Revision of TPM implementations cases in Colombia

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Abstract

Previous studies about the implementation of Total Productivity Management (TPM) in Colombia have shown that this philosophy makes a competitive company stand out internationally, and even makes the difference between survival and death for many of them. Several years after these findings, it is necessary to verify if TPM is still having a leading role, or if it has been discarded or replaced by other strategies or techniques.

This article shows the main findings and up-to-date case studies about the implementation of Total Productivity Management in Colombia, which were found in research projects at Universidad EAFIT from 2003 until today.

The questions addressed in this paper are:
Was TPM established in Colombian companies as a current administration and management trend? What are the main obstacles in the implementation of TPM? Which strategies are followed to overcome these obstacles?

Key words
TPM implementation process in the West, TPM implementation in Colombian industries, Development of TPM in Colombia, TPM and organizational change.

Conceptual approach to TPM and organizational change

Since JIPM promoted TPM implementation in 1971 (Tajiri-Gotoh, 1999) companies have been motivated to enter the world of TPM to maximize the team efficiency through its life cycle. This phenomenon started when Deming’s quality concepts were reconsidered and adopted in the automotive industry to become part of the corporative culture of companies such as Toyota, Nissan, Mazda and their suppliers and affiliates. Later on, they were introduced in process industries, starting from their experiences with prevention maintenance (Suzuki, 1995). These companies focused on implementing TPM in their process and set their goals towards “zero breakdowns” and “zero failures”; keeping the equipment in an optimal state not only means that the machine operates well, but this also means that it should not stop because of failure (Shirose, 1992). TPM focuses on improving the actual conditions of the plant and increasing the knowledge and skills to achieve the goals of zero accidents, zero defects, and zero stops. In Colombia TPM is a relative new subject that has gained relevance because of the good results obtained by major multinational companies. As a consequence, industries started to implement the philosophy beginning at affiliate companies and suppliers that were already implementing the discipline in other countries. In today’s world, companies must be competitive in order to survive, and to achieve it they must fulfill three fundamental conditions:

• To offer a high quality product: increasing the quality or conformity of the delivered product is the most common reason why clients suggest to their suppliers of raw material or any other resource, the implementation of TPM. In this case, both parts perceive the benefits.
• To have competitive costs: good management and efficient productive systems may help in the way to achieve this goal.
• To deliver on time: increasing client satisfaction by decreasing delivery time, is another important aspect for companies to suggest the implantation of TPM (Steinbacher, 1993).

The secret of the most successful companies lies in highly defined quality standards, both for their products and their employees. Therefore, TPM is a philosophy that must be applied to every hierarchical level in the organization accompanied by a process of endless and continuous improvement.

Regarding the establishment process, some authors state that an organizational culture change is required to create the proper scenario for TPM. However, other authors consider that this is adaptable and can be introduced without establishing any deep cultural change within the company. In any case, success or failure depends on the creation of a well-structured organization that is based on a commitment of the top-level management, in the company culture and in the individual characteristics of their members. It is possible for an organizational structure to be adequate for one company but it may not work for another company with similar characteristics, making it harder to guide the implementation process following exactly what the theory prescribes.

Before starting a project of this embrace, it is important to acknowledge the time, funds and effort that needs to be invested in training before major results begin to emerge. As the implementation of TPM is a radical step aimed to change a corporate culture, it takes preparation and strong commitment and it should not be rushed (Hartmann, 1992).

The sorts of results that companies intend to achieve by implementing TPM are:

• **Costs savings**, mainly because of the elimination of operative delays and stops. As the operative employees have time available to search for failures and eliminate them, the costs savings increase.

• **Improved product quality**, as a result of the quick response of operative employees to processes interruptions that can prevent subsequent adjustments can be prevented.

• **Increased safety**, because without TPM both operative and mechanical employees may employ unsafe methods to simplify their work. They may not have the adequate tools, training or supplies to develop a safe and well-done job.

• **Decreased waste**, as one of the goals of TPM includes maximizing equipment efficiency and thereby eliminating the waste produced by them.

• **Improved skills and flexibility in employees**, as each of them is prepared to react appropriately to the equipment needs (Maggard, 1992).

TPM implementations consist of four phases: preparation, introduction, implementation and consolidation (Suzuki, 1995):

• **Preparation phase.** This phase begins with the announcement made by the top-level management stating that the company is introducing TPM to the organization, and finishes with the initial draft of the TPM Developing Master Plan.

• **Introduction phase.** This phase begins when the Master Plan has been approved. It is developed in a meeting with all the staff, where the top-level management confirms their commitment to implement TPM and presents the outcome of the previous phase.

• **Establishment Phase.** This phase aims to develop the activities designed to achieve the objectives defined in the Master Plan. Here, the order and deadlines of activities are adjusted and also are adapted to the company’s particular characteristics.

• **Consolidation Phase.** In this phase the achieved levels are maintained.

It is difficult to estimate the time required to implement all the activities. However, the Master Plan should be used in first place with the purpose to visualize all the activities through the timeline (Hartmann, 1992).

**The change process**

For the theorist it is clear that establishing any “hard” administrative model requires, in parallel, the management of a “soft” process of change. In this way, the goals proposed in the administrative model can be really adopted as working habits and lead to a true transformation of how the things are done within the organization (Bridges, 1993).
Many studies have addressed administrative tendencies (López, 1999), and the failure of change processes (Kotter, 1997).

To manage processes of change, literature states that technical changes must be related and come in parallel with cultural and personal changes inside the company; especially regarding the learning and people’s adaptation (Allaire, Firsirotu, 1985). Every process of change implies a learning process.

Parallel to establishing these structured conditions, the success or failure of a TPM project depends also on the adequate management of a process of change and the organizational and individual learning process. These are the circumstances necessary for a correct implementation of the required organizational conditions. A properly oriented process requires a timely identification and management of the individual and organizational obstacles that may hinder the appropriation of new forms of working.

From a normative perspective, the adequate implementation of TPM implies a transformation in the thinking and doing habits adopted inside the business. A profound change must lead to a paradigm shift; regarding business operations, rethinking the current practice and proposing new ways to operate and relate to other people within the organizational context. When the change is only focused on procedures, processes and functions according to the organizational chart—or just including formal attributes of the operation—, the change does not reach the essence of business transformation oriented to a new way of seeing and working in the company. A profound change may lead to a change in the mindset of people. Therefore, acting just to follow the norm does not assure that the change has really happened. If a change of mindset is not achieved, the purpose of establishing a new meaningful work model for people is incomplete and the whole change stays halfway even though the systems, the procedures and practices have been established (Senge, 2000).

The change of mindset is complete when there is stability in the results of the change process. Nonetheless, when the change is motivated or induced only by reasons of authority, force, or economic interests the outcome is alienation, obedience or imposition (Etzioni, 1975). The consistency of results does not go further than the presence of external elements that induced such behavior. On the contrary, when the implementation of a change process comes from personal conviction the change lasts longer. The autonomy level that people acquire while mastering the process manifests this second case. Studies about autonomy at work and autonomous groups have disclosed this second case (Orsburn, 1990; Hackman, 1992).

Bridges (1993) revised the concept of “resistance to change” as an obstacle. People do not resist to a change by the change itself, but the losses the change entails. Identifying the losses of each person or group, combined with a good support strategy, is fundamental in the change process (Bridges, 1993).

Identifying and managing the obstacles that hinder changes are major factors for an adequate implementation of the TPM model. Nevertheless, there is no strict formula for that, it depends on the creativity, resources and inventiveness of the process leaders to manage and solve those problems. Therefore, when obstacles are not identified properly, and the strategies to manage these obstacles are not developed, the progress towards the formal implementation of the model will be slow, expensive and will not give the expected results.

**Implementation on TPM in the West**

In contrast to Total Quality Management (TQM) and Just in Time management (JIT), the introduction of TPM marked a breakdown of how new manufacturing practices were introduced and established in Japan. TPM introduced the “Top-Down” process for its implementation (Fruin y Nakamura, 1997), very close to the approach used by the Strategic Management tendency in the West (Hitt, 1999), in response to the economic crisis of the East in the 90s. The “Top-Down” process generates a very different dynamic in the episodic nature of the total process compared to the “Bottom-Up” process.

The Japanese theory forms the foundations of all propositions for the implementation of TPM. However, in the West, TPM was introduced together with JIT and TQM, which is referred to as “World-Class Manufacturing” (Shonberger, 1986). Each author establishes their own implementation criteria according to the proposal of adaptation or adoption of the Eastern philosophy they make. For that reason, processes of change are more complex to model.
Different authors have shown that TPM and TQM are complementary methodologies that do not compete with each other. Moreover, both methodologies reinforce each other to help organizations achieve their competitiveness and improvement objectives in a globalized environment. Samuel Ho (Ho, 1999, 169-181) proposes a model to integrate TPM and TQM by arranging them in a sequence with other quality practices. This model is named TQMEX and was useful in Malaysian companies as a guide to reach the excellence TQM aims for.

Figure 1. Stages of TQMEX Implementation

| 5-S | BPR | QCC | ISO 9000 | TPM | TQM |

The TQMEX model presents TPM as a previous stage towards TQM and also presents other improvement techniques connected in a sequence as depicted in figure 1. The model shows how the companies oriented to achieve TQM must develop and establish in advance fundamental basis of behavior, habits and thinking that are supported by TPM and TQM. The systematic implementation of improvement techniques previous to TQM (i.e. 5-S, reengineering, quality circles, ISO 9000 and TPM) is the method to establish the required behavior platform.

The Japan Institute of Plant Maintenance (JIPM) proposes twelve well-defined consecutive steps that are oriented to the implementation of TPM. They are prescriptive and emphasize that TPM requires a process of change framed in the long term (Hartmann, 1999). However, without focusing on the detail and step-by-step of this method, previous studies—that were developed during the implementation process of TPM in Colombian companies—highlight differences between the actions taken and results obtained (Villegas, 1995; 1998; 2000; 2002; León, 2002; Naranjo, 2002; Montoya, 2002; Restrepo, 2002; Agudelo, 2001; Sierra, 2001; Arango, 2000; Rodríguez, 1999). Therefore, a permanent research topic is whether or not the verification of monitoring of the JIPM methodology was carried out and its connection to the success or failure of the TPM implementation process.

Previous research at Universidad EAFIT (Colombia) validated and proposed guidelines to implement TPM in Colombian companies based on real cases. The objective of revising each implementation process of TPM was to find common parameters that lead to the development of a model that guides future implementations (Villegas; Vélez, 2005).

Research related to the implementation of TPM in 25 Colombian companies that have advanced most in TPM, found two main concepts: the “change rate” and the “layers”. The change rate explains the differences in the implementation of TPM progress better than the “time of implementation” concept (assumed by the study initially). The layers concept suggests that the companies require shorter implementation times for different improvement techniques as they overlap them over previous techniques. In this case, the implementation time may last longer if the company needs to start the process from zero (Villegas; Vélez, 2006). The case study of SOFASA RENAULT describes these concepts clearly; therefore, it is described in detail as follows.

**Case study: an implementation of TPM in SOFASA-RENAULT**

SOFASA REANULT is a transnational company that is part of the Colombian automotive sector. It was founded in 1969 in Medellin. Its emergence was part of a government drive to foster the industry with the construction of an automotive assembly plant in the Country. Along its history, it has been surrounded by several changes in its shares and the arrival of new investors that brought change and new ideas for its development. Therefore, this is a company that is continuously restructured. In 2008 the shares were divided in three groups: Renault with 60%, Toyota with 28% and Mitsui with 12%. After Renault bought Nissan, Toyota withdrew SOFASA and its share. Toyota left a valuable legacy in the company’s transformation, which today is internationally competitive in one of the most competitive sector of industry.

TPM in SOFASA has had three main periods. The first one began with the introduction of 5S, which started its implementation by the end of the 80s. Afterwards, Toyota joined the company. By this time, new techniques as Kaizen and the system of ideas and suggestions were introduced to lead the company to the consolidation of focused
improvements, as it is known in TPM. Many years went by until TPM was formally introduced. The Renault headquarters suggested the TPM implementation, due to the good results obtained in other plants worldwide.

The previously named strategies were integrated in SOFASA as the “Renault Production System” (SPR from its initials in Spanish), which was configured after the alliance Nissan-Renault in 2012. With the SPR the company aims to achieve the highest efficiency, assuring the quality demanded by clients and achieving a high indicator in the use of resources by reducing and avoiding losses (Villegas, 2012).

The main approach of SPR is based upon two principal variables: driving for quality, and the search for the best production cycle. Its share in the markets that are different from the local one, such as Ecuador and Venezuela, have made SOFASA to set an essential production objective to assure 100 percent of the quality to their clients both internal as external. Furthermore, to face the threat of Free Trade Agreements, the second essential production objective is to reduce the global production costs; therefore, TPM joins the strategy as a tool for costs reduction. Moreover, TPM supports SPR with personal development by defining a training pillar. Figure 2 depicts the pillars of SPR at SOFASA.

![Figure 2: Pillars of SPR at SOFASA RENAULT](image)

At SOFASA, TPM concepts were not introduced as the basis of a profound organizational change; it was simply taken as an additional tool from the available continuous improvement processes, which were already used and completely understood by the company. Likewise, TPM has not been implemented from a prescriptive approach (as suggested by conservative researchers in the field) but there is simultaneous progress in the five pillars defined by RENAULT, which are named TPM2 (i.e. TPM adjusted to the method used by RENAULT). The process leaders within the company have found that the guidelines proposed by the authors of the JIPM represents a slow process and then decided to make it faster based upon the development of their own methodology. TPM is constructed from a collective and conversational process, where ideas are developed and valued while the process leader guides the path.

The communication process about the TPM implementation was purely conversational, person-to-person by means of interviews hosted by the plant leader named as “accompanying in line”. These interviews reveal the obstacles related to the process and provide information to implement solutions quickly. Likewise, massive communication tools were developed to reach the employees; for instance, billboards and meetings with the employees of all the different workshops were arranged.

Within the main obstacles that appeared in the development phase of the tool was the strong opposition of the production department during the initial stage and the development phase of autonomous maintenance. The main reason for this opposition was that the department started losing prominence while the responsibilities increased. The strongest opposition was from the middle management that did not allow the operators to spend time on developing TPM related tasks. Furthermore, they did not attend meetings and there was a general indifference that hindered the progress. However, the production department began to proactively participate and accelerate the
implementation process thanks to the confirmation of results, the support from the vice presidents and the benefits from TPM implementation going to sale.

Even though SOFASA has achieved great benefits from TPM such as time and resources savings, it is important to highlight that TPM is not the only tool used by SOFASA to achieve higher operational efficiency. However, TPM has been a key element in the strategic plans for: cost reduction and development and management of human resources. The current strategic plan, named *Altius*, has the ambitious challenge to make RENAULT the most profitable general automobile constructor in Europe. The company plans to sell 90,000 units with an operating profit margin of 6% and reach an 84% of Totally Satisfied Customers (TSC). In order to achieve this goal, the production systems used tools from TPM such as zero stock policy and modular construction.

Nowadays, SOFASA possess intelligent working systems: learning groups that have the ability to evaluate themselves and correct errors in real time. In other words, intelligent working systems are a combination of automatic equipment and people, however, it is focused on people’s skills and competencies. A clear example of vertical integration in the productive chain is the “accompanying in line”, which is a task for all employees. On the other hand, horizontal integration as is evidenced by the creation of work teams for each area and teams of employees from diverse areas focused on raising improvement ideas. Such initiatives show the maturity of the company and a proper field to consolidate TPM.

Even though the company has evolved, it was not always like that. By the end of the 80s there was a period in which the Top-level management collided with the labor union, leading to a crisis where the only possible way for the company to survive was a radical change. In 1988 happened an episodic change and from there the company has evolved. A new strategy does not replace the existing ones, on the opposite; the learning process is capitalized and the new strategy builds upon the previous. Therefore, new strategies are not applied rigorously, but gradually using the elements required to improve each day and building an own management system. From this emerges the concept of layers; the lower layers (the older strategies) support the new ones so that the company can adopt them faster. Figure 3 depicts the main layers adopted from 1989 until now.

**Figure 3: Layer concept at SOFASA RENAULT**

Renault Production System (SPR)
TPM
Standardisation: ISO, EAQF
Toyota Production System (SPT)
Total Quality

**Conclusions**

When identifying the companies in Colombia with the greatest progress in the implementation of TPM, some questions arose: What does it mean that they have progressed? How to determine progress in the implementation of TPM? After trying to answer these questions it was identified that the implementation time is not correlated with its progress (even though at the beginning we thought there was correlation). Next, we identified a new concept that we named “change rate” which relates progress and time in terms of speed. Likewise, the concept of layers emerged, which explains progress in terms of superposing different improvement techniques (previous organizational experiences). This concept helped to answer the first question and showed the need to open the TPM scenario to
other related techniques. Since ISO 9000 certification was one of the criteria to select the companies for this study, all of the surveyed companies were certified. Moreover, 5S was the most used technique among the surveyed companies. This finding is coherent with the TQMEX model proposed by Samuel Ho (Ho, 1999) which validates the selection of the model as a reference framework adopted by the discretional sampling developed.

In the longitudinal study developed at SOFASA-RENAULT, the variables with greater influence on the implementation of TPM were leadership and learning. The study evidenced the evolution of these variables from the period where the company had a chaotic work environment (where the top-level management and labor union forces collided) and how they were fundamental to implement quality and productivity systems (including TPM). Finally, this scenario allowed the company to become competitive in the automotive sector at an international level.

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