CONTINUOUS IMPROVEMENT CYCLE WITHIN ELEMENTS AND ANALYSIS SYSTEM OF CONTINUOUS IMPROVEMENT IN QUALITY AT TOYOTA

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ABSTRACT: The concept of the TQM philosophy is focus on continuous improvement (KAIZEN). Kaizen is a system of continuous improvement in quality, technology, processes, company culture, productivity, safety and leadership. Kaizen is based on making little changes on a regular basis: always improving productivity, safety and effectiveness while reducing waste. Kaizen involves setting standards and then continually improving those standards. To support the higher standards Kaizen also involves providing the training, materials and supervision that is needed for employees to achieve the higher standards and maintain their ability to meet those standards on an on-going basis. In this sense this article present a analyses to determine causes and practical problem solving in seven step at Toyota.
KEYWORDS: continuous improvement, quality, PDCA, processes.

1. INTRODUCTION

Traditional systems operated on the assumption that once a company achieved a certain level of quality, it was successful and needed no further improvements. We tend to think of improvement in terms of plateaus that are to be achieved, such as passing a certification test or reducing the number of defects to a certain level.

Traditionally, change for American managers involves large magnitudes, such as major organizational restructuring. The Japanese, on the other hand, believe that the best and most lasting changes come from gradual improvements. To use an analogy, they believe that it is better to take frequent small doses of medicine than to take one large dose. Continuous improvement, called kaizen by the Japanese, requires that the company continually strive to be better through learning and problem solving. Because we can never achieve perfection, we must always evaluate our performance and take measures to improve it. A approaches that can help companies with continuous improvement is the plan –do– check – act (PDCA)

2. CONTINOUS IMPROVEMENT (KAIZEN)

Key features of Kaizen:

• Improvements are based on many, small changes rather than the radical changes that might arise from Research and Development

• As the ideas come from the workers themselves, they are less likely to be radically different, and therefore easier to implement

• Small improvements are less likely to require major capital investment than major process changes

• The ideas come from the talents of the existing workforce, as opposed to using R&D, consultants or equipment – any of which could be very expensive

• All employees should continually be seeking ways to improve their own performance

• It helps encourage workers to take ownership for their work, and can help reinforce team working, thereby improving worker motivation.

Table 1. Concepts of the TQM

Concept	MAIN IDEA
Customer focus	Goal is to identify and meet customer needs
Continuous improvement	A philosophy of never-ending improvement
Employee empowerment	Employees are expected to seek out, identify, and correct quality problems
Use of quality tools	Ongoing employee training in the use of quality tools
Product design	Products need too be designed to met customer expectations
Process management	Quality should be built into the process; sources of quality problems should be identified and corrected
Managing supplier quality	Quality concepts must extend to a company's suppliers

The Toyota Production System is known for kaizen, where all line personnel are expected to stop their moving production line in case of any abnormality and, along with their supervisor, suggest an improvement to resolve the abnormality which may initiate a kaizen.

The cycle of kaizen activity can be defined as:

• Standardize an operation;

• Measure the standardized operation (find cycle time and amount of in-process inventory);

• Gauge measurements against requirements;

• Innovate to meet requirements and increase productivity;

• Standardize the new, improved operations;

• Continue cycle ad infinitum.

The plan–do–check–act (PDCA) cycle describes the activities a company needs to perform in order to incorporate continuous improvement in its operation. This cycle, shown in Figure 5-6 is also referred to as the Shewhart cycle or the Deming wheel. The circular nature of this cycle shows that continuous improvement is a never-ending process. Let's look at the specific steps in the cycle.

As a result, the Shewhart cycle can be used as the basic tool for continuous/ continual improvement and as the foundation for QMS implementation and a quality system must be designed to be measurable. In fact, the cost of poor quality can be staggering.

Table 3.1
Equivalency of Continuous and Continual Improvement

Shewhart Cycle	Continual Improvement Process As Specified in ISO 9000:2000	Continuous Improvement Process As Specified in a Typical TQM Program
Plan (initial)	Top management formulates a continual improvement process based on quality objectives and a search for opportunities for improvement	Top management formulates a continuous improvement process based on cost-of-nonconformance metrics and a search for opportunities for improvement (OFIs)
	The management review is used for decision making	The executive review committee is used for decision making
Do	Action items are assigned by top management to resolve problem areas	Action teams are assigned by the executive review committee to resolve problem areas to develop a project schedule, and to identify milestones for completion
Study	Audits findings and conclusions, as well as other databases, are used as the basis for analysis of data	Root causes are identified by means of interviews, internal audits, and supplier audits
		A system is developed to measure the results of a proposed corrective action
Act	Corrective or preventive actions are taken and presented at management review	A list is developed of possible corrective actions and one solution is selected
		A system is developed to implement the corrective action
		The proposed plan is implemented on a test basis and monitor the results to determine the proposed action's effectiveness
		Oversight is provided by the executive review committee
Plan (iterative)	The process is repeated—another problem area is selected for resolution	The process is repeated—a method is proposed to implement the corrective action companywide

Table 3.2
Examples of Other Elements That Contain the Continuous Improvement Cycle

ISO 9001:2000 Element	Plan →	Do →	Check/Study →	Act →
7.4 Purchasing	Establish criteria to evaluate and select suppliers.	Select suppliers and prepare purchasing information.	Ensure adequacy of specified purchase requirements and maintain records. Implement the inspection or other activities.	Evaluate and reevaluate suppliers.
8.5.2 Corrective Action	Document procedure to define requirements.	Review nonconformities (including customer complaints); determine the causes.	Evaluate the need for action; determine action needed. Review corrective actions taken.	Implement actions needed and record the results of actions taken.
8.2.2 Internal Audit	Planned program at planned intervals and planned arrangements. Define audit criteria, scope, frequency, and methods. Create documented procedure.	Conduct internal audits based on status and importance of the processes and areas to be audited. Maintain records. Effectively implement and maintain QMS.	The management responsible for the area ensures that actions are taken without undue delay to eliminate detected nonconformities.	Follow-up activities to include the verification of actions taken and the reporting of verification results.

Figure 1. Identify root causes and practical problem solving in seven step at Toyota using System Kaizen

This study (theory and practical) was realized in the department of quality management at Faculty of Economic Science because Toyota is the best learning organization and has judiciously used stability and standardization to transfer individual and team innovation into organization-wide learning. It is one thing for individual employees to come up with innovative ways to do things. But to be transferred to

organization learning, the new way must be standardized and practiced across the organization until a better way is discovered.

Toyota evolved out of innovation, originally in making looms and then in automobile design, and ever since, the leadership has worked hard to keep this innovative spirit alive. For example, Toyota used the Prius project to revitalize a maturing product development process. Lexus also pushed the organization to new levels of quality and excellence. However, breakthrough innovation is only one aspect of the Toyota way. Possibly the most important aspect is Toyota's relentless application of the more "mundane" process of continuous improvement. The Toyota Way involves the company learning from its mistakes, determining the root cause of problems, providing effective countermeasures, empowering people to implement those measures, and having a process for transferring the new knowledge to the right people to make it part of the company's repertoire of understanding and behavior.

An integral part of kaizen is Toyota's famous five-why analysis. The problem is oil on the shop floor. In this example, each why brings us further upstream in the process and deeper into the organization. For example, cleaning up the oil would simply be a temporary measure until more oil leaked. Fixing the machine would be a little longer term, but the gasket would wear out again, leading to more oil on the floor. Changing the specifications for gaskets could solve the problem for those particular gaskets, but there is a deeper root cause that would still go unresolved. Only by fixing the underlying organizational problem of the reward system for purchasing agents than can be prevent a whole range of similar problems from occurring again in the future.

Table 2. Analysis of problems

Level of problem	Corresponding level of countermeasure
There is a puddle of oil on the shop floor	Clean up the oil
Because the machine is leaking oil	Fix the machine
Because the gasket has deteriorated	Replace the gasket
Because we bought gaskets made of inferior material	Change gasket specification
Because we got a good deal (price) on those gaskets	Change purchasing policies
Because the purchasing agent gets evaluate don short-term cost savings	Change the evaluation policy for purchasing agents

Source: Toyota Technical Center, Ann Arbor, Michigan

The real learning point of these case is to keep asking why until the root cause(s) are determined. Take countermeasures at the deepest level of cause that is feasible and at the level that will prevent reoccurrence of the problem.

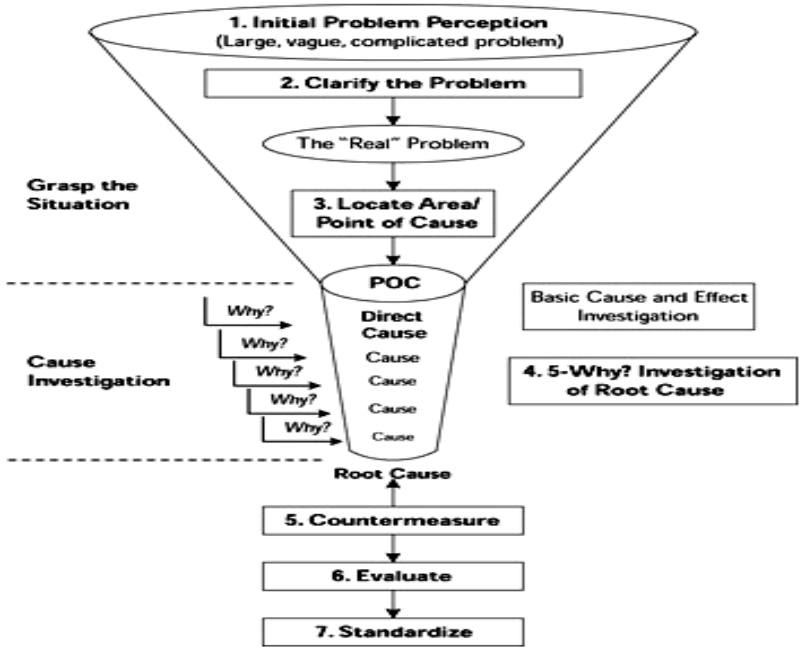

Figure 2. Toyota's practical problem-solving process

At Toyota, a five-why analysis is often used as part of a seven-step process they call "practical problem solving." (See Fig. 2) Before the five-why analysis can begin, "practical problem solving" requires to clarify the problem or, in Toyota terminology, "grasp the situation." Trainers who teach this methodology within Toyota have found the most difficult part to learn is grasping the situation thoroughly before proceeding with five-why analysis. Grasping the situation starts with observing the situation with an open mind and comparing the actual situation to the standard. To clarify the problem, we must start by going to where the problem is (genchi genbutsu). This may include prioritizing a number of different problems in a Pareto analysis. The Pareto diagram uses bar graphs to sort

problems according to severity, frequency, nature, or source and displays them in order of size to show which problems are the most important. It is probably the most often used statistical analysis tool within Toyota-simple, but powerful.

The seventh step (standardizing the new process) is very important at Toyota. Toyota's standards have a much broader role than making shop floor workers' tasks repeatable and efficient. The Toyota Way results in standardized tasks throughout the company's white-collar work processes, such as engineering. Everyone in the company is aware of and practices standardization. For example, an engineer can walk into any Toyota factory in the world and see almost identical processes. Toyota also applies standards to the design of products and manufacturing equipment. Managers have a misconception that standardization is all about finding the scientifically one best way to do a task and freezing it. As Imai (1986) explained so well in Kaizen, his famous book on continuous improvement, it is impossible to improve any process until it is standardized. If the process is shifting from here to there, then any improvement will just be one more variation that is occasionally used and mostly ignored. One must standardize, and thus stabilize the process, before continuous improvements can be made. In fact, at Toyota the standard work is posted outward, away from the operator. The operator is trained using the standardized work, but then must do the job and not look up at the standardized work sheet. The standard work sheet is posted outward for the team leaders and group leaders to audit to see if it is being followed by the operator. Any good quality manager at any company knows that you cannot guarantee quality without standard procedures for ensuring consistency in the process. Many quality departments make a good living turning out volumes of such procedures. Unfortunately, the role of the quality department is often to assign blame for failing to "follow the procedures" when there is a quality problem. The Toyota is to enable those doing the work to design and build in quality by writing the standardized task procedures themselves. Any quality procedures have to be simple and practical enough to be used every day by the people doing the work.

3. CONCLUSIONS

Standardization and learning go hand in hand and are the basis for continuous improvement. If we don't standardize the improved process, the learning up to that point falls into a black hole, lost, forgotten, and unavailable for further improvements.

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