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A study on implementation of 5's in XYZ oil seal production company Madurai

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Abstract

This paper presents an in-depth exploration of the 5S methodology: Sort, Set in Order, Shine, Standardize, and Sustain which has been widely adopted across industrial and service organizations for workplace management. Originating from the Toyota Production System in Japan, 5S aims to optimize efficiency, improve productivity, reduce waste, and enhance workplace safety. The study examines how these principles contribute to operational success, with a particular focus on their impact on workplace organization, productivity, and employee morale. Data collected from 120 employees at XYZ Limited through structured interviews reveal high levels of engagement in 5S activities, with significant improvements in workspace efficiency, cleanliness, and orderliness. Correlation analysis indicates weak relationships between demographic factors, such as age and education, and participation in 5S initiatives, suggesting that the methodology's effectiveness is largely independent of these variables. The findings underscore the importance of sustained 5S practices for long-term organizational improvement.

Keywords: House Keeping Techniques; 5 S; TQM; Lean and Six Sigma

1. Introduction

The five S's stand for "Sort," "Set in order," "Shine," "Sustain," and "Standardized." Japanese industrial engineers Taiichi Ohno and Eiji Toyoda created the Toyota Production System in 1995 (Cortiglioni et al., 2020; Kumar et al., 2015), and the 5S is an enlarged study of that system. After that, Sakichi Toyoda, the father of the Japanese industrial revolution, and his son Kiichiro collaborated with Taiichi Ohno to develop 5S (Wada, 2020). Shipbuilders in Venice employed a similar idea in the sixteenth century. The ship was constructed using excellent process production during the assembly process. Instead of taking days to finish the process, they finished it in hours. In the end, the idea evolved into the methodology.The 5S System has since grown and is now incorporated into lean manufacturing, Just-In-Time (JIT) processes, and Total Productive Maintenance (TPM) (Burawat, 2019; Kumar & Thavaraj, 2015; Senthilkumar & Thavaraj, 2014). Two frameworks were provided later for implementing the 5s methodology. Osada provided the former, and Hiroyuki Hirano eventually presented the latter. According to Osada, maintaining discipline in instruction and training raises both the caliber of work and standards(Thavaraj, n.d.). A structure was assigned by Hiroyuki Hirano to improve the programs in a few ways.

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- **Seiri (Sort):** This stage involves differentiating between necessary and unnecessary items in the workspace. Unneeded items are discarded or relocated, freeing up valuable space and eliminating clutter
- **Seiton (Set in Order):** Here, the focus is on establishing a designated place for every tool, material, and equipment. This ensures easy access, reduces wasted time searching, and promotes a sense of order.
- **Seiso (Shine):** Maintaining a clean and hygienic work environment is paramount. This stage emphasizes regular cleaning and upkeep, fostering a sense of ownership and responsibility among employees.
- **Seiketsu (Standardize):** The goal is to establish best practices and procedures for maintaining the
- organized state achieved in the previous stages. This includes creating visual aids, checklists, and clear communication channels.
- **Shitsuke (Sustain):** Building a culture of continuous improvement is crucial for long- term success. This stage involves ongoing monitoring, evaluation, and refinement of the 5S practices, ensuring their ongoing effectiveness.

1.1. The Link Between 5s And Productivity

By implementing 5S, organizations can expect to reap significant benefits in terms of productivity performance. Here's how:

- **Reduced Waste:** Eliminating unnecessary items and streamlining processes minimizes wasted time, effort, and resources.
- **Improved Efficiency:** Easy access to tools and materials translates to less time spent searching, leading to faster task completion and increased output.
- **Enhanced Safety:** A clean and organized work environment minimizes the risk of accidents and injuries.
- **Boosted Employee Morale:** Working in a well-maintained and organized space fosters a sense of pride and ownership among employees, leading to increased motivation and engagement.
- **Standardized Practices:** Established procedures ensure consistency and quality in the execution of tasks.

Objectives

- To analyze the existing implementation of 5S methodology.
- To assess the impact of 5S on productivity performance.

1.2. Sources of Data

1.2.1. Primary data

Primary data has been collected from employees of XYZ limited with the help of structured interview method.

1.2.2. Sampling Size

Data collected from the employees of XYZ limited, Madurai. The total population is 300. The sample size selected is 120 respondents.

2. Review of literature

According to (Ghodrati & Zulkifli, 2013) in his study in their research "The Impact of 5S Implementation on Industrial Organizations' Performance". The study on the impact of 5S implementation on industrial organizations' performance utilized a survey method to collect data from five organizations. The results indicated a substantial improvement in organizational performance after 5S implementation, with a 63% improvement in governmental organizations and a 51% improvement in private organizations. The study recommends future research on comparative 5S effects, implementation requirements, and success factors for organizations. This suggests that 5S has a positive impact on organizational performance and highlights the need for further investigation into its effects and implementation strategies.

According to (Wani & Shinde, 2021) in his study in their research "The Performance Evaluation of Manufacturing Industries by Using 5S Techniques". The evaluates the implementation of 5S techniques at Tanmay Sales Corporation in Nagpur, India, aiming to improve efficiency and productivity in manufacturing. Quantitative data shows a 89.29% increase in productivity, with 150,000 pics produced at a rate of 400 pic/min. The study suggests better space utilization, prevention of tool misplacement, improved employee discipline, enhanced internal communication, and human relations.

According to (Ojha et al., 2023) in his study in their research "Implementation Of 5s Practices In The Company". The Quantitative data from various studies demonstrate the positive impact of implementing 5S practices, including cost reduction, increased efficiency, and improved safety. To enhance implementation success, organizations should prioritize continuous training, effective communication strategies, and strong management support. These measures can help overcome barriers like resistance to change and ensure sustained benefits from 5S implementation in improving overall organizational performance.

According to (Sati & Adam, 2019) in his study in their research "Evaluating the Effectiveness of 5S Implementation in the Industrial Sector" in COLDAIR Engineering Company, finding a significant improvement in workflow efficiency, workplace environment, and operational performance. Quantitative data, including Chi-square test values and median scores, supported the effectiveness of 5S implementation. The study recommends further research on the application of 5S in various sectors and its mediating role in occupational health and safety.

According to (Ojeda-Safra et al., 2021) in his study in their research "Productivity Improvement in Vishal Agro Industry Khurai through 5S Methodology" has resulted in significant improvements, including reduced worker absenteeism, enhanced team spirit and discipline, and increased operation effectiveness. The Implementation has also led to a better working atmosphere, improved safety, and reduced injuries and material slips. The 5S approach has positively impacted productivity, efficiency, and employee morale, as evidenced by quantitative data and case studies. The document suggests that the 5S methodology can be beneficially applied to various industries, including small-scale manufacturing, to achieve similar positive outcomes.

According to (Sunny & Anu, 2018) in his study in their research "Literature Review on Evaluation of 5 'S' Conformity in Construction Sites". The literature review on the evaluation of 5S conformity in construction sites highlights the positive impact of 5S implementation on workplace quality, productivity, safety, and organizational performance. Studies show that 5S leads to consistent quality improvements, cost optimization, enhanced productivity, and timely deliveries. The review emphasizes the universal applicability of 5S across various sectors and organizations, making it an essential tool for sustained organizational growth and development.

According to (Gupta, 2022) in his study in their research "A Review on Implementation of 5S for Workplace Management". The document provides a comprehensive review of the implementation of the 5S methodology in various organizational settings, including manufacturing, service sectors, and tertiary industries. It highlights the positive impact of 5S on productivity, waste reduction, and workplace safety. The paper also emphasizes the challenges and recommendations for sustaining 5S, including the potential extension of 5S to 6S with the inclusion of safety and the need for sustainability interventions.

According to (Radzali & Thomas, 2020) in his study in their research "Assessment on 5S Approach Strategy for Small Medium Enterprise (SME): A Case Study in Sabah".

The implementation of the 5S plan at resulted in a remarkable increase in employee satisfaction scores from 2.7 to 4.3 over three months. This improvement signifies a boost in workplace morale and productivity. To maintain these positive results, continuous monitoring, training, and employee engagement programs are recommended to ensure sustained adherence to 5S principles and further enhance operational efficiency.

According to (Randhawa & Ahuja, 2018) in his study in their research "5S methodology and its contributions towards manufacturing performance: A Review". The founds to significantly improve safety, productivity, efficiency, morale, and housekeeping in industrial organizations. Studies have shown that the successful implementation of 5S leads to reduced waste, improved quality, and increased employee engagement. To ensure effective 5S implementation, it is crucial to have strong top management commitment, clear communication, and ongoing training for all employees. It is recommended that organizations integrate 5S initiatives with their overall strategic objectives and foster a culture of continuous improvement.

3. Results and discussion

3.1. Percentage analysis

Table 1 Departments

S. No	Department	Frequency	Percent
1	Production	86	71.7
2	Quality control	29	24.2
3	Maintenance	5	4.2
Total		120	100.0

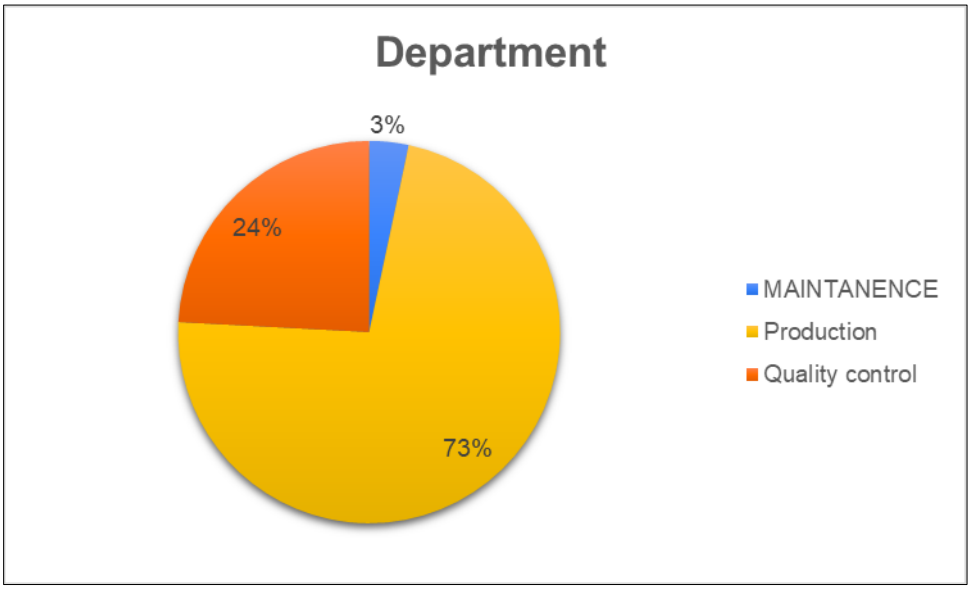

Figure 1 Department of respondents

Among the total number of 120 participants 73% of respondents are Production department, 24% of respondents are Quality control department, 3% of respondents are Maintenance department.

Table 2 Formal training on 5s methodology

S. No	Formal training on 5S methodology	Frequency	Percent
1	Yes	119	99.2
2	Maybe	1	.8
Total		120	100.0

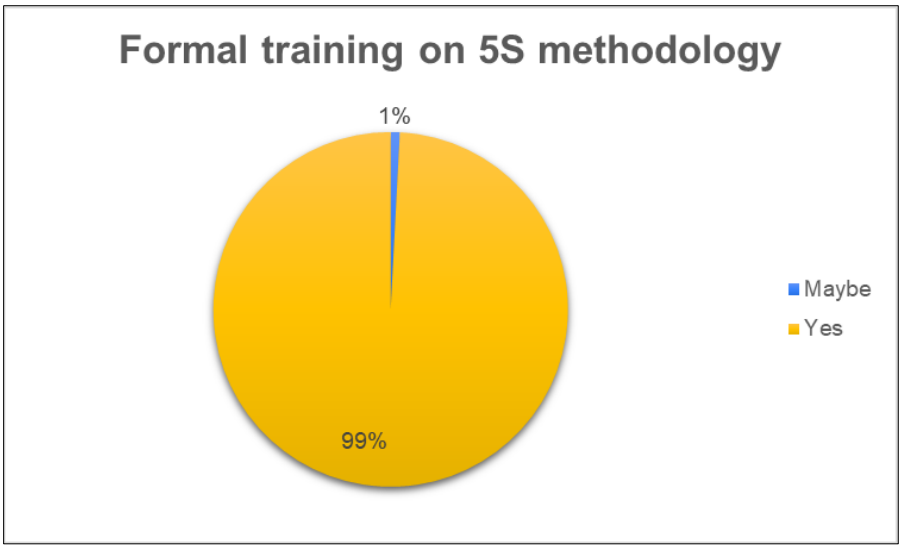

Figure 2 Formal training on 5s methodology

INFERENCES: Among the total number of 120 participants 99% of respondents are Yes with formal training on 5s methodology, 1% of respondents are Maybe with formal training on 5smethodologyforEmployees.

Table 3 Participate in 5s activities organizing workspace

S. No	Participate in 5S activities organizing workspace	Frequency	Percent
1	Daily	116	96.7
2	Weekly	2	1.7
3	Never	2	1.7
Total		120	100.0

Figure 3 Participate in 5s activities organizing workspace

INFERENCES: Among the total number of 120 participants 96% of respondents are Daily,2%ofrespondentsareWeeklyand2%ofrespondentsareNeverofParticipatein5Sactivitiesorganizingworkspace.

Table 4 Current workspace efficient

S. No	Current workspace efficient	Frequency	Percent
1	Yes	118	98.3
2	Maybe	2	1.7
Total		120	100.0

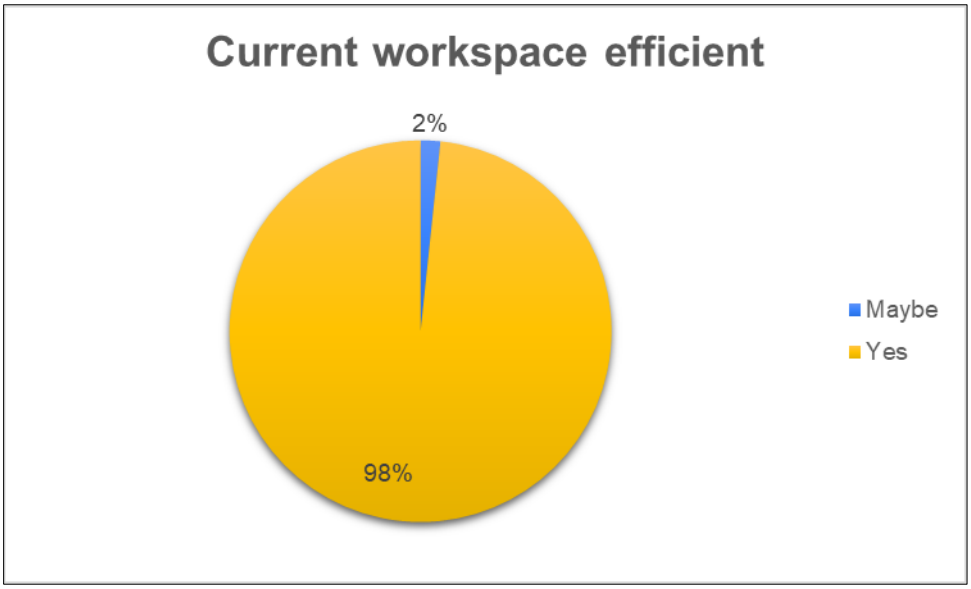

Figure 4 Current workspace efficient

INFERENCES: Among the total number of 120 participants 98% of respondents are Yes, 2% of respondents are Maybe of Current workspace efficient.

Table 5 Workplace cleanliness and orderliness checked and maintained

S. No	Workplace cleanliness and orderliness checked and maintained	Frequency	Percent
1	Daily	120	100.0
Total		120	100.0

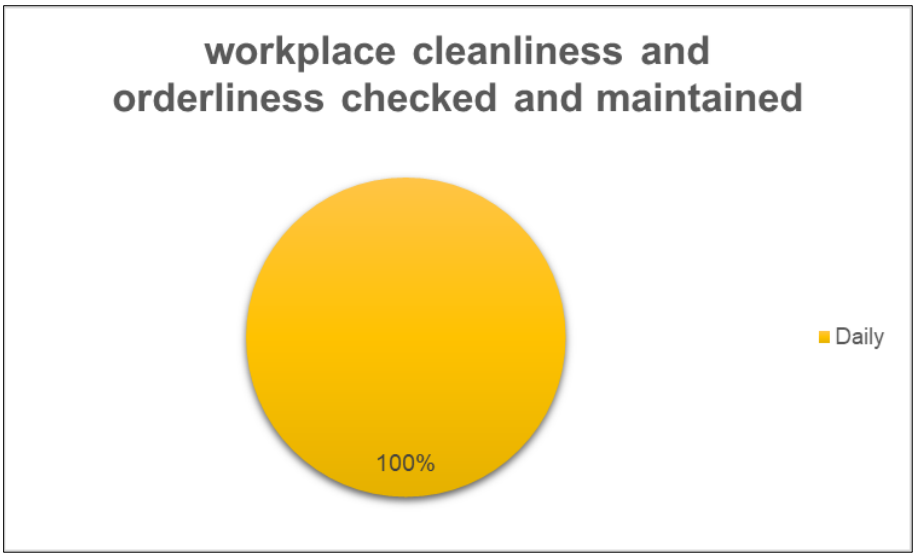

Figure 5 Workplace cleanliness and orderliness checked and maintained

INFERENCES: Among the total number of 120 participants 100% of respondents are Daily with workplace cleanliness and orderliness checked and maintained.

Table 6 Designated places for tools and materials in work area

S. No	Designated places for tools and materials in work area	Frequency	Percent
1	Yes	120	100.0
Total		120	100.0

Figure 6 Designated places for tools and materials in work area

INFERENCES: Among the total number of 120 participants 100% of respondents are Yes with designated places for tools and materials in work area.

Table 7 Unnecessary items removed

S. No	Unnecessary items removed	Frequency	Percent
1	Daily	120	100.0
Total		120	100.0

Figure 7 Unnecessary items removed

INFERENCES: Among the total number of 120 participants 100% of respondents are Daily with unnecessary items removed.

Table 8 Visual management tools such as signs or labels

S. No	Visual management tools such as signs or labels	Frequency	Percent
1	Yes	120	100.0
Total		120	100.0

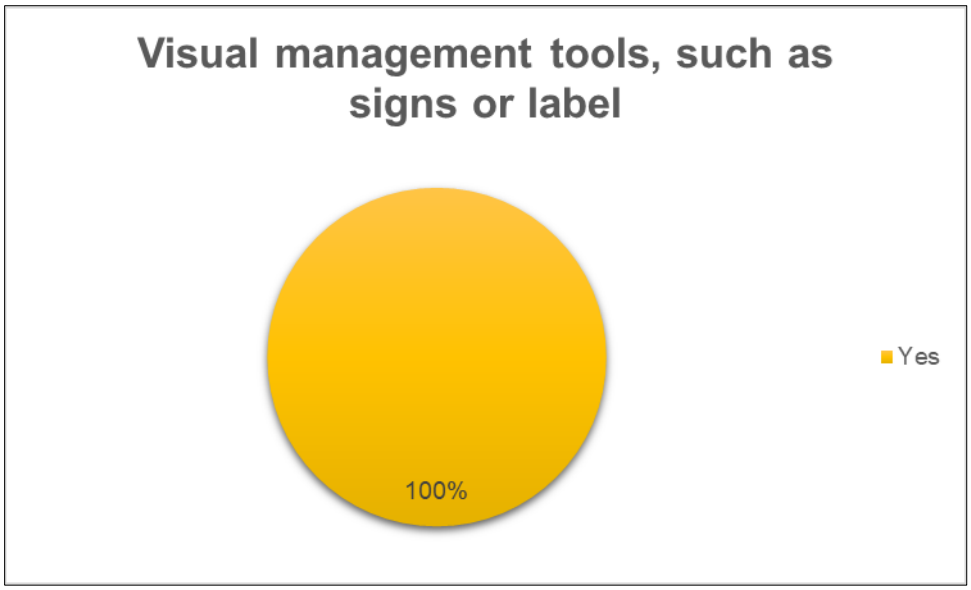

Figure 8 Visual management tools such as signs or labels

INFERENCES: Among the total number of 120 participants 100% of respondents are Yes with visual management tools such as signs or labels.

3.2. Correlation analysis

Correlation also known as bivariate. Its primary aim is to determine whether there is a relationship between variables and then assess its strength and direction (positively correlated or negatively correlated.

3.2.1. Gender and motivated are you to participate in 5s activities

Table 9 Correlation matrix for gender vs motivated are you to participate in 5S activities

	Gender	**Motivated are you toparticipatein5Sactivities**
Gender	1	.180*
Motivatedareyoutoparticipatein 5S activities	.180*	1

Since the value of correlation for Gender and Motivation are you to participate in 5S activities is 0.180. There are Very weak positive relationship between Gender and Motivation are you to participate in 5S activities.

3.2.2. Age and motivated are you to participate in 5s activities

Table 10 Correlation matrix for age vs motivated are you to participate in 5S activities

	Age	**Motivated are you to participate in 5S activities**
Age	1	-.218*
Motivated are you to participate in 5S activities	-.218*	1

Since the value of correlation for Age and Motivation are you to participate in 5sactivities is -0.218. There is a weak negative relationship between Age and Motivation are you toparticipatein 5S activities

3.2.3. Educationand5s – related achievements celebrated or acknowledged in department

Table 11 Correlation matrix for education vs 5S-related achievements celebrated or acknowledged in department

	Education	**5S-related achievements celebrated or acknowledged Iin department**
Education	1	-.198*
5S-related achievements celebrated or acknowledged in department	-.198*	1

Since the value of correlation for Education and 5S-related achievements celebrated or acknowledged in department is -0.198. There is a Very weak negative relationship between Education and 5S-related achievements celebrated or acknowledged in department.

3.3. Correlation Analysis

3.3.1. Gender and Motivation to Participate in 5S Activities

A weak positive correlation (0.180) was found between gender and motivation to participate in 5S activities. This suggests that gender has a minimal influence on an individual's motivation to engage in 5S practices, with no significant difference in participation based on gender.

3.3.2. Age and Motivation to Participate in 5S Activities

A weak negative correlation (-0.218) exists between age and motivation to participate in 5S activities. As age increases, the motivation to engage in 5S activities tends to decrease slightly, although the relationship is weak and not substantial.

3.3.3. Education and 5S-Related Achievements Celebrated or Acknowledged

A weak negative correlation (-0.198) was observed between education level and 5S-related achievements being celebrated or acknowledged in the department. This suggests that individuals with higher educational qualifications may be less likely to have their 5S achievements formally recognized, though the relationship is minimal.

4. Conclusion

The analysis reveals a strong implementation of 5S practices across the organization, with high levels of participation, awareness, and engagement. The workforce is largely experienced, with a significant proportion having technical qualifications. The 5S methodology has contributed to improved workspace organization, efficiency, and cleanliness. The correlation analysis suggests only weak relationships between demographic variables (such as age and education) and participation in or recognition of 5S activities, indicating that factors like age and educational background have a minimal impact on the effectiveness of 5S practices. Overall, the findings suggest that 5S has been successfully integrated into daily operations, leading to a more organized, productive, and efficient work environment.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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