OF CONTINUOUS IMPROVEMENT.

BY SUE LONGMAN-CZEROPSKI

Many organizations focus on short-term results and successful competition at any cost. They labor under the philosophy that managers solve problems and workers do the work. They tend to resist change and opt for patchwork cures.

One flaw in their philosophy is that they fail to regard individual processes as total systems in themselves. Instead of trying just to improve their workers, they need to examine and improve their systems—in other words, they need to combine systematic problem solving with organizational cultures of continuous improvement.

VLSI Technology, a manufacturer of integrated circuits, wanted to upgrade its San Jose, California, wafer fabrication plant to equal its state-of-the-art facility in San Antonio, Texas. The company saw the rehauling as an opportunity to enhance employees' abilities, to make employees more responsible for their own contributions, and to improve overall performance.

San Jose began the rehauling by implementing training in statistical process control and design of experiments. The methods worked, at first. But instead of SPC and DOE becoming tools that controlled and continually improved processes, they turned into management programs that drained limited resources.

Why did those approaches fail? An external consultant pointed out that the company's utilization of SPC and DOE wasn't integrated into an overall philosophy of continuous improvement. VLSI couldn't get where it wanted to go without changing its philosophy. The key was recognizing that workers could be only as effective as the systems in which they worked.

A beginning

The first step was to organize employees at the San Jose plant into work groups. Then a steering committee developed a training matrix for all employees that was divided into target audiences for training and the types of training needed for each audience.

The committee identified the following areas for training in continuous improvement: basic math, SPC and DOE, problem solving with statistical tools, customer relationships, team building, communications, facilitation, organizational philosophy, and time and meeting management. The committee established subgroups to develop course content and timetables.

Consultant L.B. Day of Day-Floren Associates met with the steering committee to hear organizational problems. Then Day developed a continuous-improvement pilot workshop in which the committee created a mission statement. It read: "To be the premier supplier of reliable application-specific devices that exceed our customers' requirements, while remaining cost-competitive and profitable; and to foster an environment of honesty and integrity that provides job security, continuous development, and shared financial success with all employees."

With that statement, continuous improvement become an operational philosophy. The steering committee vowed not to stray from the mission's goals. The group was determined to help create an environment in which continuous improvement would be a way of life for all employees.

After the pilot workshop, the committee created a plan to rouse people from a reactive mode, in which managers think and workers act, to a mode in which all employees are involved in and take responsibility for solving problems and improving performance. The plan called for every one of the plant's 350 employees to attend a continuous improvement workshop similar to the pilot.

Once the effort was underway, the steering committee would review the progress and direction of continuous improvement teams, plan additional opportunities for employee involvement and training, and continue enhancing its own understanding of continuous improvement by reviewing and discussing literature on the subject.

In late 1989, training officially began. The committee explained to employees how the move toward change affected every level in the organization and how it would be beneficial.

Manufacturing manager David Neill began roundtable discussions with influential frontline workers to explain the goals and to get their input. The discussions themselves helped create a conducive environment for implementing training. Neill wanted to show that senior managers supported the program, so line managers were welcome to attend and participate in the discussions, but not to conduct them.

The committee began to use systematic problem solving by viewing each job and process as a total system. It posed this question: Does the system do the job?

Steps in Systematic Problem Solving

The following steps show how to address system problems in order to achieve continuous improvement. The approach is flexible; the steps needn't be followed in the order in which they're listed. In some cases, one or more steps may be skipped.

- Select a problem or process to address, based on selection criteria.
- Construct a process flowchart of the situation as it is now.
- Brainstorm possible causes of the problem.
- Identify situations that are out of control.
- Decide what data need to be collected. Design methods for data collection.
- Collect and analyze data.
- Determine whether the results are conclusive.
- Implement needed change, based on findings to date.
- Test, verify, and document the validity of results.
- Establish a system for monitoring results.

Getting back to basics

One problem that surfaced during the initial SPC effort at the San Jose plant was that operators were making mistakes that showed they didn't have basic math skills. They needed a math review before they could receive SPC training.

The committee enlisted the San Jose Unified School District to help do a needs assessment. The results were shocking. The committee found that 35 percent of the plant's workers failed tests in basic addition and subtraction.

In response, the committee collaborated with the local school district to develop an appropriate curriculum. The district interviewed and hired teachers; classes were held at the plant. Instruction took place during all shifts so employees wouldn't have to disrupt their personal lives.

When the committee first announced the math training, the news created fear among employees. They were afraid that if they didn't pass the course, they'd lose their jobs. They were afraid of appearing stupid to their supervisors and peers. Neill and Vice-President David Pye sent a letter to employees that guaranteed the math training wouldn't affect their performance reviews or cause them to be fired. The letter clearly stated that the math training was the first step to continuous improvement, not a way to appraise employees.

As their fears subsided, participants found that the training helped them on their jobs and at home. Many of them said that the math training enabled them to balance their checkbooks and to help their children with homework.

Classes were structured so that participants could work in small teams to help each other with the exercises. Several participants became tutors for others. The tutoring, which took place during work hours, showed employees that they could take more responsibility for their own learning. The success of the math training opened doors for future training.

The next course involved statistics. Workers had to know how to make small, incremental improvements to continually reduce the amount of variation in processes. Consequently, they had to understand statistics. All employees went through some kind of SPC training. They learned about statistical reasoning, variability, and distribution. The same problem solving method that they examined during the continuous improvement workshop now helped them utilize basic statistical tools to analyze problems.

Facilitator training

The training that most affected the continuous improvement effort was facilitator training. It trained supervisors, engineers, and other key employees to facilitate teams in problem solving. The objective of the training was to send people back into the organization armed with team-leadership skills.

Participants were divided into teams, and each team chose a problem to work on. Then each team chose one step of the problem solving approach to facilitate. The committee wanted participants to have fun, so it didn't limit their choices to work-related problems. One team might conduct a brainstorming session; another might suggest ways to create a process-flow diagram.

During the course of their problem solving activities, the teams were recorded by a video camera. On the third day, participants watched footage of their behavior, commented on what they'd been thinking at the time, and discussed how to change. They saw positive differences between the first day of class and the third day. In some cases, they observed themselves going through distinct stages of team development.

After watching the videotape, participants gave feedback on each others' behavior, particularly on how they had handled any conflicts. They also commented on participants' facilitation skills and made suggestions for improvement.

Participants assessed the effectiveness of their own teams in terms of facilitation and teamwork skills. The criteria included leadership styles, flexibility, and adaptability. This stage was a real eye-opener. Participants addressed such issues as eliminating barriers and dealing with disruptive behavior by team members. Eventually, the realizations led the way to more communication among team leaders and to the creation of plans to improve the performances of their teams.

The course included lectures on adult-learning principles, so that team leaders could teach others the steps involved in systematic problem solving. Facilitators became role models; many said they felt empowered to help make continuous improvement a reality.

Project criteria

By the end of 1990, people were struggling with issues surrounding the continuous improvement project teams. How many teams were desirable? How many could the plant support? Who would choose what projects to work on?

In a brainstorming session, the steering committee defined the criteria for projects. It decided that projects had to have definite starting and ending points that allowed for quick results. They had to have a high probability of success. And they had to have an impact.

Teams could choose their own projects, as long as those projects met the selection criteria and fit the continuous improvement philosophy. This option allowed employees to be more self-directed and helped ensure their commitment. Letting workers choose the problems made sense; managers weren't always aware of problems that occurred on the line.

A real problem

After training, it was time to start acting. Teams adopted a 12-step problem solving approach, extrapolated from the Deming Cycle and further developed by consulting statistician Fred Khorasani.

The first step in this systematic approach is to define a problem to work on or a process to improve. The next step is to draw a process-flow diagram of the process as it is currently practiced, in order to find weak links, bottlenecks, missing steps, and other flaws.

Then team members conduct a cause-and-effect analysis to help determine the root causes of any glitches. Once the causes are known, team members collect data to validate them. After data are collected and analyzed, the results must be verified through documentation. The final step is to monitor the process to study the effects of whatever improvements are made.

The first problem chosen had to do with costs. VLSI was in a down quarter, which was prompting company-continuous improvement process, wafer costs were further monitored for one year. The ultimate result was an annual savings of $1.1 million.

The team responsible for the savings was made up of people from the front line. By following the problem solving steps, they did what they had been trained to do. The efforts of this single team—only one of many working on similar projects in the plant—covered the cost of the entire training effort and then some.

More problems

Another problem solving project was prompted by a mistake made on the line. An operator had used the wrong solution to clean expensive material, which had to be thrown away. It wasn't her first mistake. In one year, she'd been responsible for $43,000 in mistakes. Her supervisor's first impulse was to fire her. According to VLSI's corrective-action process, that would have been the correct response.

The team that took on the problem collected data that indicated that no matter who operated that particular system, mistakes would occur. Interviews with the operator's coworkers showed that she was a good worker, but that her skills fell short of the job's requirements. The operator needed repositioning; the process system needed improving.

The upshot was another paradigm shift—from "only process engineers can make process changes" to the possibility that operators could also make process changes. By simply asking operators about the process, the team determined the root causes of recurring errors.

Firing the operator would have been an expedient way to solve the problem. But the company's new operating style regards people as assets. The new philosophy promotes the removal of barriers so that all workers can contribute to systems improvement.

In the new paradigm, systems create their own quality. The operator who made mistakes worked in a system that made quality nearly impossible to achieve. By using a team approach and problem solving, the company was able to change that system into a process that could produce high-quality results.

From there to here

The first companywide continuous improvement workshop sparked the change effort. It allowed people to learn about themselves and their coworkers, and about functioning in a team environment. During the workshop, even the most resistant people engaged in soul-searching. When it was over, most workers stopped asking what managers could do for them and started asking what they themselves could do to bring about improvement.

The training that followed the workshop was based on the goals set forth in the continuous improvement philosophy and mission statement. The methods included using statistical tools and skills for effective teamwork. But the initial courses were just the core. Training never stops. Ongoing training keeps people thinking about what they're doing. It enhances awareness and creativity, reduces variation in processes, and supports continuous improvement.

The facilities at the San Jose plant still don't equal those at the San Antonio plant, but San Jose does produce comparable results. The credit goes to the continuous improvement philosophy, training, and teams. And the San Jose plant's results have prompted other areas of the company to emulate its approach.

In the past four years, VLSI has invested more than 92,000 training hours at all levels. In return, the company has earned millions of dollars in savings, new ideas, and motivation. Problem solving project teams have become a way of life. Teams meet regularly with the steering committee to report on their progress, to identify areas in which they need help, and to let the committee know what it can do to help them knock down barriers.

Clearly, organizations with continuous improvement cultures increase their potential for larger market share, enhanced relationships with customers and suppliers, and higher-quality products for less cost. They know their customers' wants and needs, and are ready to supply them. ■

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