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The Moderating Role of Safety Management Practices on the Relationship of 5s Implementation and the Operational Performance of Automotive Repair Shops in Philippines

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ABSTRACT: Background: Operational performance in small and medium automotive repair enterprises is influenced by workplace organization and safety systems, yet the interplay between lean 5S practices and safety management remains insufficiently examined in developing country contexts.

Objective: This study assessed the effect of 5S implementation on operational performance and examined whether safety management practices moderate this relationship in automotive repair shops in selected cities of Cavite, Philippines.

Methods: A cross-sectional quantitative survey design was employed among 133 owners, managers, and employees of automotive repair facilities. Data were collected using validated Likert-scale instruments and analyzed using descriptive statistics, Spearman correlation, and regression-based moderation analysis with mean-centred interaction terms. IBM SPSS Statistics version 29 was used for all analyses, with significance set at $p < 0.05$.

Results: 5S implementation showed a moderate positive association with safety management practices ($r = 0.325$, $p < 0.001$), indicating that higher workplace organization is linked with stronger safety practices. Safety management was also moderately and positively associated with operational performance ($r = 0.364$, $p < 0.001$). Regression analysis confirmed that 5S implementation significantly predicted operational performance ($\beta = 0.264$, $p < 0.001$), demonstrating that improved workplace organization enhances speed, flexibility, and service efficiency. However, safety management practices did not significantly moderate the relationship between 5S and operational performance ($p > 0.05$), indicating that the effect of 5S on performance remains stable regardless of safety management levels.

Conclusion: 5S implementation is a significant independent driver of operational performance in automotive repair shops, while safety management contributes positively but independently. The absence of a moderating effect suggests that lean workplace organization improves performance outcomes regardless of safety management intensity.

KEYWORDS: 5S implementation, safety management practices, operational performance, automotive repair shops, lean management

INTRODUCTION

Operational Performance is still an issue of concern for service industries. In smaller and medium sized businesses (SME) often will directly affect the competitiveness of the service. This is due to the fact that efficiency, quality and responsiveness are key considerations when determining competitive advantage (Linda et al., 2023). In addition to competitive advantages, workplace organization and safety are two areas of importance to labor intensive industries, like automotive repair, as both are the main factors affecting productivity and reliability of the services provided(Vishnu S Chandran, 2024). Many companies have implemented lean management approaches to increase operational efficiency through standardisation of workplace organisation and systematic processes (5S methodology). The 5S methodology was developed from the traditional Japanese manufacturing method and involves five steps: Sort, Set in order, Shine, Standardise and Sustain (Maheshwari et al., 2025). It is not limited to manufacturing; there has been significant research indicating that 5S can be used effectively in both the healthcare and service sectors, which illustrates its versatility and positive impact on operational performance, including both employee engagement and safety (Campbell, 2022). Operational Performance in smaller and medium sized businesses (SME) often will directly affect the competitiveness of the service is still an issue of concern. This is due to the fact that efficiency, quality and responsiveness are key considerations when determining competitive advantage(Lam et al., 2025). The 5S methodology was developed from the traditional Japanese manufacturing method and involves five steps: Sort, Set in order, Shine, Standardise and Sustain. Since then, it has been shown to improve productivity, quality and reduce waste in a variety of

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industries (Mazur et al., 2024). It is not limited to manufacturing; there has been significant research indicating that 5S can be used effectively in both the healthcare and service sectors, which illustrates its versatility and positive impact on operational performance, including both employee engagement and safety (Campbell, 2022).

Scholars have begun focusing more on both the convergence of lean practice and safety management. When 5S is used, it naturally creates a more organized and cleaner work area and reduces the opportunity for risk, but the extent to which it achieves this may depend on the overall safety management system of an organization (Albayrak, 2024). There is research that shows that both safety climate and safety management practices are critical to achieving the desired results of process improvements and that they both affect employee behavior and compliance with standardized procedures (Saleem & Malik, 2022). Therefore, safety management practices may act as independent contributors to performance but may also moderate the impact of operational interventions to improve performance such as 5S.

Though there is an increasing number of studies on the different areas of lean management and occupational health and safety, there is still a lack of empirical studies examining the two integrated together, specifically within the automotive repair industry in developing countries. Many automotive repair shops work in environments that contain significant physical hazards, unpredictable work flows, and limited resources, and are therefore very sensitive to both organizational inefficiencies and safety hazards. In the Philippines, adherence to both the Republic Act No. 11058 (OSH Law) and the need for safety to be built into daily operations demonstrates the need for more adequate examination(s) regarding the interaction of safety management and lean practices and their effect on performance outcomes in the automotive repair industry (Cudney et al., 2015; Rodrigues et al., 2025). To address this gap, this study aims to examine the moderating effect of safety management practices on the relationship between 5S implementation and operational performance in automotive repair shops located in selected major cities of Cavite.

METHODS

Study design

This study employed a quantitative, cross-sectional design integrating descriptive, correlational, and causal-analytical approaches to examine the relationship between 5S implementation and operational performance in automotive repair shops, and to assess the potential moderating role of safety management practices. The descriptive component of the study provided an overview of the extent to which 5S implementation is practiced in automotive repair facilities. The correlational component evaluated the relationships between 5S implementation and the use of safety management systems and operational performance in automotive repair facilities. Regression analysis (both direct and through the use of mean-centered variables) was then conducted to test for the presence of interactions and for statistical support for the theoretical assertions made.

Study setting

The research was performed in some of the biggest cities in Cavite province in the Philippines, an area that is undergoing significant urbanization and development of the automotive service industry. The sites used for research included a spectrum of repair facilities ranging from small businesses to medium sized auto repair and sales shops using various organisational structures. The businesses studied provide mechanical repair, service and maintenance and can therefore be used as appropriate sites to consider and test workplace organisation systems (e.g., 5S) and their effect on operational results.

Participants

The research population was made up of owners and part owners, managers, and employees at licensed auto-body repair facilities located within the selected communities. A total of 133 individuals participated in the final study analysis. By including individuals in a variety of work positions one could get an idea of both management level and the operational level perspectives reflected by those in the study. The inclusion of individuals in different categories (managers versus operators) contributed to the validity of the results because they provided different perspectives on safety culture, performance measures, and business processes.

Sampling and sample size

The researchers used a probability sampling approach through simple random sampling which guaranteed that every eligible auto-body repair facility; as well as every participating individual had an equal opportunity of being chosen as a part of this study. The sampling frame used for this project was developed from official records of facilities licensed by the Department of Trade and Industry. Sample size calculation was based on Slovin's method of determining a margin of error and a finite population. Based on an estimated 200 licensed auto-body repair establishments, a minimum sample size of 133 respondents was derived from this population and successfully obtained. The number of respondents was adequate to conduct multivariate statistical analysis including regression and moderation models and sufficient statistical power for this study.

Inclusion and exclusion criteria

Eligible participants for this study were persons between the ages of 21 and 60 years, who are currently employed or actively manage an automotive repair facility located within the defined municipalities being researched. Eligible participants had to have at least six months of continuous experience in their present workplace in order to have sufficient knowledge regarding their operational procedures, safety procedures, and workplace organization systems. All employees regardless of whether they were in authority or in an operations position were utilized to gather the most complete assessment of the organization under study.

Individuals were excluded from the study if they were temporary workers, trainees, or had less than six months of work experience within their current organization due to their limited exposures to their workplace compromising accurate responses. All organizations that were excluded from consideration should have not been formally registered with the state or do not conduct standardized automotive repair processes in order to remain consistent across all areas being studied.

Data collection procedures

The data collection for this research utilized a structured self-administered questionnaire distributed in person to the participants after obtaining formal authorization/permission from those in charge of the shops. Before administering the questionnaire to all the respondents, the researcher identified the research purpose and provided instructions about how to complete the questionnaire to ensure that the data were collected uniformly.

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The participants filled out the questionnaires at the time of data collection, which allowed for collecting completed questionnaires right away, thereby minimizing potential nonresponse and possible data loss.

The questionnaires were comprised of four sections: business profile, 5S implementation, operational performance, and safety management practices. Each of the four sections was recorded using a five-point Likert scale that ranged from one (minimum level of implementation/agreement) to five (maximum level of implementation/agreement). The use of a standardized scale across the four sections of the questionnaire allows quantitative comparison between different constructs and enables future statistical analyses to be conducted on them.

Measures and variables

The study looked at the five conditions of implementing the 5s (5's): Sort, Set in order, Shine (clean), Standardize, and Sustain (make it stick). The 5's dimensions were assessed using various measurements that reflected observable workplace practices (e.g., tools being organized, cleanliness, labeling systems and adherence to procedures).

The Operational performance dependent variable had 4 different dimensions of operational performance; Flexibility, Speed, Dependability and Quality. These dimensions measured how the repairs shops (dependent on their operational performance) adapted with customer demand for service, how effectively they delivered their service, how reliable their service was, and how well they performed with high service standards.

The moderating variable was safety practices at the workplace. The overall safety practices were assessed across 6 different areas (management commitment, training for safety, safety communication/feedback, safety rules/procedures, and safety promotion). The 6 domains cover both formal and behavioral components of the work safety system.

The dependent, independent and moderating variables were calculated as composite variables based on responses to the measure items, in which higher values reflect a higher level of Implementation or Operational Performance.

Instrument validity and reliability

To justify the content validity of the tool, experts in academia and industry from both the field of operations management and the field of occupational safety were used for expert review of the content of the questionnaire. Items from previously validated research articles were kept, with minor modifications made to reflect the context of the automotive repair industry.

A small group of individuals of 15 representative of the target population were selected to participate in a pilot study to assess the clarity, logic, and reliability of the instrument. Reliability testing was performed using the internal consistency method with Cronbach's alpha on each construct; the resulting alpha coefficients were found to exceed 0.79. Therefore, based on these procedures, we can conclude that the instruments would yield consistent and valid measures for all study variables.

Data analysis

Descriptive statistics medians, frequencies, and percentages were generated to provide an overview of the respondents' characteristics, levels of 5S implementation, operational performance, and safety management practices. Spearman's rank correlation coefficient was used to test the relationship between the variables 5S implementation, safety management practices and operational performance.

Regression-based path analysis was utilised to evaluate the direct impact of 5S implementation on operational performance. Moderation analysis was conducted using mean-centred variables to assess whether safety management practices would alter the relationship between 5S implementation and operational performance. A level of statistical significance was established at $p < 0.05$ and was set at $p < 0.001$ for highly significant results. This analytic approach allowed for the analysis of both direct and interaction effects while ensuring methodological rigour. Statistical analyses were conducted using IBM SPSS Statistics version 29 for both descriptive and inferential analyses.

Ethical considerations

Informed consent was obtained from all participants and Ethical approval was granted by the Cavite State University Committee for Ethical Review. All data were kept strictly confidential, with no personally identifiable information disclosed.

RESULTS

Demographic Characteristics of Respondents

The majority of all automotive repair facilities, as depicted in Table 1, had either 5-8 employees (50%) or 4 or fewer employees (34%), whereas those with 9 or more total employees were much less numerous (16%). Based upon this data, it can be concluded that most auto repair shops are small businesses. When it comes to the length of time in business, most (41%) have been in business between 6 and 10 years while the second largest group has been in business for fewer than 5 years (38%). Only 22% of respondents have been in the automotive repair industry for 11 or more years suggesting that most respondents have a moderate level of industry experience. Respondents were mainly workers (42%) of the company they work for followed closely by part owners (37%) and lastly owners (21%). The data that illustrates the relatively low proportion of owners to workers suggests that the majority of the respondents are employed in non-ownership operational roles.

Table 1. Demographic Profile of Automotive Repair Shops

Variable	Category	Frequency	Percentage
Number of Employees	4 and below	45	34
	5 to 8	67	50
	9 and above	21	16
Years of Operation	5 and below	50	38
	6 to 10	54	41
	11 and above	29	22
Tenure Status	Owner	28	21
	Part Owner	49	37
	Worker	56	42

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Table 2 indicates that the overall level of 5S implementation was consistently high (overall median of 4.50). Among the 5S dimensions, shine (median of 5.00) was the strongest implementation level indicating a very high level of consistency in cleanliness and maintenance. The other dimensions, sort, set in order, standardize, and sustain (median of 4.50 or less than 4.00) had high levels of implementation, but there is less consistency across facilities, particularly with respect to procedures being standardized.

The operational performance of the evaluation scored as very high overall (median score of 4.50). Speed was the strongest scoring dimension (median score of 4.50) demonstrating the highest degree of efficiency in delivering services; while flexibility, dependability, and quality (median score of 4.00) were also high scores but slightly less consistent.

The safety management practices demonstrated an overall consistent pattern of implementation, or "frequently practiced," across all dimensions (overall median of 4.00). All indicators measured, including commitment by management, training of employees, involvement of employees, communication systems, written safety rules, and promotion policy have central tendency (mean & median) to be similar indicating a stable but not fully established safety program.

Table 2. Descriptive Statistics of 5S Implementation, Operational Performance, and Safety Management Practices

Construct	Dimension	Median	Interpretation
5S Implementation	Sort	4.50	High
	Set in Order	4.50	High
	Shine	5.00	Very High
	Standardize	4.00	High
	Sustain	4.50	High
Operational Performance	Flexibility	4.00	High
	Speed	4.50	Very High
	Dependability	4.00	High
	Quality	4.00	High
Safety Management Practices	Management Commitment	4.00	Often Practiced
	Safety Training	4.00	Often Practiced
	Worker Involvement	4.00	Often Practiced
	Safety Communication & Feedback	4.00	Often Practiced
	Safety Rules & Procedures	4.00	Often Practiced
	Safety Promotion Policies	4.00	Often Practiced

Inferential Results

Correlation Analysis

According to findings displayed in Table 3, 5S implementation showed a strong positive association with safety management practices ($r = 0.325$, $p < 0.001$), meaning that when there was greater 5S implementation, there were also greater amounts of safety management practices present. The presence of safety management practices also had a similarly higher amount of operational performance ($r = 0.364$, $p < 0.001$), meaning that when there were higher levels of safety systems, there were also higher levels of performance outcomes among the operational aspects across the sample.

Table 3. Correlation Analysis Between Study Variables

Variables	Spearman r	Strength/Direction	p-value	Interpretation
5S Implementation → Safety Management Practices	0.325	Moderate positive	< .001	Statistically significant
Safety Management Practices → Operational Performance	0.364	Moderate positive	< .001	Statistically significant

5S implementation had an effect on operational performance (see Table 4). Specifically, we observed a statistically significant and positive effect of 5S implementation on operational performance ($\beta=0.264$; SE=0.08; $z=3.312$; $p<.001$). The strength of the coefficient suggests a moderate predictive relationship between 5S implementation and improved operational performance. The significance of the relationship indicates that the relationship was not the result of random chance; therefore, the model displays a predictable and stable positive relationship among all of these variables.

Table 4. Direct Effect of 5S Implementation on Operational Performance

Path	β	SE	z-value	p-value	Effect Interpretation	Result
5S → Operational Performance	0.264	0.08	3.312	< .001	Moderate positive, statistically significant	Supported

Moderation Analysis

Table 5 indicates that Safety Management Practices did not have a statistically significant moderating influence on the 5S/Operational performance relationship at any of the three percentile levels that were tested (16th, 50th and 84th percentiles). While both total effect and indirect effect were

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incrementally higher at the two highest percentiles, none of the estimates were statistically significant ($p > .05$), indicating that differences in Safety Management Practices did not have any meaningful impact on the strength of the relationship between 5S implementation and Operational Performance. The implication is that the direct relationship between 5S implementation and Operational Performance is statistically stable across different levels of Safety Management Practices.

Table 5. Moderation Effects of Safety Management Practices on the Relationship Between 5S and Operational Performance

Effect Type	Percentile	Estimate	SE	z-value	p-value	Interpretation
Indirect Effect	16	0.160	0.094	1.707	0.088	Not significant
Indirect Effect	50	0.160	0.094	1.707	0.088	Not significant
Indirect Effect	84	0.193	0.132	1.459	0.145	Not significant
Total Effect	16	0.160	0.094	1.707	0.088	Not significant
Total Effect	50	0.160	0.094	1.707	0.088	Not significant
Total Effect	84	0.193	0.132	1.459	0.145	Not significant

DISCUSSION

This study was carried out to determine the nature of the relationship between 5S implementation, safety management practices, and operational performance in auto repair shops. Results from this study showed that there is a positive correlation between 5S implementation and safety management practices. This means that as a workplace becomes more structured and organized through the use of 5S methodologies there tends to be an increase in positive safety related behaviors and procedures. Additionally, the results showed that there is a correlation between safety management practices and operational performance which means that by implementing effective safety-oriented systems, businesses will likely see improvements in their overall efficiency, reliability and quality of service provided to customers. Results from the structural model indicated that 5S implementation has a statistically significant direct positive impact on operational performance thus demonstrating that implementing 5S has a direct effect on the outcome(s) of performance. Finally, no significant moderating effect was found between 5S implementation and operational performance as a result of the level of safety management practices, therefore indicating that regardless of the level of safety management practices employed by a business, implementation of 5S will maintain the statistically significant positive effect on operational performance.

The evidence of a positive correlation exists between implementing a 5S method into an organization and how well that organization is run. This is in line with the ideal principles of Lean management, which state that the organization of the workspace, the reduction of waste, and the standardization of processes all help improve efficiency and quality (Mazur et al., 2024). There is a strong direct link between implementing a 5S system into an operation and the way at which that operation performs. There is also evidence from the literature to support that having a well-organized structured workplace will increase productivity and decrease the amount of non-value-added activities performed, especially in service maintenance environments(Balinado & Tri Prasetyo, 2020).

The findings support the assumption that there is a moderate positive association between the implementation of 5S and the practice of safety management. Evidence from several studies suggests that the use of lean tools like 5S helps to improve workplace safety by decreasing hazards and improving environmental orderliness. A recent study by Ho et al found that as 5S implementation increased, safety performance-related measures, such as reduced workplace congestion and enhanced visual control systems, increased and, therefore, improved, and, therefore, decreased the probability of accidents and injuries occurring (Ho et al., 1995). The utilization of systematic workplace organization aids in meeting compliance of occupational safety practices in an industrial setting. The current results add to the body of knowledge supporting the influence of 5S implementation on safety management practices even in small-scale service environments like repair shops (Tanwir et al., 2024).

Established occupational safety research further confirms the positive link between safety management practices and operational performance. For instance, Ismail et al, found that there is a positive correlation between safety climate and safety compliance and organizational performance outcomes (Ismail et al., 2024). In addition, enhanced operational effectiveness is due to stability in work processes and reduced variability as a result of accident-related/unsafe practice variances from the strong safety management systems. The current results are consistent with these studies by providing evidence that safety management improves not only risk mitigation efforts but also operational efficiency within service industries (Fomude et al., 2025).

While previous research has shown a moderate effect of safety management practices on the 5S-performance connection as expected through theory or case studies (by those who researched in 5S), there are conflicting findings from empirical data that show lean tools like 5S may affect performance independently of the safety system in mature settings, based on how the operational structure of the environment drives efficiency (Renante Garcia Castelo, 2024) .

The results of the study lend support to Lean Theory by further establishing 5S as a basic Operational Improvement Mechanism that, in turn, directly improves the performance outcomes produced by the Lean Organization (Oleksiak et al., 2025). Additionally, the moderate degree of association between 5S and Safety Management provides support for the socio-technical perspective that a worksite's organization and human behavioral systems are interrelated but not fully integrated in developing an organization's outcomes(Tanwir et al., 2024).

However, there are a number of limitations to consider, since the study utilized a cross-sectional design, the causal inference of the relationships among variables is limited to an associative basis; therefore, any relationships identified should only be viewed as associative rather than causal in nature. Additionally, the use of self-report measures raises the possibility of bias in the responses provided by the participants in the survey; for example, the possibility of a participant overstating their use of safety practices or their operational performance. Finally, the study was limited to a specific geographic area; thus, the findings may be limited to select automotive repair shops in Cavite, which may limit generalizability to other geographical areas and/or other types of industries.

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CONCLUSION

This study demonstrates that 5S implementation significantly enhances operational performance in automotive repair shops, particularly in improving speed, flexibility, and overall efficiency. The evidence supports that 5S implementation and safety management practices are positively related to operational performance, signifying that each of these practices has a separate but equally important role as an organizational performance driver. The findings of the current study also indicate that safety management practices do not moderate the relationship between 5S and operational performance, indicating that the influence of each practice occurs independently of one another.

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