

Impact of 5S on quality, productivity and organizational climate - Two Analysis Cases

Paloma Martínez Sánchez and Carolina Montoya Rodriguez

Engineering Faculty. Bosque University.

Av. Cra. 9 no. 131 A-02, Bogotá, Colombia

martinezpaloma@unbosque.edu.co, montoyacarolina@unbosque.edu.co

Ursula Maruyama

Engineering and Business Department. CEFET-RJ

Av. Maracana 229, Bloco E, 1 andar, Maracana – Rio de Janeiro, Brazil.

ursula.maruyama@cefet-rj.br

Fernando Salazar

School of Management. Rosario University.

Autopista Norte Calle 200. Bogotá, Colombia

fernando.salazar@urosario.edu.co

Abstract

This article shows the impact of the 5S on the study factors: quality, productivity and organizational climate in two manufacturing SME located in Usaquen (Bogotá). The purpose of the study is to evaluate whether the 5s methodology could be considered as an effective tool to improve manufacturing processes at SMEs. A visual diagnosis is chosen to identify the areas that present the largest amount of clutter and dirt. Once the location is identified, surveys and performance measurements are conducted focusing on particular study factors so as to understand the initial situation of the area. Subsequently, implementation of 5s is carried out and then three measurements are taken to monitor the performance of the study factors in order to find out if there is a trend during the measuring period. The study proves the lack of knowledge on the part of some Colombian SMEs on the methodology of 5S, despite of the low cost of implementation and the benefits offer to organizations. The results shows the existence of a positive relationship between the study factors and the implementation of the 5s methodology, since there is evidence of an increase in productivity (83% - 68%) and quality (36% - 67%) based on performance measurements as well as improvement of the organizational climate (18% - 33%)

Keywords

5S, Quality, Productivity, Organizational Climate

1. Introduction

The 5S methodology comes from five Japanese words: Seiri, Seiton, Seiso, Seiketsu and Shitsuke. The term was formalized by Takashi Osada in 1980 (Ho et al., 1995; Gapp et al., 2008, HungLing 2011). The word *Seiri*, refers to selecting and sorting the elements into two main categories: essential and nonessential (Cura 2003); Michalska & Szewieczek 2007). *Seiton* consists in establishing the adequate manner for locating and identifying the essential materials so that they can be easily accessible (Cura 2003); Ho 1999; Mateus 2011). *Seiso* seeks to maintain the workspace under clean conditions (Michalska & Szewieczek 2007) by having a regular schedule for removing dirt and dust (Osada 1991; Mateus 2011). *Seiketsu* indicates that everything should be easy to identify (Becker 2001) and with clearly visible labels for all operators (Riera 2010). *Shitsuke* consists in sustaining each of the five Ss (Sacristán 2005).

5s can be thought of as a simple house cleaning method to organize desktop that emphasize visual order, organization, cleanliness and standardization. This helps to eliminate all types of waste related to uncertainty, waiting, the search for relevant information and so on. By eliminating what is not necessary and to leave everything clear and predictable, clutter is reduced, the necessary items are always in the same places and the work is easier and faster (Magalhães et al, 2014, p.100).

The 5S methodology is not seen in the same way in all countries: Japan emphasizes 5S as a strategy for business excellence, requiring participation both at work and in the home; in the other hand, 5S in the UK and US is viewed as a system or tool for the workplace only. In some countries, the implementation of 5S methodology is a simple way to comply with the minimum requirements for health and safety in the workplace. (Jiménez et al, 2015).

Active co-operation of personnel in 5S-related programs is the major factor in its successful implementation. In other words, staff responsibility and their commitments to run 5S is the secret behind this system's success (Sharma & Singh, 2015).

When 5S becomes a way to conduct business, operations need to have different approaches due to behavioral changes required by 5S. Once all members in the organization can understand and fully implement the 5S, the organization is ready to make the most realistic practice, thus leading to a result of the 5S practice succeed and increase so the moral and organizational resilience (Santos, et al, 2012).

Even though 5S methodology is well known in the manufacturing sector, there is little evidence about its implementation (Sánchez, 2007). In Colombia it was demonstrated that the 5S methodology is being underutilized, especially in small a medium enterprises (Cura, 2003; Hernández et al, 2015; Martinez et al, 2015).

The companies chosen for the present study are located in Usaquen (Bogotá), and focuses on the processing and marketing of different kind of stones like marble, quartz and granite. Currently, the companies operate in a dirty and untidy environment. This causes several problems such as unsafe working environments, longer times for finding tools as well as a loss of quality control.

2. Study factors

This study evaluates the effects of the 5S methodology on productivity, security, organizational climate and quality before and after its implementation. The study factors were defined as follows:

**Productivity*: pertains to how efficiently the resources of any business unit are being used (Gutiérrez 2006; Business Solution Consulting Group 2008). Productivity can be defined as the relationship between the amount of goods or services produced and the amount of resources used to produce them (Chase et al 2009; Febrero 2000). Other authors refer to productivity as the efficiency in production, or simply the increase in quality caused by reducing rework (Syverson 2011; Deming 1989).

* *Quality*: is defined by Juran (1990) as “fitness for intended use”, so is the absence of deficiencies in those characteristics that satisfy the customer. Likewise, in quality, the primary goals are customer satisfaction and processes-and-outcome improvement (Aenor 2000; UMH 2000). Quality also means doing things right from the beginning to the end of a process while satisfying the customer's expectations at the lowest possible cost (Nebrera 1999).

* *Organizational Climate*: refers to the way people perceive the surrounding environment in which organizations interact. These perceptions can be objective (i.e. related to organizational structures, policies or rules of the organization), or subjective (i.e. related to cordiality and support, which may affect the results of each individual) (Chase et al., 2009; Castillo et al., 2011).

3. Methodology

Diagnosis tests were applied using indicators, surveys and a risk landscape to establish the initial situation of the workshop regarding study factors of productivity, quality and organizational climate, Once the 5S methodology was implemented in the workshop, the same diagnosis tests were performed on the month 2, 3 after implementation. Afterwards, the measurement results taken before and after the implementation were compared in order to determine how the 5S affect each factor's performance, and also, to observe whether or not the variables followed a particular pattern.

4. Results and Findings

4.1. Productivity

Partial productivity indicators [see equations (1) and (2)] were used to measure productivity.

$$\text{Human productivity} = \frac{\text{Linear meter processed}}{\text{Total \# hours worked-man}} \quad (1)$$

$$\text{Multifactorial productivity} = \frac{\text{Net production}}{(\text{Labor} + \text{Capital})} \quad (2)$$

Figure 1, shows the trend of both indicators in the SME's 1 and 2.



Figure 1. Productivity Performance Measurement Results

Figure 1 shows, in general, an increase on human and multifactorial productivity, but the growing trend in SME 1 is more consistent than in SME 2. This behavior is mainly due to the low organizational commitment to clearly establish roles and tasks for operators, in the second month after 5S implementation, which leads to the decrease. Later, on the third month, a handbook of functions was implemented which influence the increase on productivity.

4.2. Quality

Non-financial indicators [see equations (3) and (4)] were used to measure the quality of the processes carried out in the workshop.

$$\text{Percentage of action fulfillment} = \frac{\text{Anomalies Corrected}}{\text{Anomalies Identified}} \times 100 \quad (3)$$

$$\text{Percentage of reprocessing cuts} = \frac{\# \text{ of reprocessed cuts}}{\text{Total of processed cuts}} \times 100 \quad (4)$$

Figure 2, shows the trend of both indicators in the SME's 1 and 2.



Figure 2: Quality Performance Measurement Results

As shown in Figure 2, the percentage of reprocessed cuts decreased on both SME's. The percentage of action fulfillment is more drastic in SME 1 than in SME 2, which demonstrated the operator's commitment to do the job better.

4.3. Operational Climate

The TECLA test was used to measure organizational climate because this test was developed within the Colombian culture. Moreover, TECLA is one of the models applied by students and consultants in the Colombian context. The questionnaire was answered by operators, supervisors and heads of the company so as to compare the viewpoints of each hierarchical level. In this test people were asked about particular aspects such as environmental conditions, communication, structure, motivation, cooperation, sense of belonging, labor relationships and leadership.

Figure 3, shows the trend of average organizational climate performance results in the SME's 1 and 2.

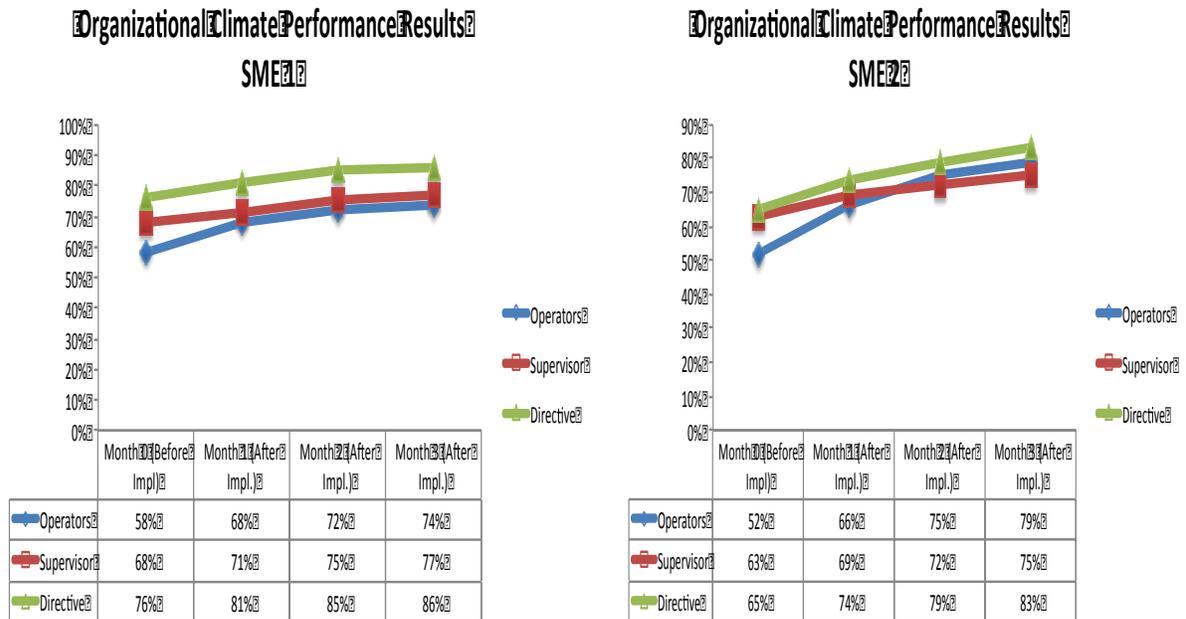


Figure 3. Organizational Climate performance results

Figure 3 shows the improvement in the perception of directives, operators and supervisors regarding the positive effect brought by the implementation of 5S. In both cases, SME 1 and SME 2 a sustained improvement in the aspects evaluated were perceived.

5. Conclusions

- The study proves the lack of knowledge on the part of some Colombian SMEs on the methodology of 5S, despite of the low cost of implementation and the benefits offer to organizations.
- Unlike most 5S assessment studies, which focus only on the impact of 5S on single factors (as separate aspects); the present study offers a simultaneous assessment of three aspects that contribute to improving the overall company's performance. This suggests that the 5S methodology is an effective tool to solve a range of inconveniences within an organization in parallel.
- The study factors' measurements corresponding to the third month were taken once the 5S methodology had been implemented in the workshop. The impact of this methodology on each of the study factors is as follows:
 - Multifactorial productivity had a positive effect supported by an average percentage increase of 83% and 68%, respectively in each case, taking into account that SME 2 had some problems for establishing roles and tasks for operators.
 - Improvement is evidently reflected in quality indicators, especially on reprocessed cuts, which had a decrease of 36% - 67%, respectively.
 - The organizational climate within the workshop achieved improvements in terms of perception of operators (26% - 52%), supervisors (13% - 19%) and the board of directors (13% - 28%). It is worth noting that the results on the SME 2 are better than SME 1, this can be supported on the inferior initial organizational conditions.
 - All the factors that were evaluated in the short term showed an increase in their respective units, thus the results obtained in this research support the literature review, which mentions the positive impact the 5S methodology has on the quality, productivity and organizational climate of any company.

6. Recommendations

It is recommended that additional case studies be performed to accomplish the following:

- Determine whether the results of 5S present prevalence over time.
- Determine if the results of 5S implementation differ between large and medium enterprises.
- Validation of the relationship between the productivity and quality variables, and any changes according to the kind of manufacturing activity

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Biography

Paloma Martínez Sánchez is an Associate Professor, and Director of the postgradual program on Production and Productivity at El Bosque University, Bogotá, Colombia. She holds a Master of Science on Quality and productivity, from Monterrey Technological Institute (TEC), and is studying her PhD on Logistic.

Carolina Montoya is an Associate Professor at El Bosque University, Bogotá, Colombia. She holds a Master in Holistic Science from Plymouth University.

Ursula Maruyama is an Assistant professor at CEFET-RJ, Brazil. She holds Master degree on Science, Technology and Education and is currently as PhD student in Information Science in IBICT / UFRJ.

Fernando Salazar is an Assistant professor at Rosario University. He holds a PhD degree on Logistics and Master degree on Strategic Planning at UPAEP.