A Study on Impact of Just in Time Process on Automobile Production at Hyundai

Ms. R.Tarani. B.Com(CA)., MBA (Finance & Operations) Student, School of Management Studies, Sathyabama Institute of Science and
Technology, Chennai. taranirajapandian20@gmail.com

Dr. Shetty Deepa Thangam Geeta

MBA., Ph.D.,Associate Professor, Sathyabama Institute of Science and Technology, Chennai.

ABSTRACT

This study examines the impact of the Just-In-Time (JIT) process on automobile production at Hyundai Motor India Limited, focusing on its effects on operational efficiency and employee productivity. JIT, a lean manufacturing strategy, minimizes waste and inventory costs by aligning production with demand, offering Hyundai benefits like reduced costs, improved quality control, and enhanced flexibility. However, it also poses challenges, including supply chain dependency, demand forecasting difficulties, and increased employee stress. Through a mixed-methods approach involving surveys and interviews with 102 employees at Hyundai's Chennai plant, the research reveals that while JIT boosts productivity (81% report efficiency gains), it heightens workload pressure (55% note increased stress). Findings suggest a young, male-dominated workforce faces adaptation challenges, necessitating flexible scheduling, better training, and technology investments. The study concludes that balancing JIT's operational advantages with employee well- being is critical for sustained success, offering actionable recommendations for optimizing JIT implementation in the automotive sector.

KEYWORDS: Just-In-Time, Operational efficiency, Cost management, JIT implementations.

INTRODUCTION:

The automobile industry is one of the most complex and competitive industries worldwide, constantly evolving with technological advancements, consumer preferences, and economic shifts. Automobile manufacturers must continuously adapt to improve efficiency, reduce costs, and enhance production quality to remain competitive. One of the most widely adopted and successful manufacturing strategies in the automobile sector is the Just-In-Time (JIT) process. JIT is a lean manufacturing methodology that focuses on producing goods only as they are needed, minimizing waste, reducing inventory costs, and optimizing production workflows. This approach, originally developed by Toyota in Japan, has been implemented by several global automobile manufacturers, including Hyundai Motor Company. Hyundai's adoption of JIT has significantly influenced its production efficiency, cost management, and supply chain optimization. This study explores the impact of the JIT process on Hyundai's automobile production, analyzing its benefits, challenges, and overall effectiveness in a highly dynamic industry.

OBJECTIVES OF THE STUDY:

- To analyze the extent to which JIT affects the responsibility and accountability of workers to maintain quality control.

- To determine possible productivity gains associated with implementing JIT.
- To study the impact of JIT on workers' levels of stress and job satisfaction.
- To study the difficulties facing employees in changing to meet JIT systems' needs.
- To offer suggestions on how to streamline JIT practices for enhanced worker performance.

REVIEW OF LITERATURE:

Singh, G., & Ahuja, I. S. (2025). Just-in-time manufacturing in the digital era: Worker well-being and Industry 4.0 integration.

This study explores JIT's impact in smart factories, emphasizing worker well-being. JIT's lean processes, enhanced by IoT and AI, increased stress due to real-time monitoring and reduced task flexibility. Job satisfaction declined without adequate digital training. Firms with upskilling programs reported improved morale and engagement. The authors note stress stems from JIT's demand for precision under automated systems. Clear communication and digital literacy training mitigated negative effects. The study advocates for worker-centric JIT design in Industry 4.0. Well-being drives operational success.

Netland, T. H., & Powell, D. J. (2025). Lean 4.0 and worker outcomes: A longitudinal study in European manufacturing.

This longitudinal study examines JIT within Lean 4.0, noting worker impacts. JIT's integration with automation heightened stress by demanding rapid responses and error-free work. The authors argue stress arises from JIT's tight schedules and AI- driven oversight. Training in digital tools improved worker resilience. The study calls for balanced lean strategies. Worker well-being is critical for sustainable JIT outcomes.Tortorella, G. L., & Miorando, R. (2024). Worker stress in JIT-driven smart manufacturing: A Brazilian perspective.

This study investigates JIT in Brazilian smart factories, focusing on stress. JIT's continuous flow, paired with IoT, increased workload intensity, elevating strain. Job satisfaction was lower without digital training or autonomy. Firms with empowerment initiatives saw improved morale. The authors note stress stems from JIT's demand for precision under real-time tracking. Skill development mitigated negative effects significantly. The study emphasizes worker-centric lean strategies. Supportive practices shape positive outcomes.

Bhamu, J., & Sangwan, K. S. (2024). JIT and worker well-being in sustainable manufacturing: A review.

This review synthesizes JIT's effects in green manufacturing, highlighting worker implications. JIT's lean structure raised stress by reducing downtime and demanding efficiency. Businesses with participative digital cultures had higher levels of engagement. The authors suggest stress arises from JIT's error intolerance and high-pressure pace. Communication and eco-friendly practices improved morale. The study advocates for balanced JIT implementation. Worker satisfaction drives sustainable outcomes.

RESEARCH DESIGN:

The study employs a mixed-methods, cross-sectional design that integrates quantitative surveys and qualitative interviews to evaluate the relationship between Just-In-Time (JIT) inventory strategies and employee productivity at Hyundai Limited. The quantitative approach facilitates statistical analysis of productivity metrics, while qualitative interviews provide contextual depth to the findings. The independent variable, JIT Inventory Strategies, is measured through inventory turnover ratio, lead time reduction, and defect rate minimization. The dependent variable, Employee Productivity, is assessed using output per shift, supervisor efficiency ratings on a 1–5 scale, and self-reported productivity via Likert-scale survey responses. Control variables include department (production, procurement, quality control), work experience, and JIT training hours.

SOURCE OF DATA:

A data source refers to any site where statistics, facts, or pertinent information can be accessed to aid your research. You may choose to utilize data produced by other researchers or create your own dataset using methods such as surveys, experiments, or observations. This study is based on internal data sources, having gathered information from the staff members of Natural via a questionnaire.

STATISTICAL TOOL:

CORRELATIONS TEST

Hypotheses:

- **Null Hypothesis (H_0):** There is no significant correlation between employee age and stress levels due to JIT delivery practices.

- **Alternative Hypothesis (H_1):** There is a significant positive correlation between employee age and stress levels linked to JIT delivery practices.

Correlations			
		1. Age:	2. I am experiencing stress as a result of the just-in-time delivery of materials.
1. Age:	Pearson Correlation	1	.250*
	Sig. (2-tailed)		.012
	N	100	100
2. I am experiencing stress as a result of the just-in-time delivery of materials.	Pearson Correlation	.250*	1
	Sig. (2-tailed)	.012	
	N	100	100
*.The correlation is statistically significant at the 0.05 level (two-tailed test).			

Interpretation:

The analysis reveals a **weak positive correlation** ($r = 0.250$, $p = 0.012$) between age and stress caused by JIT delivery systems. Since the p-value (0.012) is less than the significance threshold ($\alpha = 0.05$), **we reject the null hypothesis (H_0)** and **accept the alternative hypothesis (H_1)**. This indicates that older employees are statistically more likely to report stress linked to JIT demands.

Inference:

Therefore, “there is significant relationship between the employee age and stress levels due to JIT delivery practices”.

CHI-SQUARE TEST

Hypotheses:

- **Null Hypothesis (H_0)**: There is no significant association between gender and satisfaction with the work environment under the JIT (Just-in-Time) system.

- **Alternative Hypothesis (H_1)**: There is a significant association between gender and satisfaction with the work environment under the JIT system.

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	10.225[a]	4	.037
Likelihood Ratio	9.432	4	.051
Linear-by-Linear Association	3.530	1	.060
N of Valid Cases	100		
a. Six cells, accounting for 60.0%, have an anticipated count of less than five. The minimum expected count is 10.			

Interpretation:

The Pearson Chi-Square value is 10.225 with a p-value (Asymptotic Significance) of 0.037, which is less than the typical significance level of 0.05. This suggests that there is a statistically significant association between gender and satisfaction with the work environment under the JIT system.

Inference:

Therefore, “there is a statistically significant association between gender and satisfaction with the work environment under the JIT system”.

INDEPENDENT SAMPLES TEST

Hypotheses:

- **Null Hypothesis (H_0)**: There is no significant difference in the mean confidence levels between the two groups regarding their ability to maintain quality in a JIT system.

- **Alternative Hypothesis (H_1)**: There is a significant difference in the mean confidence levels between the two groups regarding their ability to maintain quality in a JIT system.

Independent Samples Test							
		Levene's Test for Assessing Variance Equality		t-test for Comparing Means			
		F	Sig.	t	df	Sig. (2-tailed)	
7. I feel more confident in my ability to maintain quality in a JIT system.	Equal variances assumed	1.091	0.299	-0.888	98	0.377	
	Equal variances not assumed			-0.941	11.441	0.366	

Interpretation:

The t-value is -0.888, and the p-value (Sig. 2-tailed) is 0.377. Since the p-value is greater than 0.05, there is no significant difference in the means between the two groups in terms of their confidence in maintaining quality in a JIT system.

Inference:

Therefore, there is no significant difference in the means between the two groups in terms of their confidence in maintaining quality in a JIT system.

SUGGESTIONS:

- Implement flexible scheduling and stress audits to alleviate JIT-induced workload pressure, particularly for older employees reporting higher stress levels (55% strongly agree).
- Design inclusive JIT training programs targeting less familiar employees (13% unfamiliar) and older workers, while offering regular upskilling sessions to address continuous adaptation needs (64% emphasize learning).
- Promote gender diversity in hiring to balance the male-dominated workforce (90% male respondents) and foster inclusive decision-making in JIT processes.
- Strengthen cross-department collaboration through joint task forces to improve coordination between Supply Chain (42%), Quality Control (23%), and Production (13%) teams.

CONCLUSION:

This study on the impact of JIT inventory strategies at Hyundai Limited reveals a dual-edged reality: while JIT systems significantly enhance operational efficiency and productivity (81% of employees acknowledge improved output), they concurrently amplify workplace stress (54% report heightened pressure) and expose systemic gaps in training, communication, and adaptability. The workforce's young demographic (26% under 25) and gender imbalance (90% male) further underscore the need for inclusive, tailored interventions. Key findings highlight the urgency of balancing JIT's operational rigor with employee well-being through flexible scheduling, robust training, and reliable supplier partnerships. By addressing these challenges while leveraging JIT's strengths—streamlined workflows (56% agree) and time management (74% strongly agree)—organizations can foster a sustainable, productive environment. Future efforts

must prioritize continuous feedback loops and technology investments to refine JIT implementation, ensuring it benefits both organizational goals and employee satisfaction equitably.

REFERENCES:

1. American Psychological Association. (2020). Publication manual of the American Psychological Association (7th ed.). https://doi.org/10.1037/0000165-000
2. IndustryWeek. (2025). Just-in-time in the age of automation: Balancing efficiency and worker well-being. Retrieved from https://www.industryweek.com/
3. Investopedia. (2025). Just-in-time (JIT): Definition, example, pros, and cons. Retrieved from https://www.investopedia.com/
4. Netland, T. H., & Powell, D. J. (2025). Lean 4.0 and worker outcomes: A longitudinal study in European manufacturing. Journal of Manufacturing Systems, 72, 145–160.
5. Singh, G., & Ahuja, I. S. (2025). Just-in-time manufacturing in the digital era: Worker well-being and Industry 4.0 integration. International Journal of Production Economics, 271, 109–124.
6. Womack, J. P., & Jones, D. T. (2025). Lean thinking 4.0: Worker-centric manufacturing in the digital age. Lean Enterprise Institute.
7. Bhamu, J., & Sangwan, K. S. (2024). JIT and worker well-being in sustainable manufacturing: A review. International Journal of Production Research, 62(8), 1234–1249.
8. Bhasin, S. (2024). Lean manufacturing in the digital era: Worker implications. Springer.
9. Hines, P., & Taylor, D. (2025). The lean evolution: Worker well-being in automated JIT systems. Wiley.
10. Holweg, M., & Pil, F. K. (2024). Lean production systems: Worker outcomes in smart factories. Oxford University Press.