

## Total quality management principles: implementation experience from Mexican organisations

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The purpose of this paper is to evaluate the impact of a basic quality practice in manufacturing and service organisations in Mexico. Several factors are defined for measuring quality practice implementation and investigating two major aims: the critical success factors and the major benefits from the quality implementation. A survey was applied to 50 manufacturing and service organisations. Pairs of factors were constructed to study their linear relationships. ANOVA was used to determine the significance of the relationship between factors; and Pearson product moment correlation coefficient was used to measure the strength of the relationship. This paper contributes to understanding the challenges and benefits encountered when implementing quality principles. It also demonstrates that this quality practice is a significant driver towards a continuous improvement (*Kaizen*) philosophy. A total of 16 critical factors and 51 significant relationships were identified, which explain the quality practice success implementation. The positive impacts produced by the quality practice implementation are summarised in six significant benefits. The findings clearly show the necessity of applying the philosophical dimension or way (*do*) of implementing this quality practice.

**Keywords:** total quality management; quality practice; 5S practice; 5S management; *Kaizen*; quality improvement

### 1. Introduction

The Global Manufacturing Research Group has researched 1493 manufacturing plants from 25 countries; the sample has been divided into three groups (low, medium, and best performers). The best performers have been identified and the results show that their most important competitive priority is quality, and among the best quality practices 5S has been widely implemented (Prester, 2013). The aim of this research is to investigate further this basic Japanese quality practice.

Part of the Japanese academic and practitioner literature states that 5S practice is not only useful for improving the working environment, but also raises process and product quality standards, reduces and optimises lead time, reduces operating costs, and enhances process performance (Liker, 2004; Liker & Hoseus, 2008). Thus, when certain Toyota Motor Corporation plants sought to achieve their quality, cost, productivity, worker morale, safety and delivery goals in the early 1950s, the beginning of the application of the first two Ss (*seiri* and *seiton*) was developed (Hino, 2006). Other researchers note that these first Ss had formed a part of Japanese culture since the times of the Samurais. This included shaping their implementation after the Second World War in Toyota

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plants, and was the result of a reversion to behaviour inherited from the Bushido code or way of the samurai: *order, cleanliness and discipline (both physical and mental)* (Pheng, 1997). Other authors argue that this philosophical root in the Bushido code may be traceable to principles such as Shintoism, Buddhism and Confucianism; Shintoism emphasises the importance of cleanliness of mind, and that taking advantage of other people for personal benefit is considered unclean.

Monden (1998) states that in order to start operating the Toyota Production System it is necessary to establish, as fundamental requirements, *seiri* (organisation) and *seiton* (neatness). For example, the two Ss are the basis for initiating a process of standardisation, and elimination of *muda* (Japanese term meaning ‘waste’) in any organisation. Nevertheless, it should be stressed that care and quality assurance of process and product alike has always been, and still is, one of the main focuses of 5S (Liker & Hoseus, 2008).

According to the study conducted in 1999 by the Japan Industrial Safety and Health Association (JISHA), the next two Ss – *seiso* (cleaning) and *seiketsu* (standardisation) – began to be integrated later, between 1956 and 1972. The term *shitsuke* (discipline) was included in the 1980s and 1990s (JISHA, 1999); according to Nishibori (1985), this S is the most important element of all, as those who practice it constantly are capable of training other employees by providing an example, with their superior behaviour of order and discipline. Around the same time, a sixth S was incorporated in certain cases standing for safety, complementing those already mentioned (JISHA, 1999). Recently, 5S practice has even started to expand into forming part of environmental management systems (Tice, Ahouse, & Larson, 2005).

From a different perspective, it could be said that the path followed by Japanese organisations from 2S to 5S or 6S was the result of maturity in the implementation of each element, and the emphasis placed on the strategic objectives of each organisation (Zelinski, 2005). Thus, to date 5S has gradually progressed towards its incorporation alongside the management trends of recent years such as total quality management (TQM), lean thinking, total productive maintenance (TPM), *Kaizen*, and even ISO 9000 and Six Sigma (Ho, 1999; Suárez-Barraza, 2007). Some research has addressed the use of 5S for driving the implementation of advance quality techniques, such as TQM in Latin-American countries. Ablanado-Rosas, Alidaee, Moreno, and Urbina (2010) studied the Mexican case. Recently, de Miranda Kubo and Carlos Farina (2013) reviewed the quality movement in Brazil; and Bello-Pintado and Merino-Díaz-de-Cerio (2013) investigated manufacturing firms in Argentina and Uruguay, concluding that the diffusion of 5S is at a very low level. This research is aimed to fill this gap in the Latin-American context.

## 2. Historical roots: what is 5S?

5S is a technique used to establish and maintain a quality environment in an organisation (Ho & Cicmill, 1996). The original Japanese concept has socio-historical and philosophical roots (Gapp, Fisher, & Kobayashi, 2008; Kobayashi, Fischer, & Gapp, 2008).

For years, in Japan, there have been several practices that incorporate the elements *do* (way: philosophy) or *jujutsu* (technique) in their name. For instance, *judo* (philosophy) and *jujyutsu* (Japanese combat technique without weapons), seek to train the body and mind through discipline (Monden, 1998). This creed can be applied to Japanese management, including the 5S practice, thus involving an element of ‘management philosophy’, and also an element of ‘management technique’ (Kobayashi, 2005; Hino, 2006; Gapp et al., 2008; Kobayashi et al., 2008; Suárez-Barraza, 2011). Within this method, there are

organisations that apply 5S to their *do* (way of life) and also to their *jyutsu* (management technique). Examples of this include Matsuchita (Gapp et al., 2008), Toyota (Hino, 2006; Suárez-Barraza, 2011) and Honda (Monden, 1998). The reason for using this philosophical approach is to ensure that systematisation, personal well-being, and discipline form part of the individuals applying the 5S technique (*jyutsu*), as an integral part of their day-to-day activities, both in their work and in their workplace environment.

The first S *seiri* refers to a clear distinction between what is needed on the workforce and what is not: what is not needed is discarded (thrown away or recycled). Thus, in *seiri* it is necessary to establish a set of criteria on frequency of usage in order to be able to organise such items, from those that will not be used (red cards) to those that will be used in a non-immediate future (yellow cards) (Ho & Cicmill, 1996; Monden, 1998).

In turn, the second S *seiton* refers to the idea that ‘each item has a place and only one place’. Naturally, the item concerned here is the one that is left out after the sorting in the *seiri* stage. For this reason, the place of each item must be clearly identified for everyday use by means of visual control. After use, it must be returned to its previously appointed place (Ho & Cicmill, 1996; Monden, 1998). Thirdly, from the moment *seiri* is applied, it is necessary for all those involved in a particular workforce to carry out corrective cleaning; this is the third S *seiso*. Likewise, the second main premise of *seiso* is preventive cleaning; ultimately, the aim is not to get the workforce dirty, or get it dirty as little as possible. Preventive cleaning helps sustain improvements, keeps equipment and machinery in good condition, and even motivates employees to operate better in the work place (Suárez-Barraza, 2007).

Lastly, *seiketsu* refers to the systematisation and/or standardisation of the work undertaken in the other three Ss. In other words, all the changes and improvements made so far, including new good practice, must be maintained on the workforce. In practice, some authors recommend drawing up maintenance plans and standard operating procedures (Osada, 1991; Ho & Cicmill, 1996; Monden, 1998). Another aspect of *seiketsu* is the systematisation of personal well-being; the intention is that while workers perform and maintain the activities of the other three Ss, their personal activity should synchronise with the practice of 5S, through exercise, good food and other practices (Osada, 1991). This is precisely the moment when *shitsuke* appears. This last S focuses more on the person, by developing the habit of improvement and change through worker self-discipline. *Shitsuke* should encourage everyday action to improve the workforce, either through teamwork, or as an individual member of that team. Disciplined teamwork can reduce the tensions and stress of day-to-day activities, orienting each team member towards an organised, tidy, clean way of thinking (Ho & Cicmill, 1996; Monden, 1998). The conceptual diagram in Figure 1 summarises these ideas.

In reference to Figure 1, Kobayashi et al. (2008) hold that the models proposed by Osada (1991) and Hirano (1995) operate according to the PDCA (plan, do, check, act) cycle and *Kaizen* philosophy (Hino, 2006), in which *seiketsu* acts as a bond between discipline and the three operational Ss (*seiri*, *seiton*, *seiso*). For Hirano (1995), starting in a disciplined manner, with the first 3S, brings specific benefits in the workplace and in the processes that operate on them such as quality, work environment, and productivity improvement. Kobayashi et al. (2008) and Hirano (1995) argue that the record in the application of the 5S is based on both the *Seiketsu* (systematisation) and the *Shitsuke* (discipline), which come to consolidate, over time, greater benefits, such as cost reduction, delivery time assurance, and production time reduction (see Figure 1). Other authors such as Scharrok (2007) and Chapman (2005) confirm the previous arguments indicating

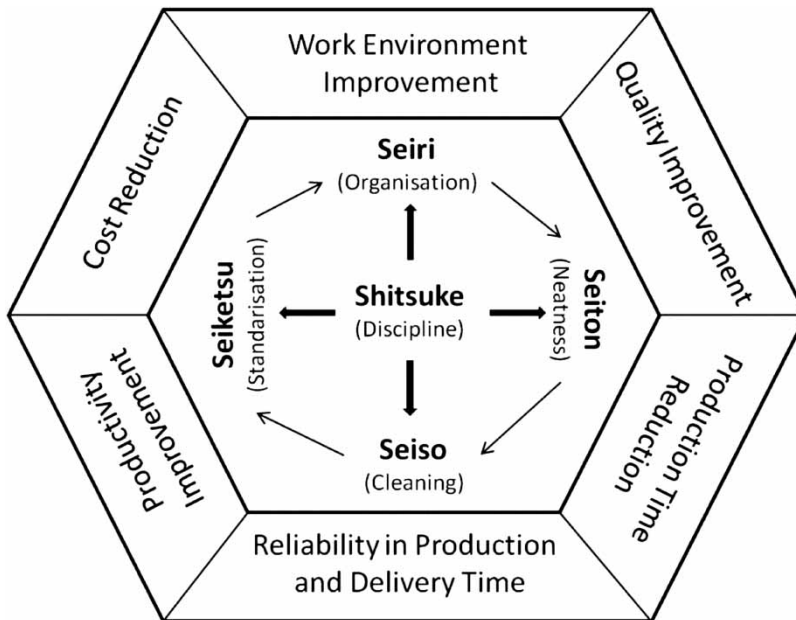


Figure 1. The 5S practice.

that the 5S practice generates the benefits, listed above, when it is comprehensively applied over time.

A major relationship depicted in Figure 1 is the link between the 5S practice and cleaner production. Improved quality of products, processes and systems is the key to a more sustainable society (Lindsey, 2011). Other quality improvement programmes have been identified as a driver for cleaner production by several authors (Lindsey, 2011; Dahlggaard-Park, Chen, Jang, & Dahlggaard, 2013). The opposite relationship also has proved to be true, environmental management systems are a source of productivity and quality improvement as well (Pil and Rothenberg, 2003; Zeng, Tam, Tam, & Deng, 2005; Santos, Mendes, & Barbosa, 2011). Pil and Rothenberg (2003).

### 3. Research hypotheses and empirical results

#### 3.1. Respondents

Obstacles for implementing quality business strategies have been studied by different authors; Cândido and Santos (2011) identified about 21 obstacles for TQM implementation. Some of these obstacles are investigated in this research about 5S practice: strategic planning; leadership and senior management commitment; employees' real involvement; personnel empowerment, personnel identification with the change; communication and dialogue; quality education; training; infrastructure for quality; quality as top priority; and institutionalisation of the change in structure and culture, among others.

The survey reported in Ablanado-Rosas et al. (2010) was applied to 50 Mexican organisations in the Toluca Metropolitan Area, México. All of these companies currently have an active 5S quality programme. A total of 40 (80%) and 10 (20%) companies perform production and service operations, respectively. The sample includes small and large enterprises with a sample average of 220 employees, and with 76% of them having a

quality department. Most of the organisations have advanced quality programmes, therefore, this was the first selection criteria for the sample; for example, 60% follow the ISO 9000/2000 standards and 50% use statistical process control (SPC). Data were gathered using a mixture of methods: field work (gathering data on the company – 70%), telephone calls (20%) to e-mail surveys (10%). We used MBA students in order to assure the 85% response rate of the survey (50 from a total of 59 surveys). Pairs of factors were constructed to study the existence of linear relationships. ANOVA was used to determine the significance of the relationship between factors, and the Pearson product moment correlation coefficient in order to measure the strength of the relationship.

A question about the recommended sequence for the 5S implementation was answered by the surveyed organisations. The average of the responses draws the following sequence: Commitment from top management, integration of a team to carry out promotional activities, development of a promotional plan, execution of the promotional plan, instruction and training in the 5S practice, implementation of the 5S practice, records keeping of the implementation process, assessment of implementation, and follow-up of the 5S implementation.

### **3.2. Highly significant relationships between factors**

The fierce global business environment leads companies to search competitive strategies, and choose practices as means to engage their employees in continuous improvement processes (Dahlgaard-Park et al., 2013). This section investigates specific relationships of 5S implementation and identifies the significant implementation success factors.

*H1.1.* Organisations with top management commitment to the 5S practice have included the 5S practice in the organisational strategic plan ( $p < 0.01$ , Pearson product correlation  $\rho = 0.60$ ).

Top management commitment has been identified as a critical success factor for advance quality tools such as Six Sigma (Aksoy & Dinçmen, 2011), TQM (Dahlgaard-Park, 2011; Oakland, 2011; Dahlgaard-Park, 2012), and basic ones such as 5S (Ho & Cicmill, 1996). Furthermore, managers are rewarded for the commitment to quality management (Duh, Hsu, & Huang, 2012). Withanachchi et al. (2007) showed how the 5S-based TQM programme was feasible, as the vision and mission of a hospital were set on the right direction of achieving quality; the long-term strategy was TQM, and the short-term plan was 5S. Top management is in control of their work environment and guarantee quality output; they develop the vision and mission statements (Ho, 1999). This is exemplified by Bryar and Walsh (2002) who studied an Australian firm; a success factor was the inclusion of the 5S practice in the strategic business plan, which had been approved by the board of management, and consequently gained their commitment. A total of 78% of the surveyed organisations reported top management commitment to the 5S, and 70% of them have included the practice in their organisational strategic plan. Furthermore, this relationship is highly significant, and agrees with previous research (Ablanedo-Rosas et al., 2010) suggesting inclusion of the 5S practice in the organisational strategic plan.

*H2.1.* Organisations that have included the 5S practice in the organisational strategic plan have communication channels for employees' improvement suggestions ( $p < 0.01$ ,  $\rho = 0.62$ ).

One of the challenges in introducing change through improvement philosophies, is the mechanism for gathering improvement suggestions; for example, Aksoy and Dinçmen (2011) identified communication as a critical success factor for Six Sigma deployment.

Withanachchi et al. (2007) discusses how the 5S practice may explain improvements. Moreover, employee feedback is a measure of positive impact. Any 5S-based improvement philosophy can stimulate organisational changes, as it is based on a bottom-up approach with employee participation providing improvement suggestions. Ho (2006) discusses the difference between the Japanese and western 5S implementation, which lies mostly in the degree of employees' involvement and their improvement suggestions. Furthermore, two-way communication with employees provides opportunities for feedback, and is essential towards successful implementation of lean initiatives (Liker and Hoseus, 2008). From the surveyed organisations, 70% have included the practice in their organisational strategic plan, and 86% of them have communication channels for employees' improvement suggestions. The highly significant relationship shows the importance of the 5S practice in the organisational strategic plan as a means to guarantee the communication channels for employees' improvement suggestions.

*H2.2.* Organisations that have included the 5S practice in the organisational strategic plan perceive managerial and production activities performed with quality and continuous improvement (*Kaizen*) principles ( $p < 0.01$ ,  $\rho = 0.55$ ).

When formalising the 5S technique in the organisational strategic plan, a framework which enables successfully conveying the message across the organisation is established for achieving total participation, and for systematically implementing the practice. The 5S practice is a feasible and promising system to perform service and production activities with quality and continuous improvement principles (Withanachchi et al., 2007). According to Suárez-Barraza, Smith, and Dahlgaard-Park (2009) 5S represents the 'building blocks' for the *Kaizen* principles. In fact, without this approach it is very difficult to implement and support more complex continuous improvement programmes such as pull systems, kanban, TPM, and TQM, just to name a few (Dahlgaard-Park, 2011; Dahlgaard-Park et al., 2013). From the surveyed organisations, 70% have included the practice in their organisational strategic plan, and 80% of them have perceived that their managerial and production activities are performed with quality and continuous improvement (*Kaizen*) principles.

*H3.1.* Organisations that have communication channels for employees' improvement suggestions perceive benefits from the 5S implementation ( $p < 0.01$ ,  $\rho = 0.56$ ).

Employee participation is strategic for attaining TQM and other quality practices (Dahlgaard-Park, 2011). From the surveyed organisations, 86% have communication channels for employees' improvement suggestions, and 88% of them have perceived benefits from the 5S implementation.

*H4.1.* Organisations that have perceived benefits from the 5S implementation have obtained positive impact in the way to do businesses ( $p < 0.01$ ,  $\rho = 0.51$ ).

The 5S practice is a powerful quality programme, and being action oriented induces all personnel in the business to get involved in the continuous improvement process (Ho, 2006). The 5S practice has become the way to do business, not only to impress the customers but to establish efficient and effective quality processes required for producing and providing good products and services, respectively (Ho, 2006). The 5S implementation improves overall organisational performance and productivity by understanding the implications and relationships between all the actors in the business process in terms of the output and requirements (Gapp et al., 2008). From the surveyed organisations, 88% have perceived benefits from the 5S implementation, and 84% have obtained positive impact in the way to do business. This highly significant relationship proves that the 5S practice really is a business improvement tool.



*H5.1.* Organisations where SPC is applied in everyday operations have quality department ( $p < 0.01$ ,  $\rho = 0.56$ ).

The quality of a product or service is difficult to define; it is based on the customers' perception, and measured against their own experiences. Since it is desirable to meet this 'undefined or difficult-to-define' quality, superior philosophies look for constant improvement and dictate that it is the responsibility of all members of an organisation (Dahlgaard-Park et al., 2013). From this point of view, the quality department should be the entire organisation, but in practice in the Mexican organisations, it is common to find the quality department being responsible for quality results. On the other hand, an excellent technique to determine whether a process is delivering what customers want is SPC. SPC is a key element of TQM and Six Sigma. From the surveyed organisations, 50% of the organisations use the SPC tool, and 76% of them have a quality department. This significant relationship shows that in the Mexican environment quantitative quality tools require a reputable department for reporting results.

*H6.1.* Organisations where the ISO 9000 norm is used in everyday operations have quality department ( $p < 0.01$ ,  $\rho = 0.52$ ).

The agenda of the quality manager is mainly related to quality standards, such as ISO 9000 and environmental management systems (Elg, Gremyr, Hellström, & Witell, 2011). Pheng (2001) showed that there are many similarities between the ISO 9000 requirements and the 5S practice, and suggested that the 5S principles provide a framework within which the ISO 9000 requirements can be built on. Furthermore, in the long run the integration of ISO and 5S leads to TQM. Ho (2006) investigated the 5S practice as a technique used to establish and maintain a quality environment within an organisation, and as a basis for ISO 9000. From the surveyed Mexican organisations, 60% use ISO 9000 principles in everyday operations and 76% of them have a quality department.

We have just discussed the highly significant relationships between factors ( $p < 0.01$ ). There are a total of 51 significant relationships; 41 of them with  $p \leq 0.05$  and the remaining 10 with  $.05 < p \leq .10$ . Figure 2 summarises the most significant relationships. The corresponding Pearson correlation coefficient  $\rho$ , which measures the strength of the relationship, is indicated as well.

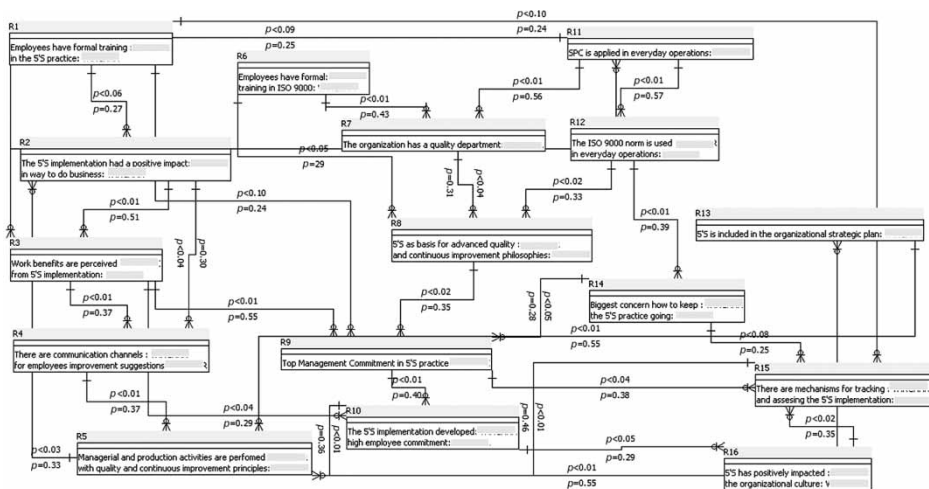


Figure 2. Significant relationships between factors.

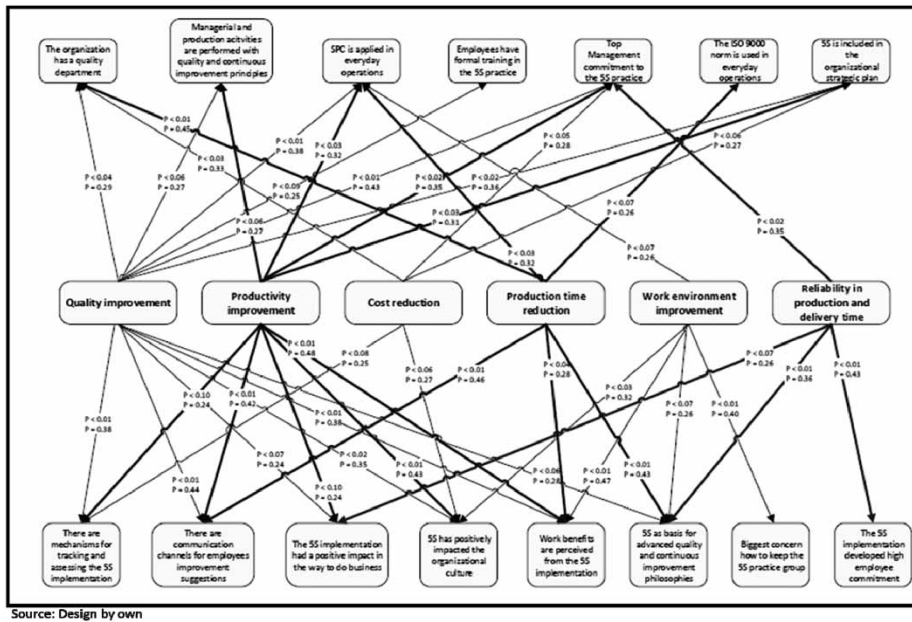


Figure 3. Major impacts of the 5S practice implementation.

The 5S implementation is directly associated with work and management, by improving their workplace through organising and cleaning activities (Kobayashi et al., 2008). The 5S practice is useful because it helps everyone in the organisation to live a better life (Ho, 2006). Ablanedo-Rosas et al. (2010) studied Mexican organisations with the aim of understanding their implementation experience, empirical relationships, and ongoing challenges associated with the 5S practice. This paper differs from the study of Ablanedo-Rosas et al. (2010), and makes a significant contribution revealing the factors that are linked to relevant benefits when the 5S practice is implemented; these relationships are shown in Figure 3. In fact, our theoretical contributions confirm some other studies about the benefits and drivers of the 5S. There are a total of 15 factors and 6 major impacts, which are linked by 25 and 12 significant relationships at the .05 and .01 significance levels, respectively. The substantial contributions of the 5S practice implementation correspond to: quality improvement, productivity improvement, cost reduction, reduction of production time, improvement of the work environment, and reliability in production and delivery time (Figure 1). The factors linked to these major impacts are briefly discussed in the following paragraphs, and are properly depicted in Figure 3.

### 3.2.1. The benefits of top management commitment to the 5S practice

The highly significant ( $p \leq 0.05$ ) benefits are cost reduction, quality improvement, productivity improvement, and reliability in production and delivery time. An organisation that promotes the 5S practice should have top management commitment (Table 1) and be operated companywide (Kobayashi et al., 2008). One of the major reasons for failure in the lean journey is the lack of institutionalisation of the 5S practice by the top management (Kulak, Durmusoglu, & Tufekci, 2005). The 5S is a simple but effective tool to improve productivity through a better management of the working environment (Ho, 1999).



Table 1. The benefits of top management commitment to the 5S practice.

| Factor                        | <i>Top Management commitment to the 5S practice</i> |
|-------------------------------|-----------------------------------------------------|
| *Highly significant impact on |                                                     |
|                               | <i>Cost reduction</i>                               |
|                               | <i>Quality improvement</i>                          |
|                               | <i>Productivity improvement</i>                     |
|                               | <i>Reliability in production and delivery time</i>  |
| *(p-value $\leq$ 0.05)        |                                                     |

3.2.2. *The perceived work benefits from the 5S implementation*

The highly significant work benefits are reduction of production time, quality improvement, and productivity improvement. The 5S practice results in immense benefits to the company (Table 2). A 5S environment shows high quality and productivity, satisfied customers, keeps cost down, ensures delivery on time, is safe and healthy for people to work, and is high in the well-being and morale of employees (Ho, 1999).

3.2.3. *The benefits when SPC is applied in everyday operations*

The highly significant benefits are reduction of production time, quality improvement, and productivity improvement; a significant ( $p \leq 0.10$ ) benefit is work environment improvement. SPC is one of the major tools for achieving TQM (Table 3) and the 5S is broadly accepted as the basis for TQM (Ho & Cicmill, 1996; Bryar & Walsh, 2002; Withanachchi et al., 2007).

Table 2. The perceived work benefits from the 5S implementation.

| Factor                        | <i>Work benefits are perceived from the 5S implementation</i> |
|-------------------------------|---------------------------------------------------------------|
| *Highly significant impact on |                                                               |
|                               | <i>Reduction of production time</i>                           |
|                               | <i>Quality improvement</i>                                    |
|                               | <i>Productivity improvement</i>                               |
|                               | <i>Work environment improvement</i>                           |
| *(p-value $\leq$ 0.05)        |                                                               |

Table 3. The benefits when SPC is applied in everyday operations.

| Factor                                          | <i>SPC is applied in everyday operations</i> |
|-------------------------------------------------|----------------------------------------------|
| *Highly significant impact on                   | **Significant impact on                      |
|                                                 | <i>Work environment improvement</i>          |
|                                                 | <i>Quality improvement</i>                   |
|                                                 | <i>Productivity improvement</i>              |
|                                                 | <i>Reduction of production time</i>          |
| *(p-value $\leq$ 0.05), **(p-value $\leq$ 0.10) |                                              |

Table 4. The benefits of communication channels for employees' suggestions.

| Factor                        | <i>There are communication channels for employees' improvement suggestions</i> |
|-------------------------------|--------------------------------------------------------------------------------|
| *Highly significant impact on |                                                                                |
|                               | <i>Reduction of production time</i>                                            |
|                               | <i>Quality improvement</i>                                                     |
|                               | <i>Productivity improvement</i>                                                |
| *(p-value $\leq$ 0.05)        |                                                                                |

#### 3.2.4. *The benefits of communication channels for employees' suggestions*

The highly significant benefits are reduction of production time, quality improvement, and productivity improvement. Empowerment at the shopfloor level with improved communications and appropriate feedback mechanisms was the most effective means of changing attitudes, promoting mutual respect throughout, and seeing real improvements and the resulting benefits to the firm as a whole (Table 4). It was felt that the management structure should be flattened and more power given to all employees to make decisions quickly (O'hEocha, 2000).

#### 3.2.5. *The benefits of including the 5S in the organisational strategic plan*

The highly significant benefits are quality improvement and productivity improvement; a significant benefit is cost reduction. The inclusion of the 5S practice in the organisational strategic plan (Table 5) is crucial to guarantee the desired outcome (Gapp et al., 2008; Ablanedo-Rosas et al., 2010).

#### 3.2.6. *The impact in the way to do businesses*

The highly significant impacts are reliability in production and delivery time, quality improvement, and productivity improvement. The 5S practice has become the way to do business (Table 6); it can be used as an integrating tool towards 'Business Excellence' (Ho, 2006). The 5S enhances relationships with customers, and includes their requirements when thinking about and designing the work environment required to create the product or service (Gapp et al., 2008).

Table 5. The benefits of including the 5S in the organizational strategic plan.

| Factor                                          | <i>The 5S practice is included in the organizational strategic plan</i> |
|-------------------------------------------------|-------------------------------------------------------------------------|
| *Highly significant impact on                   | **Significant impact on                                                 |
|                                                 | <i>Quality improvement</i>                                              |
|                                                 | <i>Productivity improvement</i>                                         |
|                                                 | <i>Cost reduction</i>                                                   |
| *(p-value $\leq$ 0.05), **(p-value $\leq$ 0.10) |                                                                         |

Table 6. The impact in the way to do businesses.

| Factor                                             | <i>The 5S implementation had a positive impact in the way to do businesses</i> |
|----------------------------------------------------|--------------------------------------------------------------------------------|
| <hr/>                                              |                                                                                |
| **Significant impact on                            |                                                                                |
| <i>Reliability in production and delivery time</i> |                                                                                |
| <i>Quality improvement</i>                         |                                                                                |
| <i>Productivity improvement</i>                    |                                                                                |
| <hr/>                                              |                                                                                |
| **(p-value $\leq$ 0.10)                            |                                                                                |

4. The link between 5S and some managerial dimensions

In addition to the benefits referred to in the previous sections, it is of the utmost importance to create a link between the literature and practitioners of the 5S in some managerial dimensions such as: economical, environmental, safety, and ethical. The original work of Hirano (1995) highlights the importance of the economic dimension. Hirano’s claim was based on his experience in applying the 5S in several Japanese companies, where the basic premise was creating trust with the customer to maintain sustained economic growth.

Recent research shows that most academic and practitioner studies report impacts on the economic dimension of companies that have implemented the 5S practice (Becker, 2001). The Lean model of Ho (2010) in which the 5S is its main axis has reported impacts on the economic dimension. Ng (2008) reported that the Ocean Empire Group increased sales and reduced costs by adopting the principles and practice of this model. Leung (2008) presented how a restaurant has managed to cut labour costs and increase savings by minimising waste; she concluded that Ho’s Lean-5S model was very helpful in facing the financial crisis. Ho (2010) indicates that approximately 8000 organisations employing over 100,000 people, in no less than 20 countries have been using his Lean-5S model as main strategy for fighting the economic and financial crisis, and achieving significant improvements in safety, quality, productivity, speed, and image.

Similarly, there is a close link between implementing the 5S and the environmental dimension of organisations worldwide. Ho (2010) reports his Lean-5S model can be a catalyst to reduce global warming, and presents the following chain reaction: *Lean Management (including 5S) reduces consumption of resources (manpower, machinery, materials, and methods) and therefore, minimizes global warming.* Ho (2010) presents a comparative table of different countries showing their GDP and energy consumption. It is an essential issue to study the implementation of the 5S and its impact on the environmental dimension. Chapman (2005) indicates that a successful implementation of 5S can create an environment conducive to practicing green initiatives in organisations, creating an atmosphere with a clean working environment, sorted and organised to achieve self-explaining, self-ordering and self-improving leading to ecological thinking. Similarly, Becker (2001) reported the 5S as a clear driver of waste reduction particularly of water, oil and energy. The 5S practice can be used to break down existing procedures and ensure that safety is effectively included into the overall production process of the company. Including safety efforts in the overall business objectives can help achieve a higher level of participation in safety initiatives participation (Becker, 2001).

For Hirano (1995) the ethical and moral dimension of employees using 5S improves when they practice it continuously. Hirano (1995) argues that the 5S generates a habit of improvement (related to *shitsuke*) which allows the achievement of a higher level of ethical thought based on the order and discipline in their work environment. Bryar and

Walsh (2002) argue that the 5S practice is a helpful transition phase between an organisation without ethical behaviours and another with this behaviour. The main challenge is to sustain the ethical behaviour of 5S in the daily routine. As mentioned, the 5S has its roots in a strong code of ethics that comes from the samurai time of the Japanese culture, where discipline, order and organisation are fundamental values. Styhre (2001) researched the notion of ethics as the basis of management techniques and how *Kaizen* (including 5S) was used as a model which enabled various individual, collective, and managerial objectives to be carried out simultaneously. The strong tie between 5S and ethics in European family environments was investigated by Filipusic (2007).

## 5. Conclusion and future research

5S practice has proved to be a significant driver towards a TQM philosophy. This research investigated 50 Mexican manufacturing and service organisations which have implemented 5S practice. A survey was conducted to identify the significant success factors for implementing the 5S practice. Furthermore, significant impacts of 5S implementation were identified by the surveyed organisations. A total of 16 factors defining 51 significant relationships explained the 5S success implementation. Moreover, the positive impacts produced by 5S implementation are summarised in six significant benefits: quality improvement, productivity improvement, cost reduction, production time reduction, work environment improvement, and reliability in production and delivery time. Additionally, the surveyed organisations defined a sequence for implementing 5S practice (Section 3.1).

The 5S practice implementation generates significant benefits in organisational performance and constitutes the basis for more advanced continuous improvement (*Kaizen*) philosophies such as TQM, Lean Systems, Pull Systems, Kanban, Just in Time, ISO 9000, SPC, TPM, among others. An 88% of the surveyed organisations reported tangibles benefits from the 5S practice implementation, and 68% recognised that they have used it as a basis for more advanced quality programme implementation. These findings confirm what the academic literature indicates about the subject. The 5S practice represents the basic foundation for improvement efforts and more advanced improvement philosophies such as TQM, *Kaizen*, and Lean thinking (Suárez-Barraza et al., 2009).

The results show the most significant success factors for implementing 5S practice which define the highest frequency of significant relationships between factors. The factors with the three highest frequencies are as follows. With a total of nine significant relationships: top management commitment to 5S practice, there are mechanisms for tracking and assessing 5S implementation, and 5S implementation has a positive impact on the way to do business. The 5S practice as basis for advanced quality and continuous improvement philosophies reported a frequency of eight significant relationships. Finally, the following factors recorded a frequency of seven significant relationships: 5S practice is included in the organisational strategic plan, work benefits are perceived from 5S implementation, 5S implementation develops high employee commitment, and SPC is applied in everyday operations. These complex maps of relationships (Figures 2 and 3) show the highly significant impact that the 5S practice has as a driver for improving performance in manufacturing and service organisations. The 5S implementation constitutes a serious process for developing continuous improvement habits in employees and creating a unique organisation culture towards excellence performance (Green, 2012). This finding shows the clear need to apply the philosophical dimension or way (*do*) for

implementing 5S practice, and confirms for Mexican organisations the trend in the literature dealing with organisations in the USA and UK (Ho & Cicmill, 1996; Gapp et al., 2008; Kobayashi et al., 2008). The lack of a balanced implementation of *do* (philosophy or way) and *kyutsu* (technique), together with the failure to apply Deming's PDCA cycle throughout the process, may block the entire deployment of the potential benefits from the 5S practice implementation.

Immediate future research includes the investigation of other manufacturing and service environments in different geographic areas and cultural settings. Further research also includes investigating the specific factors that influence the significant role of top management commitment in the implementation of 5S practice, such as the two-way communication, management feedback, long- and short-term planning, and employee empowerment among others. Finally, it is desirable to study the alignment and synergy of the 5S practice with environmental management systems.

### Acknowledgements

This research was partially funded by a summer research grant from the University of Texas at El Paso's College of Business Administration.

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