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A Study On The Role Of Green Hrm And Lean Manufacturing In Enhancing Operational Performance In A Manufacturing Company

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ABSTRACT: In the current fast-evolving and competitive market, companies are feeling increasing pressure to follow sustainable strategies, seeking a balance between an economic, an environmental and a social performance. This study examines the concept of Green HRM and Lean Manufacturing in enhancing operational performance in a manufacturing company. The objective of this study was made and assessed. The data were collected from 152 respondents through questionnaire and analyzed with statistical tools such as Mann Whitney U test, Kruskal Wallis H test and Spearman's Rank Correlation. The results indicate a significant and positive relationship between the implementation of both Green HRM as well as lean manufacturing practices with the performance levels of the organization. The study concludes with a set of recommendations for improving existing practices and integrating them with long-term sustainability goals.

Keywords: Green HRM, Lean Manufacturing, Operational performance, Sustainability.

INTRODUCTION

The manufacturing industry is going through a major shift as companies work hard to boost their operational efficiency while also tackling environmental sustainability issues. With a growing global focus on sustainable development, businesses are getting creative with strategies that strike a balance between making a profit and being environmentally responsible. Two standout approaches that have gained popularity are Green Human Resource Management (GHRM) practices and Lean Manufacturing (LM).

Green Human Resource Management (GHRM) weaves environmentally friendly principles into HR policies and practices, creating a culture of environmental responsibility among employees. By implementing initiatives like green recruitment, training, performance management, and employee engagement, GHRM helps organizations shrink their ecological footprint and align their operations with sustainability goals. On the flip side, Lean Manufacturing (LM) is all about cutting out waste, making the best use of resources, and boosting operational efficiency. Grounded in principles like continuous improvement, Just-In-Time (JIT) production, and Total Quality Management (TQM), lean manufacturing helps company's lower costs, speed up production times, and improve overall productivity. Bringing together GHRM and LM in manufacturing firms offers a fantastic chance to enhance operational performance while lessening environmental impact. However, obstacles like resistance to change, high initial costs of implementation, and a lack of awareness can stand in the way of successfully adopting these practices. This study aims to evaluate the level of awareness, satisfaction, and challenges related to GHRM and LM, along with their impact on the industry. Manufacturing companies that strategically integrate GHRM and LM practices stand to gain major advantages in today's

international market, which is highly competitive and environmentally sensitive. These include increased stakeholder relationships, greater environmental performance, increased operational efficiency, increased staff dedication, and a robust, future-ready organizational structure.

OBJECTIVES OF THE STUDY

- To study the level of awareness on green HRM practices & Lean manufacturing among the employees.
- To examine satisfaction level on role of GHRM & Lean Manufacturing in enhancing operational performance.
- To assess the impact of GHRM & Lean Manufacturing strategies in the firm's productivity.
- To identify the key challenges of GHRM & Lean Manufacturing on the overall operational performance
- To recommend strategies for improving operational performance by leveraging both GHRM and Lean Manufacturing practices.

SCOPE OF THE STUDY

This study examines the impact of Green Human Resource Practices (GHRP) and Lean Manufacturing (LM) on Operational Performance in a manufacturing company. It will be beneficial for HR professionals, manufacturing managers, operational heads, and employees involved in sustainability and lean processes within manufacturing companies and it provides practical insights for manufacturing firms to enhance sustainability while maintaining lean operations, offers policy recommendations for integrating environmental HR practices with lean methodologies, and helps businesses improve employee engagement, productivity, and overall operational efficiency.

LITERATURE REVIEW

Atul Kumar Sahu, et al., (2025) conducted a conceptual model that connected supply chain performance to proactive supply chain strategies, including information sharing, collaboration, GHRM, and lean-green practices. It provides a comprehensive viewpoint to assist in making sustainable organisational decisions. [9]

Tinotenda Machingura, Olufemi Adetunji, Catherine Maware, (2024) examined the combined effects of lean and green manufacturing on operational and environmental performance in Zimbabwe manufacturing sector. According to their findings, both enhance operation as well as environmental performance, but Green Manufacturing has an indirect impact on operations through benefits to the environment. [7]

Panigrahi S, et al., (2023) investigated the impact of lean manufacturing (LM) techniques on operational and financial performance of manufacturing companies in Oman. According to SEM data, LM enhances operational performance but not overall corporate performance. The most commonly used techniques were rapid setups and small-lot production. [8]

Alavi, S. and Aghakhani, H. (2023) identified eight GHRM practices are most important for fostering a lean-agile mindset in the steel sector. They discovered that green reward management and training were two of the most effective strategies using SEM and FAHP. [1]

Wahab, A. (2022) examined the role that organizational culture plays as a moderator in the relationship between lean methods and sustainable performance in Karachi's manufacturing industry. The study discovered that culture, supplier connections, and HR policies all have a major influence on sustainability, with culture mitigating the effects of suppliers. [10]

Alipour, N., Nazari-Shirkouhi, S., Sangari, M.S. *et al.*, (2022) evaluate the effects of the LARG (lean, agile, resilient, green) HRM paradigms on organizational innovation and performance, they set out to develop and validate them. The findings demonstrated that LARG HRM greatly improves performance, with essential components being multiskilled workers (lean), agile and participative decision-making, resilience and adaptability, and green and environmental policy knowledge. [2]

RESEARCH METHODOLOGY

This study adopts a **Descriptive Research Design** using **Simple Random Sampling** technique. A sample of **152** employees was selected based on the Krejcie and Morgan table.
Sampling Period: February 2025 – March 2025.

Data Sources:
Primary data: Collected by circulating the questionnaire through email using google form.
Secondary data: Sourced from articles, journals and magazines.

Tools Used:
Normality: Normality test was conducted using SPSS and it indicates non-normal distribution i.e., ($P < 0.05$).
Statistical Tools: Mann-Whitney U test, Kruskal-Wallis H test and Spearman's Rank correlation.

Software Used: Google sheet and SPSS 16.

DATA ANALYSIS AND INTERPRETATION

Demographics data:

Categories	Sub categories	No. of respondents	Percentage (%)
Age	< 25 years	83	54.6
	26-30	34	22.37
	31-35	11	7.24
	36-40	16	10.53
	Above 40 years	8	5.26
Gender	Male	132	86.84
	Female	20	13.16
Educational Qualification	UG	40	26.32
	PG	102	67.1
	Others	10	6.58
Designation	Operator/Technician	76	50
	Supervisor	49	32.24
	Manager	5	3.29
	Senior management	10	6.58
	Others	12	7.89
Experience	Below 2 years	70	46.05

	2-6 years	60	39.47
	7-10 years	12	7.89
	Above 10 years	10	6.59
Total	**All categories**	**152**	**100**

Table 1: Demographic data of the respondents

Findings:

From the above table, 54.6% of the respondents are below the age of 25, followed by 22.37% aged 26-30, 7.24% aged 31-35, 10.53% aged 36-40 and 5.26% are above the age of 40. In gender, most of the respondents are male 86.84% and female 13.16%. In educational qualification, 26.23% completed UG, 67.1% completed PG and 6.58% have completed other qualifications. In terms of designation, 50% are operator/technician, 32.24% are supervisor, 3.29% are Manager, 6.58% are from senior management and 7.89% are from other departments. In terms of employees' work experience, 46.05% have less than 2 years of experience, 39.47% have 2-6 years of experience, 7.89% have 7-10 years of experience and 6.59% have experience more than 10 years.

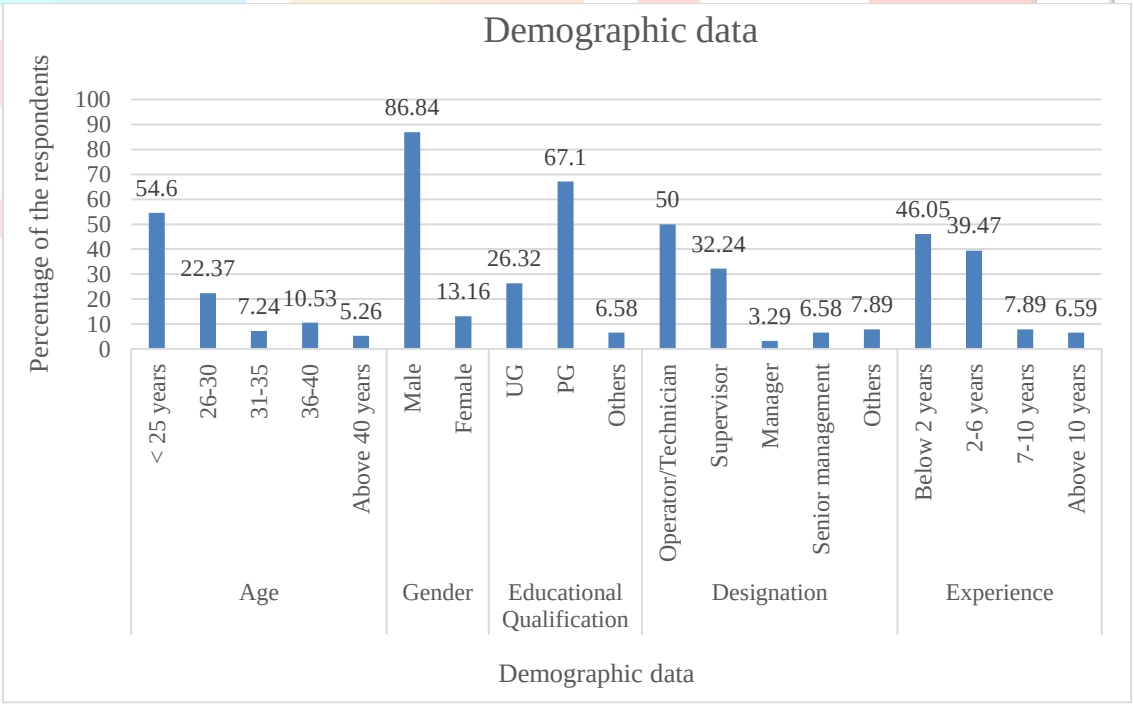

Figure 1: Demographic data of the respondents

Inference:

It inferred that, the majority of respondents are below the age of 25. In terms of gender, the majority of respondents are male. In terms of educational qualification, the most of the respondents have completed PG. In terms of designation, the majority of respondents are operator/technician. Regarding work experience, most of the respondents have less than 2 years of experience.

MANN-WHITNEY U TEST

H_0: There is no significant difference between mean ranks of men and women with respect to employees' awareness, employees' perception, impact of GHRM and Lean Manufacturing, challenges of GHRM and Lean Manufacturing and improvement strategies.

H_1: There is significant difference between mean ranks of men and women with respect to employees' awareness, employees' perception, impact of GHRM and Lean Manufacturing, challenges of GHRM and Lean Manufacturing and improvement strategies.

Test Statistics[a]

	Employees' Awareness	Employees' Perception	Impact of GHRM and Lean Manufacturing	Challenges of GHRM and Lean Manufacturing	Improvement Strategies
Mann-Whitney U	1271.000	1118.000	1224.000	1102.500	1009.000
Wilcoxon W	1481.000	1328.000	1434.000	1312.500	1219.000
Z	-.269	-1.115	-.536	-1.199	-1.736
Asymp. Sig. (2-tailed)	.788	.265	.592	.230	.083

a. Grouping Variable: Gender

Table 2: Mann-Whitney U test

Inference:

The p value > 0.05, hence the null hypothesis is accepted. There is no significant difference between mean ranks of men and women with respect to employees' awareness, employees' perception, impact of GHRM and Lean Manufacturing, challenges of GHRM and Lean Manufacturing and improvement strategies.

KRUSKAL-WALLIS H TEST

H_0: There is no significant difference between mean ranks of categories of age group with respect to employees' awareness, employees' perception, impact of GHRM and Lean Manufacturing, challenges of GHRM and Lean Manufacturing and improvement strategies.

H_1: There is significant difference between mean ranks of categories of age group with respect to employees' awareness, employees' perception, impact of GHRM and Lean Manufacturing, challenges of GHRM and Lean Manufacturing and improvement strategies.

Test Statistics[a,b]

	Employees' Awareness	Employees' Perception	Impact of GHRM and Lean Manufacturing	Challenges of GHRM and Lean Manufacturing	Improvement Strategies
Chi-Square	11.754	5.138	7.107	17.157	4.255
df	4	4	4	4	4
Asymp. Sig.	.019	.273	.130	.002	.373

a. Kruskal Wallis Test

b. Grouping Variable: Age group

Table 3: Kruskal-Wallis H test

Inference:

The p value < 0.05, hence the null hypothesis is rejected. There is significant difference between mean ranks of categories of age group with respect to employees' awareness and challenges of GHRM and Lean Manufacturing

The p value > 0.05, hence the null hypothesis is accepted. There is no significant difference between mean ranks of categories of age group with respect to employees' perception, impact of GHRM and Lean Manufacturing and improvement strategies.

SPEARMAN'S RANK CORRELATION

H_0: There is no significant relationship between Employees' awareness, Employees' perception, Impact of GHRM and Lean Manufacturing, Challenges of GHRM and Lean Manufacturing and Improvement strategies

H_1: There is a significant relationship between Employees' awareness, Employees' perception, Impact of GHRM and Lean Manufacturing, Challenges of GHRM and Lean Manufacturing and Improvement strategies

Correlations

			Employees' Awareness	Employees' Perception	Impact of GHRM and Lean Manufacturing	Challenges of GHRM and Lean Manufacturing	Improvement Strategies
Spearman's rho	Employees' Awareness	Correlation Coefficient	1.000	.506**	.526**	.534**	.425**
		Sig. (2-tailed)	.	.000	.000	.000	.000
		N	152	152	152	152	152
	Employees' Perception	Correlation Coefficient	.506**	1.000	.644**	.604**	.575**
		Sig. (2-tailed)	.000	.	.000	.000	.000
		N	152	152	152	152	152
	Impact of GHRM and Lean Manufacturing	Correlation Coefficient	.526**	.644**	1.000	.595**	.682**
		Sig. (2-tailed)	.000	.000	.	.000	.000
		N	152	152	152	152	152
	Challenges of GHRM and Lean Manufacturing	Correlation Coefficient	.534**	.604**	.595**	1.000	.662**
		Sig. (2-tailed)	.000	.000	.000	.	.000
		N	152	152	152	152	152
	Improvement Strategies	Correlation Coefficient	.425**	.575**	.682**	.662**	1.000
		Sig. (2-tailed)	.000	.000	.000	.000	.
		N	152	152	152	152	152

**. Correlation is significant at the 0.01 level (2-tailed).

Table 4: Spearman's Rank Correlation

Inference:

Hence, the null hypotheses are rejected. There is a strong, positive and significant relationship among employees' Awareness, employees' Perception, the impact of GHRM and Lean Manufacturing, the challenges of GHRM and Lean Manufacturing, and improvement Strategies.

SUMMARY OF FINDINGS

1. It inferred that, the majority of respondents are below the age of 25. In terms of gender, the majority of respondents are male. In terms of educational qualification, the most of the respondents have completed PG. In terms of designation, the majority of respondents are operator/technician. Regarding work experience, most of the respondents have less than 2 years of experience.
2. From Mann-Whitney u test, it is found that the (p value > 0.05), hence the null hypothesis is accepted. There is no significant difference between mean ranks of men and women with respect to employees' awareness, employees' perception, impact of GHRM and Lean Manufacturing, challenges of GHRM and Lean Manufacturing and improvement strategies.
3. In Kruskal-Wallis h test, it is found that the (p value < 0.05), hence the null hypothesis is rejected. There is significant difference between mean ranks of categories of age group with respect to employees' awareness and Challenges of GHRM and Lean Manufacturing. The (p value > 0.05), hence the null hypothesis is accepted. There is no significant difference between mean ranks of categories of age group with respect to employees' perception, impact of GHRM and Lean Manufacturing and improvement strategies.

4. Spearman's rank correlation is conducted on the sample data and it is found that there is a strong, positive and significant relationship among employees' Awareness, employees' Perception, the impact of GHRM and Lean Manufacturing, the challenges of GHRM and Lean Manufacturing, and improvement Strategies

SUGGESTIONS

From the findings of the study, it is recommended to create training materials that are tailored to the requirements of individuals with varying educational backgrounds. By doing this, knowledge gaps will be filled and the overall efficacy of implementation across all workforce departments would be enhanced. The learning preferences, experiences, and expectations of the different age groups within the company should be taken into consideration when designing internal communication and support systems. Workers with varying degrees of experience view difficulties in different ways. GHRM and Lean techniques can be adopted more easily, knowledge sharing can be encouraged, and perceived barriers can be decreased by establishing mentoring programs that connect less experienced staff with senior staff. With the help of consistent training, open communication, and customised interventions, the manufacturing organization should take a strategic, employee-centered approach to combining Green HRM and Lean Manufacturing in order to improve overall operational performance. Through the alignment of these practices with organizational objectives and personnel competencies, the business can attain long-term enhancements in environmental performance, efficiency, and productivity.

CONCLUSION

The purpose of this study is to investigate how Lean Manufacturing and GHRM can improve an organization's operational performance. The study's conclusions show that Lean Manufacturing and GHRM significantly improve operational performance, especially when staff members are knowledgeable about and have favourable opinions of these approaches. Organizations should use inclusive development strategies, engagement techniques, and customized communication because employee knowledge and the difficulties of GHRM and Lean Manufacturing are influenced by age and education. Strong relationships between the variables emphasize the necessity of incorporating Lean and GHRM principles into training, evaluations, and culture, making a comprehensive approach crucial. Manufacturing companies can increase operational efficiency and sustainability through inclusive implementation procedures, ongoing learning opportunities, and intentional employee involvement.

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