

**: IMPACT OF LEAN MANUFACTURING SYSTEM ON BUSINESS
COMPETITIVENESS AND WORK SCHEDULE OF MSMEs – A
PERCEPTUAL STUDY:**

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ABSTRACT:

The performance of MSMEs in the nation is greatly improved by the lean manufacturing system. Lean manufacturing system implementation helps the MSMEs in enhancing its competitiveness by boosting productivity and lowering product costs by removing and minimizing waste in the various operational areas of the MSMEs. This research study evaluates the difference in perception between lean manufacturing practitioners towards the impact of lean manufacturing system on business competitiveness and work schedule in MSMEs. A one-way ANOVA test is used to evaluate, analyse, and draw conclusions about the data after it has been obtained using a questionnaire (5.1 Likert scale) from 60 lean manufacturing practitioners from 10 different MSMEs in Mysuru. The result shows that, the significant value ($p=0.00$) is less than the standard alpha value (0.05), hence, the null hypothesis is rejected and alternative hypothesis is accepted. The major finding of the study is, the top-level management personnel and branch level management personnel are strongly agreed that, the lean manufacturing system is impact on both business competitiveness and work schedule of MSMEs.

Key words: Lean Manufacturing system, Business competitiveness, work schedule, lean manufacturing practitioners. Non-value-added activity.

1. INTRODUCTION.

Lean Manufacturing system is a leading production methodology that minimizes and eliminates waste during production process and other operational activities in the business without compromising the quality of the finished products. The key wastes in every manufacturing process are defects, excess output, waiting, underutilization of talent, unnecessary transportation, over inventory, needless motion, and excessive processing (MUDA, MURI, and MURA). Such wastes can be reduced and eliminated with the use of various lean manufacturing tools and techniques like JIT, Kaizen, kanban, six sigma, 5S etc. The manufacturing sector must develop and maintain the competitiveness necessary to meet the challenges posed by globalization if it is to grow at a sustainable rate. MSME units, in particular, are so preoccupied with day-to-day management concerns that they lack the time and resources to comprehend and become knowledgeable about the many methods and strategies that may help them increase productivity and, as a result, be competitive in the global market. MSMEs should successfully apply the lean manufacturing system to all of the company's operational activities in order to accomplish this goal. Lean manufacturing system will, in general, assist an MSME in increasing its overall quality, eliminating waste, lowering total costs, and reducing the time needed to complete an operation from beginning to end. Several qualitative, quantitative, as well as monetary gains are expected to be realized through the application of lean tools.

2. REVIEW OF LITERATURE:

Lean production system is a multi-dimension method for reducing and minimise wastes, increasing the value of products and processes, and incorporating several management practices such as Just-in-Time, inspection systems, working teams, and others (Liker and Meier 2006). Lean production is regarded as one of the most advantageous approaches that can be used by organisations of all sizes and types. It offers a solution to every production and service problem, leads to amazing improvements in manufacturing excellence, and encourages MSMEs to become more competitive (Amos et al. 2020; Belhadi et al. 2018; Dora et al. 2013). Panizzolo et al. (2012) claim that Indian SME's have seen a variety of operational advantages from implementing lean manufacturing. Taj and Morosan (2011) noted that through the application of lean, considerable improvements were shown in inventory, teamwork, maintenance, layout and handling, suppliers, and performance enhancement. TPM, Kaizen, and 5S are effective lean tools, and control over product quality and time delivery are measures for leanness, according to Thanki et al. (2016) who evaluated the impact of lean and green

manufacturing practices in Indian SMEs. The most significant challenge for SME's is developing a lean culture because it alters people's perspectives and impacts on environmental sustainability and sustainable growth (Roscoe et al. 2019; Bhadu et al. 2020).

3. RESEARCH GAP:

The review of literature reveals that some research studies focus on the impact of lean manufacturing on the operational performance of large businesses, while other research articles are more focused on the effects of each tool and technique of lean manufacturing on operational function in large industries. There have been many studies on lean manufacturing undertaken in large-scale companies, but there have only been review studies on the effects of lean manufacturing systems on MSMEs and a small number of empirical studies on the impact of lean manufacturing on the operational performance of MSMEs. More critically, no research has examined how lean manufacturing practitioner's perception towards the impact of lean manufacturing system on MSMEs' work schedules and business competitiveness. As a result, With the help of an empirical study, this research article fills the resulting gap.

4. STATEMENT OF THE PROBLEM:

Any organisation that wants to reduce costs must eliminate waste from the production process since customers will only pay for components that have value added rather than non-value added (waste) components. The lean manufacturing system is essential for reducing the numerous production-related wastes. large business units are able to implement the lean manufacturing system much more quickly and easily because of stronger financial backing, access to trained labour, and technical expertise in the area of lean manufacturing system. On the other hand, MSMEs are not having neither financial stability nor skilled personnel and technical know-how related to lean manufacturing. As a result, this research study assesses how different levels of personnel in the MSMEs perceive the success of the lean manufacturing system in the production units of MSMEs.

5. NEED FOR THE STUDY:

Due to globalization of the business, there exist a huge competition for MSME units. To survival in the competitive market, the MSME units has to gain competitive advantage in the various operational areas. Decrease the price of the products through cut-down the cost of production, quick delivery of products according to the market changes and demand, produce the products according to taste and preference of the customers etc., these are the business

competitiveness for the long-term survival in this competitive era. To achieve such competitiveness, the MSME units should standardize its work schedule. to standardize the work schedule the MSME units should implement lean manufacturing system effectively. For the effective implementation of lean manufacturing system in the manufacturing units the role of different level of management personnel (Lean manufacturing practitioners) plays a vital role. Hence, this study evaluates the difference in perception between the lean manufacturing practitioners in different MSMEs related to the impact of lean manufacturing system on business competitiveness and work schedule of MSMEs.

6. RESEARCH QUESTION:

1. Is there any difference in perception between lean manufacturing practitioners towards the impact of lean manufacturing system on business competitiveness and work schedule in MSMEs?

7. OBJECTIVES OF THE STUDY:

- To evaluate the difference in perception between lean manufacturing practitioners towards the impact of lean manufacturing system on business competitiveness in MSMEs.
- To examine the difference in perception between lean manufacturing practitioners towards the impact of lean manufacturing system on work schedule in MSMEs.

8. HYPOTHESES FOR THE STUDY:

Hypotheses for Objective No 1: To evaluate the difference in perception between lean manufacturing practitioners towards the impact of lean manufacturing system on business competitiveness in MSMEs.

H₀ : There is no significant difference in perception between lean manufacturing practitioners towards the impact of lean manufacturing system on business competitiveness in MSMEs.

H₁ : There is a significant difference in perception between lean manufacturing practitioners towards the impact of lean manufacturing system on business competitiveness in MSMEs.

Hypotheses for Objective No 2: To examine the difference in perception between lean manufacturing practitioners towards the impact of lean manufacturing system on work schedule in MSMEs.

H₀ : There is no significant difference in perception between lean manufacturing practitioners towards the impact of lean manufacturing system on work schedule in MSMEs.

H₂ : There is a significant difference in perception between lean manufacturing practitioners towards the impact of lean manufacturing system on work schedule in MSMEs.

9. SCOPE OF THE STUDY:

The study only takes into account MSMEs in the Mysore urban region in order to provide an effective result. Additionally, the study only looked at two key goals of the lean manufacturing system: work schedule and business competitiveness. The current study is a perception study that evaluates the different opinions between lean manufacturing practitioners (at various management levels) regarding how the lean manufacturing system impacts on business competitiveness and work schedules in MSMEs.

10. RESEARCH METHODOLOGY:

All MSMEs in the Mysore urban area are the study's population (only MSMEs implementing the lean manufacturing system). The sample size for the study is 60 lean manufacturing practitioners from 10 different MSMEs. A one-way ANOVA test is used to evaluate, analyse, and draw conclusions about the data after it has been obtained using a questionnaire (5.1 Likert scale).

11. DATA ANALYSIS AND INTERPRETATION:

I. Profile of the Respondents:

Gender: The following table and chart shows the gender details of the respondents

Table 1: Gender of the Respondents:

Gender	Frequency	Percent
Male	38	63.33
Female	22	36.67
Total	60	100.0

Source: Primary Data

Summary: In the above table 1 shows that, out of the 60 (100%) selected respondents, male respondents are 63.33% and female respondents are 36.67%.

Occupation: The following table and chart show the Occupation of the respondents.

Table 2: Occupation of the Respondent.

Occupation	Frequency	Percent
Top level Management	10	16.67
Middle level Management	29	48.33
First level Management	13	21.67
Branch Level Management	8	13.33
Total	60	100.0

Source: Primary data.

Summary: The above table 2 shows that, out of the 60 selected respondents, 16.67% are Top level Management employers, 48.33% are Middle level Management employers, 21.67% are First level Management employees and 13.33% are Branch Level Management employees.

Types of Enterprise: The following table and chart shows the types of enterprise of the respondents.

Table 3: Type of the Enterprise of the Respondents.

Type of Enterprise	Frequency	Percent
Micro Enterprise.	5	50.00
Small Enterprise.	3	30.00
Medium Enterprise.	2	20.00
Total	10	100.0

Source: Primary data.

Summary: The above table 3 shows that, out of the 10 (100%) selected enterprises, 50% are Micro Enterprise respondents, 30% are Small Enterprise respondents and 20% are Medium Enterprises.

II. Reliability Test.

Reliability Test for Objective No 1: To evaluate the difference in perception of lean manufacturing practitioners towards the impact of lean manufacturing system on business competitiveness in MSMEs.

Table 4: Difference in perception of lean manufacturing practitioners towards the impact of lean manufacturing system on business competitiveness

Construct	Number of items	Cronbach's Alpha	Reliability level
Impact of lean manufacturing system on business competitiveness	12	.890	Very good

Source: Cronbach's Alpha reliability test in SPSS.

Summary: Table 4 shows that, impact of lean manufacturing system on business competitiveness with 12 items ($\alpha=.890$) are found reliable because it is more than 0.70 alpha value.

Reliability Test for Objective No 2: To evaluate the difference in perception of lean manufacturing practitioners towards the impact of lean manufacturing system on work schedule in MSMEs.

Table 5: Difference in perception of lean manufacturing practitioners towards the impact of lean manufacturing system on work schedule

Construct	Number of items	Cronbach's Alpha	Reliability level
Impact of lean manufacturing system on business competitiveness	12	.908	Very good

Source: Cronbach's Alpha reliability test in SPSS.

Summary: Table 5 shows that, impact of lean manufacturing system on work schedule with 12 items ($\alpha=.908$) are found reliable because it is more than 0.70 alpha value.

III. Descriptive Statistics:

Table 6: Descriptive Statistics for impact of lean manufacturing system on business competitiveness

Statements:	Mean	Std.dev	N
Lean manufacturing system enhances the overall image of the enterprise to suppliers, customers, management, and employees.	2.2116	1.14846	60
The process of lean manufacturing system implementing and sustaining lean is a tedious job as the concept relates to time, cost, interest, and involvement, the concepts that together support the new change for development in a firm	2.0581	1.09656	60
Lean manufacturing system is to convert external changeover steps, it simplifies and at the same time streamlines the conclusive efforts.	2.0021	1.16872	60
Lean manufacturing System helps to achieve astonishing levels of success in the enterprises for outpacing the competition	2.0581	1.09656	60
Any company out there is selling a product or service to meet client needs and generate a profit doing so. Whether you are a brewery, packager, or automotive manufacturer, lean manufacturing can give you powerful basic guidelines for running a successful	2.0021	1.16872	60
Lean is widely regarded as a business strategy and implementation of lean techniques improves business competitiveness and organizational performance	2.1618	1.17791	60
The smart partnership between supplier and customer in lean manufacturing could benefit both partners	2.0581	1.09656	60
With the deployment of Lean tools, various qualitative, quantitative as well as monetary benefits are likely to be achieved	2.0021	1.16872	60
The production time or work in lean MSME is directly related to the customer rate demand	2.0021	1.16872	60
Lean manufacturing makes the enterprises to close work relationships with their customers (frequent and direct contact, mutual visits to our respective plants, collaboration agreements)	2.1618	1.17791	60

Industry processing is integrated with that of the customer (logistic collaboration, integrated information systems, mutual technical assistance) in lean MSME.	2.1618	1.17791	60
Lean MSMEs work together with suppliers during the product/service design and development process	2.2116	1.14846	60

Source: Descriptive Statistics output in SPSS

Interpretation: The above tables shows that, the mean and standard deviation for each statements, which is asked to the selected lean manufacturing practitioners in the selected MSMEs, the average mean of all statements is around 2 i.e., all the respondents are agreed with the statement. Lean manufacturing system enhances the overall image of the enterprise to suppliers, customers, management, and employees and Lean MSMEs work together with suppliers during the product/service design and development process shows the higher mean value of 2.2116.

Table 7: Descriptive Statistics for impact of lean manufacturing system work schedule

Statements	Mean	Std.Dev	N
Lean manufacturing system helps in the overall continuous improvement in the industry	2.0145	1.16149	60
Lean manufacturing aims to make things as simple as possible to make the entire process transparent and easy to remember	2.0581	1.09656	60
Efforts are made to reduce the size of the manufacturing or assembly batches in lean MSME.	2.0581	1.09656	60
The work schedule in lean MSME is calculated by taking into account time for line shutdown time (due to machinery shutdown, quality problems, or any unexpected event)	2.2116	1.14846	60
The lean MSME machines are grouped according to the product family they produce	2.0021	1.16872	60
During the design process in lean MSME, an effort is made to ser only those specifications that are necessary	2.0021	1.16872	60
lean manufacturing system obtains the designs, that reduce the number of components/stages in products/services in lean MSME	2.0021	1.16872	60

Components/services in lean MSME are designed so that they are easy to maintenance and assemble in the company lines (in the case of services, they are easy to offer)	2.2116	1.14846	60
The manufacturing or servicing machinery and the processes used are controlled via SPC in lean manufacturing MSMEs.	2.0021	1.16872	60
Lean manufacturing in MSMEs can now leverage lean improvement in a manner specifically tailored for their needs and within a realistic cost bracket.	2.1618	1.17791	60
The machines used to manufacture products/give services in lean MSME have been solely developed and built for your company	2.2116	1.14846	60
The different departments in the lean MSME plant share integrated information, for example, ERP companies	2.1618	1.17791	60

Source: Descriptive Statistics output in SPSS

Interpretation: The above tables shows that, the mean and standard deviation for each statements, which is asked to the selected lean manufacturing practitioners in the selected MSMEs, the average mean of all statements is around 2 i.e., all the respondents are agreed with the statement. Components/services in lean MSME are designed so that they are easy to maintenance and assemble in the company lines and the machines used to manufacture products/give services in lean MSME have been solely developed and built for your company shows the higher mean value of 2.2116.

IV. Testing of Hypotheses.

Testing of Hypotheses for Objective No 1: To evaluate the difference in perception between lean manufacturing practitioners towards the impact of lean manufacturing system on business competitiveness in MSMEs.

Hypothesis:

H₀ : There is no significant difference in perception between lean manufacturing practitioners towards the impact of lean manufacturing system on business competitiveness in MSMEs.

H₁ : There is a significant difference in perception between lean manufacturing practitioners towards the impact of lean manufacturing system on business competitiveness in MSMEs.

Table 4.8: Descriptive statistics for difference in perception between lean manufacturing practitioners towards the impact of lean manufacturing system on business competitiveness in MSMEs

Lean manufacturing practitioners	N	Mean	Std. Deviation	Std. Error
Top level Management	10	1.6747	.74588	.05972
Middle level Management	29	2.2823	.88172	.06971
First level Management	13	2.5190	.48000	.04684
Branch Level Management	8	1.9167	.52861	.05681
Total	60	2.0909	.77351	.03523

Source: Anova test output in SPSS

Table 9: Anova test for difference in perception between lean manufacturing practitioners towards the impact of lean manufacturing system on business competitiveness in MSMEs

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	53.986	3	17.995	36.790	.000
Within Groups	233.806	478	.489		
Total	287.792	481			

Source: Anova test output in SPSS

Interpretation: The above statistical table shows that, the F value is 36.790 and the mean value of first level management is 2.5190 which is highest mean score when compare to other levels of management. Since the significant value i.e., **p-value is .000** is less than the standard alpha value of **0.05** at the confidence level of 95%, therefore, there is a statistically significant differences in perception between lean manufacturing practitioners (different level management personnel) towards the impact of lean manufacturing system on business competitiveness in MSMEs. Hence it is concluded that, the null hypothesis is rejected and alternative hypothesis is accepted.

Testing of Hypotheses for Objective No 2: To evaluate the difference in perception between lean manufacturing practitioners towards the impact of lean manufacturing system on work schedule in MSMEs.

Hypothesis:

H₀ : There is no significant difference in perception between lean manufacturing practitioners towards the impact of lean manufacturing system on work schedule in MSMEs.

H₂ : There is a significant difference in perception between lean manufacturing practitioners towards the impact of lean manufacturing system on work schedule in MSMEs.

Table 10: Descriptive statistics for difference in perception between lean manufacturing practitioners towards the impact of lean manufacturing system on work schedule in MSMEs

Lean Manufacturing practitioners	N	Mean	Std. Deviation	Std. Error
Top level Management	10	1.6277	.74958	.06001
Middle level Management	29	2.2448	.94020	.07433
First level Management	13	2.6063	.47514	.04637
Branch Level Management	8	1.9891	.04160	.00533
Total	60	2.0915	.81184	.03698

Source: Anova test output in SPSS

Table 11: Anova test for difference in perception between lean manufacturing practitioners towards the impact of lean manufacturing system on work schedule in MSMEs

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	65.793	3	21.931	41.728	.000
Within Groups	251.223	478	.526		
Total	317.017	481			

Source: Anova test output in SPSS

Interpretation: The above statistical table shows that, the F value is 41.728 and the mean value of first level management is 2.6063 which is highest mean score when compare to other levels of management. Since the significant value i.e., **p-value is .000** is less than the standard alpha value of **0.05** at the confidence level of 95%, therefore, there is a statistically significant differences in perception between lean manufacturing practitioners (different level management personnel) towards the impact of lean manufacturing system on work schedule in MSMEs. Hence it is concluded that, the null hypothesis is rejected and alternative hypothesis is accepted.

Results:

With the statistical result of one-way ANOVA test in the above tables: all the test results shows that the significant value (p-0.00) is less than the standard alpha value (0.05), therefore, it is concluded that the null hypotheses is rejected for both the objectives and accept the alternative hypotheses. Therefore, it is concluded that, the lean manufacturing practitioners from different MSMEs units are have difference in opinions related to impact of lean manufacturing system on business competitiveness and work schedule in MSMEs.

12. Findings:

Top level management and branch level management people are strongly agreed that, the lean manufacturing system is impact on both business competitiveness and work schedule in MSMEs but the First level management and middle level management are just agreed for the impact of lean manufacturing system on business competitiveness and work schedule in MSMEs. The average mean of all statements is around 2 i.e., all the respondents are agreed that the lean manufacturing system have positive impact on business competitiveness and works schedule in MSMEs.

13. Conclusion:

The shortage of financial resources affects MSMEs businesses even in the early stages of its establishment. To keep costs as low as possible during this critical time, MSMEs must cut back on waste in all areas of business operations. Lean manufacturing system implementation is therefore required for MSMEs in order to reduce waste. All levels of management's commitment are crucial for the successful adoption of the Lean manufacturing system in MSMEs. This leads to the conclusion that, in order to achieve the goal of lean manufacturing,

commitment from all levels of management in MSMEs units is required, not just that of any one level of management.

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