

**AN EVALUATION OF CLUSTER DEVELOPMENT APPROACH TO IMPLEMENT LEAN MANUFACTURING  
COMPETITIVENESS SCHEME**

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**ABSTRACT**

The Lean Manufacturing Competitiveness Scheme (LMCS), which is a part of the National Manufacturing Competitiveness Program (NMCP), is a core component and is thought of as one of the game changers for the MSME sector in India. However, the NMCP in general and LMCP in particular are found to be sound in principle but found to be suffering in their implementation. This paper sets out to explore the Cluster Approach to LMCS implementation and tries to figure out whether the cluster approach is appropriately being utilized for the implementation of LMCS. Different questions related to the NMCP in general and Lean Manufacturing in specific was formulated and responses from 200 MSME units in the state of Karnataka were collected. Simple frequency tabulation of the questions related to awareness and implementation levels of the NMCP and Lean Manufacturing was carried out. A factor analysis of the barriers to implementation of NMCP was also done. The findings clearly indicate that the MSMEs find that the cluster approach is a barrier to implementation of NMCP in general and LMCS in particular. A few measures to take corrective action are suggested.

**KEYWORDS:** National Manufacturing Competitiveness Program, Lean Manufacturing, Cluster Development Program, MSME, Competitiveness.

## INTRODUCTION

Government of India, in the budget year 2006-2007, announced a comprehensive package for MSMEs under National Manufacturing Competitiveness Program (NMCP) for enabling this sector to face and stand up to the pressures and challenges unleashed in the wake of liberalization and globalization. Among nine components of NMCP, Lean Manufacturing Competitiveness Scheme (LMCS) stands out as a unique enabler of competitiveness enhancement among micro, small and medium enterprises. Lean manufacturing consists of time tested, universally accepted techniques which work on reduction of cost, wastage and enhancement of quality and competitiveness. The components of NMCP including LMCP, are planned for implementation at the level of clusters of MSMEs rather than on stand-alone basis. This imperative makes another NMCP scheme namely Cluster Development Program (CDP) equally significant and concurrent. Success of Lean Manufacturing Scheme hinges upon how well clusters are formed and how effective they are. Latest report on LMCS released by MSME ministry indicates that as many as 4084 MSME units are since brought under clusters. LMCS has had its own limitations and more often than not, tardy implementation of this scheme is attributed to non-operationalization of CDP in full swing.

Government of India has come out with detailed procedure for identifying prospects for cluster formation and issues on financing, nurturing and monitoring. Functionaries under the aegis of MSME ministry and state level MSME development Institutes are enjoined upon to take this program in letter and spirit. Added to this, government's decision to extend financial incentives for engaging Lean manufacturing consultants only through clusters has made the things all the more difficult for MSMEs.

## PROBLEM STATEMENT

The LMCS, is a very important component of NMCP as it allows the MSMEs to reduce costs and operate in an effective manner, which is very vital for competitiveness at a global level. However, the Ministry of MSME makes it mandatory for MSMEs to form into clusters in order to avail the benefits of this scheme. To begin with, we had the following important questions related to this scheme. What is the effectiveness and overall result of this approach? Are MSMEs aware of this scheme sufficiently? Are they aware of the benefits of the lean manufacturing scheme? Are they really able to form clusters and make use of this scheme? What is their experience of cluster formation?

Not much of research has been carried out based on first hand field information to answer any of the above questions. Though the Ministry of MSME might have had several interactions with the MSMEs, it is unlikely that they have paid attention to the prevalent feedback, since we do not find any new attempts made by the Ministry to alter the status quo that currently exists in this area.

## RESEARCH OBJECTIVE:

The objective of this research is to find out the awareness about and challenges to the approach of cluster formation to avail the benefits of LMCS of the NMCP.

## RESEARCH METHODOLOGY

Keeping in mind the importance of interdependence of these two schemes and more particularly the impact of NMCP components on MSME competitiveness, a field study covering MSME units was undertaken in three of the Industrial Estates of Karnataka. A structured questionnaire which has questions related to the awareness of Lean Manufacturing component and benefits thereof, lean manufacturing implementation level, and general barriers to implementation of NMCP itself was made. 200 organizations were approached and relevant personnel were administered with the questionnaire. The results were tabulated. Frequency tabulations and percentage analysis was carried out to ascertain the different aspects of the LMCS. A factor analysis of the barriers of implementation of NMCP was carried out. The findings and relevant results are presented below.

## DISCUSSION

### GENERAL AWARENESS ABOUT NMCP

The respondents were asked to indicate their level of awareness about the NMCP in general. Five awareness levels were given and the respondents were asked to choose their level of awareness. The results are tabulated and presented in Table 1.

All the responding organizations were aware of the NMCP as is evident from Table-1 below. Also we can see from the table that 69% of the organizations were aware but have not availed any benefits of the NMCP through the Ministry of MSME. At the same time, 69% of the firms said that they did implement some components of the MSME independently and 31% of the organizations went ahead and implemented some components in addition to NMCP.

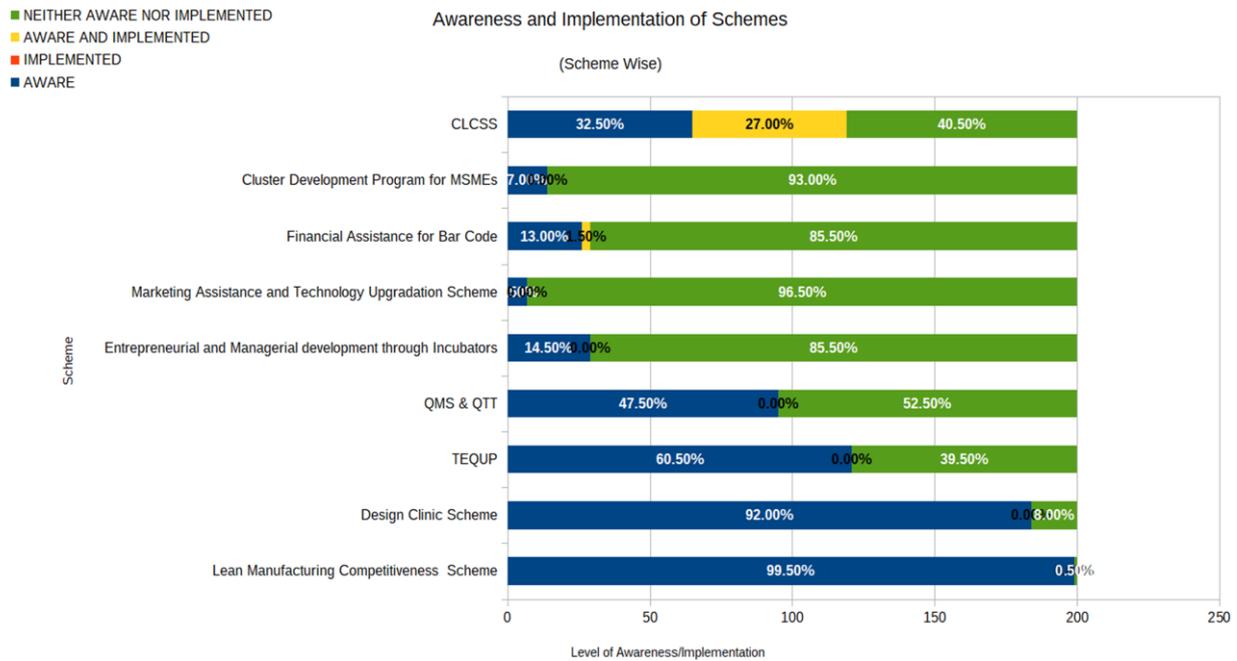
This clearly shows the seriousness of the MSMEs in the implementation of NMCP. We can infer that MSMEs are highly aware and are proactively implementing the different components of NMCP with or without the support of the Ministry of MSME.

**Table 1: Showing the Level of General Awareness of NMCP Components**

Option	Label	Yes	%	No	%
A	Not Aware of NMCP	0	0	200	100
B	Aware but not Availed Benefits	138	69	62	31
C	Implemented Some Components	62	31	138	69
D	Implemented Components Independently	138	69	62	31
E	Implemented Components in Addition to NMCP	62	31	138	69

### **AWARENESS ABOUT DIFFERENT COMPONENTS OF NMCP**

The respondents were asked to indicate their level of awareness and level of implementation of different components of NMCP. The results were tabulated and illustration – 1 below presents the summary of the responses. From this, we see that the LMCS has got the highest awareness amongst all other schemes with 99.5% of respondents reporting that they are aware of the scheme.



However, we can also see from the above illustration that when it comes to implementation, no one has implemented the same.

Another interesting, rather important, observation we can make from the above illustration is that 93% of the respondents have said that they are neither aware nor have implemented CDP. Since, the LMCS requires that the MSME units form clusters; we can assume that the implementation of the scheme has taken a back seat from this requirement.

We can conclude from this that though the Ministry of MSME has done a commendable job in creating awareness about NMCP in general, it has failed in creating awareness about the different components of the NMCP and their inter-relatedness.

### **AWARENESS ABOUT BENEFITS AND COMPONENTS OF LEAN MANAGEMENT COMPETITIVENESS SCHEME**

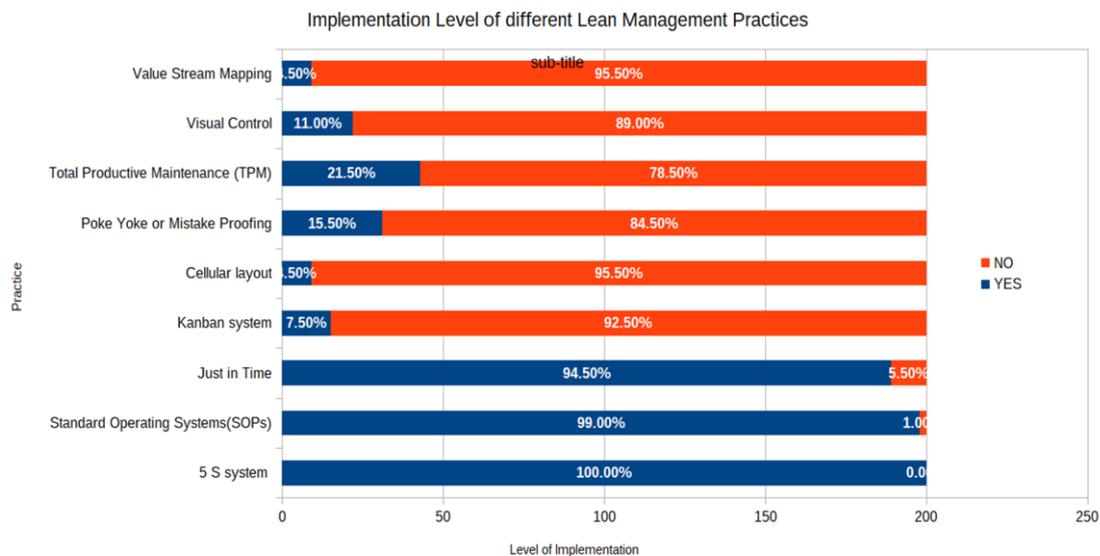
A list of benefits was presented to the respondents and they were asked to indicate whether they thought a particular benefit can be achieved through the implementation of Lean Manufacturing. It is noteworthy that 67% of the respondents felt that Lean Manufacturing leads to all the benefits listed. This indicates the high degree of awareness and the positive attitude that respondents have towards Lean Manufacturing practices. Only 33% of the respondents feel that Lean Manufacturing will not give one or more of the

benefits listed. While, the reason for this has not been explored by the researcher, it maybe because of the limited knowledge of these firms. As Lean Manufacturing is one of the major and focal components' of NMCP, this finding further demonstrates the importance of NMCP in the present context, to enhance the competitiveness of MSMEs'.

**Table 2: Showing the Benefits of Implementing Lean Management Practices**

OPTION	LABEL	YES	NO
A	Reducing manufacturing costs	200	0
F	Reduced engineering time	190	10
E	Improved process flows	177	23
C	Better space utilization	171	29
B	Personnel management	161	39
D	Scientific inventory management	154	46

We can also infer from the above that most MSME units face cost and time pressures as they have focused on Reduced Manufacturing Cost and Reduced Engineering Time as the prime benefits of Lean Manufacturing.



**Illustration 2: Showing the level of Implementation of Lean Manufacturing practices**

A list of different Lean Manufacturing practices which were encapsulated by the LMCS was presented to the respondents and they were asked to indicate if they have implemented a given practice or not. Illustration – 2 summarizes the responses. Here, we can see that within Lean Manufacturing practices, implementation is limited only to 5S and developing Standard Operating Procedures. This indicates that the MSMEs are in only the introductory stage of Lean Implementation. It also shows that the SME units are approaching the Lean Manufacturing Competitiveness in a piecemeal manner.

One of the reasons for such piecemeal implementation could be that the MSMEs are trying to implement Lean Manufacturing in their own ways, without much support from the Ministry of MSME. The reason for such self-initiative is that the LMCS requires the formation of clusters and the MSMEs find it difficult to form clusters.

Also, the lower levels of implementation in other areas like KanBan, Poka Yoke, VSM, TPM, etc., require additional training/support/expertise. This highlights the need for hand holding of MSMEs by the Ministry and brings out the need for a more pro-active implementation of NMCP.

**FACTOR ANALYSIS OF THE BARRIERS TO IMPLEMENTATION OF NMCP**

From systematic literature review 17 variables related to the barriers faced by MSMEs in implementation of NMCP were listed out. These barriers were presented to the respondents and they were asked to rate each barrier on a Likert Scale. Since the number of variables was very large Factor Analysis was used for data reduction. The results are discussed below.

**TEST OF INSTRUMENT RELIABILITY**

Chronbach’s Alpha that indicates the reliability of the instrument was calculated using R. The value of Standardized Alpha was found to be 0.75. This high value of Alpha clearly indicates that our instrument is reliable.

**SAMPLE ADEQUACY TEST**

To test the Sample Adequacy for Factor Analysis, KMO Test was used and it was done using R. The MSA value was found to be 0.68. Thus, we conclude that the sample is adequate to carry out Factor Analysis.

**Table 3: Showing the result of tests done before Factor Analysis**

Test	Value	Result
Chronbach’s Alpha	0.75	Instrument is highly reliable
KMO	0.68	Sample is adequate

**CORRELATION PLOT**

A correlation plot was drawn using R, to identify how variables could be grouped or if grouping is possible at all. Given in the Illustration below is the correlation plot. As can be seen from the Illustration, there are some strong correlations that can be seen along the diagonal. A cursory examination of the plot indicates a 5 Factor Model is plausible.

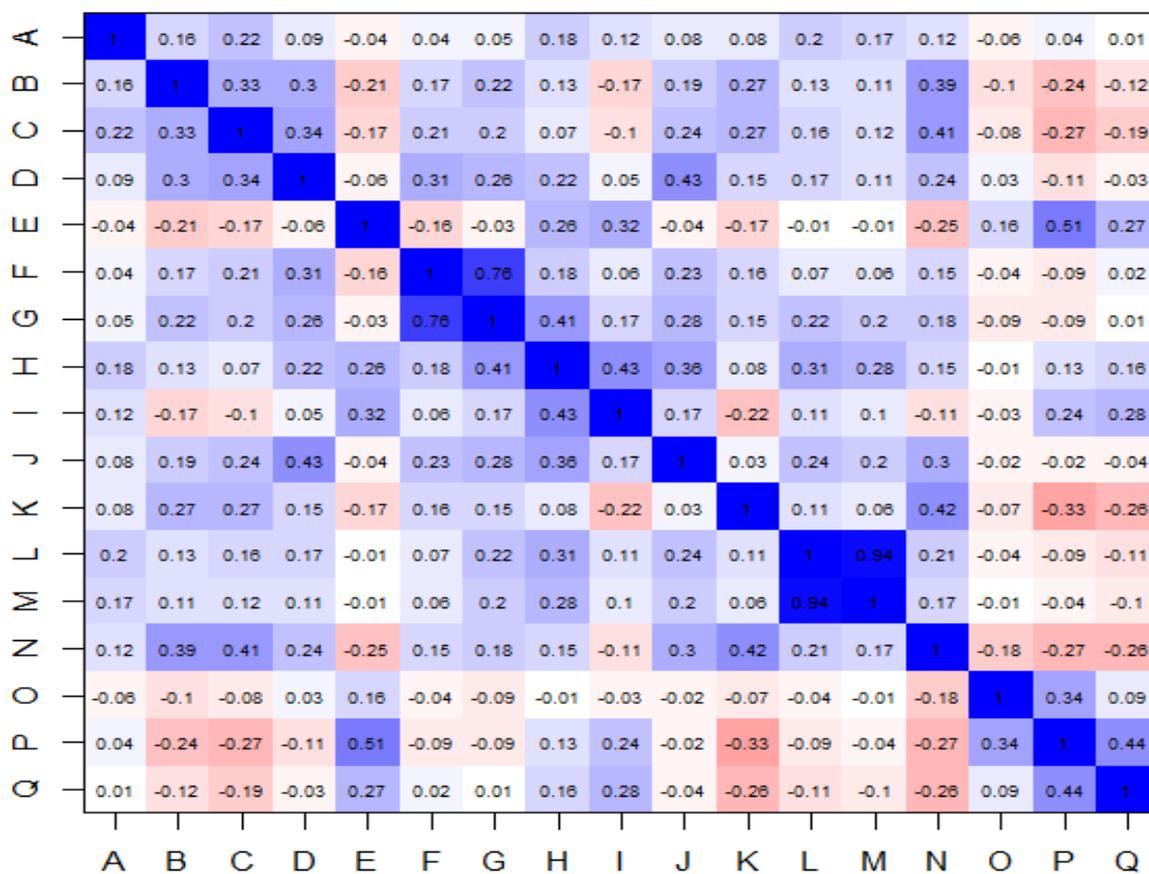
**FACTOR ANALYSIS**

Using the above as a hint, Factor Analysis was carried out for a 5 Factor Model. The factor loadings obtained in the Principal Component Analysis were rotated using “Varimax” Rotation and the rotated factor loadings, Eigen Values and other details were extracted using R. The results are tabulated in the tables below.

The Eigen Values shown in the table, when examined, confirm the 5 Factor Models, as the number of values that are above 1 are 5. From the 6<sup>th</sup> variable, the values are below 1. The same is indicated by the Scree Plot, which is also generated using R. Further, to reduce the number of variables, we have considered only those variables that have factor loadings of 0.6 and above to be admissible into the factor model. These values are highlighted in the table. The total variance explained through these factors stood at 50%, which is considered to be valid for analysing and drawing inferences from the groupings.

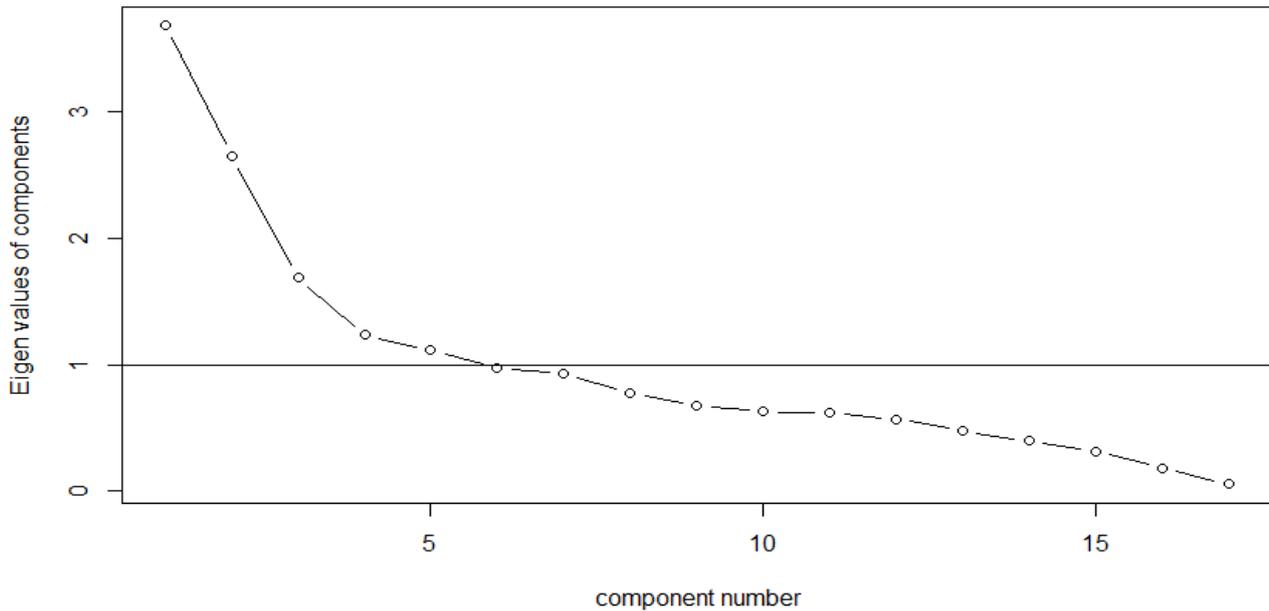
Further to this, all the variables in each factor were examined and a common construct was found to be determining the grouping. The factors were thus labelled based on the commonality observed. The same are tabulated in Table: 4.

### Correlation plot



**Illustration 3: Showing the Correlations between variables.**

**Scree Plot - barriers**



**Illustration 4: Showing the Scree Plot based on Eigen Values**

**Table 4: Showing the rotated factor loadings and Eigen Values for Factors**

SNO	VAR	LABEL	MR5	MR2	MR1	MR4	MR3	Eigen Values
1	A	The schemes under NMCP are procedural, rigid and multi-layered	0.24	0.14	0.00	0.11	0.06	3.68426801
2	B	The functionaries do not visit our work place and make things known	0.54	0.05	0.06	-0.07	-0.15	2.64934021
3	C	There is no publicity to the components/schemes	0.56	0.06	0.10	-0.10	-0.16	1.69267640
4	D	We do not have time, resources to run around the departments	0.47	0.04	0.23	0.10	-0.03	1.23428824
5	E	The components are similar to one we already have in place	-0.17	-0.01	-0.11	0.42	0.43	1.12058015
6	F	Forming clusters to be able to avail of the benefits is difficult and long drawn process	0.19	-0.01	<b>0.98</b>	-0.01	-0.02	0.97566247
7	G	Even where clusters are formed, small and micro units do not have much freedom and hence cannot participate usefully	0.24	0.11	<b>0.73</b>	0.27	-0.09	0.92875438
8	H	The schemes are not implemented uniformly across the country – partial implementation loses the focus and penetration	0.28	0.19	0.14	<b>0.73</b>	0.03	0.77847990
9	I	Existing manpower finds it difficult to implement. Required training support is	-0.12	0.06	0.10	<b>0.61</b>	0.11	0.68265649

		not forthcoming from the implementing agencies						
10	J	Project approval and subsidy sanction processes are slow and tardy. The system is more bureaucratic and slow moving	0.44	0.12	0.16	0.27	0.00	0.62982777
11	K	District level agencies such as DIC, SISI do not show any involvement and keenness	0.43	0.01	0.08	-0.13	-0.25	0.61910260
12	L	Support from Banks is not encouraging. Their participation is missing.	0.19	<b>0.92</b>	0.05	0.12	-0.07	0.57092189
13	M	Even where implementation is there, there is no follow-up or second dose of help	0.12	<b>0.98</b>	0.05	0.07	-0.01	0.47860627
14	N	There is no face to face dialogue/communication between the industry and the agencies	<b>0.65</b>	0.09	0.03	-0.07	-0.18	0.39712081
15	O	There is not much acceptance of these components from the employees	-0.06	0.01	-0.03	-0.05	0.38	0.31815127
16	P	We are comfortable with what we are doing. There is no special benefit or value addition	-0.17	-0.02	-0.04	0.22	<b>0.89</b>	0.18474533
17	Q	Implementation of some of the components call for knowledge of statistical tools and techniques. We have constraints in this regard.	-0.20	-0.10	0.07	0.30	0.38	0.05481782

**Table 5: Showing the Cumulative Variance Explained through the Factors**

SNO	Item	MR5	MR2	MR1	MR4	MR3
1	SS loadings	2.02	1.93	1.64	1.44	1.44
2	Proportion Var	0.12	0.11	0.10	0.08	0.08
3	Cumulative Var	0.12	0.23	0.33	0.41	0.50
4	Proportion Explained	0.24	0.23	0.19	0.17	0.17
5	Cumulative Proportion	0.24	0.47	0.66	0.83	1.00

**Table 6: Showing the Factor Names and the Variables forming the Factors**

SNO	Factor Code	Factor Name	Variance Explained (%)	Variables	
1	MR5	Communication Barrier	12	N	There is no face to face dialogue/communication between the industry and the agencies.
2	MR2	Lack of Support from Banks	11	L	Support from Banks is not encouraging. Their participation is missing.
				M	Even where implementation is there, there is no follow-up or second dose of help.
3	MR1	Cluster Formation	10	F	Forming clusters to be able to avail of the benefits is difficult and long drawn process.
				G	Even where clusters are formed, small and micro units do not have much freedom and hence cannot participate usefully.
4	MR4	Lack of Implementation Competency	8	H	The schemes are not implemented uniformly across the country – partial implementation loses the focus and penetration.
				I	Existing manpower finds it difficult to implement. Required training support is not forthcoming from the implementing agencies.
5	MR3	Apathy towards local offices of Ministry of MSME	8	P	We are comfortable with what we are doing. There is no special benefit or value addition.

As we can see from Table-6, the cluster formation activity forms the third major barrier for implementation of NMCP and its components, with 10% of the variance explained. Three major components of NMCP, viz.,

Lean Manufacturing Competitiveness Scheme, Design Clinic Scheme and Cluster Development Program for MSMEs', require the MSMEs to take initiative, come together (in groups of minimum 10) and form a cluster before approaching the Ministry of MSME for availing any benefit. Further to this, they are also expected to identify a 3<sup>rd</sup> party facilitator for the scheme they are going to implement. MSMEs' are finding this to be a major barrier as they cannot spare the time and effort required to do this. Thus, there is a cat and mouse game going on in the implementation of NMCP, where the Ministry blames the MSMEs for not forming clusters, and the MSMEs blame the ministry for unsupportive policy. This conundrum is the main culprit in the failure of implementation of NMCP.

MSMEs have clearly expressed that the cluster formation is a long drawn process and they find it difficult to form clusters. In this regard, they expect the Ministry of MSME to help them with this cluster formation, and with its tardy communication (which is the first barrier to implementation of NMCP, with 12% of variance explained), the Ministry of MSME is not coming forth to help them. This is clearly the reason why MSMEs are showing an inclination towards implementing the Lean Manufacturing Competitiveness Program on their own, resulting in a piecemeal approach. This also contributes to the formation of the last barrier, viz, "Apathy Towards the local offices of Ministry of MSME" where the respondents feel comfortable with what they are doing and feel that there is no real value addition from the local support agencies.

MSMEs also feel that the cluster formation activity, even when sees some initial success, fizzles out because they experience a lack of freedom and hence they wouldn't participate meaningfully. It is understood that the activity of forming clusters requires a few adjustments on the part of the MSMEs. They might have to make changes to some of their internal processes and learn to work in a co-ordinated fashion with others. This also requires one to have a bit of tolerance towards those who are a bit slow or those who are a little faster. However, with all the pressures of cost and time that MSMEs face, it becomes difficult for them to remain cooperative for a long period of time.

These two aspects of the cluster formation and sustenance require the active participation of the ministry of MSME. In fact, the Cluster Development Program itself can be of great support. However, we have already seen that the awareness of the program itself is very low amongst the MSMEs.

### **SUGGESTIONS**

The first thing the Ministry of MSME has to do is to spread the awareness of the entire NMCP and its components in detail to the MSME units. This can be done by conducting awareness campaigns that detail not only NMCP but also by highlighting the specific components of the NMCP. Further, the need for different components in different regions can be ascertained and detailed awareness campaigns can be conducted by local agency of the Ministry of MSME for that specific region. Through this, the ministry of

MSME can ensure that adequate awareness and willingness is created for co-operative participation amongst MSME units.

For making effective use of resources and also to scale efforts up quickly, Ministry of MSME can associate themselves with Engineering Institutions of repute in various regions as they have the infrastructure and human resources to conduct the awareness programs and would be happy to help as this gives them the platform for interacting with the Industry directly. This is a win-win solution for both the Ministry of MSME as well as the participating Institutions.

The second issue we need to work on is working on the CDP itself. As we know that around 4000+ MSME units have already been brought under the CDP, a detailed survey of the various aspects of the CDP along with the challenges and barriers of implementation of CDP can be undertaken to clearly arrive at the impediments. Further to this, suitable measures can be taken to remove the impediments. This will allow the CDP to be smooth and hence remove this as a barrier from implementation of the LMCS. This may also help in reducing the time taken to form clusters and quicken the whole process, reducing the grievance that the cluster formation process is long-drawn.

The MSMEs have been complaining that they do not have enough freedom to participate in the implementation of the LMCS clusters. This is perhaps more due to the lack of willingness to alter the age old established practices. The MSMEs might be finding it both strange and difficult to understand why such changes might be required. The Ministry of MSME can handle this through a Grievance Redressal mechanism that is partially decentralized. The grievance redressal process makes sure that the MSMEs have an opening to express their dissatisfaction with the process being followed and the Ministry of MSME can know, on an on-going basis, the specific reasons why MSMEs are unwilling to co-operate. Further such a mechanism allows the ministry of MSME to identify region specific issues from overall issues and address them appropriately.

LMCS is seen as beneficial and hence the MSMEs have had their own implementation of the practices. This has resulted in heterogeneity in terms of the level of implementation and that too without any pattern. This further complicates the process of cluster formation. Thus, the Ministry of MSME must first take care to see that the implementation level of the MSMEs is at a common level, at least on a regional basis. For this, it can take the support of those MSME units that have seen some success in the implementation of different components. This can be facilitated through “Best Practices and Knowledge Sharing” meetings amongst the MSME units on a regional basis. The MSME units that have successfully implemented a given lean manufacturing practice can be identified as “Champions” and encouraged to mentor some others who have not been able to implement a given practice. These groups maybe termed and operated as “Circles of Lean Manufacturing” similar to that of “Quality Circles”. This will lead to the first stage of cooperative engagement which can be the foundation for cluster formation at a later stage.

## CONCLUSION

The fragmented and uneven implementation of LMCS is a cause of concern, not only for the MSMEs but also for the Ministry of MSME as it is not yielding fruitful results in line with the expectations of both MSME units as well as the Government of India. Our research clearly identifies that the Cluster Formation Approach is a barrier to the implementation of LMCS. While the CDP provides a way out, the Ministry of MSME has abysmally failed to develop awareness about this component. Thus, we find the MSMEs struggling and wanting support in implementation and aggrieved that the Ministry, though having access to solutions, is not supporting them adequately. This has also led to a certain degree of Apathy towards the ministry of MSME which is a dangerous for the success of NMCP in general and LMCS in particular. The authors sincerely feel that the suggestions given here are not only practical but also feasible to follow resulting in the desired benefits for the MSMEs.

## REFERENCES

- Balasubrahmanya, M.H(2007), “ Development strategy for Indian Small Scale Industries: Promoting linkages with global transnational corporations”, Management Research News, Vol 30,
- Singh R, Garg S, and Deshmukh (2007), “ Comparative study on strategies of Indian Small, Medium and Large Scale Organizations”, South Asian Journal of Management , July-Sept 2007,
- Ashish K, Vikas B, and Sharma ( 2009), “ MSMEs in India: Challenges and Issues in the current scenario”, SMS Varanasi, December,
- Nagayya, D and Rao T V ( 2011), “ Enabling small and medium enterprises to target globalization”, The IUP Journal of Managerial Economics, Vol.1X,
- Deveshwar, A(2014), “ Globalization: Impact on Indian Small and Medium Enterprises”, Conference paper, International Trade and Academic Research Conference,
- Venkatesh, J and Lavanya (2014), “ Impact of globalization on MSMEs in India”, International journal of trade and global business perspectives,
- Ghosh B. B and Debasish (2015), “ The impact of globalization on India’s technology regime: A quantitative exploration of India’s organized manufacturing Industries”, The IUP Journal of Applied Economics, Vol. XIV,
- Dhore, K B.(2015), “Opportunities and challenges for SSIs of India in a global economy” Conference paper, International conference on issues on emerging economy,
- Balasubrahmanya, M.H(2015), “ SSIs in India in the globalization era: Performance and Prospects”, Indersciences Ltd,
- Shrimane and Soni (2015), “ Examining role of innovation in changing landscape of MSMEs in India”, Conference paper, International conference on issues in emerging economies,
- Government of India, Ministry of MSME, Annual Report 2016-2017