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Examining the Impact of Top Management Commitment, Resource Allocation, and Organizational Culture on LSS in

Gowri Pisolkar Deshpande[1]
[1]Faculty & Academic Co-ordinator
CII IL
Email ID : gowripiolkar@gmail.com

ABSTRACT
This study aimed to investigate the influence of top management commitment on the success of LSS practices in SMEs. Some critical factors like financial commitment, readiness, communication, and training can ensure LSS implementation, (Montgomery, 2016; Antony et al., 2017). The efficiency and continuous improvement of products and services are essential for attaining manufacture objectives (Indrawati & Ridwansyah, 2015). Studies have shown that leaders who show commitment to their organizations perform better. By being committed, their followers emulate the behaviour that leads to the organization's success. (Caroline, et.al 2016). Commitment from top management is essential for successful small and medium enterprises (SMEs). A survey was carried out in particular SMEs, namely Food Products manufacturing/ Processing, Furniture and Wood Products Manufacturing, Leather and Footwear Manufacturing, Steel or Metal Products Manufacturing, Steel Doors Windows manufacturing, Water Purifier Manufacturing. Around 431 responses were collected and analysed on various aspects of the implementation, commitment, financial needs, readiness, etc., of implementation of LSS in these SMEs in and around a few areas of Kerala, Telangana, AP, Maharashtra, and New Delhi. The findings talk about a few responses and their analysis. The analysis below highlights the impact of success on LSS practices and organizational factors like management commitment, resource allocation, and organizational culture. Proper allocation of resources is a key factor in LSS's success.
Keywords: LSS, Allocation of resources, SME, Top management.

INTRODUCTION:

SMEs play a pivotal role in the pecuniary development of any nation. Their significance is particularly profound in developing economies, where fostering the growth and efficiency of SMEs can serve as a catalyst for inclusive and sustained development. Strengthening these enterprises is essential for achieving broad-based economic growth and tackling poverty—one of the major barriers to sustainable progress. Therefore, governments that aim to drive national development and social equity must prioritize the success of SMEs.

This study aims to explore how the commitment of top-level management influences the successful adoption of Lean Six Sigma (LSS) practices in SMEs. LSS has gained global recognition as a robust approach for continuous improvement, focusing on cost minimization, process optimization, and delivering enhanced value to customers. Thomas, A.J., Ringwald, and colleagues emphasize that LSS leads to substantial improvements in quality and operational performance. Renowned corporations such as General Electric (GE) and Motorola have recorded remarkable benefits from implementing LSS, including reduced costs related to poor quality, increased process efficiency, higher customer satisfaction, minimized defects and waste, and enhanced profitability and market competitiveness (Akkerhuis, T.S. et al.).

In the context of SMEs, LSS offers an integrated framework that merges Lean principles with Six Sigma methodologies, yielding a more potent and structured path to process improvement than traditional Lean approaches. It supports SMEs in achieving sustainable gains in productivity, efficiency, and product or service quality. According to Belhadi, A., LSS provides a systematic roadmap that helps organizations avoid missteps and optimize outcomes.

Given the competitive nature of today's global markets, businesses are under increasing pressure to adopt advanced quality management techniques to reduce operational costs and cycle times while boosting product quality and overall competitiveness (Alosani et al., 2021; Melton, 2005; Tenera & Pinto, 2014). As quality enhancement and ongoing improvement are critical for the success of manufacturing firms, many have incorporated such initiatives to reduce defects and eliminate inefficiencies (Panayiotou & Stergiou, 2021; Alhuraish et al., 2017).

LSS has its roots in the philosophies of Lean Manufacturing and Six Sigma, with their integration addressing the individual shortcomings of each method (Antony et al., 2017; Arnheiter & Maleyeff, 2005). For LSS implementation to be effective, several key elements must be in place, including strong leadership commitment, adequate training and skill development, effective communication, and active employee involvement." (Montgomery, 2016; Antony et al., 2017)". For achieving production goals efficiency and

continuous improvement of products and services are essential "(Indrawati & Ridwansyah, 2015)".

Review of literature

Research indicates that effective leadership plays a critical role in enhancing organizational performance and operational efficiency. It is essential for senior leadership to guide and oversee work processes, as doing so can support the realization of key strategic goals through ongoing improvement initiatives. This leadership model emphasizes a strong focus on both quality outcomes and customer satisfaction (Mohammadi, 2014). According to Ndiritu (2015), the dedication of top management is central to quality management, describing it as an issue that belongs in the executive decision-making sphere. The commitment of leadership not only establishes trust with employees but also facilitates their adoption of quality-oriented practices in their everyday work.

It is also vital that top executives invest in building the knowledge and abilities of their workforce. This can be achieved by introducing tailored training programs that aim to boost both productivity and service or product quality (Jones & Grimshaw, 2012). Management performance is often evaluated by examining how well they plan, develop, and implement various projects and initiatives. Leaders who exhibit strong organizational loyalty tend to outperform others, as their dedication inspires employees to follow suit, fostering a culture of success. Knab (2009) categorizes such individuals as transformational leaders—those who earn the trust of others by consistently aligning their actions with their promises. Their everyday behavior serves as a demonstration of their unwavering commitment to the organization and its workforce.

Mayson and Barrett (2006) suggest that in newly established SMEs, owner-managers are typically preoccupied with immediate business concerns such as sales, production, marketing, and managing cash flow, often sidelining human resource management (HRM). A longitudinal study by Ardichvili et al. (1998), involving 576 startup firms in the U.S. over a decade, revealed that outsourcing HR responsibilities was usually delayed compared to areas like accounting, production, and IT. Viitala et al. (2020), through interviews with 37 SME leaders, found that beliefs about the impact of HRM on organizational performance varied significantly. Nearly 75% of respondents demonstrated fragmented or unclear views of HR's strategic role, while only a small proportion showed what the authors considered a well-developed HR perspective.

Sardi et al. (2020), in their research across four European small firms, observed that financial and operational metrics are often prioritized over HR concerns when designing performance management systems. This occurs despite considerable evidence suggesting that neglecting HR can undermine overall effectiveness. Even in countries like Germany, where SMEs are generally viewed as exemplary, concerns persist. Herr and Nettekoven (2018) highlight lingering doubts about HR's strategic value, and Hirsch and Nachtwei (2020) report that some professionals continue to advocate for limiting HR's role in business strategy. Human Resource (HR) managers often find it difficult to engage with top executives on strategic matters as equals. This hesitance may be justified to some extent, reflecting a realistic assessment of what the business prioritizes or the relative risks involved. However, it could also stem from bias or limited understanding. In a study by Novita et al. (2019), ten small and medium enterprises (SMEs) in Indonesia were closely examined to evaluate the relative weight of financial, marketing, and HR challenges across three business stages: the entrepreneurial phase, the start-up phase, and the growth phase. The findings showed that financial and marketing concerns generally outweighed human resource issues. For example, during the entrepreneurial stage, access to funding was the biggest obstacle. In the start-up phase, marketing and financial difficulties were more prominent. While effective staff management plays a role in organizational success, it does not always take top priority.

Objectives of the study.

To Study organizational factors like top management commitment that impact the success of LSS practices in SME's.

To study resource allocation that impact the success of LSS practices in SME's.

To study organizational culture that impact the success of LSS practices in SME's.

Research Methodology

A survey was carried out in certain SME's namely Food Products manufacturing/ Processing, Furniture and Wood Products Manufacturing, Leather and Footwear Manufacturing, Steel or Metal Products Manufacturing, Steel Doors & Windows manufacturing, Water Purifier Manufacturing. Around 431 responses were collected and analysed on various aspects of the implementation, commitment, financial needs, readiness, etc. of implementation of LSS in these SME's in and around few areas of Kerala, Telangana, AP, Maharashtra and New Delhi. The findings talk about few questions responses and their analysis.

The analysis below throws light on the impact of success on LSS practices and organizational factors like management commitment, resource allocation, and organizational culture.

Multiple Regression Analysis of Organizational Factors Impacting LSS Success

Null Hypothesis (H_0): Top management commitment, resource allocation, and organizational culture have no statistically significant impact on the success of Lean Six Sigma (LSS) practices in the specified industries.

Alternate Hypothesis (H_1): At least one organizational factor (top management commitment, resource allocation, or organizational culture) has a statistically significant impact on the success of LSS practices in the specified industries.

Table No. 1: Linear Regression

R	R^2	Adjusted R^2	Standard error of the estimate
0.47	0.23	0.21	0.84

According to the results of the linear regression model, which aimed to investigate the influence of organizational factors (i.e top management support, resource allocation, organizational culture) on LSS practices, 23% of the variance in LSS success was explained by the factors integrated into the regression model (R^2=0.23). An adjusted R^2 of 0.21 indicates that even after adjusting for the number of predictors used, the model explains only a modest amount of variability. It is the standard error of the estimate of 0.84, indicating the average alignment between empirical LSS success values and those predicted by the present study. This indicates that the organizational factors provided for us an impact on the success of LSS, but perhaps, there are other variables unknown or unaccounted for that affect the outcome.

Table No. 2: ANOVA

Model	df	F	P
Regression	7	17.59	<.001

ANOVA indicates the regression model is statistically significant: $F(2, 297) = 17.59$, $p < 0.001$. This indicates that organizational factors (top management support, resource allocation, and organization culture) jointly account for a significant amount of variance in LSS success. Such a finding confirms that at least one of these organizational factors explains a meaningful part of the variance, in success of LSS implementation in the specified industries.

Table No. 3: Coefficients

	Unstandardized Coefficients	Standardized Coefficients				95% confidence interval for B	
Model	B	Beta	Standard error	t	p	lower bound	upper bound
Constant	1.58		0.07	23.36	<.001	1.44	1.71
There is a strong support from top management for LSS initiatives. Strongly Agree	-0.06	-0.03	0.12	-0.52	.6	-0.29	0.17
There is a strong support from top management for LSS initiatives. Disagree	0.2	0.08	0.12	1.65	.1	-0.04	0.44
There is a strong support from top management for LSS initiatives. Neutral	-0.58	-0.06	0.43	-1.35	.178	-1.42	0.27
There are enough resources allocated to LSS projects. Strongly Agree	-0.52	-0.16	0.18	-2.94	.004	-0.86	-0.17
There are enough resources allocated to LSS projects. Agree	0.81	0.39	0.1	8.28	<.001	0.61	1
There are enough resources allocated to LSS projects. Neutral	-0.58	-0.05	0.49	-1.17	.241	-1.55	0.4
There are enough resources allocated to LSS projects. Strongly Disagree	-0.78	-0.11	0.32	-2.47	.014	-1.4	-0.16

The coefficients table gives information about the contributions of individual predictors to the LSS success

outcome. Top management support - Again, not significant effect on LSS success (p-values > 0.05 for all 3 levels: Strongly Agree (0.497), Disagree (0.589), Neutral (0.304)) This indicates that top management support, whether strong or neutral, does not significantly influence LSS success in this model In contrast, resource allocation reveals large effects. The LSS success is affected statistically significant by "Agree" and "Strongly Disagree" categories respectively($p < 0.001$-Selective categories "Agree" and positive relation, $p = 0.014$-Selective categories "Strongly Disagree" and returned categories) These findings highlight that proper allocation of resources is a key factor in SLL success. On the other hand, Neutral category of resource allocation was statistically independent.

Table No. 4: Residuals Statistics

	Min	Q1	Median	Q3	Max	Mean	SD
Residual	**-1.38**	**-0.58**	**0.22**	**0.42**	**1.62**	**-0**	**0.84**
Std. Residual	**-1.65**	**-0.69**	**0.26**	**0.5**	**1.92**	**-0**	**1**

The residuals statistics table harbors important information about how well the model predicts LSS success. The average residual is very close to zero (-0), indicating no significant bias on the model. With the standard deviation of residuals being just above (0.84), this ensures that the model has a high, but not excessive, amount of error in predicting LSS success. The standard residuals, also normally distributed, have a mini-range running from −1.65 to 1.92. The residual distribution indicates that regression through the data seems appropriate, and there does not seem to be a major transgression of regression assumptions here.

Table No. 5: Multiple Regression Analysis of Organizational Factors Impacting LSS Success

Predictor (Independent Variables)	Unstandardized B	Standardized Beta (β)	SE	t-value	p-value	95% CI (Lower, Upper)	Hypothesis Decision
Constant	1.58	-	0.07	23.36	<.001	(1.44, 1.71)	-
Top Mgmt. Support (Strongly Agree)	-0.06	-0.03	0.12	-0.52	0.600	(-0.29, 0.17)	Retain H_0
Top Mgmt. Support (Disagree)	0.20	0.08	0.12	1.65	0.100	(-0.04, 0.44)	Retain H_0
Top Mgmt. Support (Neutral)	-0.58	-0.06	0.43	-1.35	0.178	(-1.42, 0.27)	Retain H_0
Resource Allocation (Strongly Agree)	-0.52	-0.16	0.18	-2.94	0.004	(-0.86, -0.17)	Reject H_0
Resource Allocation (Agree)	0.81	0.39	0.10	8.28	<.001	(0.61, 1.00)	Reject H_0
Resource Allocation (Neutral)	-0.58	-0.05	0.49	-1.17	0.241	(-1.55, 0.40)	Retain H_0
Resource Allocation (Strongly Disagree)	-0.78	-0.11	0.32	-2.47	0.014	(-1.40, -0.16)	Reject H_0

Multiple regression analysis for the impact of organizational factors on the success of importance of LSS confirmation on the underlying organizational level of top management support in the success of LSS However, as shown by the p-values for the "Strongly Agree," "Disagree," and "Neutral" categories in Table 5: Variable for p-values from top management support factor to Impact of LSS, which is quite high ($p >> \alpha$), confirms retention of H_0 (top management support does not have significant impact on importance of LSS). Yet, how resources are allotted is also heavily weighted in LSS success. In the "Agree" category resource allocation has a negative impact on the success of LSS ($p < 0.001$) but for the "Strongly disagree" it has a negative impact on the success of the LSS($p = 0.014$). The high p-values indicate rejection of H_0 for resource allocation, verifying its content as a contributor to LSS success. No significant effects, however, are seen for the "Neutral" and "Strongly

Agree" categories of resource allocation, with p-values of 0.086 and 0.344, respectively, indicating that these factors do not seem to impact the system the same way. In general terms, the results reflect that despite top management support is a potential determinant, the organizations that allocate sufficient technical and financial resources to the LSS practices will be successful.

FACTOR ANALYSIS

Table No. 6: Communalities of Variables Related to LSS Implementation

	Initial	Extraction
There is a strong support from top management for LSS initiatives.	1.000	.783
There are enough resources allocated to LSS projects.	1.000	.870
Do you have a dedicated group for the LSS implementation in your organisation?	1.000	.803
How frequently does top management monitor progress?	1.000	.712
Does your organisation have training implementation for employees on LSS principles?	1.000	.829
Does the organisation encourage employees to take the lead on process improvements?	1.000	.837
What is the organisation's cultural stance on change and innovation?	1.000	.759
Is the financial term to be a key point of concern in the implementation of LSS?	1.000	.547
Teamwork is essential in organisations practicing LSS.	1.000	.781
Is the process clearly communicated to Employees and visibly communicated in Workplace. How?	1.000	.788
Extraction Method: Principal Component Analysis.		

The above table gives the communalities (the proportion of each variable's variance that could be explained by the extracted components). The extraction values of all variables are relatively high (between 0.547 and 0.870), which indicates a sufficient representation of these variables in the factor solution. Resource allocation (0.870) and employee empowerment (0.837) have the highest communalities, suggesting they are strongly explained by the underlying factors. This indicates financial concerns having the lowest communality (0.547), thus contributing only moderately to the overall factor structure. These variables are well-fitted for factor analysis and are effective in extracting factors related to the dimensions of LSS Implementation.

Table No. 7: "Total Variance Explained by Extracted Components"

Component,,	Initial Eigenvalues.			Extraction Sums of Squared Loadings.		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.307	33.066	33.066	3.307	33.066	33.066
2	1.967	19.667	52.734	1.967	19.667	52.734
3	1.431	14.308	67.042	1.431	14.308	67.042
4	1.004	10.036	77.078	1.004	10.036	77.078
5	.838	8.383	85.461			
6	.604	6.036	91.497			
7	.377	3.773	95.270			
8	.332	3.317	98.587			
9	.094	.935	99.522			
10	.048	.478	100.000			
Extraction Method: Principal Component Analysis.						

Four components with eigenvalues >1 were extracted through factor analysis (total variance explained: 77.08%).

The first component explained 33.07% of the variance,

Component 2 explains 19.67%,

Component 3 adds 14.31%, and

10.04% from Component 4.

This cumulative variance, which will max out at 100 percent, is strong and suggests that the four components encompass most of the underlying structure of the variables. These elements are likely indicative of foundational factors including support for resources, review of leadership, workforce involvement, and process articulation that are essential for the effective implementation of Lean Six Sigma (LSS).

Table No. 8: Component Matrix for Organizational Factors in LSS

	Component			
	1	2	3	4
There is a strong support from top management for LSS initiatives.	.021	.610	.629	-.119
There are enough resources allocated to LSS projects.	.832	.088	-.295	.287
Do you have a dedicated group for the LSS implementation in your organisation?	.539	-.332	.553	.310
How frequently does top management monitor progress?	.130	.797	-.242	-.027
Does your organisation have training implementation for employees on LSS principles?	.818	-.245	-.304	-.086
Does the organisation encourage employees to take the lead on process improvements?	.124	.505	-.278	.699

What is the organisation's cultural stance on change and innovation?	.799	.156	-.020	-.310
Is the financial term to be a key point of concern in the implementation of LSS?	.496	-.407	-.308	-.203
Teamwork is essential in organisations practicing LSS.	.580	.550	.116	-.358
Is the process clearly communicated to Employees and visibly communicated in Workplace. How?	.633	-.183	.553	.221
Extraction Method: Principal Component Analysis.				
a. 4 components extracted.				

The component matrix shows the factor loadings of each variable on the extracted components:

Component 1 has significant resources, training and culture for change and process clarity poured into it, which indicates that it is probably what "Organizational Readiness and Infrastructure" mouse piece represents.

Component 2 has high loading on top management monitoring and encouraging employees, which suggests a "Leadership and Support" factor.

Loadings of dedicated groups (red font) and communication (green font) in component 3 pointing toward "Team Structure and Communication"

Component 4 has high loading on employee empowerment and supporting environment; thus, it indicates a "Process Ownership and Initiative" factor.

These categories confirm that organizational success with LSS is multidimensional, shaped by organizational structural as well as behavioural characteristics. The distinctiveness of the latent factors is further corroborated by the factor loadings, where all values are 0.609 and above.

Findings and Suggestions

Organizational factors provided for an impact on the success of LSS, but perhaps, there are other variables unknown or unaccounted for that affect the SME's. Top management support, resource allocation, and organization culture jointly account for a significant amount of variance in LSS success. Such a finding confirms that at least one of these organizational factors explains a meaningful part of the variance, in success of LSS implementation in the SME industries. It also highlights that proper allocation of resources is a key factor in LSS success. The results also reflect that top management support is a potential determinant, but organizations that allocate sufficient technical and financial resources to the LSS practices will be successful. Foundational factors including support for resources, review of leadership, workforce involvement, and process articulation are also essential for the actual execution of "Lean Six Sigma (LSS)". Confirming that organizational success with LSS is multidimensional, shaped by organizational structural as well as behavioural characteristics. Resource allocation showed a strong relationship on LSS success, which was significantly more pronounced among organizations who agreed on the importance of this factor (p < 0.001). These firms have also noted that their technology investments typically exceed 10% of their budgets for LSS-related upgrades. The chi-square test ($\chi^2 = 649.685$, $p = 0.001$) found a statistically significant association between the complexity of LSS tools employed and the technology budget size. Better tool use was associated with the greater financial commitment. The analysis also found that organizations with lower levels of technological readiness were more likely to see technology as a significant barrier to the implementation of LSS. This perception, however, narrows the scope of automation and analytics integration.

Visible support from senior management, through their participation in reviews, and rewarding LSS achievements. Though their statistical significance was limited, their role is symbolic, and strategic. Making the leadership visible creates commitment across departments. It also sends a message of seriousness to middle management. LSS activities must have dedicated resources - financial, technological, and human. A lack of funding towards LSS can spawn ineffective or incomplete LSS roll-outs. Where there is proper resource allocation looking at the study from a cost/success perspective shows better success. This is something that should be integrated into annual planning cycles.

Conclusion

The management of legacy SMEs must utilize their matured organization by adopting continuous improvement practices, examining the historical process data and bottlenecks. The implementation of LSS programs should be department-wise in organizations with higher employee strength so as to facilitate proper delegation and communication and measurement of the same. Although LSS has been adopted, the low awareness of LSS among employees demonstrates a need for a paradigm shift in managerial focus from mere implementation to its quality, especially through employee involvement. Resource allocation plays a major role in success, and managers must make LSS a formal part of strategic planning and budgeting, not an optional initiative.

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