Methods and Conditions for Achieving Continuous Improvement of Processes

Florica BADEA
The Bucharest Academy of Economic Studies, Romania
E-mail: florica_badea@yahoo.fr
Phone/Fax: + 4 (0)21.31819.00
Cătălina RADU
The Bucharest Academy of Economic Studies, Romania
E-mail: kataradu@yahoo.com
Phone/Fax: + 4 (0)21.31819.00
Ana-Maria GRIGORE
The Bucharest Academy of Economic Studies, Romania
E-mail: ana_grig2006@yahoo.co.uk
Phone/Fax: + 4 (0)21.31819.00

Abstract

In the early twentieth century, the Taylor model improved, in a spectacular maner the efficiency of the production processes. This allowed obtaining high productivity by low-skilled workers, but used in large number in the execution of production.

Currently this model is questioned by experts and was replaced by the concept of "continuous improvement". The first signs of change date from the '80s, with the apparition of quality circles and groups of operators on quality issues, principles which are also found in other continuous improvement strategies like: TQM (Total Quality Management), TPM (Total Production Maintenance), Kaizen and Six-Sigma. All these strategies are based on an active participation of the workers. Within this framework, many companies organize autonomous teams of workers responsible for organizing their work and improve economic performances.

Keywords: *continuous improvement, segment improvement, Kaizen, TQM, TPM, autonomous teams, Six Sigma*

JEL classification: L23, M10, M11

1. The concept of continuous improvement (Kaizen)

Kaizen is the Japanese word meaning continuous improvement. Kaizen principle requires employees to make continuous improvements in their current activity. Japanese industrialists give great importance to the Kaizen principle because:

- Despite the quality of the equipments and methods of making various technical services, there is significant potential for improving economic processes.

- The most recommended authors for continuous improvement are the people working daily the processes subjected to improvement.

Toyota's management believes that enterprise productivity growth occurred 50% because of Kaizen and 50% due to investments. Today, this point of view is shared by many leaders of western enterprises (Fukuda R. 1990).

Masaaki Imai (1990), in the kaizen work demonstrates how the continuous improvement of performance always involves two components:

- Profound changes in technology and methods of organization.
- Overall continuous improvements made by the company staff.

In the absence of Kaizen, performance degrades after each technological or organizational change, because of difficulties of adjusting to the new system. On the other hand, Kaizen allows a performance improvement, continuously, between two major improvements.

If the concept of continuous improvement is quite clear, the implementation method is difficult. There is no single method, but there are a variety of tests and tools that companies use, depending on circumstances. All these methods have three common traits:

a) Are collective;
b) Are applied on an organized process;
c) Are action-oriented.

a) Errors, losses and other malfunctions that affect performance usually take place indoors, and a responsible will never go on the field to understand the difficulties of the people involved in the production processes. Solving problems requires an overall cooperation of all persons involved, not only workers, but also from other employees which are part of the professional services or representatives of customers and external suppliers of the enterprise. This principle was applied in quality circles, in problem solving groups and in independent teams.

b) Continuous improvement consists in solving a multitude of issues that affect everyday activity. The people involved are generally not specialized, and the time they assign to these activities is limited. That is why these people should be guided by an accurate process, and simple and efficient methods. Process corresponds to the general structure of a project: the precise definition of the problem, analyzing data, searching and validating solutions, implementation, monitoring results. All these are methods of solving problems.

c) Kaizen has an important feature: it is action-oriented. A simple and quick solution worth's more than a complicated solution, which takes more to be implemented. (Badea F., Gherase (Radu) C, Grigore AM, 2009).

2. Systems of Solutions

The "Idea Box" is the oldest example of kaizen applications. In 1898, William Conors, worker at Kodak Eastmen suggested washing the windows of his studio work to improve brightness. He got for the idea a $ 2 bonus. In the '80s this experience is resumed by Siemens, Michelin and other companies in Europe (YF Liviana, 2008).

Following this example, the *Japanese's* have mastered the principle successfully. Results are unequivocal. Even if the values announced by the western companies are *average* solutions of 0.1 per person per year, the Japanese companies give off 30 solutions per person per year, more than 300 times.

In reality, we do not talk about the same thing. Boxes installed in Western companies were elitist because they referred only on ideas which had important results. But these ideas were few and their implementation is slow.

Systems of solutions seek to involve a larger number of people; they target small improvements daily, even if their financial contribution is reduced. Solutions are usually displayed to be seen by everyone and their implementation, which is often obtained by means of board, is very fast.

2.1 Conditions of achievement

All solutions are interesting, more or less. However even if they can not be put into practice, they signal that there is a problem to be solved and this is the first step in a process of improving in a Kaizen process. It should be stressed that a solution initially refused, can become then a viable solution.

Difference between box solutions and Kaizen solutions

Table 1

	Solution Box	**Kaizen Solution**
Nature of ideas	Looking for solutions whose financial contribution is not measurable	Seeking solutions to simplify business
Motivation	Awards according to profitability solution	No prize, just different ways of rewarding
Implications		Each manager is responsible for the number of solutions implemented
Showing	1% or 2% of staff propose solutions	More than 80% of people proposing new solutions

There are a few cases when an improvement solution works from the first phase. Discussed with colleagues, analyzed and improved, it is more likely to be accepted by everyone upon implementation. These differences are a reason for boxes failure with traditional solutions. Each person believes that is forced to think individually, without the help of the team, and the rejection of an idea is perceived as a personal failure. It is therefore important to say again: Kaizen is a collective approach to join a team working mode. Enterprises employees react according to what it is expected from them. If the priority of the enterprise is production and if the support services are disinterested in improvement solutions, there are few chances that workers devote their efforts to achieve improved solutions. That is why leaders need to support creative activity within their team. A good solution is

to require each responsible to monthly attend to a steering committee to present the results of the previous period: the curve of productivity, quality levels and compliance with delivery periods, then he will present the number of improvement solutions which were implemented. The fact that the staff sees how the proposed solutions are quickly implemented is motivating. Rapid application of the solutions assumes that the means of achieving are decentralized. Decentralized means can be internal (a general mechanical workshop which made small technical devices or upgrading work) or external (a direct relationship with a subcontractor). In this case, the workshop has an autonomous budget.

Decentralized means allow the processing of 80-90% of improvement solutions. The rest remains to solve the central departments. Improving solutions proposed by the enterprise staff is just one element among others in a Kaizen process. Other methods may work in parallel, as some are better adapted to specific situations. The most common are:

- Problem-solving groups that follow a methodical approach to solving a given problem;
- The Hosin site, which requires the mobilization for a short duration of time of a team for the reorganization of production equipment.

3. Quality management in a Kaizen project

Parallel with constant developments in industrial production management, the quality had a much sustained upward trend in recent decades. Initially, the main task was to control the quality in conformity with the products. Consequently, the company was interested in the structural organization in order to offer its clients maximum satisfaction. (Badea F., 2006)

Henceforth, the role of quality functions exceeds the importance of the concept of quality in that it highlights the interest in enterprise performance. Research in product conformity must be accompanied by a dynamic vision of progress, which requires a specific set of actions.

Introducing the Six Sigma approach, in part reflects this development together with the desire to change the pace in improving company performance. This method aims to improve the quality segment rather than a permanent improvement (continued). In conclusion, continuous improvement is necessary, but the obtaining methods can be applied only on segments. For this either process or product must be considered.

To illustrate the difference between continuous improvement and the segment improving, we may take into account the number of accidents on European highways. While in southern Europe, continuous improvement goes on (by modernizing automobiles, eliminate the weaknesses, etc.), Northern Europe uses methods which recall the role of the automobile in society. The result is given by twice the number of accidents for those who are followers of continuous improvement.

3.1 Kaizen method of continuous improvement of the quality of processes

Previous assertion is not meant to criticize the continuous improvement of the quality, but there must be a balance between continuous improvement and segment improvement of the quality.

Overall variation of the quality system is due to many factors of variability throughout the production process. All small quality improvements are often insignificant for the company strategy. However, adding small improvements, but in a larger number, helps to reduce factors of variability of processes, finally acting on costs and working time. On the other hand, these small improvements in most cases do not require high costs, but contribute significantly to reduce costs and eliminate losses.

In addition, to the quality improvement of the job processes, even workers on these jobs contribute. This is what the literature called Kaizen principle according to which continuous improvement of the processes will use energy and knowledge of all people in the enterprise. This continuous improvement method was used for the first time in the company Suzuki from Japan and highlighted the role of operational staff in an enterprise with lean production against a traditional enterprise.

3.2 Six Sigma method

This method consists of an overall assessment of industrial performance of enterprise and of the customer service. (G. Baglin, O. Bruel, Garros A, Grief M, Kerbache L. C., Delft C., 2007). Building a better customer satisfaction, Six Sigma approach helps to increase business profitability with the following effects:

- Reducing spoilage, and non-quality costs.
- Improving the availability of machines and their efficiency.
- Increasing market share due to increasing product quality.

The overall assessment of industrial quality and performance using Six Sigma methodology acts as a complement to all methods of continuous improvement. Six Sigma method is:

- A quality-oriented philosophy for total satisfaction of customers;
- A performance indicator which allows the company location at a certain level of quality;
- A problem solving method that reduces the negative consequences on products.
- A method of organizing the competences and responsibilities of the human factor in business;
- A way of quality management which is used mostly by project management.

Resolving Six Sigma method is structured in five phases:

1. Defining. Segment Improvement involves a very large investment, for it is necessary to justify the return on such a study.

2. Measurement. Never know what to do if it is not known how to measure. It will therefore seek to characterize a problem by measuring and highlighting its data.

3. Analysis. Cause research leads to the relationship between cause and effect.

4. Improving. Presentation of improving actions and their effects.

5. Control. Applying a set of measures to ensure a lasting improvement. The methods used for process continuous improvement are most appropriate for the enterprise with lean production. Lean production requires a very high level of quality in business processes. Production can not be fluent in business without having adopted a set of specific methods and tools of quality. Multitude of applications that aim at resolving these problems in the enterprise can not bear fruit without a well-structured project management. (J Womack 2005) The Six Sigma method proposed such a management, within which the roles are well defined. Thus:

✓ Black Belt or Six Sigma animator is to lead the working group throughout the Six Sigma project implementation;

✓ Green Belt plays the role of animator of Six Sigma project, but has less experience than black belt and whose presence is not permanent during project implementation;

✓ The Champion allows the development of Six Sigma concept by defining the concepts, objectives to be achieved while being a black belt adviser. Based on individuals who are competent and organized on a project management, Six Sigma method is very effective in segment improvement of the quality of its business.

3.3 Nonconformity, source for the continuous improvement and for the segment improvement

To be effective, lean production must be endowed by two solutions of progress: continuous improvement and segment improvement of the quality. (V. Deac, F. Badea, C. Dobrin, 2010). Any nonconformity of the process highlights its weaknesses. When nonconformity occurs very often, two principles will be applied:

o The principle of the iceberg, modest information about non-conformity no doubt put out a very serious problem. Visible nonconformity is only the visible part of an iceberg. Japanese specialist Ohno, Toyota Motors Company Manager, in the early 50's, recommend that at the moment of the emergence of non-conformity to ask five times the question "Why?", in order to detect its source. A fault must be, paradoxically welcomed as it allows removing the source of the default, while being a source of progress.

o Principle of magic candle: non-conformity similar with the candles on birthday cake - you want to put out and it turns on always. To turn it off you have to do more than the traditional blowing over it. 80% of detected faults by quality services are current problems, and, for this, a detailed analysis for each non-conformity must be done to determine whether it is part of the continuous improvement area or segment improvement.

Lean production requires a very high level of processes, which could not be obtained without the use of specific instruments like: validation using statistical evidence, management of measurement processes, statistical management of processes etc.

In conclusion, we can say:

Summary of using Six Sigma and lean production

Table 2

Lean production without Six Sigma	Quick production, but low quality
Six Sigma production without lean production	Quality production without added value
Lean production with Six Sigma	Quality production at low costs

4. Working autonomous teams, a solution for continuous improvement

Volvo car manufacturer has made in the '60s an experience that was very much publicized at the time.

The experiment's objective was to find a substitute for Fordiana flow line. Volvo decided, in Udevalla and Kalmar plants, to entrust to teams of 10 members the complete assembly of an automobile. Instead of relentlessly repeating the same gestures and movements, workers took two hours for installation of a car. Working at conveyor was replaced with a modern form of handicraft. In terms of working conditions, experience has been very conclusive. In a country which at that time had a labor shortage, workers will not be very pleased to work on a flow line.

Regarding the performance plan, the number of vehicles rejected decreased due to defects apparition.

But most observers recognize that the initiative has a major obstacle: it was started on a small number of elements (to improve working conditions) but didn't join a global strategy to improve performance. Currently, most companies believe that evolution is directed with reasons by the necessity of independent teams for three reasons:

- The first reason is the human nature. Enterprise workers have competences that progress steadily. Provided that they are organized and have appropriate tools and methods, they are able to manage their own activities and make their own decisions, which were previously vested by their leaders.

- The second reason is in connection with the need of reactivity and adaptation of enterprises. To respond without delay to customer demand and quickly launch new products on the market, companies apply short decisions systems. Workers organize themselves, without waiting for authorization or intervention of senior staff. This approach is a representative example of Kanban method, in which production is managed directly by operators.
- -The third reason is highlighted by the desire of every enterprise to implement its policy of continuous improvement. All studies show that this approach is more effective when the operators are responsible and work in action groups. In conclusion, the autonomous teams are the organizational form most suitable for solving current problems and improve performance. Onward we will present, one of the methods with good results in continuous improvement field, which in Romania was not yet given due attention, autonomous teams working method.

4.1 Autonomous working team- definition of the concept

R. Semler (Semler R. 1990) shows how SEMCO was created, against all conventions. In his firm, workers assign their production tasks themselves, have a free schedule of work, and are invited to work every time, whenever it is possible. Important decisions are taken democratically within the department or production studio. Recruitment is done collectively by colleagues or subordinates. Service managers are marked by team members they lead. Also, enterprise personnel are strongly encouraged to change the regulations of services or functions. This example is a particular situation, spectacular. But there are many situations, less spectacular, where autonomy is developed taking into account the characteristic features of its own sphere of team activity.

For instance, when car assembly line workers decide to stop the assembly line they believe it will be affect the quality of the product. For this reason, they change freely work place with another colleague, come together to propose improvements to their work methods, or participate in sharing the workload. In other words, they develop the concept of autonomous team.

There are three common traits of autonomous teams:

a) Work is carried out between teams, fact which doesn't happen in the Taylorian organizations, where every worker was concerned with his work rate. Teamwork requires a better sharing of production, the possibility of interchangeability of the work places and help of the team mates, if needed.

b) The team has autonomy for certain kinds of decisions. Table 3 presents the mission of the autonomous team that can completely cover an increasingly large area, depending on staff competence and maturity of the organization.

c) The team is responsible for its performance. She has to reach targets for improvement and, for this; it should always improve its methods of work.

Mission of the autonomous team

Table 3

Technical Missions	Management Missions
Self-control Manufacturing changes Detection of stop causes Maintenance and cleaning job	Distribution of the activities among team members Passing orders to the next team Administrative supervision of the production (quantity, quality)
Simple adjustment of equipment Statistical Process Control First level maintenance of equipment (lubrication)	Supplying Weekly production planning Calculating and updating the performance indicators Management of absences and leave
Difficult adjustments Second level maintenance of equipment Defining and job placement	Malfunctions analysis Troubleshooting on corrective and preventive actions Creating job documents Training new staff employed
Participation in equipment election and manufacture new products	Processing customer orders and their invoicing Participation in choosing suppliers Participation in setting budgets and annual plans for continuous improvement

4.2 Operation of autonomous teams

To obtain an effective autonomous team is not sufficient to constitute a group of people. Effective operation of these teams requires several conditions met.

Multifunctional roles

Even if Taylor organization obtains profit from stabilization of the workers on jobs, teamwork stimulates the change. Job rotation of workers offers several advantages:

- Allows an adaptation to market demand, staff can easily move from one workshop running a product to a workshop with another product;
- Authorizes a more supple management of working hours and holidays;
- Has a positive effect in terms of quality, because each worker understands the activity of other members of the team and can focus on global production process;
- Mobility enhances communication. Individual behavior is a substitute for team spirit, encouraging the exchange of experience, solidarity in difficult situations and decisions on consensus.

Team integration

In the Taylor system, members of a maintenance and repair shops have an undeveloped relationship with the environment (other workshops, technical services, deposits, etc.). Coordinating the activity was essentially based on a hierarchical structure. Each person receives instructions from higher level and transmits his subordinates.

An organization based on autonomous teams works in different ways. Integration of a team assumes its membership in a network. Hierarchical levels are no longer exclusively in the processing of information, but will focus on important issues: strategically decisions and actions on the medium and long term.

On short term, the team relationship with its environment is through direct exchanges of information and decisions with partners (domestic suppliers' upstream and internal clients downstream).

Team responsibility

A directly productive worker performance is exclusively measured by the level of productivity achieved. From now on, collective assessment criteria are used like: the total production of the work team, respecting timelines, consumption of raw materials. Remuneration system must suppress the bonuses based on individual productivity and should be to put back into the collective interest. Collective performance indicators should be posted in common work area and the whole team will be reviewed regularly in meetings of team work.

4.3 Implementation of the autonomous work teams

Implementation of such a project will change in depth the enterprise operation. A study on this issue in 50 companies has highlighted the following conclusions:

- In less than 10% of enterprises, trade unions oppose such a project. The reluctance category consists of persons from the first hierarchical level that of the executants.
- Among the obstacles that may occur in the project succeed, companies put on first place division services and then lack of team spirit of employees.
- Regarding the length of the project, the study shows that, on average, enterprises need to obtain satisfactory results.

In conclusion, to obtain a high level of performance parameters in terms of continuously improving their processes, companies need to have resources available and appropriate means, and no less importantly, be persistent and tenacious in achieving this ambitious goal.

References

1. Badea F. (2006) *Production Management*, ASE Publishing House, Bucharest
2. Badea F., Dobrin R (2005) *Production budget management systems*, Editura Economica, Bucharest
3. Deac V., F. Badea, Dobrin C. (2010) *Organization, flexibility and maintenance*, ASE Publishing House, Bucharest
4. Badea F., Gherase (Radu) C, Grigore A.M. (2010) *Present the Evolution of Enterprises, in the context of New Organizational Changes*, International Conference "Modern Approaches in economics and organizational management", 12-13 Nov. 2009, to be published
5. Baglin G, Bruel O., Garros A, Grief M, Kerbache L., Delft C. (2007), *Management Industriel et Logistique*, Editura Economica, Paris
6. Fukuda R. (1990) *Productivity, mode d'emploi*, Les Editions d'Organisation, Paris
7. Liviana YF. (2008) *Organisation et Pratiques theories*, Dunod, Paris
8. Masaaki I. (1990) *Le Kaizen*, Dunod, Paris
9. Semler R. (1990) *Contre-course*, Dunod, Paris
10. Womack J. (2005), *Lean System*, Pearson Education