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Implementation of Quality Systems in Sociotechnical Systems

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1. Introduction

In the increasingly dynamic environment which has been configured over the twentieth century based on the increasing demands of the environment, the need to innovate has been a constant. But if productivity was initially the key element to achieve, in the last quarter century, have appeared new elements where quality should be highlighted.

There is no doubt that these competitive pressures arising from the internationalization of markets that occurs at an increasing rate over the last decades of the twentieth century, have forced many organizations to implement quality approaches while the mismatches and errors arising from the application of traditional approaches to work organization, still not been sufficiently analyzed and diffused. A management approach based on hierarchy and control derived from an approach predominantly Taylors that is not always disputed by organizations in implementing quality models, despite its focus to prevention and organizational learning.

The reasons must be sought in the uncertainties and weaknesses of the models:

- *ISO 9000 standards* extend quality concept to areas related to the production process, but do not fall to discuss the paradigm of work organization to apply for the Organization (Lahera , 2004)
- The *EFQM model* adopts a systemic approach but it raises an additive scheme of interactions between its elements (Eskildsen et al, 2000; Conti, 2002)

As well as in the diffusion process, which has been linked to:

- *ISO 9000 standards*, to the demands of customers to implement and certify their quality systems, which calls into question their voluntary nature and the adoption of the approach to improving business continuity (Jones et al, 1997; Martinez, 2004).
- The *EFQM model*, to the adoption of an award requirements as criteria for implementing quality management, although their approach to evaluation (Zink and Schmidt, 1998)

This has resulted in quite a lot of deployments of these quality systems where become evident the contradictions and inconsistencies arising from the uncertainty of a paradigm of a clear

underlying organization of work which leads us to propose a reflection about how it has been developed quality in different areas (in the West in general and Spain in particular).

2. Objectives and methodology

The aim of this study is to establish how quality systems models are influenced by work organization which can act as a limiting factor or facilitator and develop an analytical framework for the implementation of quality systems in organizations, which collects in an integrated manner the contributions of both disciplines, work organization and quality, in regard to socio-technical nature of the organization and the particular importance of quality as a learning tool.

To achieve these goals it has been developed a large study of the origins and the evolution that have been experienced as the work organization models, from the Taylors model to the sociotechnical systems model, as the quality management models, from the quality assurance standards and total quality models applied in the West and USA to the CWQC and lean manufacturing in Japan.

This bibliographic review examine in depth , in both disciplines, as the theoretical approaches and methodologies developed for its implementation, as the results achieved whit its application.

From this information on, a research work has been done in three large Spanish industrial companies to study in depth the relations and interactions between work organization models and quality tools and models through the evolution of the implantation process of quality management.

By means of all of this information, it studies and contrasts, comes up the connections between these matters and the identification criterions for the development and the implementation of quality systems in sociotechnical systems.

3. Development of the theoretical framework

3.1 Evolution of the industrial work organization models

The enormous success reached by USA in its industrialization process in the early twentieth century following the Taylorist model based on the division of labor and specialization of workers, made it became gradually extended in the developed world and become into the true paradigm of business management and organizations during the twentieth century.

Although the model had mismatches, and the proof of it are the results obtained by Elton Mayo at the Hawthorne plant, not until the early '50s when a series of British Tavistock Institute researchers call into question the Taylor paradigm as the only possible one, the one best way to achieve high productivity.

The Institute's researchers pointed out that the process of mechanization had destroyed the traditional structure of small groups of miners who carried out all of the tasks related to coal mining, replacing it with specialists who worked independently in highly specialized jobs.

The solution suggested by the researchers was a new form of work organization which they called the Design of socio-technical systems, inspired by systems theory, biology, logic, and cybernetics, from which they adopted concepts and theories which were later modified on the basis of practical experience:

- A holistic system, which makes it possible to look at the overall situation, adopting an integrated view of a production system made up of a technical system and a social subsystem in continuous interaction.
- An open system, where it is necessary pay attention to the relations between its elements and between the system and their environment.
- The self-regulation, which is the basis of work groups.

Conceptually, the new model means a change in the design of work organization. Traditionally, in the Taylorist model, engineers decide what form of organization is best, based on the demands of the technical system, and without taking into account the relationship between the technology and people. The theory of socio-technical systems, opposite to the Taylorist model, proposes the necessity of establishing a joint design of the technical system and the social system.

To do this, the socio-technical model proposes the analysis of both the social and the technical systems, on an equal basis, and the study of the relationship between them. This is because considerate that the proper performance of the system depends more on how its parts interact than on how they work independently and the optimum performance of a system cannot be reduced to the sum of the optimum performance of its parts (Trist, 1981).

An important paradigm shift in traditional Taylorist approach, which has its main exponent in the new role of workers within the company and which is reflected:

- Both in its design principles (Trist, 1981)
  - Endless process and minimum critical specification vs. the use of standards for control.
  - Multifunctionality vs. specialization in the work.
  - Sociotechnical criteria vs. separation in the planning and in the operation.
  - Location of the boundaries vs. functional organization.
  - Compatibility vs. Clear delineation of authority and responsibility
- As in applied practices for an implementation in organizations, carried out mainly through the working groups, which are integrated into what was called the operation unit, and are but different parts of process where the transformation of the product is made.

This recognition of the importance of the social system in the organization of work not only involves changes in the social system:

- The multifunctionality of the working groups allows the exchange of jobs, reducing the coordination needs between workers and bureaucracy and ultimately, increasing the autonomy of workers, especially in decision-making in those areas directly related to the activities they perform.

But also in the technical system:

- The new focus is on the product and not the task, on the outcome of the action, on the client, and not on the action itself.
- The objective is the control of the product by the workers, instead of the control of the workers.

An innovative approach, not nowadays but in 1950, which was created with the objective of improving life quality of workers, becomes equally valid to improve productivity and product quality and to facilitate organizational flexibility, achieving a double objective: satisfying the wishes of both workers and managers (Molleman and Broekhuis, 2001).

This view allows us to see once again the possibilities afforded by worker involvement and participation, from a different perspective. First of all, the workers share a common work language – the product – which makes them strive to achieve this one goal instead of simply doing the tasks that are assigned them without knowing what these are for. Secondly, they are in the best position to control the process while they are working: they know how the process works, what its key variances are, and how to keep these under control.

But the model despite the good results achieved in some industrial experiments, has had a very limited distribution, in contrast to other models and management techniques, such as in quality models (Jackson, 2003).

This fact and the strong dependence of the methodological approach of the model, the action research, not only have difficult its further development, especially in technical and methodological aspects, but which led to the continuation of the Taylor's model.

For though the prestige of the Taylor's paradigm has been declining to the point that few managers today would dare to confess that they are still applying it, the fact is that many of the basic elements of this approach are still applying it today, more than one century after his birth.

In this context, in the following lines are being examined the models and techniques of quality. In these management models can be observed how the absence in its definition of clear references to one or the other paradigm of work organization has made to be common to see in many of their deployments, clearly Taylorist elements with others that substantially differ.

At the same time and despite this lack of reference, in its evolution (these methods emerged from under taylorist environment) may find the continuity of critical socio-technical approach, turning to cast doubt on such principles as: the maximum division of work, extreme hierarchy, the excessive mechanization and automation, etc.

3.2 The role of quality in a global economy – Nature and importance of quality

3.2.1 The quality management – Technique, strategy or philosophy?

From the historical point of view, it can be said that it is in the late '80s when Western companies began to implement quality systems and techniques widely in response to the competitive challenge launched by Japan.

The absence of competitors made in the '50s that Western companies leave quality techniques and their interest focused on producing and selling goods for the world market

(Ivancevich et al, 1997). The companies, more concerned about issues such as improving productivity or the incorporation of advanced technologies (ERP's, etc.), forgot about the customer.

This overconfidence led to stagnation in the evolution of quality in the West, Japan spoke about ppm while the West was still talking about acceptable percentage of defects. While it is clear that the effort done in terms of quality in Western companies has recovered this focus on the customer, the quality has been developed from a highly technical form of the labor standards and models assessment and specialists in the field.

These systems, on the one hand, allow companies to both reduce costs by avoiding errors and time wastes and achieving improvements in business processes, as well as reaching a high degree of differentiation and reinforcing its brand image (Claver et al, 1999; Tari, 2001).

But this step forward in rationalization of the processes of quality assurance of the providers and also in spreading the culture of quality, poses risks, especially as companies face the pragmatic implantation, underestimating the cultural impact involved in its implementation (Camison et al, 2007).

And despite this implicit recognition that if you want to improve, is necessary to impact on the way of working on certain products, is also obvious that often influence on the design of the organization of work is avoided and assuring quality is limited to the control of the process by setting certain standards or guides of good practice that are slowly converging to international recognition models but are made outside the system itself which they are applied to (though often sectoral specificities are recognized, of organizational size, etc.) and to which are incorporated a certification scheme for its audit and evaluation.

Its rapid diffusion through the demands of customers requiring certified quality systems has prompted many companies to focus their efforts in meeting the requirements of the models, creating a dynamic of "ensuring the existence and functioning of the system", that has been left out not only many of the principles of quality management, but also the improvement of productivity.

The certification does not guarantee that the product quality is good, or that the quality improves with time, or that the products of the registered companies meet the needs of its customers, or the quality levels of products of companies registered is such or simply that the quality of these products is much better than those of non-registered (Ciampa, 1993; Rotger and Canela, 1996).

In this sense it is possible to say that this process of operationalization and instrumentation of quality, which seems that apart from continuing the approach of total quality management around the EFQM model and the Excellence Accreditation, has resulted in significant competitive advantages for companies, and in parallel has also fallen into another series of serious errors, because the implementation of quality required to put into practice a series of organizational mechanisms designed to facilitate and promote the participation of everyone in the organization in the control and improvement of quality (Prida and Grijalvo, 2008).

Behind this, is not but the difficulty to perceive, as different cases of companies analyzed, how old methods of motivation to prioritize the performance or use of standards for the

control of those people still present in the culture of the organization, even years after they have been eliminated, acting as constraints to change (Prida and Grijalvo, 2007; Prida, 2005).

Many of the problems of implementing these models arise when procedures and standards, key elements to achieve the stability of the process and therefore also to apply improvement techniques, are used exclusively for the control of labor that has been excluded from any real participation in their design and implementation (Lahera, 2004).

Errors must be detected and managed there where they are produced and this is not possible without the participation of those who do the work. Empowerment is not a new mechanism for motivating workers to accept executing that which is derived from plans designed exclusively by management, but is a necessary tool for the management and learning of the organization starting from their base.

The Japanese culture was the pioneer in mobilizing human resources from improving quality, enhancing mechanisms for employee participation. The involvement of employees within the process becomes a common form of development work in Japanese companies. The goal is to delegate as much planning and control as possible, making workers responsible of the quality and the improvement (Imai, 1991).

It is not that workers participate in strategic decisions of the company but constantly studying the problems that appear within their immediate environment and solving them, so in this way, they constantly improve the results of their work and the environment in which they play it.

This brings as a result the redefinition of the roles of all personnel of the organization. It contributes significantly to the redesign of the organization, not so much on its organizational structure, which maintains the traditional hierarchical-functional, but the design of work organization, for initiatives to promote interactions between the different units and teamwork (Tillery and Rutledge, 1991; Imai, 1991; Beckford, 1998).

This is a very interesting aspect, given on one hand, the existing debate in the West about the need for changes in organizational structure to implement quality management and, in parallel, none of the models mostly used by companies: the rules ISO 9000 and EFQM Excellence Model, explicitly contemplate.

In this sense Belohlav (1993) and Conti (1993) assert that the problem in the implementation of quality management is not so much that the company is organized according to models of work organization based on hierarchy and standardization of activities, but in non-structural activities that the company carries out to ensure coordination between various departments and to break down any barriers to effective communication processes.

The evolution of the standards of assurance quality management in its review in the year 2000 has been marked by the introduction of these approaches through the principles of quality. While it should be noted that the solution is not so much in the fact that the models adopt these principles, but on the development of policies and guidelines within companies that create a culture of commitment, participation or improvement at a medium and long term.

Principles and practices generally are not independent, but are correlated and the success in the implementation of quality models and techniques depends largely on achieving this

synergistic effect (Gown et al, 2007). Otherwise you may encounter problems and practices implanted, instead of exercising a facilitating or driving role in the implementation of the principles of quality that may act as a limiter or brake.

Although there are no explicit references to models of work organization in the techniques of quality, research has shown that the continuity of a critical thinking about the socio-technical approach in the Taylorist model in Japanese approaches, the CWQC and lean manufacturing, that return into question principles such as: the highest division of labor, extreme hierarchy, the excessive mechanization and automation, etc. At the same time it has drawn attention to the validity of Taylor approach in some of the existing quality models and whose most extreme case is probably the re-engineering of Hammer and Champy.

3.2.2 The systemic nature of principles and quality practices: Neo-Taylorism or continuous improvement

After this analysis it can be said that this new way of understanding human resources management has resulted to be the key strategy in the implementation of quality systems in Japanese companies, whose products in the 80's burst massively displacing many Western products of its own common market.

The KAIZEN integrates all the concepts and methodologies developed by American scientists and later by the Japanese Ishikawa, Taguchi and Shingo (Figure 1). All are tools and techniques to improve quality and do not have, as raised in the West, an end in themselves, but represent efforts of improving of all personnel in the company in different areas (Butch and Spangler, 1990; Ishikawa, 1988; Walton, 1986).

This is because of the approach to the system adopted by Japanese companies in their implementation; where so important are both the technological elements of the model and the humans', and the interactions between them (Imai, 1991; Mizuno, 1992).

Simple tools such as Kankan or suggestion systems have taken 10 years for its adoption in Japanese corporations. The implementation of these techniques requires time not only for training people in new skills, but also for undertaking them and putting them into practice (Galgano, 1993; Fortuna, 1991; Camison et al, 1991).

In addition, productivity and quality are inseparable linked (Coriat, 1993). The idea is to design systems that allow more dynamic response to an increasingly demanding and changing environment, not only in regard to aspects of quality but also to those related to service: responsiveness reliability, speed deliveries and the own flexibility to adopt to the changes.

In this sense, JIT is a technique that is based on the application of continuous improvement and waste elimination but whose implementation directly affects the production environment and also means to change the focus of cost management systems and the criteria for its measurement and control (Mcllhattan, 1991).

And is that not only now the cost management system should aim to identify the real usefulness of added value activities, but also that some traditional measures of cost accounting systems can encourage contrary actions to the desired ones: the extent of the use of machinery can induce the production of a good, creating inventories with an advance of the needs.
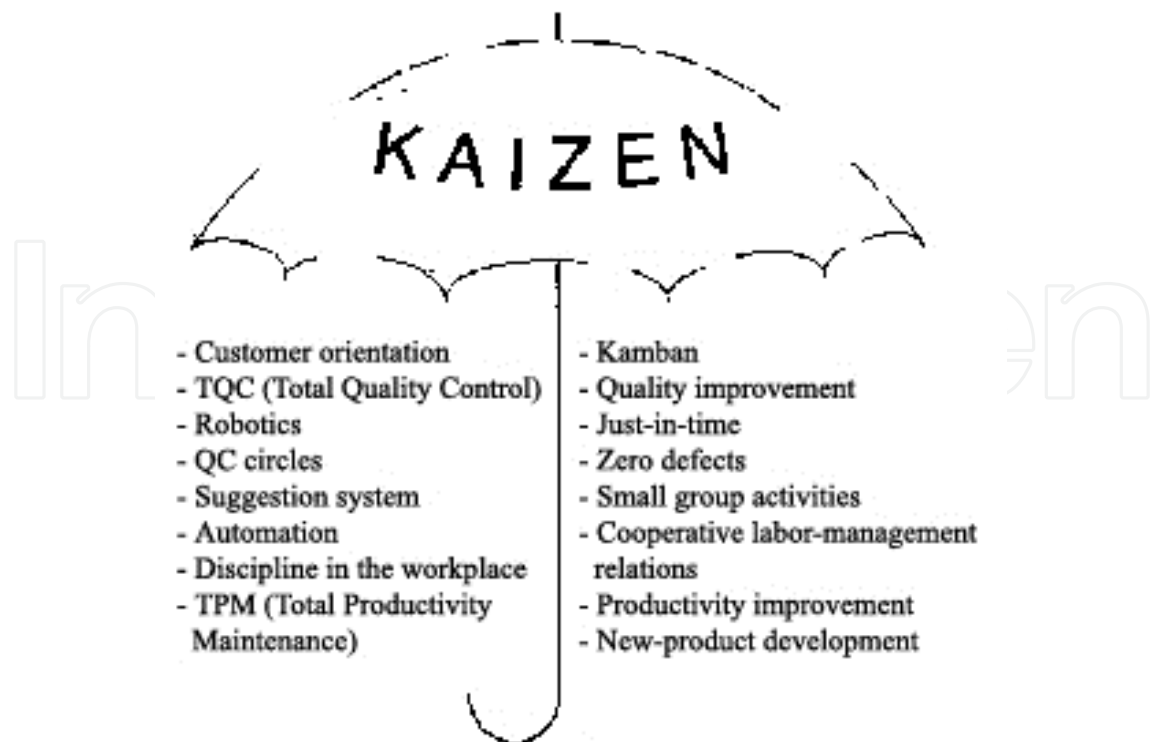
Fig. 1. The KAIZEN umbrella (Imai, 1991)

Therefore, Japanese companies do not separate the quality of the other demands on the system, but they integrate all these aspects to achieve a more robust system that is capable of responding effectively and efficiently to the demands of the environment in general and customers in particular.

Systemic approach is probably where the own approach goes far beyond the specific techniques, what has not always been understood in the West. This has facilitated the spread of many of them, but has meant that many companies understand them as simple methods to improve productivity that can be applied in a pragmatic way.(Jackson, 2001).

So is common to find organizations where they try to copy imitating these techniques, where these and objectives are confused or where the great philosophies can last for months before being replaced by new ones.

This utilitarianism and fragmentation, whose origin is in the ignorance of the functioning of systems with socio-technical nature, and that is the cause of many of the failures that occur in its implementation, can also be observed in the application of total quality models where again the West copies Japanese practices, in this case the Deming Prize, and where again is made the mistake of applying them in a pragmatic way.

For Nieto and Ros (2006) this award of excellence, the first that was created, although is based on non prescriptive guidance, presents a more technical nature with regard to the considerations to take into account when implementing the CWQC model:

- Both regarding to its principles, which are based on Deming's 14 principles
- as on the criteria for granting, which are based on statistical control in problem solving and continuous improvement.

By contrast, the criteria of EFQM model and Malcolm Baldridge are the criteria to examine, evaluate and rate those organizations wishing to present to the awards, and therefore, what they reflect is the opinion of several experts on the philosophy, methods and issues that, in their opinion, the organizations should take into account to address management excellence.

Cases such as Wallace & Co. firm, released even by the lay press (Ivey and Carey, 1991) that few months later after it was awarded with the Malcolm Baldrige American excellence prize, finished by disappearing because of bankruptcy, but can be considered as a anecdote that shows the need to relativize the word excellence in this type of model.

Conti (2007), one of the fathers of the European model of excellence, the EFQM, had already pointed in this direction some of its weaknesses in its systemic structure, pointing out its limitations as a benchmark for improvement.

But although the model recognizes that the company is a system and its various elements are interrelated, it does not explain how these interactions occur; that is to say, which is, in general, the common relationship between enablers and results, but taking a global approach: through innovation and learning is enhanced the work of the enablers to lead to an improvement in the results.

In addition, they establish a point model to evaluate each part of the system, without take in consideration the interactions among the various stakeholders which are operating in an organization, instead of the fact it is well known that in a system the sum of the parts cannot explain the behaviour of the whole.

This ambiguity of the systemic structure which the model presents, determines its usefulness to establish concrete plans of action in complex systems of socio-technical nature. The complex network of feedbacks of this type of systems against overly simple structure of cause-effect relationships established by the model, can lead the organization to make mistakes, thinking that the best way to achieve excellence is to focus on actions to add the maximum amount of points in the model or undertake less problematic actions to quickly demonstrate improvement.

In this sense, excellence models give indications according to the ultimate goal to be achieved by the organization to achieve the highest score on the excellence, but in them there are little evidences regarding to the best way to reach it.

Is its development, which is linked to the prize, what makes its application within the continuous improvement cycle to be centered almost exclusively on one of its phases, the evaluation, forgetting the rest, what certainly limits its usefulness as a learning tool.

On the other hand, the evolution of the ISO 9000 of quality assurance has been marked in its review on year 2000 by introducing approaches to improve quality through quality principles: focus on customer, leadership, involvement of the staff, approach based on the processes, system approach for management, continual improvement, factual approach for decision making and mutually beneficial relations with the supplier.

But implementing these principles goes beyond providing quality products or services and following predetermined procedures. It is a new way to organize and to work in the company: barriers between departments and functions should be break down, providing visibility and transparency, improving workflow and communication, etc.

The implementation of the standard requires, therefore, to consider three dimensions: technique, people and organization, since the mere documentation of practices that are taking place in the company, which may have even incorporated the requirements established in the rule, all it does is its formalization.

However, numerous studies show that all these aspects are not always addressed by companies in the process of implementation of standards. So, to the extent that the rule only states what the company should do and does not indicate anything about how to do it, the application of approaches to processes, continuous improvement and equal participation of workers, is strongly influenced by factors such as : the commitment of the company, its organization, its dynamic of change, etc. (Muthler and Lytle, 1991).

The reasons which may be behind this situation can be varied but in general they are all directly or indirectly related to the acquisition of the quality system certification, one of the objectives, if not the most important of those persecuted by the companies when they decide to implement a quality system according to international standards (Nanda, 2005; Celada, 2005).

Although the companies also hope to achieve with the implementation of standards-benefits related to the improvement of the quality, of both products and processes that lead to be more efficient, certification is the key element that provides value and that converts system of quality management into a competitive advantage (Duran, 2005).

Special mention, within the quality models based on standards, should be made of two sectors such as the automotive and the aeronautics where the pressures of big corporations, leaders in the sector, have led to the fact that the implementation and certification of the quality system is not anymore a differentiating factor but an essential requirement to operate (Grijalvo y Prida, 2005).

In this situation the need to facilitate both the implementation and certification of the system can lead to avoid, as far as possible, changes in the organization and processes to meet the requirements of the standard, because it allows them to both reduce efforts and reduce delays (Martínez, 2005).

Perhaps because companies are not sufficiently aware of the conflict of the principles of quality that are intended to implement with some of the models of work organization derived from Taylorism. For example:

- If it is accepted that there is one best way of doing the work, continuous improvement is meaningless.
- The only activities in which direct workers can participate in the Taylorist model are the ones about implementation that have been assigned by the technicians.
- The technicians' activities, in contrast, are reduced to planning, preparing and controlling, and are based on the exercise of authority and hierarchy, not leadership.
- The extreme division of labor looks for the decomposition of the process in its elements and thus, for the improvement of efficiency and effectiveness, are focused on each of them independently, forgetting that the organization is a system and the importance of the operation of the interactions between them and their environment.

In contrast, the models derived from the model of socio-technical systems design of work organization, fit much more to these new principles of quality. For example:

- The focus on the system so that the results depend both on the different elements and on the interaction between them and the environment, what provides a stronger basis on which to define the processes, their interactions and their improvement.
- The focus on the participation and worker self-control, which allow more efficient monitoring of the process' variability and establishes the necessary basis for the connection between processes.
- The flow of information, aimed to those who must take decisions, have the data necessary to do so.

Therefore it is necessary to prevent the implementation of the rules against this false sense of ease, particularly attractive to managers looking for quick results. The speed is not consistent with the slow pace of cultural change which takes a long time to involve people in the use and improvement of the system as part of their daily work.

The cases of companies that are discussed below show:

- The implementation of quality management requires the company to adopt a contingency approach that allows maintaining internal coherence between the different areas of management. The transfer of management techniques is not a linear process of diffusion, but a process of adaptation of those involved in the context where it is being implemented.
- The relationships and interactions between models of work organization and the techniques and models of quality through the development process of implementation of quality management, proposing different ways to address improving the competitiveness of the organization, but always based on the perception of the role of workers in the control and quality improvement.

4. Business case study

The study of these cases has allowed setting the evolution of the processes of implementation of quality management in enterprises, as well as the relationships and interactions that are established between the models and techniques of quality and organization work.

The choice of this type of qualitative methodology to carry out this stage of the research meets the objectives of our work, since the aim is partly to deepen the relationships and interactions between them, not to establish a statistical measure in the application of certain practices and on the other hand, to develop a model or framework of analysis with methodical recommendations for the implementations of the techniques and models of quality companies (Rialp, 1998; Eisenhardt, 1989; Glaser and Strauss, 1987; Ying, 1989).

The three selected companies belong to the industrial sector, more specifically to the automotive, the agricultural and the aerospace, have all a long way in the implementation of quality models, although it is possible to find significant differences between them:

- In the three companies manufacturing flawless products has always been an imperative for their business and in the three of them focus on quality assurance based on a mechanistic model, has been insufficient to achieve customer satisfaction, while the new approaches taken by each of them are different both from the standpoint of to the organization of work.

- In the three companies to move towards greater complexity either in the products made, in production equipment or in both, has not only but increased the importance of the participation of human resources, although this process has been tackled in a different way.

The study has shown that though the models in both areas, quality and organization of work, evolve in a structured way over time, the path taken by the companies, which otherwise reflect different models analyzed in this research:

- The first case, the automotive sector company, presents an alternative closer to the one developed by Japanese quality model. The commitment of the management of the company with quality is geared within the company to train workers in technical problem solving and teamwork, to subsequently be able to manage their own processes, after which they will be available to participate in defining the mission and vision of the company.
- The other two cases, companies in the agriculture and aerospace sector, pose an alternative closer to the developed by Western models of quality. The commitment of the management of the company with quality is geared within the company to define the mission, vision and long term objectives, which are then deployed by the organization, analyzing the critical processes for their achievement, for which, now, a technical staff is in continuous improvement, teamwork, etc.

They are different ways to address improving the competitiveness of the organization, but are based on the perception of the role of workers in the control and quality improvement. It is this conviction that they all lead to the development of organizational or social innovations, it lead to a clear empowerment and to a participation of workers in decisions affecting the organization of work.

4.1 Total quality as the development of organizational culture – The "*mini-companies*"

The company is one of the 19 factories of a multinational automotive sector and since its foundation it has focused its activities mainly in the manufacture of thin cables and wires for the reinforcement of radial tires. The first years of operation of the facilities are very complicated and the results are not within expectations. Inefficiencies in production and especially the problems with the quality of the products manufactured for its main client, created much discontent among both managers and employees.

In this context, managers "took the decision of concentrating all their efforts on quality and use the total quality management as the most appropriate way to redress the operation of the enterprise" (Martinez, 1993).

The managing director asks his engineers to visit other plants and study how they operate. There they will get familiarized with the techniques of problem solving and teamwork and as they return they will develop and implement the technique of the Color Lines.

This is the first of a long series of techniques and tools that have been implemented in the company to support the improvement of management, two of which are discussed below delving into the reasons that have made that the effort to improve has been effective.

The Color Lines has an approach similar to quality circles applied in Japan and as them, are aimed to the participation of people, with facts and data management and the systematic approach to improvement.

In general, each Color Line refers to the entire production process of a product or a small family of products and integrates all the people who have relationship with it. Each Color Line has established key parameters of which information is collected on daily activity and that are followed up in monthly or bimonthly meetings.

This methodology is applied initially to a small process, which is called "Orange Line", where many problems were detected, while the dramatic improvements in results in this line in a short time served to initiate a process improvement throughout the organization led by its managing director that decided to "do whatever was necessary to provide engineers and workers the resources, skills and tools to start the journey with no end in continuous improvement."

And that is translated into a series of training initiatives focused not only on providing to the plant personnel an awareness of quality concepts and practices, but above all, to develop especially an attitude of learning that can facilitate the development and deployment in the enterprise.

Therefore, the "Color Lines" are considered the basis for the development of values and culture of quality (Club Gestión de Calidad, 1995). Its application integrates many technical and social aspects to promote active employee participation and collaboration among workers and staff of the service areas in improving the productivity of processes. A comprehensive approach not only allowed changing the rules but also the organizational skills to make possible a system in which workers can better control the variability of work.

This gradual and systematical increase of the responsibilities of workers associated with the implementation of these and other quality techniques and tools, leads to the development of a new model of work organization, the "mini companies", a model for the autonomous management of small business units, a colored line or part of a color line, with common activities and objectives.

Each "mini company" is made up of customers, suppliers, bankers (Chiefs) and its members (employees), functioning as a real company with its own mission, its customer-supplier letter and its communication channels and it defines and deploys annual improvement plans based on their objectives (Suzaki, 2000).

The management of its daily activity is carried out through two cycles SDCA / PDCA: standardize, find problems, solve problems and implement new methods. A methodology aimed at improving outcomes in Safety-Quality-Delivery- Cost-Moral, the "SQDCM."

Despite this, the key for the development of self-management in "mini companies" has been the continued development of the skills of workers which has been promoted from the "Respect for people," one of the values on which it bases its culture and involves considering all workers, not as a simple resource or manpower but as human beings who seek self-fulfillment through their work. That is what they call solve "a problem feet" (the distance between the head of the heart), and it brings to contemplate the whole person: hands, brain and heart.

In this sense, is ceaseless to stress that this increase in responsibilities of employers was carried out gradually, what has enabled not only the formation of workers but the managers, especially supervisors, to explore new responsibilities without clinging to the current preventing the change.

Overall the experience of the company in the extension of the model within the enterprise shows that "Only those who have internalized the basic principles that underlie the systems have further success in the application in other cultures. It is not a matter of copying *the know how*. You do not get sustainable and lasting improvements without internalize *the know why*. "

4.2 Continuous improvement in business processes – Work teams

The company is one of the factories of an American enterprise and whose facilities were initially used in the production of agricultural machinery for the Spanish market, and later specialized in the manufacture of components for further assembly factories of the group in the world.

The evolution of quality in the factory reflects the perseverance in improving the quality of the products for its customers, which has been accompanied by an integration project of the human resources in the production processes, which has promoted major changes in the organization work (Dueñas, 2010; Macías, 2010).

At the end of the '50s, the initiatives around quality in the company were focused on quality control approach orientated both to standardization or development of technical specifications as well as to the use of control techniques and inspection of products and processes.

In addition, until the '80s the company applies traditional models of functional and hierarchical work organization based on the division of labor, and also on time and movements study, the basis of the pay system of the factory, the incentive system.

This pyramidal structure allows the company to grow by introducing unqualified people or with very simple levels of qualification, but the increased complexity of the factory and the loss of visibility of material flow through the different specialized departments makes necessary the redesign of the structure of production processes.

The factory is geared towards the product rather than to the manufacturing processes throughout the cellular manufacturing and, therefore there, appear the first initiatives for the versatility of the workers, who must now operate several machines.

The need to operate in the new market where the plant will be open to, that happens from producing a single final product to produce a variety of components for other plants, results in the mini factories, specialized production areas, each of which fully addresses the development of a separate component, and whose implementation involves the decentralization of some services such as production control, which passes directly to depend on these new units.

Since 1997, the company addresses the improvement of its quality system through the implementation of different models of quality: ISO 9001:1994 and the Corporate Quality Manual.

In parallel the company will implement the Teamwork, model based on methodologies of group work that is associated with an enrichment of both the vertical position by decentralizing decision-making, and the horizontal promoting versatility versus specialization and which seeks to respond to the new technological level of the plant with production lines becoming increasingly automated and characteristics which requires some characteristics and superior skills of the operators.

Despite this, the participation of workers is still very limited in spite of their participation in the Quarterly Cycle of Continuous Improvement, a methodology that consists of several phases based on the model of improvement of 6-sigma improvement, DAMAIC cycle, very similar to PDCA cycle

Meanwhile we must consider that creating in workers a positive attitude towards issues such as implication and assumption of responsibilities is a process that requires a relatively long time and that passes through a realistic assessment of structural inertia that programs on change must meet. In this sense, it is important to note the revised wage policies, despite the difficulty of changing the incentive system deeply rooted in the organizational culture, to the fixed portion of salary or base now it must be added a variable that encourages:

- the quality over quantity, substituting the premiums to productivity for premiums for good parts and
- teamwork and cooperation over the merits and individual skills, when replacing the right to collect the premium as the result of individual work for its collection according to the results of the work of the whole team.

The implementation of the process approach in the factory which started in 1998/99 with the implantation of Corporate Quality Manual, continues with the implementation of a guide developed by the Company to improve business processes, in which techniques are applied and also tools of six-sigma approach, the Green Teams.

The Green Teams is the first of several corporate assessment models whose goal is to standardize processes in different plants in the world that are focused on the implementation of six-sigma tools and techniques and, read in production processes, with which the Company looks not so much to introduce new requirements but to achieve better results.

The Models, in similar way to other models of self-evaluation, look both, for each procedure, identifying the strengths and areas for improvement of the plant, such as assigning a score. Noted that plants are not only not free to implement the model but also from the Company it is stated that they must obtain a minimum assessment to remain being suppliers.

4.3 A strategic approach to quality – Plant management areas

In this case it is presented and analyzed the case of a Spanish multinational (Grijalvo and Prida, 2006) from the aerospace sector which in recent years has undergone trough significant changes as a result of the following factors:

- The increasing globalization of the industry, which has significantly changed the characteristics of its market and has forced the company to cope with an increased international competition.

- The change in ownership from public to private sector, which has been a major internal restructuring with the introduction of different foreign partners.

The whole process of deep changes in the company coincided with the increasingly determined incorporation of new approaches of quality in its management which over recent years, have not only been maintained but have renewed their impulse and no doubt that have certainly contributed to a competitive company today.

The recognition of the strategic importance of quality dates, in most sectors, of the last decades of the twentieth century, but in this case, the existence of departments of inspection and verification and the use of quality manuals have been integrated in the production activities, since much more years and manufacturing products with the guarantee of being free of defects, has traditionally been a business imperative.

It is noteworthy that in this enterprise customer requirements and the application of stringent quality standards, in some cases derived from the military sphere, joined to the high technological complexity of manufactured products, required the use of formal systems and quality manuals highly developed. In this situation the application of ISO 9000 initially assumed no more than minor adjustments in the systems and pre-existing quality manuals.

However, at the end of the 80's started to be felt in the company that this approach to "quality assurance" applied so far was insufficient both to achieve full customer satisfaction and to achieve economic efficiency in production operations, which facilitates the search for new ways to combine the new demands of the market with the usual quality.

The successful experience of a project to integrate human resources and material in production processes and management of factories in what is called Participatory Management coincides with attempts to move towards new models of total quality in the company and boost a new culture of continuous improvement in the organization that has promoted important changes in regard to its organizational structure and in relation to the management system itself.

Participative management is an organizational model that is based on the application of the following practices:

- Organization by products and processes, to achieve simplification and optimization of processes.
- Coordination / integration of the functions / activities at the lowest level, so that operational decisions are taken at that level.
- Team work and multi-functionality focused on the process / product.
- Dynamic adaptation to each situation through changes brought by the application of reengineering techniques and / or continuous improvement.

The aim is to increase people's participation in decision-making (within their level of responsibility), to achieve continuous improvement in the performance of the functions and activities assigned to each person and guide all efforts to the product to satisfy the customers.

For this, the company develops the Plant Management Areas. A Plant Management Area is a multi-functional team on a permanent basis, constituted within an organizational unit,

where are, directly, effectively and in an integrated way, assumed and coordinated all activities associated with the process variables necessaries for the obtaining of a product.

For the implementation of Plant Management Areas, it is initially developed a parallel organization to the existing one, with teams around the production processes with hierarchical and nonhierarchical relationships among its members, to join them later when is changed the organizational structure of the company.

Plant Management Areas become a facilitator of the transition from functional hierarchical organization and the new organizational model adopted by the company which is the organization's processes; however, it should be noted that there are elements that can affect the development of the proposed change both from the social system and from the technical system:

- While the participation of people in the preliminary experiments was high, the new model involves changes in compensation systems which had been applied for years (more oriented towards functional productivity increase than customer satisfaction), which may give rise to situations of demotivation.
- The degree of repetitiveness and variety of manufactured products is not equal in all the production processes of the company and therefore, will not always be possible to propose the same solutions in all processes. On the other hand, it cannot be expected the same degree of control in high repeatability processes than in others that are ad.hoc processes established almost like a project.

In addition, the new organizational model marks a significant cultural change in the company, because although it was initially implanted in Manufacturing Directorate, also affects other units involved in the processes. This cultural change is also the main difficulty to which the company has to face with in its introduction:

- External orientation towards the client versus internal orientation towards the product.
- Results commitment rather than compliance.
- Process and equipment versus departments and heads.
- Participation and support against hierarchy and control.

The challenge now for the company is moving forward in organizational change implemented in production and in their new culture, extending it to the entire organization and in this line have been focused new improvement projects (Grijalvo and Prida, 2007):

- Both in the area of work organization, with the revision of the wage policies of the technicians and managers of the different divisions to align them with the group and the development of a new remuneration system which now includes a variable pay based on the fulfillment of objectives of the Company.
- As for quality, the company currently is doing in all of its plants, a project to implement lean methodologies in the production processes of all plants

5. Study results and conclusions

The study has proven that the success in implementing the principles of quality is contingent on the system of work organization in the company implemented and how it also strongly conditions beliefs and values shared within the organization, its culture (Ciampa, 1993, Merli, 1995; Camison et al, 2007).

Probably the competitive pressures that have come under Western companies since the 80's, have made much greater emphasis on customer focus and the structural changes that were needed to put it into practice that on policy human resource management related to work organization.

The substantial decrease in research activity in the organization of work in the design of sociotechnical systems in the 80's, whose proposals did not exceed the scope of experimentation, is but a reflection of the concerns of Western companies that have abandoned this focus of interest.

In contrast with the West, in Japanese firms, their concern to improve the quality was the trigger for a much larger systemic process that is reflected in the development of many techniques grouped under the name of Kaizen (Imai, 1991) and whose application results a change in organizational culture that involves the continued acceptance by all employees that their work is not only to meet the standards but also to improve them.

And most important, in general, its application results in a change in organizational culture that involves permanent acceptance by all employees that their work is not only to meet the standards but also improving them , with an approach that goes beyond the "zero defects" is not so much to get it right the first time, but doing it better.

Two different approaches related to the implementation of approaches to work organization that not only help to understand the contradictions in the implementations of quality systems in Western companies but, that companies do not obtain the expected results.

And is that traditional approaches of work organization based on hierarchy and control (Taylorism) or external motivation to work (School of Human Relations) are not always questioned by organizations when applying models quality, despite its focus to prevention and organizational learning. This makes that some companies:

- Associate quality basically to compliance with the product features and dissociate it from productivity
- See continuous improvement more as a technique than as part of their culture.
- Raise the participation more as a necessary element for the process control than as a key element for continuous improvement.

In this sense, in Japanese companies implementing quality has always been closely linked to improving productivity and to the application of techniques of work organization, which affect both the system design, as well as the participation of workers in the process management and that has given rise to a philosophy that transcends the techniques used: focus on processes, internal customer, continuous improvement, etc..

Moreover, the empirical work has shown that the evolution of the quality system is not dependent on the application of certain approaches: quality assurance or total or specific models, EFQM and ISO 9000 standards, but whether they are linked to the restructuring processes to guide the client and the restructuring of work organization (Senge, 1995, Moreno-Luzon et al, 2001). It ultimately consists on enabling the participation of workers in the control and quality improvement.

It is therefore necessary that organizations address the implementation of quality from a socio-technical approach by applying models to improve the quality and organization of

work to facilitate the participation of workers in management processes (Deming, 1989; Imai, 199). An integrated input from both disciplines, work organization and quality, in regard to the socio-technical nature of the organization and the particular importance of quality as a goal and as learning methodology, based on:

- A strategic approach to quality through increased involvement of company personnel and the adoption of forms of work organization that give more power to workers in decision making or empowerment, that enables the management system to evolve over time regardless of the quality management model adopted.
- An approach to the processes by redesigning the production system from two key elements: the structure of production and control structure that allows an approach to the complete structure of the system without going into the distinction between the social system and the technical system.
- An approach to standardization and continuous improvement through the implementation of action research methodologies and the PDCA cycle, allowing an approach to more balanced technological innovation and linked to social development of the organization.

Is interesting to highlight the compatibility of this approach with the principles of quality and the ISO 9000 and EFQM models. Although, as has been noted throughout this paper, the use of references is a useful tool, its use and mainly its abuse involve risks, especially as companies underestimate the impact that involves the application or that this is done in a pragmatic way. They are not the principles or models that make an organization excellent today but are its structure and function the ones that allow adjusting to a changing environment.

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Quality Management and Practices

Edited by Dr. Kim-Soon Ng

This book is comprised of a collection of reviews and research works from international professionals from various parts of the world. A practical approach to quality management provides the reader with the understanding of basic to total quality practices in organizations, reflecting a systematic coverage of topics. Its main focus is on quality management practices in organization and dealing with specific total quality practices to quality management systems. It is intended for use as a reference at the universities, colleges, corporate organizations, and for individuals who want to know more about total quality practices. The works in this book will be a helpful and useful guide to practitioners seeking to understand and use the appropriate approaches to implement total quality.

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