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QUALITY IMPROVEMENT

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ABSTRACT

As a function of quality management, quality improvement has a decisive role in reducing costs.
Quality improvement refers to a set of actions taken by the entire organization to increase the efficiency and effectiveness of the activity and processes, in order to ensure increased advantages both for the organization and for its customers.
The work presents strategies for continuous quality improvement, as well as specific methods and techniques.

KEYWORDS: quality improvement, KAIZEN, KAIRYO, Deming Cycle, KANBAN, Total productive maintenance.

1. INTRODUCTION

To create a favorable environment for quality improvement, the following should be considered (figure 1):

-encouragement and support of a leadership style that supports the action;

- promoting values, attitudes and behaviors that stimulate quality improvement;

- establishing clear objectives for quality improvement;

-encouraging communication and teamwork;

-recognition of successes and achievements;

- training and education for quality improvement.

The steps to be taken to improve quality are:

1. Proving the need for improvement by highlighting the possible benefits due to the implementation of an improvement program;

2. Identification of improvement proposals and selection of proposals according to the specific advantages they can bring, expressed both in monetary savings and in technological terms;

3. Organization of work teams for each quality improvement project;

4. Diagnosing the causes of defects in design, manufacturing. Defects can be controllable by management or by the operator;

5. Establishing the necessary remedies to eliminate the causes of defects and justifying the efficiency of applying these remedies;

6. Application of improvement options and control of new work procedures, with the aim that the benefits obtained from quality improvement continue in the future.

Fig. 1 Influential factors for quality improvement

2. STRATEGIES FOR CONTINUOUS QUALITY IMPROVEMENT

In Japan, a continuous quality improvement strategy was devised and applied. This strategy is known by the Japanese name of KAIZEN, which means KAI-change and ZEN-for the

better.

The KAIZEN concept, the most important concept of Japanese management, was known by Masaaki Imai, the president of the Cambridge Corporation in Tokyo and of the European KAIZEN Institute, the author of the works "KAIZEN, the Key to Japan Competitive Success".

In the late 1950s, Masaaki Imai worked at the Japan Productivity Center in Washington, which was meant to help Japanese industrialists understand the secret of American firms' productivity.

Continuing his activity in Japan, as a consultant to enterprises, he witnessed the spectacular increase in their competitiveness, which he made known in the USA, through the American KAIZEN Institute.

The KAIZEN strategy is based on the principle of gradual and continuous quality improvement, "with small steps", in contrast to the improvement obtained through technological innovation (by introducing new machines, new processes, new technologies) called in Japanese KAIRYO, which is based on large leaps, on the dismantling of what is old and the construction of the new through the necessary investments for new technological processes and new inventions.

The difference between the two improvement strategies, KAIZEN and KAIRYO, is systematized in table 1 or can also be seen in figure 2.

Tabe 1

	The main characteristics of the KAIZEN strategy	**The main characteristics of the KAIRYO strategy**
1	"Small steps"	"Large steps"
2	New conventional technological processes	Important technological change
3	Limited investments	Substantial investments
4	Orientation towards process and efforts	Orientation towards results and profit
5	Slow economic growth	Rapid economic growth
6	The entire staff is engaged	Reserved for the elites
7	Preventive, active character	Corrective, reactive character
8	High staff motivation	Low level motivation

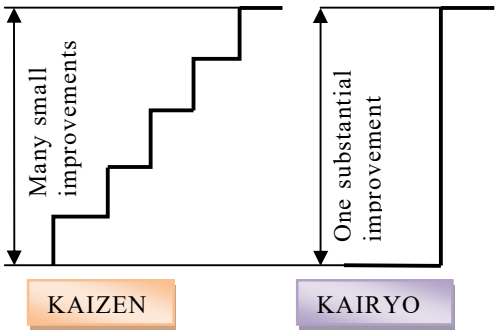

Fig.2 Difference between KAIZEN and KAIRYO

The KAIZEN strategy is based on the individual efforts of employees; it requires a great human involvement, but limited investments. The KAIRYO strategy requires substantial investments and the involvement of small, technological or organizational elite.

Taking into account the successes achieved by Japanese enterprises, a number of Western and U.S.A firms shows interest in the KAIZEN strategy. Recognizing the possibility of implementing this strategy in other countries as well, Masaaki Imai draws attention to the fact that a "change of the company's culture" is assumed, of the value system on which it is based. The main difficulties in applying the KAIZEN strategy would be due to the following causes:

• Managers' reluctance to admit the existence of problems that represent the starting point of all improvement efforts;

•The often transfunctional nature of the problems to be solved;

• The resistance shown by the workers towards changes, considering that they could affect them negatively;

• Poor communication between managers and workers.

3. METHODS AND TECHNIQUES SPECIFIC TO THE CONTINUOUS IMPROVEMENT STRATEGY

Continuous improvement must be applied to all processes in the enterprise. In order for the entire staff of the enterprise to be able to effectively carry out the improvement activity, it is necessary to use some methods that allow the industrialization of the improvement with small steps. Thus, the KAIZEN strategy is based on a series of methods and techniques:

• Deming Cycle (PDCA);
• Suggestion system;
• Kanban;
• Total productive maintenance;

• The "3S" and "5S" methodology.

Deming Cycle (PDCA)

This quality improvement method was conceived and designed by Deming in the form of the PDCA ("Plan-Do-Check-Act") cycle. Through the graphic representation, Deming highlighted the importance of permanent collaboration between research-design, production and sales, in the process of improving quality. This suggests that, in order to improve quality, the "plan-execute-check-act" circuit must be constantly restarted (figure 3).

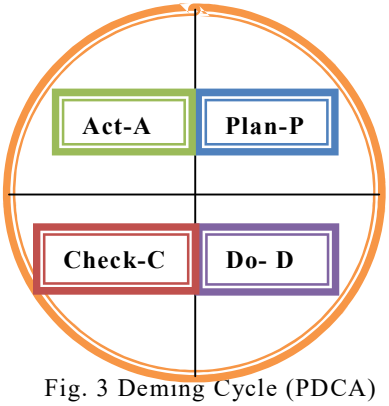

Fig. 3 Deming Cycle (PDCA)

PDCA represents the sequence of activities for improvement, highlighting the fact that it is essential to understand and correctly evaluate the consequences, before acting. The four main stages of the cycle are as follows:

- *PLAN*

In this stage, the given situation is analyzed, establishing what is desired in the future (what are the customer requirements that must be satisfied). It is then evaluated to what extent the system can meet the requirements, what changes are necessary for this purpose, what are the most important results to be obtained, whether the available data is sufficient, what new information is needed.

Priorities are established, an improvement plan is drawn up, based on the assessments made, as well as who will be responsible and for what;

- *DO*

The improvement plan, developed in the planning phase, is applied (tested) with the involvement of all employees, in order to obtain information on the possible effects (results) of this plan.

This stage will include:

- training in scientific methods;

-examination of feedback information obtained from customers regarding their expectations;

- collection of statistical information from processes;

- understanding process control and variations;

- formation of work teams for improvement projects;

- communicating the resulting successes.

It can be said that in this phase the small-scale implementation of any change or any planned test takes place and the resulting data will be collected;

- *CHECK*

In this stage, the small-scale implementation of the improvement plan is investigated, identifying the critical points. This check involves:

- measuring and observing the effects of any change or any test, carried out in the execution phase;

- analysis of the results;

- if the differences between customer needs and process performance have been reduced by adopting the plan.

Statistical methods will be useful in analyzing the results. The results of the verification may or may not confirm that the improvement project is correct;

- *ACT*

The results from the previous phase are studied and if the expected improvements have been achieved, measures are taken to:

- making the necessary changes in the procedures;

- the development of new standards or the modification of the existing ones to make them agree with the expected solutions.

Feedback will be obtained from the processes and from customers after the large-scale implementation of the plan, this information providing a real assessment of the success of the plan. In fact, at this stage the decision is made on the implementation of the plan.

If the results of the verification phase do not show significant improvements in satisfying the customers' requirements, we move on to the development of alternative plans and another PDCA cycle must be restarted.

4. SUGGESTION SYSTEM

The suggestion system is considered to be the simplest technique used in the continuous improvement strategy.

This technique involves collecting improvement impressions.

The implementation of a suggestion system involves the following phases: encouraging workers to formulate suggestions for improving their own activity and the group

they belong to; Managers emphasize training workers so that their suggestions are relevant; Workers analyze the suggestions made, with the help of managers, taking into account their economic impact.

The suggestion system works effectively in most large enterprises in Japan.

The advantages of applying this technique are: Improvement of workers' activity; Improving the working environment; Improvement of processes and equipment; Increasing the quality of products; Improving customer relations; Increasing productivity; Obtaining important resource savings; Cost reduction.

In order for the suggestion system to achieve the expected results, it is recommended that managers consider the following elements:

• formulating positive responses to all suggestions for improvement;

• supporting workers in formulating suggestions;

• clear definition of the areas where suggestions are expected;

• operative implementation of accepted suggestions.

5. JUST IN TIME (KANBAN)

The JIT method originally represents a method of coordinating production processes, which ensures the manufacture and delivery of parts (subassemblies), only at the right time, established by the orders that come to the next work station. In other words, each process takes from the previous one the exact number of pieces it needs at a given time.

The method was used by Taichi Ohno, within the Toyota company, starting in the 60s.

Coordination is carried out by means of a card, hence the name KANBAN, in Japanese, of the method. This method applies to series production that can be divided into small batches.

The method uses two cards: one of the cards for transport and the other for the launch in manufacturing, and there is also an intermediate stock. The methodology is as follows: from the work station located downstream (i+1) a transport card is launched with which a container with parts from the intermediate stock is brought. From here, a card is sent to the workplace (i) for the launch in manufacturing, on the basis of which parts are produced, which will complete a container. With these, the intermediate stock is restored.

The method is effective if the following rules are followed: no piece should be processed, if there is no release card; for each container there is a launch card and a transport card, and the number of containers is carefully established by the process manager; the card is permanently attached to the container; when there is no card, transport and processing stops; only standard containers are used, in which exactly the prescribed quantity is inserted; it is not allowed to process a quantity smaller than that indicated in the card.

By applying the JIT method, stocks are reduced and production optimized, but also the quality of the processes is improved and implicitly the quality of the products obtained.

6. TOTAL PRODUCTIVE MAINTENANCE

It is a technique used within the strategy of continuous improvement, in order to increase the degree of use and the lifetime of the machines, with the participation of all workers, so not only the maintenance team.

An important premise of the application of this method is the training of each worker on how to operate and maintain the working machines (hence the name of the method).

Its implementation is carried out in the following stages: a) ensuring the maintenance of machines with the participation of workers; b)identification of areas with reduced accessibility, with a view to maintenance; c) establishing the causes of the identified deficiencies; d) the development of procedures related to the maintenance of the equipment, with the support of the specialists from the maintenance team, procedures that will be applied by those who work with the respective equipment.

7. CONCLUSIONS

The paper presents the importance of quality improvement and a series of methods and techniques specific to the continuous quality improvement strategy.

Through continuous quality improvement, high quality products or services are obtained, which allows maintaining the market and developing the business. While the demands of the customers have increased, only those companies have resisted for which ensuring the quality of the products delivered and the services offered is a permanent concern, going to satisfy the demands of the consumers.

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