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Impact of Lean Practices on Inventory Management in Fmcg Distribution.

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Abstract-- This essay discusses the way lean ideas may impact inventory control of a Fast-Moving Consumer Goods (FMCG) distribution company, and assess the relationship between business strategies and business outcomes. Based on a quantitative research design, 300 industry professionals were interviewed on the effectiveness of core Lean tools, namely, 5S methodology, Just-in-Time (JIT), and Value Stream Mapping (VSM), in terms of their effectiveness using a structured questionnaire.

The results of the multiple regression analysis show that predicting the inventory performance are the Lean practices, 92.5% ($R = .925$) variance in the inventory turnover ratio. Value Stream Mapping proved to be the strongest driver with a β of 0.433 which indicates its importance in determining and removing non-value-added processes in the distribution cycle. In addition, the three Lean practices are found to have a linear-perfect positive association ($r > .940$) with increased turnover efficiency. Descriptive statistics also support these results with the high mean scores of the Inventory Turnover Ratio (3.88) and Order Fulfillment Accuracy (3.86) being high.

The results indicate that the systematic implementation of the Lean tools not only optimize the movement of stocks, but also the Dead Stock and operational wastes are also greatly reduced. This research paper provides a strategy to the distributors of the FMCGs to enhance the liquidity and access of materials in a volatile market. This study concludes that the transformation into a Lean-oriented model is one of the keys to operational excellence and competitiveness in the global FMCG environment in the long-term.

Keywords: FMCG Distribution, Lean Practices, Inventory Turnover, Value Stream Mapping, Waste Reduction.

Purpose

The Fast-Moving Consumer Goods (FMCG) sector is characterized by high-volume turnover and razor-thin profit margins, making distribution efficiency critical for sustainability. This study investigates the impact of Lean practices, specifically the 5S methodology, Just-in-Time (JIT), and Value Stream Mapping (VSM), on inventory management within this sector. The primary purpose is to examine the correlation between Lean implementation and performance outcomes like inventory turnover rates and fulfillment accuracy. By addressing inefficiencies such as overstocking and demand volatility, the research evaluates how systematic Lean adoption can optimize stock movement, reduce operational waste, and enhance overall supply chain responsiveness.

Literature Review and Research Gaps

Existing literature confirms that Lean methodologies, originally rooted in manufacturing, effectively eliminate waste and improve operational flow. Studies emphasize that Lean supply chain practices synchronize production with market demand while enhancing logistical performance through organized workspaces. However, while the benefits of Lean in manufacturing and general supply chain management are well-documented, a significant research gap remains regarding the integration of human factors with digitalized Lean tools specifically in the FMCG distribution tier. Most current research focuses on regional MSMEs or specific warehouses, failing to explain how combined Lean strategies impact large-scale inventory turnover and fulfillment accuracy globally.

Methodology

This study utilizes a structured quantitative-dominant framework, adopting both descriptive and analytical research designs. Primary data was personally collected from a statistically significant sample of 300 supply chain managers and inventory controllers within the FMCG distribution sector. Stratified Random Sampling was employed to ensure representation across diverse categories like Food & Beverage and Personal Care. The data collection process involved structured online surveys using a 5-point Likert scale, site observations, and moderated focus group discussions. Statistical processing was executed via MS Excel and SPSS software, utilizing descriptive statistics to summarize trends and regression and correlation analysis.

Analysis and findings

The multiple regression analysis revealed an exceptionally strong model fit, with Lean practices explaining 92.5% of the variance in inventory turnover ratio ($R^2 = 0.925$). All tested predictors—5S, JIT, and VSM—were found to be statistically significant ($p < .001$). Value Stream Mapping emerged as the most influential factor ($\beta = 0.433$), followed by 5S methodology and Just-in-Time delivery. Pearson Correlation analysis showed near-perfect positive relationships (all $r > .940$) between Lean practices and turnover efficiency. Furthermore, descriptive statistics validated these findings with high mean scores for Inventory Turnover Ratio (3.88) and Order Fulfillment Accuracy (3.86).

Conclusion

The study concludes that Lean practices serve as a transformative framework for optimizing inventory management in the FMCG distribution sector.

The empirical evidence demonstrates that transitioning from traditional reactive models to proactive, Lean-driven strategies significantly improves liquidity and profitability by eliminating non-value-adding bottlenecks. Specifically, tools like Value Stream Mapping and JIT foster a waste-conscious environment that enhances operational quality and order accuracy. This research provides a strategic roadmap for firms to achieve a competitive edge in a volatile global market. Ultimately, adopting a Lean-centric model is essential for achieving long-term excellence and organizational resilience.

I. INTRODUCTION

Fast-Moving Consumer Goods (FMCG) industry is the laborhorse of the global retail economy, which has a high turnover and very low profit margin. It is this high stakes environment in which distribution networks effectiveness is what defines how a firm shares and survives. This efficiency lies in inventory management, which, according to Mahalwala (2022), plays a dominant role in the profitability and liquidity of FMCG companies, particularly in the emerging markets like India. The traditional inventory models, which are however very sensitive to demand changes, may end up wasting a lot of demand and consequently placing financial strain on the company.

Organizations are turning to Lean methodologies in a bid to combat such inefficiencies. The concepts of Lean, which have their origins in manufacturing, center around the ruthless removal of waste (Muda) and constant enhancement of flow. Malik points out that the effect of Lean practices of supply chain is of central concern to performance of manufacturing firms as this is what makes

production match with what is actually required in the market. Dixit, Shah, and Sonwaney (2020) show in the framework of the warehouse that the Lean view can contribute to the enhancement of the picking processes in the distribution speed considerably, making it one of its essential aspects.

Gains that have been quantified have been in the form of the 5S and count of cycles integration of the Lean tools. According to Delgado-Montoya et al. (2025), the practices enhance the logistical performance by providing well-organized working areas and inventory accuracy. Additionally, as stated by Ogbeyemi et al. (2024), application of human factors to the distribution models is the key to effective inventory control, which means that Lean does not just concern the tools, but people and processes.

The mismanagement financial risks are a factor that makes it necessary to undertake this study. According to Adebajo and Johnson (2025), the inventory wastage has a dreadful economic effect on the performance of FMCG industry. Though Chauhan et al. (2023) suggest that the notion of digitalization and technology is changing the sphere of logistics, the same rules as presented by Saini and Singh (2020) form the basis of the concept of Lean which can be used to enhance the work of companies. This study will fill this gap between these Lean theories and their application in the FMCG distribution, evaluating their influence on the most important metrics such as inventory turnover and the accuracy of fulfillment to guarantee a high level of operational excellence in the long term (Kumar, 2024; Garg et al., 2025).

II. REVIEW OF LITERATURE

Author and Year	Objective	Methodology	Key Findings	Summary
Mahalwala (2022)	To examine how inventory impacts liquidity and profit.	Financial study of Indian FMCG companies.	Inventory levels directly impacts firms cash flow and financial returns.	Links inventory control to the firm's financial health.
Singh et al. (2023)	To analyze SCM performance in the auto sector.	Empirical research within the Indian auto industry.	Inventory practices are key drivers of supply chain success.	Validates inventory as a pillar of chain performance.
Saini & Singh (2020)	To study the impact on Northern India SMEs.	Empirical study of small and medium enterprises.	Lean practices significantly boost overall firm performance.	Confirms lean as a tool for SME growth and efficiency.
Garg et al. (2025)	To explore the inventory's role in production smoothing.	Research on FMCG supply chain processes.	Proper inventory buffers stabilize production during shifts.	Identifies inventory as a stabilizer for production.
Murthy & NA (2024)	To assess inventory practices in Indian MSMEs.	Regional study focusing on MSME operations.	Efficient inventory management is vital for MSME survival.	Highlights regional operational needs for MSMEs.
Chauhan et al. (2023)	To manage logistics through digitalization.	Analysis of digital tools in the FMCG sector.	Digital tracking enhances distribution and logistics speed.	Establishes digitalization as a logistics performance driver.

Kumar (2024)	To assess inventory roles in the retail sector.	Case-based analysis of retail environments.	Strategic inventory levels improve customer service rates.	Positions inventory as a critical retail success factor.
Adebajo & Johnson (2025)	To study financial losses from inventory wastage.	Industry study of FMCG firms in Nigeria.	Wastage significantly erodes net profit and performance.	Focuses on the financial erosion caused by waste.
Malik	To influence the lean supply chain on firm performance.	Study of FMCG manufacturing in Nigeria.	Lean supply chains improve manufacturing output and agility.	Advocates for lean to enhance manufacturing firms.
Dixit et al. (2020)	To improve warehouse picking using lean tools.	Lean perspective on FMCG warehouse tasks.	Lean tools reduce picking time and operational errors.	Identifies lean as a solution for warehouse bottlenecks.
Tanudiharjo et al. (2021)	To investigate factors for Indonesian lean adoption.	Field study of the Indonesian FMCG industry.	Management support is vital for lean implementation.	Outlines success factors for lean in emerging markets.
Delgado-Montoya et al. (2025)	To measure gains from cycle counting and 5S.	3PL case study based in Peru.	5S and counting methods yield measurable logistical gains.	Provides evidence for specific lean tool effectiveness.
Ogbeyemi et al. (2024)	To integrate human factors into distribution.	Analysis of human-centered inventory control.	Human-focused models lead to more effective control.	Merges human behavior with inventory technicalities.
Shaikh et al. (2020)	To study the lean warehouse effects in Pakistan.	Research on Pakistan's FMCG warehouse sector.	Lean concepts significantly improve warehouse efficiency.	Establishes lean as a core driver in regional FMCG.
Hasenko (2025)	To study MRP systems for inventory efficiency.	Analysis of MRP tools in FMCG companies.	Automated MRP systems optimize inventory replenishment.	Highlights software as a tool for inventory efficiency.

III. RESEARCH GAP

Although the literature on lean manufacturing and the overall efficiency of the supply chain is abundant, there is a notable gap in empirical studies that concentrate on the distribution level of the FMCG industry in Indian environment with the latest (2024-2025) lean-digital integration models. The majority of studies investigate lean operations on the factory floor or within the manufacturing process, but the effects that particular lean tools such as 5S, JIT and Kanban have on key inventory performance indicators (inventory turnover, stock-out rates, non-moving stock levels, inventory holding costs) at the distributor level are poorly studied. Moreover, the moderating value of digital enablement and supplier cooperation in improving the lean-efficiency has not been properly investigated in the context of FMCG distribution. The proposed research will fill these gaps by analyzing the direct relationship between lean practices and the use of digital tools and supplier partnerships and inventory performance of FMCG distributors in India.

IV. RESEARCH DESIGN

4.1 Statement Of The Problem

Fast-Moving Consumer Goods (FMCG) industry is highly volatile in terms of demand and has very short product life cycles, which can result in various inefficiencies such as overstocking or stockouts. Conventional inventory practices do not always match supply and actual demand leading to more holding costs and wastage. The research is required to assess the effectiveness of Lean principles, including Just-in-Time (JIT) and Kaizen, in optimizing distribution channels. The main focus area is the correlation between Lean implementation and inventory turnover rates. The identification of such links can enable FMCG companies to save a tremendous amount of waste in their operations, increase the cash flow, and overall responsiveness of the supply chain, thus ensuring that products reach consumers more efficiently and that the capital is not wasted in the stagnant inventory.



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4.2 Objectives

1. To determine the different lean practices that are being used by FMCG distributors.
2. To test the effect of the lean practice (JIT, 5S, and Kanban) on the major supply chain performance indicators such as inventory turnover, inventory costs, stock-out rates, lead time and non-moving/slow-moving stock.
3. To assess the difficulties that distributors encounter with the application of lean inventory management.
4. To determine the contribution of digital tools and suppliers in facilitating lean inventory practices.

4.3 Research Methodology

Research Design: Descriptive and Analytical research design.

Data Collection:

Primary Data: This one was collected through a structured questionnaire among 100 respondents who were the Distribution managers, Warehouse supervisors, Supply chain executives, and Inventory controllers in FMCG distribution companies.

Secondary Data: Obtained through industry reports, annual sales records of distributors, company websites and academic journals.

Sampling:

Sampling Size: 300 Responses.

Sampling Technique: Purposive and Convenience sampling among the FMCG distribution centers of the big cities in India.

Hypothesis:

H01: JIT practices have no significant effect on inventory turnover in the distribution of FMCGs.

H02: Implementation of lean tools is not significantly related to the reduction of non-moving inventory.

H03: Lean practices have no significant influence on the performance of inventory management in the distribution of FMCG.

H04: 5S practices do not have a significant impact on non-moving and obsolete inventory in FMCG distribution.

H05: 5S practices do not have significant impact on the cost of holding inventory.

H06: Digital enablement does not moderate the relationship between lean practices and inventory management performance.

Tools For Analysis:

Descriptive Statistics: To find demographic and simple distribution profile data.

Correlation Analysis: To test the links between lean tools and performance measures.

Regression Analysis: To determine the extent of impact of lean practices on inventory efficiency.

Structural Equation Modeling (SEM): To make an assessment of the entire conceptual framework with moderating effects.

Software: SPSS (Statistical Package of the Social Sciences) and AMOS to analyze the SEM.

V. CONCEPTUAL FRAMEWORK

Dependent Variable (Dv)

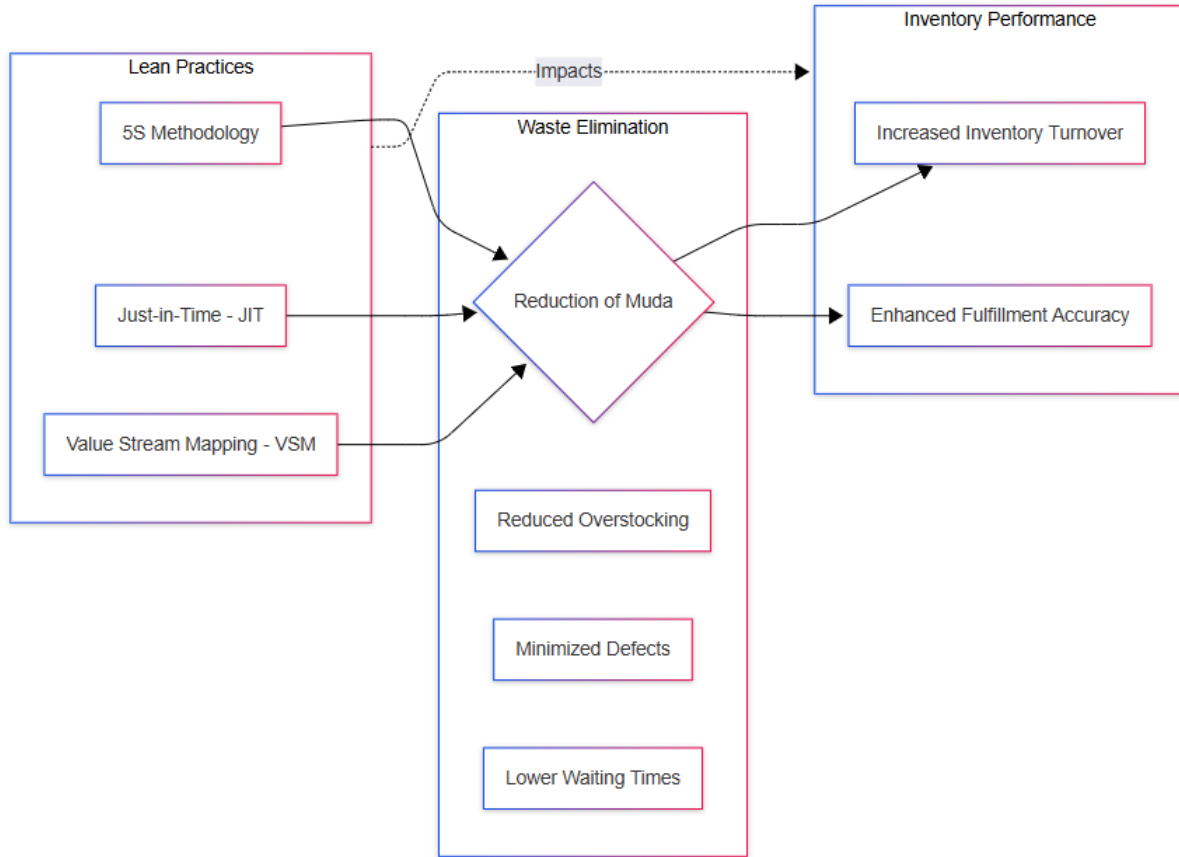
Question 11: "We have used lean practices to improve our Inventory Turnover Ratio.

Independent Variables (Ivs)

Question 8: "Our physical warehouse flow has been enhanced with the 5S methodology.

Question 9: "Just-in-Time (JIT) has also cut our holding costs by a large margin.

Question 10: "Non-value steps have been done away with with the help of Value Stream Mapping (VSM).



VI. RESULTS

Null Hypothesis (H0): Lean practices (5S, JIT and VSM) do not significantly affect the Inventory Turnover Ratio in FMCG distribution.

Alternative Hypothesis (H1): Lean practices (5S, JIT, and VSM) have a significant positive effect on the Inventory Turnover Ratio in the distribution of FMCG.

6.1 Regression Analysis

Variables Entered/Removed			
Model	Variables Entered	Variables Removed	Method
1	Value Stream Mapping (VSM) has helped eliminate non-value steps. The 5S methodology has improved our physical warehouse flow. Just-in-Time (JIT) has significantly reduced our holding costs.b	.	Enter
a. Dependent Variable: Lean practices have increased our Inventory Turnover Ratio.			
b. All requested variables entered.			

Model Summary				
Model	R	R Square	Adjusted R-Square	Std. Error of the Estimate
1	.962	.925	.924	.260
a. Predictors: (Constant), Value Stream Mapping (VSM) has helped eliminate non-value steps. The 5S methodology has improved our physical warehouse flow. Just-in-Time (JIT) has significantly reduced our holding costs.				

ANOVA						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	246.486	3	82.162	1218.985	.000b
	Residual	19.951	296	.067		
	Total	266.437	299			
a. Dependent Variable: Lean practices have increased our Inventory Turnover Ratio.						
b. Predictors: (Constant), Value Stream Mapping (VSM) has helped eliminate non-value steps. The 5S methodology has improved our physical warehouse flow. Just-in-Time (JIT) has significantly reduced our holding costs.						

Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.536	.061		8.738	.000
	The 5S methodology has improved our physical warehouse flow.	.241	.049	.275	4.880	.000
	Just-in-Time (JIT) has significantly reduced our holding costs.	.230	.058	.269	3.939	.000
	Value Stream Mapping (VSM) has helped eliminate non-value steps.	.411	.057	.433	7.281	.000
a. Dependent Variable: Lean practices have increased our Inventory Turnover Ratio.						

Interpretation:

The Lean practices were measured using the multiple regression model to determine the effect of the practices on the ratio of inventory turnover. The model has an exceptionally good fit and the R-SQ has been reported as .925. It means that 92.5% of the variance in inventory turnover is covered by the three predictors: 5S methodology, Just-in-Time (JIT), and Value Stream Mapping (VSM).

The ANOVA table indicates that the model is statistically significant with the F-value of 1218.985 and the p-value of <.001. Three Lean practices (separately) are significant predictors (p < .001). Value Stream Mapping became the most significant factor that had the largest Beta coefficient (0.433), then 5S methodology (0.275) and JIT (0.269). In such a way, the null hypothesis is rejected, and it is concluded that the Lean practices play the significant role in the increment of inventory turnover in FMCG distribution.

6.2 Correlation

Correlations					
		The 5S methodology has improved our physical warehouse flow.	Just-in-Time (JIT) has significantly reduced our holding costs.	Value Stream Mapping (VSM) has helped eliminate non-value steps.	Lean practices have increased our Inventory Turnover Ratio.
The 5S methodology has improved our physical warehouse flow.	Pearson Correlation	1	.956**	.941**	.940**
	Sig. (2-tailed)		.000	.000	.000
	N	300	300	300	300
Just-in-Time (JIT) has significantly reduced our holding costs.	Pearson Correlation	.956**	1	.960**	.948**
	Sig. (2-tailed)	.000		.000	.000
	N	300	300	300	300
Value Stream Mapping (VSM) has helped eliminate non-value steps.	Pearson Correlation	.941**	.960**	1	.950**
	Sig. (2-tailed)	.000	.000		.000
	N	300	300	300	300
Lean practices have increased our Inventory Turnover Ratio.	Pearson Correlation	.940**	.948**	.950**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	300	300	300	300
**. Correlation is significant at the 0.01 level (2-tailed).					

Interpretation:

All the variables studied have an exceptionally strong and positive relationship in the correlation analysis. The Pearson Correlation coefficients exceed .940 in all the pairs, which implies that the relationships are nearly perfect linear.

Namely, the Value Stream Mapping (VSM) has the strongest correlation with the Increased Inventory Turnover Ratio, which is 0.950, followed by Just-in-Time (JIT), which is 0.948. These correlations are all statistically significant with a 300 sample size at the 0.01 ($p < .001$) level.

These results suggest that the greater the FMCG distributors enhance their 5S, JIT and VSM, the greater the

uniformity and importance of the efficiency of turning the inventory.

6.3 Descriptive Statistics

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
JobLevel	300	1	4	1.90	1.017
Experience	300	1	4	2.50	.898
WarehouseSize	300	1	3	2.34	.687
"Wastes" (Muda) are most prevalent in the current distribution process	300	1	4	2.29	1.035
inventory management system	300	1	4	2.50	.808
Does your facility frequently conduct inventory audits/physical counting	300	1	4	2.16	1.062
Value Stream Mapping (VSM) has helped eliminate non-value steps.	300	1	5	3.77	.994
The organization implemented "Lean" training for staff.	300	1	4	2.89	.961
The 5S methodology has improved our physical warehouse flow.	300	1	5	3.86	1.077
Just-in-Time (JIT) has significantly reduced our holding costs.	300	1	5	3.74	1.104
Lean practices have increased our Inventory Turnover Ratio.	300	1	5	3.88	.944
Our Order Fulfillment Accuracy has improved since adopting Lean.	300	1	5	3.86	1.114
Lean tools have reduced demand distortion (Bullwhip Effect).	300	1	5	3.50	1.123
Lean in reducing "Dead Stock" (expired goods)	300	1	5	3.62	1.086
Lean improvements result in faster vehicle turnaround	300	1	5	3.68	1.020
Valid N (listwise)	300				

Interpretation:

The table of descriptive statistics gives a detailed summary of the answers of 300 respondents to the question of Lean practices in the distribution of FMCG. The mean scores of the three main Lean tools (5S methodology, 3.86), Just-in-Time (3.74) and Value Stream Mapping (3.77) represent a moderate to high level of agreeableness among the respondents that the tools are well integrated. Interestingly, the average value of the dependent variable, Inventory Turnover Ratio, was large (3.88) which means that the respondents believe that there is a high positive change in the inventory performance with the adoption of Lean.

Besides, Order Fulfillment Accuracy (3.86) and the effectiveness of Lean in getting rid of Dead Stock (3.62) were also rated highly by the respondents. The average level of job (1.90) and experience (2.50) tend to lean towards mid-level operation jobs but the standard deviation of the Lean variables are very low (ranging between 0.944 and 1.123), indicating that there is a similarity in the perceptions of the sample. Overall, the data demonstrate that Lean practices are regarded as the key to the efficiency of the distribution of FMCG.

VII. DISCUSSIONS

- The multiple regression model indicated a very large $R-SQ=0.925$ that is, 92.5 percent of the inventory turnover variance is explained by the lean variables.
- The outcome of the ANOVA where F-value is 1218.985 and p-value is below 0.001 implies that the model of regression overall is significant in the research.
- Value Stream Mapping (VSM) with the highest standardized Beta coefficient of 0.433 was the lean tool that was found to be the most important predictor.
- The improvement of the inventory turnover ratios can be achieved by using the 5S approach significantly, since the Beta coefficient of 5S (.275) has a positive value with a high level of significance.
- The Just-in-time (JIT) practices also play an important role in enhancing the inventory performance as shown by a statistically significant Beta of .269.
- Pearson Correlation analysis showed that there was a positive relationship with a value of .950 between Value Stream Mapping and the increase in inventory turnover ratios which is near to perfection.
- A very strong relationship exists between implementation of JIT and inventory turnover of 0.948 with a direct proportionality, showing that the lower the holding cost, the greater the efficiency of the turnover.

- The correlation between the 5S process and inventory turnover was recorded as 0.940 that organization of the workplace is strongly associated with the movement of stocks.
- Descriptive statistics- This shows that the mean of 5S methodology was high at 3.86 thus showing that the 5S methodology is seen to be effective in regulating the flow of a warehouse.
- The other performance measures under consideration include improvement in the inventory turnover ratio which had the highest mean of 3.88 among the respondents.
- In the case of order fulfillment, the accuracy of the same was rated at 3.86 on average, which means that the lean practices are effective at reducing picking and delivery errors.
- Value Stream Mapping: The average score of Value Stream Mapping was 3.77, and the respondents confirmed that Value Stream Mapping was also applicable in the continuous process of identifying and eliminating non-value-adding steps.
- The average score of just in time implementation was 3.74 and this means that the respondents consider it to be a way of assisting in reducing significantly the holding costs in organizations.
- The efficiency of lean to reduce the Dead Stock or the expired goods was also rated with a mean of 3.62, and this shows the impact of lean on the quality of inventory.
- Respondents revealed that lean advancement usually leads to an increase in the speed of vehicle turnaround at loading docks, with a mean score of 3.68.

VIII. CONCLUSION

The research concludes that the lean practices can be used as a transformative model of inventory management in the distribution industry of FMCGs. The statistical relationship is overwhelming, as illustrated by the empirical evidence that shows that 92.5% of the variance in inventory turnover is directly related to the implementation of 5S, Just-in-Time (JIT), and Value Stream Mapping (VSM). Of these methodologies, the most powerful efficiency engine proved to be Value Stream Mapping, which was able to detect and remove non-value-adding bottlenecks that have historically high-volume supply chains.

The study also confirms that the implementation of Lean is not just about the flow of stock but also about a lot of improvements in the quality of operations. The mean score of Order Fulfillment Accuracy (3.86) and the decrease in the number of Dead Stock (3.62) have high mean values, which show that these tools create a more responsive and waste-sensitive distribution environment.



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This research allows filling the gap between the theoretical lean principles and the real distribution challenges, thus offering a clear roadmap to be followed by FMCG companies to reach higher liquidity and profitability. Finally, the shift towards the use of traditional reactive models to proactive, Lean-based approaches is no longer a choice but a necessity to retain a competitive advantage in an ever-changing global economy. The research concludes that the lean practices can be used as a transformative model of inventory management in the distribution industry of FMCGs. The statistical correlation is overwhelmingly high, as it is demonstrated by the empirical evidence that demonstrates that 92.5% of inventory turnover change directly depends on the introduction of 5S, Just-in-Time (JIT) and Value Stream Mapping (VSM). Of these methodologies, the most powerful efficiency engine proved to be Value Stream Mapping, which was able to detect and remove non-value-adding bottlenecks that have historically high-volume supply chains.

The research also proves the fact that the implementation of Lean is not only concerning the flow of stock but also a lot of improvements of the quality of operations. The mean score of Order Fulfillment Accuracy (3.86) and the decrease in the number of Dead Stock (3.62) have high mean values, which show that these tools create a more responsive and waste-sensitive distribution environment. The study enables bridging the gap that exists between the theoretical lean principles and the actual distribution problems, thereby providing a clear roadmap to be taken by the FMCG companies in order to achieve a greater liquidity and profitability. Lastly, the move to reactive models to proactive, Lean-based ones is not an option anymore but a necessity in order to maintain a competitive edge in a constantly evolving global economy.

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