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Critical Success Factors and Obstacles of Lean Implementation in Micro, Small and Medium Enterprises

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ABSTRACT

Background: Small and Medium Enterprises play a very important role in the economy of any country and it is more so in a developing country like India. However MSMEs, which constitute more than 90% of the total number of industrial enterprises, are now facing a tough competition from their global counterparts due to role of MSME's in Indian Economy liberalization, change in manufacturing strategies, technological changes, and turbulent and uncertain market scenario. In order to stay in the global market, MSME's have no choice other than going to lean. However MSME's are less likely to implement lean in their organization compared to larger one. But most of the MSME's are suppliers to larger organizations. Only limited research has made on the success factors which are more critical for successful lean implementation, and also less articles on the intersection between lean and MSMEs. **Objective:** the main objective of this study is to investigate the prominent Critical Success Factor's to initiate implementing Lean Manufacturing tools. **Results:** Various research questions were asked with employees and the data were analyzed, interpreted. From the survey various prominent Success Factors and issues are revealed, which will be more useful for the MSME's in future. **Conclusion:** The lean principles cannot be implemented exactly the same in every industry and therefore the Indian firms need to choose proper tools and techniques according to the work culture, infrastructure availability and working conditions of specific industries. This survey reveals few most crucial issues and success factors of lean manufacturing implementation.

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INTRODUCTION

Currently enterprises are struggling hard to maintain competitiveness in the market; therefore, lean tools have received great attention, to assist enterprises to survive in such environments (Alaskari et al., 2012). Lean manufacturing aims at providing top quality product at the lowest cost, thus contributing to the country growth. The term lean manufacturing was first introduced by Womack and Jones in 1990 in their book The Machine That Changed the World, which describes the Toyota production system (TPS) (Womack et al., 1990). Lean tools start from the premise that adding value to processes and reducing waste are the primary goals of any business. Many companies have reported some benefits when they have moved toward becoming lean by adapting different lean tools. Lean Manufacturing has been implemented successfully in many Manufacturing organizations, such as GM, Toyota, etc.… The awareness level of Indian firms in lean manufacturing is very low. The concept is largely adopted only by the big firms. One such example is Tata Motors which have created a success story by launching Nano implementing lean manufacturing. But Small and Medium Sized Firms (SMEs) in India are still mostly unaware of lean principle. The lean principles cannot be implemented exactly the same in every industry and therefore the Indian firms need to choose proper tools and techniques according to the work culture, infrastructure availability and working conditions of specific industries. Further, most Indian firms lack the human resource commitment on acceptance of a new philosophy. The implementation of lean philosophy demands a motivated and trained workforce and committed top management which is not available in most Indian SMEs even today (M.M.Ravikumar and K.Marimuthu, 2014). The competition is very tough and lean principles can prove very beneficial for the Indian manufacturing firms to compete globally. It will help them to improve upon product quality and reduce the costs along with speeding up the delivery.

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Benefits of Lean Manufacturing:

Lean manufacturing is normally known to have the following benefits:

- Reduce Lead time by 50% at least
- Reduce Work-in-progress up to 80%
- Floor space savings around 30 %(sometimes more than 50%)
- Increased productivity at least by 30%. (Even more than 100% in some cases)
- Quality improvement by a factor of two
- Overall cost reduction

Need of study:

In the past decades SMEs have been used to produce in big lot sizes and with a long lead time. Now many of these SMEs are forced to change their strategy in order to stay competitive (Bakas and Ottar, 2011). As the competition is very tough and lean principles can prove very beneficial for the Indian manufacturing firms to compete globally. It will help them to improve upon product quality and reduce the costs along with speeding up the delivery. The fate of MSME is very critical, since they are finding it hard to come in line with their top organizations counter parts. The objective of this study is to find the crucial issues and success factors in lean implementation in Indian MSME's by knowing the employees view about crucial factors which are very significant for long. Achanga et al.(2006) suggested that the success of Lean Manufacturing implementation depends on four critical factors: leadership and management; finance; skills and expertise; and supportive organizational culture of the organization. This study clarifies the relation between industry peoples and lean.

Methodology:

A questionnaire was constructed to find the perceptions of the employees of different manufacturing sector towards their organization. A total of 7 main statements were asked of 62 respondents, which are Critical success factor for the implementation of lean six sigma. Employees were asked to rate the quality of several attributes using an interval, Liker scale ranging 1 to 5. The study period was from November 2011 to March 2012. Study comprised 62 respondents of 07 manufacturing sectors. The tests of factor analysis, chi-square and averages were used to analyze the data and interpret the results. Data Analysis and interpretation-testing hypotheses.(Survey, 2010-2011).

Table 1: Respondents Experience.

Experience	Frequency	Percentage	Cumulative percentage
Below 2 yrs	25	36.765	36.765
2-3 yrs	19	27.941	64.706
3-6 yrs	07	10.294	75.0
6-8 yrs	10	14.706	89.706
8-10 yrs	5	7.353	97.059
Above 10 yrs	2	2.941	100
Total	68	100	

Above Table 1 shows, that 36.765% of the respondents have worked in the organization for less than 2 years while 27.944% of the respondents have worked in the organization for 2-3 yrs and 10.294% respondents work from 3-6 yrs, 14.706% since6-8 yrs and 7.35% respondents work for 8-10 yrs and 2.941% respondents are to having 10 yrs experience. The respondents were asked seven questions critical factors of Lean Implementation and to find its Barriers and success factors. Their responses are shown in a given Table 1.

Table 2: Employees are Educated and Trained in Lean Implementation.

Opinion	Frequency	Percentage	Cumulative Percentage
Strongly disagree	01	1.470	01.470
Disagree	06	8.823	10.293
Neutral	19	27.941	38.234
Agree	32	47.058	85.292
Strongly agree	10	14.705	100
Total	68		

Table 2 shows that 47.05% respondents agree and 14.51% strongly agree that Employees are educated and trained in lean implementation but other side 27.94%, 8.823%, 1.47% are neutral, and strongly disagree respectively.

Chi- square is calculated using formula

$(X^2) = \sum(O-E)^2/E$

Where: $\sum$ = summation

O = Observed frequency

E = Expected frequency

Decision rule: Reject null hypothesis (H0), where x^2 calculated is greater than x^2 tabulated, and accepted and accept the alternative hypothesis (H1)

For Table 2 statement, calculated $(X^2) = \sum(O-E)^2/E=46.335$

Degree of freedom D.O.F = 4

Tabulated (x^2) = at the 0.05 % level of significance, the tabulated value of x^2 for 4 degrees of freedom is 9.488

Since the calculated x^2 is greater than tabulated x^2 We reject the null hypothesis (H0) and accept the alternative hypothesis (H1), this indicate that there is a relation of statement in Table 2 to Barriers and enablers in the implementation of Lean.

Table 3: Fearless Communication on Identification of Waste.

Opinion	Frequency	Percentage	Cumulative Percentage
Strongly disagree	02	2.941	2.941
Disagree	06	8.823	11.764
Neutral	18	26.470	38.234
Agree	29	42.647	80.881
Strongly agree	13	19.117	100
Total	68		

Table 3 shows that 42.64% respondents agree and 19.11% strongly agree that they have no fear when to speak about waste to their superior but 26.47% respondents neutral and 8.82%, 2.94% respondents disagree and strongly disagree respectively.

For Table 2 statement, calculated $(X^2) = \sum (O-E)^2/E=34.762$

Degree of freedom D.O.F = 4

Tabulated (x^2) = at the 0.05 % level of significance, the tabulated value of x^2 for 4 degrees of freedom is 9.488

Since the calculated x^2 is greater than tabulated x^2 We reject the null hypothesis (H0) and accept the alternative hypothesis (H1), this indicate that there is a relation of statement in table 3 to Barriers and enablers in implementation of Lean .

Table 4: Strong Management and Leadership with Fullest Commitment.

Opinion	Frequency	Percentage	Cumulative Percentage
Strongly disagree	00	00	00
Disagree	07	10.294	10.24
Neutral	26	38.235	48.475
Agree	23	33.823	82.298
Strongly agree	12	17.647	100
Total	68		

Above Table 4 shows that 33.82% respondent and 17.64% agree and strongly disagree and 38.23% of the respondents have neutral view and 10.29% disagree about Strong Management and leadership with fullest commitment.

For Table 2 statement, calculated $(X^2) =\sum (O-E)^2/E=34.762$

Degree of freedom D.O.F = 4

Tabulated (x^2) = at the 0.05 % level of significance, the tabulated value of x^2 for 4 degrees of freedom is 9.488

Since the calculated x^2 is greater than tabulated x^2 We reject the null hypothesis (H0) and accept the alternative hypothesis (H1), this indicate that there is a relation of statement in Table 4 to Barriers and enablers in the implementation of Lean .

Table 5: Financial Capabilities-Willing to Provide Adequate Funding for Lean Implementation.

Opinion	Frequency	Percentage	Cumulative Percentage
Strongly disagree	00	00	00
Disagree	03	4.411	4.411
Neutral	14	20.588	24.999
Agree	35	51.470	76.469
Strongly agree	16	23.529	100
Total	68		

Table 5 shows that 51.47% and 23.52% of respondents agree and strongly agree respectively when asked that their organization is willing to provide adequate funding for lean implementation and 20.58% of the respondents are neutral and 4.4% disagree.

For Table 5 statement, calculated $(X^2) = \sum(O-E)^2/E=53.498$

Degree of freedom D.O.F = 4

Tabulated (x^2) = at the 0.05 % level of significance, the tabulated value of x^2 for 4 degrees of freedom is 9.488

Since the calculated x^2 is greater than tabulated x^2 We reject the null hypothesis (H0) and accept the alternative hypothesis (H1), this indicate that there is a relation of statement in table 5 to Barriers and enablers in the implementation of Lean.

Table 6: Linking Improvement Initiatives to Business Strategy and Customer.

Opinion	Frequency	Percentage	Cumulative Percentage
Strongly disagree	01	1.470	1.470
Disagree	05	7.352	8.822
Neutral	23	33.823	42.645
Agree	25	36.764	79.409
Strongly agree	14	20.588	100
Total	68		

When respondents were asked whether Linking improvement initiatives to business strategy and customer are taken, then 36.76% and 20.58% respondents agree and strongly disagree and strongly disagree respectively on other side 20.58% were neutral and 7.35% and 1.47% respondents disagree and strongly disagree.
For Table 6 statement, calculated $(X^2) = \sum (O-E)^2/E=31.364$
Degree of freedom D.O.F = 4

Tabulated (x^2) = at the 0.05 % level of significance, the tabulated value of x^2 for 4 degrees of freedom is 9.488

Since the calculated x^2 is greater than tabulated x^2 We reject the null hypothesis (H0) and accept the alternative hypothesis (H1), this indicate that there is a relation of statement in table 6 to Barriers and enablers in the implementation of Lean.

Table 7: Accepting the Change in Organization Belief and Culture.

Opinion	Frequency	Percentage	Cumulative Percentage
Strongly disagree	01	1.47	1.470
Disagree	05	7.35	8.822
Neutral	14	20.58	29.41
Agree	42	61.76	91.174
Strongly agree	06	8.823	100
Total	68		

From the above, 61.76% respondents agree, 20.58% of the respondents neutral, 7.35% of the respondents disagree and strongly agree and 10.29% of the respondents strongly disagree that their employees are ready to accept the Change in Organization belief and culture.
For Table 7 statement, calculated $(X^2) = \sum(O-E)^2/E=77.456$
Degree of freedom D.O.F = 4

Tabulated (x^2) = at the 0.05 % level of significance, the tabulated value of x^2 for 4 degrees of freedom is 9.488

Since the calculated x^2 is greater than tabulated x^2 We reject the null hypothesis (H0) and accept the alternative hypothesis (H1), this indicate that there is a relation of statement in Table 7 to Barriers and enablers in implementation of Lean .

Table 8: Suppliers Capability in Supporting Lean Implementation.

Opinion	Frequency	Percentage	Cumulative Percentage
Strongly disagree	00	00	00
Disagree	05	7.352	7.352
Neutral	19	27.941	35.293
Agree	38	55.882	91.175
Strongly agree	06	8.823	100
Total	68		

This table shows that 55.88% of the respondents agree and 27.94% of the respondents neutral about the suppliers' capabilities in supporting new requirements and 8.82% of the respondents strongly agree and 7.35% of the respondents disagree. For Table 8 statement, calculated $(X^2) = \sum (O-E)^2/E= 65.482$
Degree of freedom D.O.F = 4

Tabulated (x^2) = at the 0.05 % level of significance, the tabulated value of x^2 for 4 degrees of freedom is 9.488

Since the calculated x^2 is greater than tabulated x^2 We reject the null hypothesis (H0) and accept the alternative hypothesis (H1), this indicate that there is a relation of statement in Table 8 to Barriers and enablers in the implementation of Lean.

RESULT AND DISCUSSIONS

This survey reveals that MSME is popular with lean, but are not willing to apply it to the ground to a larger extent stating various reasons. Only minimal organizations have taken a line from their larger organization Counterparts and have implemented Lean in their premises. We can conclude that Micro, Small and Medium Sized Firms (MSMEs) in India are still mostly unaware of lean principle. The lean principles cannot be implemented exactly the same in every industry and therefore the Indian firms need to choose proper tools and techniques according to the work culture, infrastructure availability and working conditions of specific industries. This survey reveals few most crucial issues and success factors of lean manufacturing implementation.

Table 9: Issues and Factors of Lean Implementation.

S.No	Barriers	CSF's
1	Training in lean is less	Employees are educated and trained in lean implementation
2	Little steps initiate to eliminate waste	Fearless communication on identification of waste
3	Management is Reluctant	Strong Management and leadership with fullest commitment
4	Inadequate funding	Financial capabilities-Willing to provide adequate funding for lean implementation
5	Customers are Strangers	Linking improvement initiatives to business strategy and customer.
6	Cultural Resistance	Accepting the Change in Organization belief and culture.
7	Suppliers are not involved in organization SPC	Suppliers' capability in supporting lean implementation.

Sample size of 7 manufacturing sectors appears to be small; it can be extended to Companies located in other parts of India too. The more survey needs to make the results more representatives. Sample size limited which are 68respondents; it can cover more respondents from top to bottom of organizations. A multi criteria decision making methods (MCDM) can be used to obtain a closer value on barriers and success factors. Gurumurthy and Ram babu kodali(2008) made an attempt to demonstrate the application of a Multi Attribute Decision Making model, namely Performance Value Analysis (PVA) to analyze the alternatives production system like Traditional manufacturing, Computer Integrated Manufacturing, and Lean Manufacturing among various performance measures.

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