

A Study on the Effectiveness of Six Sigma Implementation in Mahindra Logistics

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Abstract

In today's highly competitive business environment, organizations are continuously striving to enhance operational efficiency, reduce costs, and improve customer satisfaction. Six Sigma has emerged as a powerful methodology for process improvement and quality enhancement. This study focuses on analyzing the effectiveness of Six Sigma implementation in Mahindra Logistics, particularly in the Salem region. The research evaluates process efficiency, lead-time reduction, customer satisfaction, and overall organizational performance. Data was collected from 150 respondents using structured questionnaires and analyzed using statistical tools such as percentage analysis, chi-square, correlation, and ANOVA. The findings reveal that Six Sigma significantly contributes to process improvement, cost reduction, and enhanced customer satisfaction. The study concludes that effective implementation of Six Sigma leads to operational excellence and sustainable competitive advantage in the logistics sector.

Keywords:

Six Sigma, Logistics, Process Improvement, Customer Satisfaction, Supply Chain Management, DMAIC

1. Introduction

The rapid growth of competition in modern business environments has made it essential for organizations to focus on quality, efficiency, and customer satisfaction. Lean and Six Sigma are widely recognized methodologies that help organizations achieve these objectives. Six Sigma, in particular, emphasizes reducing defects, minimizing process variation, and improving overall performance through a data-driven approach.

Six Sigma is not only limited to manufacturing but has expanded into service sectors, including logistics. In logistics, where timely delivery, inventory control, and operational efficiency are critical, Six Sigma plays a vital role in optimizing processes and reducing inefficiencies.

This is an overview of two known improvement strategies lean and six sigma. The principles, benefits, critical success factors, and advantages are illustrated and opportunities to measure and control the performance are also studied.

2. Need for the Study

The logistics sector is dynamic and complex, requiring continuous improvement strategies. Implementing Six Sigma helps organizations:

Customer needs to Product Driven Features of Six Sigma Methodology:

- Six Sigma is designed to avoid waste and in efficiency, thereby increasing customer satisfaction by delivering what the customer is really expecting.
- Six Sigma is strictly structured and disciplined methodology, which is very specific for the particular participants.
- Reduce operational inefficiencies
- Improve service quality

- Enhance customer satisfaction
- Achieve cost efficiency

However, challenges such as lack of skilled personnel, training requirements, and adaptability issues make it essential to study its effectiveness in real-time environments.

3. Objectives of the Study

Primary Objective

- To study the effectiveness of Six Sigma implementation in Mahindra Logistics.

Secondary Objectives

- To analyze order cycle time and process efficiency
- To examine supply chain performance using Lean Six Sigma
- To evaluate departmental performance
- To study customer satisfaction and operational improvements

4. Literature Review

Previous studies highlight the significance of Six Sigma in improving organizational performance. Researchers emphasize that Six Sigma reduces defects to 3.4 per million opportunities and enhances quality and efficiency.

Dean and Bowen (2017)¹ The Six Sigma concept was first introduced by logistics Company in the mid-1980s, built on the philosophy of Total Quality Management. Since its inception, thousands of organizations have become ‘Six Sigma companies’ and a number of variants on the original concept have been developed, often combining Six Sigma with ideas from other improvement defined QM to include techniques and a set of principles and practices approaches. The monetary aspect was then emphasized

Linderman et al (2018)² The goal of less than defects per million opportunities was suggested, but was not included in the definition because ‘Six Sigma advocates establishing goals based on customer requirements. A trend of diversification of research topics from primarily manufacturing focused to more general in nature (service-related) included an increasing academic participation and broader focus than solely on manufacturing. Another trend of omitting the statistical texts and theory and simplifying standard statistical methods was presented by

Hahn et al (2018)³ The Six Sigma became more like a practice than a core method, as defined by The literature review allows emerging trends and issues in Six Sigma to be highlighted, enabling the future work to progress as Six Sigma continues to develop and evolve. It also open up new opportunities to apply Six Sigma in the fields that are not widely explored before. To keep pace, the shipping department implements a “load and go” process, whereby trailers are loaded as quickly as possible with no concern for preventing damage to products. Although all orders are shipped, a large number of orders are refused by customers due to damage caused during the loading and transportation process. In order to rectify the matter, the manufacturer expedites a replacement order for the customer and agrees to pay for the expedited shipping.

¹ **Dean and Bowen (2017)** Managing theory and total quality: Improving research and practice through theory development, *Academy of Management Review*, 19 (3), 392-418.

² **Linderman et al (2018)** Six Sigma: a goal-theoretic perspective. *Journal of Operations Management*, 21 (2), 193-203.

³ **Hahn et al (2018)** Statistical tools for Six Sigma-what to emphasize and de-emphasize in training, *Quality progress*, 34 (9), 78-82.

5. Research Methodology

Research Design

Descriptive research design was adopted to analyze the current practices and effectiveness of Six Sigma. The research design adopted for the studies is descriptive design. The researcher has to describe the present situation in order to know the retention of the customers.

Data Collection

- **Primary Data:** Collected through questionnaires and interviews
- **Secondary Data:** Secondary data means the data that are already available. Generally speaking secondary data is collected by some organizations or agencies which have already been processed when the researcher utilizes secondary data; the process of secondary data collection and analysis is called desk research.

Sample Size

The study based only on the opinion and expectation of customer Total number of sample taken for the study is 150 respondents.

Sampling Technique

- Convenience sampling

Statistical Tools Used

- Percentage Analysis
- Chi-Square Test
- Correlation Analysis
- ANOVA

6. Data Analysis and Interpretation

GENDER OF THE RESPONDENTS

S.NO	GENDER	NO. OF RESPONDENTS	PERCENTAGE (%)
1	Male	90	60.0%
2	Female	60	40.0%
	Total	150	100.0%

MARITAL STATUS OF THE RESPONDENTS

S.NO	MARITAL STATUS	NO. OF RESPONDENTS	PERCENTAGE (%)
1	Married	93	62.0%
2	Unmarried	57	38.0%
	Total	150	100.0%

The above table shows that marital status of the respondents, 62.0% of the respondents are married, 38.0% of the respondents unmarried.

MONTHLY INCOME OF THE RESPONDENTS

S.NO	MONTHLY INCOME	NO. OF RESPONDENTS	PERCENTAGE (%)
1	Below Rs.10,000	28	18.7%
2	Rs.10,000-Rs.20,000	55	36.7%
3	Rs.20,000 – Rs. 30,000	40	26.7%
4	Above Rs. 30,000	27	18.0%
	Total	150	100.0%

ANOVA

Educational Qualifications	Sum of Squares	df	Mean Square	F	Sig.
Between Groups (Combined)	246.818	4	61.704	394.922	.000
Linear Term	97.094	1	97.094	621.426	.000
Unweighted	236.467	1	236.467	1.513E3	.000
Weighted	10.351	3	3.450	22.082	.000
Deviation	22.655	145	.156		
Within Groups					
Total	269.473	149			

Educational Qualifications

	Benefits to motivate good relations between workers	N	Subset for alpha = 0.05			
			1	2	3	4
Student-Newman-Keuls ^a	Highly satisfied	63	1.52			
	Satisfied	39		3.00		
	Neutral	25			4.00	
	Dissatisfied	17				4.94
	Highly Dissatisfied	6				5.00
	Sig.		1.000	1.000	1.000	.672

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 16.286.

Key Findings

- **60%** of respondents are male; **40%** are female
- Majority (36.7%) belong to the **25–35 age group**
- **44%** agree that logistics services reduce lead time
- **33.3%** strongly agree that Six Sigma improves business processes
- **38%** strongly agree that Six Sigma increases financial performance

- **83.3%** believe customer satisfaction is the biggest improvement factor
- **80%** highlight talent development as a key success factor

Statistical Insights

- Chi-square test shows **no significant relationship** between experience and performance improvement
- Correlation analysis indicates a **strong positive relationship (0.875)** between age and project structure effectiveness

7. Discussion

The findings of the study indicate that the implementation of Six Sigma in Mahindra Logistics has a significant impact on improving operational efficiency and overall organizational performance. The majority of respondents expressed positive opinions regarding the role of Six Sigma in reducing lead time, improving business processes, and enhancing customer satisfaction. The results highlight that structured methodologies such as DMAIC enable better identification of process inefficiencies and support data-driven decision-making. Furthermore, the study reveals that logistics services such as transportation, warehousing, and inventory management benefit considerably from Six Sigma practices. Employee involvement, leadership support, and proper training were identified as key factors contributing to successful implementation. However, certain challenges such as lack of awareness, limited training, and resistance to change were also observed, which may hinder the full potential of Six Sigma initiatives. Overall, the discussion suggests that Six Sigma serves as an effective strategic tool for achieving process excellence and sustaining competitive advantage in the logistics sector.

8. Findings

The study reveals several important findings regarding the effectiveness of Six Sigma in Mahindra Logistics. It was observed that a majority of respondents agree that Six Sigma contributes to reducing lead time and improving overall business processes. A significant proportion of respondents strongly believe that Six Sigma enhances financial performance and increases customer satisfaction, indicating its positive impact on organizational success. The analysis also shows that transportation is the most widely used logistics service, followed by material handling, inventory management, and warehousing. In terms of workforce characteristics, most respondents belong to the 25–35 age group and have relatively lower experience levels, suggesting a young and dynamic workforce. Additionally, talent development, brand value, and employee performance were identified as major factors influencing the success of Six Sigma implementation. Statistical analysis indicates that there is no significant relationship between experience and improvement in company performance, while a strong positive correlation exists between age and the effectiveness of project structures. Overall, the findings confirm that Six Sigma plays a crucial role in enhancing operational efficiency, improving quality, and driving customer satisfaction in the logistics industry.

9. Suggestions

A fusion of Lean & Six Sigma methodology can be studied in detail separate research. Financial aspects and bottom-line impacts can be studied separately in future research. Implementation strategy should be different in different sizes of the organization. There were some uncertainties in the validity and reliability of the sampled data that are used in previous to analyze and improving the effectiveness of six-sigma and its implementations process. Some of these are based on the as-assumption. The main purpose of this research is to implement Six-Sigma in the case organization with less defective product. Though this case study has conducted in organization, the procedures and the outcomes can be used for any manufacturing organization. The Sigma Level calculated for the case organization at the final stage of finished product is the Six-Sigma value chart it can be concluded that the case organization is an industry.

10. Conclusion

Six Sigma has proven to be an effective methodology for improving performance in the logistics sector. The study on Mahindra Logistics reveals that proper implementation of Six Sigma leads to reduced costs, improved service quality, and higher customer satisfaction. Organizations adopting Six Sigma can achieve long-term sustainability and competitive advantage in the dynamic logistics industry.

The successful application of the methodology in an organization requires commitment from top management and employees. This study showed that irrespective of differences across services, there are some similarities among these parameters, which provide a fundamental basis for service organizations to apply six Sigma. It is slowly, but surely finding structured and beneficial applications in service industries.

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