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A Study On Lean Manufacturing Practices Adopted In The Manufacturing Industry

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Abstract: This study explores lean manufacturing practices in the automotive division of Leggett & Platt, focusing on waste reduction, process efficiency, and employee involvement. Data collected through a structured questionnaire highlights common wastes such as overproduction and waiting, along with the use of lean tools like 5S, Kaizen, and Value Stream Mapping. Findings reveal gaps in training and inconsistent tool usage across departments. The study recommends improved training, tool integration, and employee engagement to enhance lean implementation and support continuous improvement in productivity and cost efficiency.

Keywords: Lean Manufacturing, Automotive Industry, Waste Reduction, 5S, Kaizen, Value Stream Mapping, Continuous Improvement, Employee Involvement, Process Optimization.

1. INTRODUCTION

In today's competitive global marketplace, manufacturing organizations face constant pressure to improve product quality, reduce costs, optimize production, and meet customer demands. Lean manufacturing, originally developed by Toyota, has become a universal framework for achieving operational excellence across industries. This approach focuses on maximizing customer value while minimizing waste, shifting from traditional mass production to a more flexible and customer-centric model (Vinodh, 2023).

This study explores key lean tools such as 5S, Kaizen, Kanban, Total Productive Maintenance (TPM), and Value Stream Mapping, which help streamline production processes and enhance operational performance (Ivanov, 2023). It also highlights the importance of employee engagement, leadership commitment, training, and performance monitoring for successful lean implementation.

The core goal of lean manufacturing is to identify and eliminate "waste"—activities that do not add value from the customer's perspective—thereby improving efficiency, quality, and customer satisfaction. However, organizations often face challenges, such as inconsistent tool application, resistance to change, and employee burnout, which can hinder the effectiveness of lean initiatives (Kumar & Singh, 2023).

This research also focuses on employee awareness and involvement, recognizing that successful lean transformation depends on active employee participation. Organizations that invest in continuous training and development see higher success rates in lean adoption (Ferreira, 2023).

Ultimately, lean manufacturing is an ongoing commitment to improvement. This study aims to provide insights into how lean practices can drive efficiency, engage employees, and maintain a competitive edge

in an evolving business environment.

2. OBJECTIVES OF THE STUDY

1. To identify the most commonly observed types of waste in current manufacturing processes.
2. To identify the risk factors of lean manufacturing.
3. To evaluate the effectiveness of existing lean tools and practices.
4. To analyze the impact of lean implementation on operational efficiency and workplace practices.
5. To give recommendation for awareness and implementation of lean manufacturing principles at Leggett & Platt.

3.SCOPE OF THE STUDY

Lean manufacturing is essential for optimizing production and reducing waste. Leggett & Platt should assess its current lean practices to identify inefficiencies and evaluate employee awareness to address knowledge gaps. The study will focus on common manufacturing wastes, such as overproduction and delays, using employee feedback to uncover practical challenges. These insights will guide targeted improvements, enhance efficiency, and foster a culture of continuous improvement.

4.REVIEW OF LITERATURE

According to Ivanov. A (2023)

This paper investigates the application of lean manufacturing tools to improve the assembly process in an automotive company. The study focuses on identifying inefficiencies and implementing lean strategies to enhance productivity and reduce costs. The objectives include analyzing the current assembly process, identifying areas for improvement, and implementing lean tools to achieve continuous improvement.

According to Smith. J (2025)

This study extends knowledge in the area of digital transformation and lean production by establishing and explaining the relationship between lean production management methods and the promotion of new energy vehicle body coating performance from a dual perspective of digital transformation and value stream mapping (VSM). The paper analyzes the application of lean production management in the body painting process of new energy vehicles, identifying inefficiencies and proposing improvements using VSM and the ECRS (Eliminate, Combine, Rearrange, Simplify) technique. The objectives include enhancing the efficiency of the body painting process in new energy vehicles through lean management techniques and digital transformation.

5.RESEARCH METHODOLOGY

The study uses a descriptive research design to examine the relationship between organizational lean reduce behavior. A sample size of 155 employees was selected using convenience sampling from a total population of 260. Data collection follows quantitative methods, and since the data is not normally distributed, non-parametric tools were applied for analysis.

6.DATA ANALYSIS AND INTERPRETATION

Categories	Sub categories	No. of respondents	Percentage (%)
Age	Under 25	26	17
	25-30	84	54
	31-35	36	23
	Above 35	9	6
Gender	Male	121	78
	Female	34	22
Experience	Less than 1 year	29	19
	1-3 years	47	30
	3-5 years	50	31
	More than 5 years	29	19
Department	Production	73	47
	Quality	36	23
	Maintenance	22	14
	Engineering	24	16
Total	**All categories**	**155**	**100**

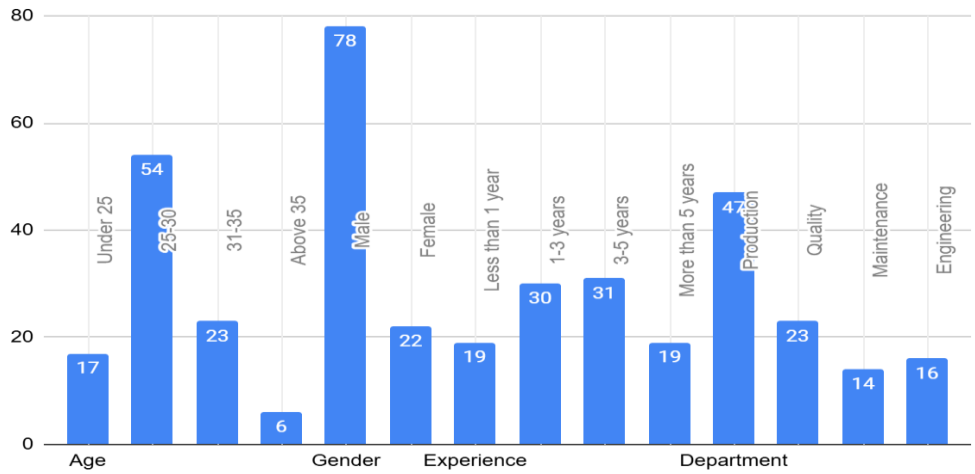
FINDINGS:

The majority of respondents (38.8%) are aged 25–30, followed by 16.6% aged 31–35, 12.1% under the age of 25, and 4.2% aged above 35. Most respondents are male, comprising 78.0% of the total, while female respondents account for 22.0%. In terms of work experience, 29.6% have 3–5 years of experience, 28.2% have 1–3 years, while 17.5% each have less than 1 year and more than 5 years of experience. Department-wise, 47.1% of respondents are from Production, 23.1% from Quality, 15.7% from Engineering, and 14.1% from Maintenance.

INFERENCE:

1. It is inferred that the majority of the respondents are male.
2. It is inferred that the majority of the respondents fall within the 25–30 age group.
3. It is inferred that most respondents have 1–3 years or 3–5 years of experience, indicating a mid-level workforce.
4. It is inferred that the majority of the respondents work in the Production department, suggesting a production-centric operational environment.

Figure 1: Demographic profile



6.2 STATISTICAL TOOLS

MANN-WHITNEY U-TEST

Null hypothesis: There is no significant difference between the common type of waste and risk factors.

Alternative hypothesis: There is significant difference between the common type of waste and risk factors.

Table 2: Mann Whitney u-test

Test Statistics		
	COMMON TYPE OF WASTE	RISK FACTORS
Mann-Whitney U	1253	1253
Wilcoxon W	1848	1848
Z	-3.492	-3.492
Asymp. Sig. (2-tailed)	0.078	0.098

INTERPRETATION:

The p-value >0.05 so we fail to reject null hypothesis (H0) is. There is no significant difference between the t common type of waste and risk factors.

KRUSKAL WALIS TEST:

Null hypothesis: There is no significant difference between the common type of waste risk factor and effectiveness of lean implementation.

Alternative hypothesis: There is significant difference between the common type of waste risk factor and effectiveness of lean implementation.

Test Statistics[a,b]			
	COMMON TYPE OF WASTE	RISK FACTORS	EFFECTIVENESS OF LEAN IMPLEMENTATION
Kruskal-Wallis H	15.780	15.780	18.236
df	3	3	3
Asymp. Sig.	.001	.001	<.001
a. Kruskal Wallis Test			
b. Grouping Variable: Age			

Table 3-kruskal walis t-test

INTERPRETATION:

The p-value >0.05 so we fail to reject null hypothesis (H0) is. There is no significant difference between the common type of waste risk factors and effectiveness of lean implementation.

SPEARMAN RANK CORRELATION

Null hypothesis: There is no significant correlation between risk factors and effectiveness of lean implementation.

Alternative hypothesis: There is significant correlation between risk factors and effectiveness of lean implementation.

Table 04-spearman rank correlation

Correlations				
			RISK FACTORS	EFFECTIVENESS OF LEAN IMPLEMENTATION
Spearman's rho	RISK FACTORS	Correlation Coefficient	1	.989**
		Sig. (2-tailed)	.	.000
		N	155	155
	EFFECTIVENESS OF LEAN IMPLEMENTATION	Correlation Coefficient	.989**	1
		Sig. (2-tailed)	.000	.
		N	155	155
Correlation is significant at the 0.01 level (2-tailed).				

INTERPRETATION:

Since the p-value <0.05, we reject the null hypothesis (H0). This indicates risk factors is significantly correlated with the effectiveness of lean implementation.

7.SUMMARY OF FINDINGS

1. The majority of the respondents are male.
2. It is inferred that the majority of the respondents fall within the 25–30 age group.
3. It is inferred that most respondents have 1–3 years or 3–5 years of experience, indicating a mid-level workforce.
4. It is inferred that the majority of the respondents work in the Production department, suggesting a production-centric operational environment.
5. There is no significant difference between the t common type of waste and risk factors.
6. There is no significant difference between the common type of waste risk factors and effectiveness of lean implementation.
7. This indicates risk factors is significantly correlated with the effectiveness of lean implementation.

8.SUGGESTION

- Enhance Gender Diversity Since the majority of respondents are male, consider strategies to promote gender inclusivity, such as targeted hiring, awareness campaigns, and a supportive workplace culture.
- Tailor Training Programs With most employees in the 25–30 age group and having mid-level experience, develop lean training that builds on existing knowledge and focuses on practical application to improve engagement and retention.
- Focus on Production Processes Given the high concentration of employees in the production department, prioritize lean implementation efforts in production workflows to maximize impact and set a strong foundation for cross-departmental adoption.
- Strengthen Integration of Lean and Waste Management Although no significant difference was found between waste types and risk factors, ensure continuous monitoring and feedback loops to align waste reduction efforts with lean goals.

9.CONCLUSION

This study on lean manufacturing at Leggett & Platt highlights both progress and areas for improvement. Lean tools like 5S and Kaizen are widely used, and 93% of employees confirm waste reduction is part of daily operations, reflecting a growing lean culture. However, challenges such as low employee engagement (52%) and stress from lean workloads (92%) suggest the need for better inclusion and workload management. While lean has improved communication, collaboration, and quality, employees call for more hands-on training to sustain progress. To advance further, the company should focus on engagement, training, and balancing efficiency with employee well-being.

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