



## **The Determinants of Sustainability of 5S Practices in the Stationery Industry, Sri Lanka**

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### **ABSTRACT**

The research was carried out in the stationery industry in Sri Lanka with the objective of identifying the factors affecting sustainability of 5S practices. For this research, a leading stationery manufacturer was selected and two of its plants that were performing well and poorly were considered. Further, in the study with regard to previous studies and employee opinions, three main variables were identified; namely Employee Awareness, Employee Motivation and Management Commitment. Analysis was based on primary data collected from shop floor employees and secondary data which were acquired through company audits. Through the analysis, it was found that sustainability of 5S was significantly impacted by Employee Awareness and Management Commitment. Also, further analysis via, Chi-Square and descriptive statistics showed that Employee Awareness was impacted by employees' level of experience and the level of education, whereas employee motivation was impacted by employee experience and gender. Finally, based on the analysis results, recommendations were made to increase the sustainability of the 5S practices and also stated how they could be implemented.

**KEYWORDS:** Employee Awareness, Employee Motivation, Management Commitment, Stationery Industry, Sustainability of 5S

### **1 INTRODUCTION**

The stationery industry or more specifically a part of the industry and its first corner stone, printing was first introduced to Sri Lanka during the period of Dutch colonization at the Port of Galle. Since then it has rapidly progressed, and in 2009, according to Sri Lanka customs the total value of imported paper and paper products was around \$300 million. Not only that but also the demand for them was expected to project towards 330,000 tons by the year 2015, thus providing good prospects for paper and pulp exports.

The selected company is a leading stationery supplier within Sri Lanka, which supplies stationery items ranging from pens, pencils, scissors, staplers, rulers, math set, to that of water bottles, school bags, pastels and clay. Beside from the Sri Lankan market it exports stationery to countries like Egypt and Malaysia as well. The company has several plants but are situated in two geographical locations. As of present the company has invested tens of thousands of

Rupees in improving 5S practices alone but to no avail. Also to be noted is the fact that the selected company has won the Taiki Akimoto 5S Award once before, but has failed to secure it since then. Hence the purpose of this is to analyze how the above mentioned and other key variables will impact on the maintenance of the 5S concepts.

### **2 LITERATURE REVIEW**

The 5S principles and concepts were introduced in the early 1980s, by Takashi Osada in Japan, and since then it has gained wide recognition in the business world. Many a business at present is actively pursuing implementation of 5S in order to achieve the benefits promised as well as to gain a competitive edge against its rivals. In the Consultants Guide to successfully implementing 5S, it is described as a workplace organization and continuous improvement system that lays the foundation for all other lean improvement activities. It further states that the 5S is not a system, or

program that can be started and completed but a continuous improvement process.

The 5S is an acronym that stands for Seiri, Seiton, Seiso, Seiketsu, and Shitsuke, which translated into English as Sorting out, Neatness, Cleanliness, Standardization, and Discipline respectively (Ho 1997; Parrie, 2007; Kumar K. & Sanjeev, 2012). Yet there are different interpretations of their meanings. Due to this wide array of translations and interpretations available, many misunderstand the underlying purpose of the individual 5S, thereby leading to failure in 5S at both the implementation and sustainability stages, and then doubting whether 5S leads to the promised benefits.

Also to be noted is the fact that 5S is not a clear cut must, but is flexible and can be modified to fit the needs of the company. Namakura in his 1992 study (as cited in Liyanage et al., 2009) had stated that while the understanding of the traditional Japanese 5S follows a 5 step methodology, there exists a difference in the manner of adopting 5S in Japanese organizations. According to Sprague's 2002 study (as cited in Liyanage et al., 2009) some Japanese organizations implement 6S whereas some 3S, to cater to the needs and capabilities of the organization.

Thereafter when previous studies conducted on sustainability of 5S principles were considered, they were relatively few. In a broader 5S sustainability study conducted by Kendangamuwa, Sridharan, Herath & Rathnayake (2015), has identified a total of 11 variables to analyze the issues in sustainability of 5S. They are top management commitment, organizational leadership, middle and frontline manager's commitment, employee commitment and satisfaction, training of employees and changing attitudes, motivation and development of employees, group cohesiveness, organizational culture, community participation, customer satisfaction and involvement and socio-demographic variables. Also In another study in 2009 conducted by Liyanage et al, they have identified that resource availability, leadership, conducive culture, need for improvement and

change, and commitment as the main variables impacting on the sustainability of 5S within Sri Lankan organizations. Finally in several studies it was noted that proper understanding is needed in organizations considering about implementing 5S and also a supportive culture as well (Pool, 2000; Nikolic & Nastasic, 2010). Thereby leading to the three selected variables of Employee Awareness, Employee Motivation and Management Commitment.

### 3 RESEARCH QUESTION

The company has implemented 5S standards in all of its departments and plants in both locations, and has gone the extra length of making sure they are implemented effectively by providing a 5S time (a period specifically granted for conducting 5S activities) and also rewarding employees. But the management is not satisfied with the implementation because some departments are performing poorly even with the extra effort and also the end results of the 5S implementation benefits are not achieved as the waste and productivity are not improved as expected. Also the company has won the 5S award in 2010, and since then they have not been close to achieving it again anytime soon. So with this amount of effort already paid into making the implementation of 5S effectively, the management is baffled as to what more could be done, and why the sustenance of 5S standards fails in some periods. This also indirectly affects the target achievement of the company and the product quality as well, hence laying the steps for the study.

### 4 RESEARCH METHODOLOGY

First and foremost secondary data which constitute the company's 5S audit information was considered thereby targeting the two extreme plants. Thereafter according to the variables identified from previous literature a questionnaire was developed and randomly distributed among 80 shop floor employees, equally divided among the two plants. In this study, their perceptions of failure in sustainability of 5S was recorded and therein analyzed using

statistical models and tests such as binary logistic, chi-square and descriptive analysis. Finally accordance to the results of the analysis, suitable solutions to uplift the sustainability of 5S standards were given along with the implementation manner.

**5 DATA COLLECTION AND ANALYSIS**

*5.1 Binary Logistic Regression Analysis*

According to this analysis two independent variables, Employee Awareness and Management Commitment were shown statistically significant contribution at 95% level to the dependent variable at the last step, Table 1. Equation of the model can be illustrated as follows.

**Table1: Binary Logistic Model**

	B	S.E.	Wald	df	Sig.	Exp(B)
MCommitment	.058	.020	8.275	1	.004	1.060
EMotivation	.042	.039	1.154	1	.283	1.043
EAwareness	.037	.019	3.906	1	.048	1.038
Constant	-9.449	3.264	8.378	1	.004	.000

Logit ( $P_{ijk}$ ) =  $E_{Awareness_i} + M_{Commitment_j} + E_{Motivation_k}$

Where,  $P_{ijk}$  is the probability of the sustainability of 5S practices being high at  $i^{th}$  (Employee Awareness),  $j^{th}$  (Management Commitment) and  $k^{th}$  (Employee Motivation). Here even though the significance of Employee Motivation with that of Sustainability of 5S seemed minor, it was not neglected in order to get the whole view.

*5.2 Chi-Square and Descriptive Analysis*

Also another significant finding in the study, shown in Fig. 5.1, is that the employee reward preference in each plant differs widely. When the management resorts to a consistent form of reward for 5S, there is a possibility of only one party benefiting in a scenario as below. Thereby leading to a difference in sustainability in each plant.

Also further in depth analysis via chi square tests revealed that employee first reward preference is impacted by the two variables employee experience and gender separately. Whereas for employee awareness it has an association with employee level of education and employee experience.

**Table 2: Chi-Square Analysis**

	Pearson Coefficient	P value	Significant value	Result
<b>With Employee First Reward Preference</b>				
Employee Experience	33.287	.031	< 0.05	Reject $H_0$
Gender	28.657	.000	< 0.05	Reject $H_0$
<b>With Employee Awareness</b>				
Employee Experience	32.126	.006	< 0.05	Reject $H_0$
Employee Education	19.359	.022	> 0.05	Accept $H_0$

Finally in the research via descriptive statistics it was found that even though employees of both plants tended to agree that tactical leadership helps sustain 5S, there was a disagreement when it came to authoritative leadership. The plant with the lower sustainability of 5S disagreed on the fact that authoritative leadership helps sustain 5S. Thereby leading to contrasting results from those of the study conducted by Liyanage, et. al (2009).

**6 ALTERNATIVE SOLUTIONS**

Considering the plant with the low sustainability of 5S practices, when the mean of the three variables were applied to the binary logistic general equation, and the value of each variable was varied while keeping the other two constant, the results depicted in Fig. 1 was obtained. As can be seen in the below figure it shows the variation in the sustainability of 5S in the plant with the variation of value of each of the three variables identified. This demonstrates two aspects. One, the management cannot focus on improving one aspect alone to increase the sustainability of 5S but must focus on all the 3 variables simultaneously.

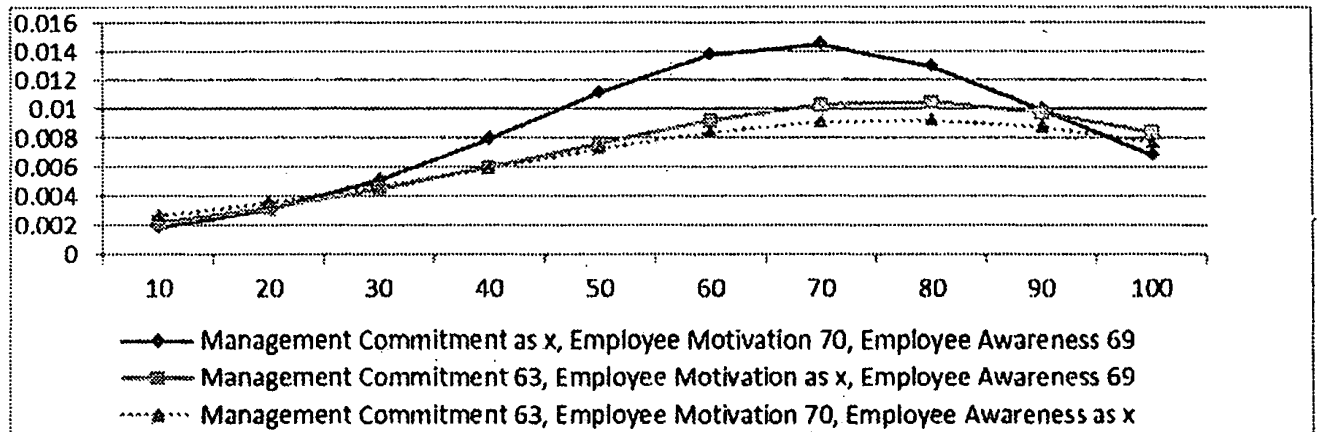


Figure 1: Probability of Higher Sustainability comparing Values of Each Variable

Two, there are other factors or variables at play that were not identified in the research. Hence considering all mentioned above the following solutions can be introduced and it is recommended to implement several solutions rather than one.

- Providing salary increments or direct cash rewards rather than providing gift vouchers.
- Providing rotating rewards and customized rewards to plants.
- Retaining experienced employees
- Providing training inside plant and at work place for both employees and management.
- Providing separate time for 5S activities.
- Share results with employees and getting feedback periodically.
- Encouraging management to practice 5S principles more, share knowledge and benefits achieved and promoting competition among management of different plants, and rewarding the management as well.

All the above solutions mentioned are feasible from a financial, operational, and technical view point. Difficulty will be present in trying to implement the solutions second and third as they could be challenging since they deal with employee attitudes, and is also contrary to traditional ways. But continuous pursuit and effort will pave the way to their success.

## 7 DISCUSSION AND CONCLUSION

### 7.1 Conclusion

When the selected variables were collectively analyzed by data obtained from shop floor employees via a Binary Logistic Model it was found that the Management Commitment and Employee Awareness had a more significant contribution to the low sustainability of 5S principles than the Employee Motivation. Thereby when the management is allocating financial resources and time to improve the 5S standards prioritization on these two variables is more important.

Also further in depth analysis revealed that Employee Awareness on 5S principles depends on the employee's experience and his/her level of education. Though the management cannot adjust the recruitment process to cater selection of educated people for 5S improvement alone, constant and persuasive training with respect to 5S can be provided to overcome this barrier. Also retaining experienced employees by provision of better service benefits can further help this cause. Thereafter, for employee reward expectations, it was found that the experience of employee has an effect, along with the gender of the employee, both of which can be overcome by providing rotating rewards which would increase employee expectation levels, and keep their curiosity levels at a peak, rather than providing the same reward throughout. Also in terms of leadership, both plants considered agreed to the fact that, tactical

leadership helps sustain 5S whereas there was a conflicting opinion to authoritative leadership.

Finally further analysis revealed that focusing solely on improving the performance of one independent variable was not enough to raise the dependent variable by a considerable margin. Collective actions must be taken with more priority given to raising management commitment in the red zoned plant.

### 7.2 Limitations

In this research even though rewards were considered, punishments were not considered. Punishments are an integral part in implementing policies and also a force of motivation.

Another factor which affected the data collection was the employees' fear of management and halo effect. Most of the employees tended to gang up when writing the questionnaire thereby eliminating the advantage of getting the employee's own insight, opinions and knowledge. Other than that, there were a few other limitations in the form of availability of secondary data in various forms (monthly data) which cannot be utilized because of that form and ensuring that the plants considered have similar work tasks and deal with similar products so that they are comparable for better results.

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