

Application of Lean in a Small and Medium Enterprise (SME) Segment- A Case Study of Electronics and Electrical Manufacturing Industry in India

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Abstract -Manufacturing organizations have adopted the concept of lean manufacturing in order to improve the quality of their products and reduce their wastes. This is done by ensuring that products are assessed or evaluated at each and every stage hence costs are reduced. In this study two methods of data collection were used, questionnaires and interviews. The responses in both methods indicated that most of the respondents were in the electrical production and quality assurance department. Continuous improvement program was indicated as the main driving force for the implementation of lean manufacturing. Preventive maintenance was the highly rated in the level of adoption. Lack of effective senior management was indicated as the main barrier of lean manufacturing implementation in the company.

Key Words- Lean, Small & Medium sized enterprises, Survey, Electronics & Electrical Manufacturing Industry and India.

1. Introduction

Lean manufacturing is mainly adopted by organizations in order to reduce wastes and improve the quality of products. Ideally, organizations have come to realization that when costs of reduction are reduced through reduction of wastes, profits improves since there is an improvement of quality and market share. In electronic and electrical industry lean manufacturing has been very successful in improving quality of products. This is because products are tested at each and every step in the manufacturing process and in case of any defect, the whole process stops for rectifications to be made. This study addresses the results of the study conducted in an electronic and electrical company in India.

2. Results

Questionnaire survey research design was used in this study whereby data were investigated, recorded and analyzed on the awareness of employees in the managerial level basing on the concept of lean manufacturing and its application in one of the Reputed Electronics & Electrical Manufacturing Company in

India. In this case, the study involved employees and the entire organization in order to provide relevant and adequate information. A sample size of 100 employees was randomly selected from the managerial spectrum to be studied. The rationale of using simple randomized method was that it is simple and selection of participants is easy hence reducing biases involved in data collection. Two methods of data collection were used, questionnaire and interview methods.

2.1 Questionnaire Method

Participants were sent email addresses that contained the structured questions used to gather information. The initial email address was sent to 100 participants. In this case, these email addresses were obtained from the phone calls made to the company under investigation (Kumar et al. 407). Out of the 100 emails 10 emails did not deliver any message. This was mainly because either the person had left the company or the addresses were wrong. According to the company under study, the emails addresses given were retrieved from the company's database hence the failure of delivery may

be because the person had changed their addresses hence the primary ones were nonfunctional (Ramiya 708). After one week, another follow-up email was sent to the respondents to remind those who had not responded and to thank those who had already responded.

This second email ensured that the questionnaires that had not been returned were returned on time. Additionally, the emails were meant to appreciate the responses of the participants who had already responded (Dennis, Pascal & Shook 32). A total of 25 responses were returned 13 of which were sent through the email address and the remainder as online survey. This gave a quite low response rate of 25%. However, another method was used to satisfactorily ensure that all the questionnaires were effectively filled. This is because the initial response rate was very low hence it could have not used in the study (Nordin et al. 374). As a result of this other 100 questionnaires were sent through email addresses and online survey. Those people to participate through the online survey were informed through phone calls. This was done to ensure that there was efficiency and reliability in the process of data collection (Ruffa 21). Out of the 100 questionnaires sent, 70 were returned and 60 online surveys were responded. This raised the response rate by 70% and 60% respectively.

2.2 Interview Method

Two types of interview methods were used, online and physical. In this case, a total of 100 employees from the Company were interviewed. The interviews occurred within the organization in the office of the human resource manager. Participants were interviewed in a group of 10s each one taking approximately 15 minutes. The response rate of this interview method was 90% as most of them cooperated with the interviewer. With this

response rate there was no need of conducting another face-to-face interview. The interviewer used semi-structured questions which were both open ended and closed ended in order to get relevant and adequate information (Vallespir & Alix 12).

In online interview, respondents were required to be online and through chatting they were interviewed. Through this method it was easy to control the respondents by asking closed ended questions. Out of the 100 participants intended to be interviewed, only 40 were found online. The resultant response rate was 40% (Wong & Wong 30). This was found to be relatively low hence another online interview was conducted. Prior to this interview, participants were effectively informed through phone calls on the day and time of interview. The response rate during the second online interview was 76%.

- i) **Respondent Profile:** The first investigated elements were the general background of the participants and their stay in the company. This included job positions in the company and length of employment as can be seen in Table 1. From the responses in both interview and questionnaire methods, it was found that most of the participants were mainly Electrical Production and Quality Assurance personnel (Wong & Wong 2164). Additionally, the responses indicated that most of the participants (43%) had worked in the company for more than ten years. Their selection was based on the fast hand information and knowledge they possessed as a result of being directly involved in the execution of lean manufacturing program in the Company (Vallespir & Alix 12). 65% of the total respondents were males while the rest were females. The ages of the respondents ranged from 34 to 56 years with the older people having a longer stay in the company than the young.

Table 1: Respondents' general background information in the Company

(N=100)

Position in the company	Number	Percentage (%)
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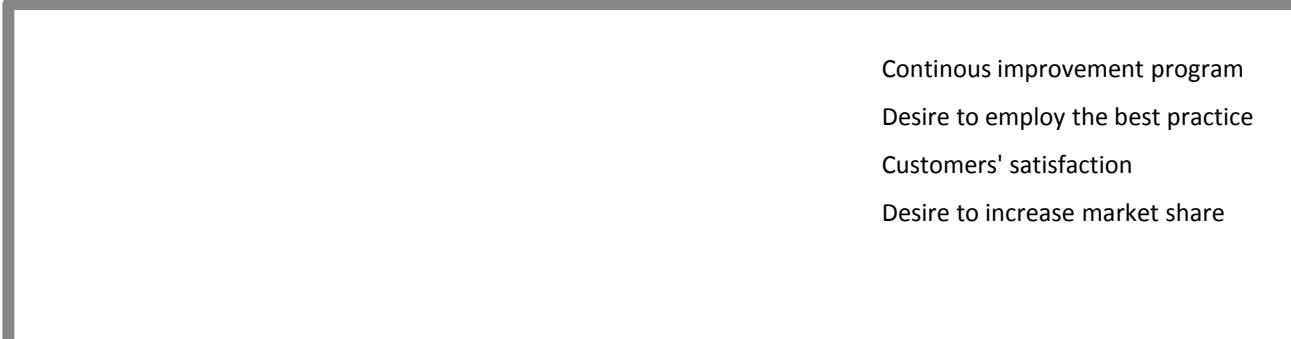
Production Manager and executives	25	25
Quality Assurance Manager and executives	30	30
Other Employees in the management spectrum	45	45
Years of employment		
Below five years	13	13
Between five and nine years	31	31
Above ten years	56	56

It should be noted that employees were selected from assembly, electronic and electrical parts. In this case, investigations were done on the types of products, company ownership, and the systems of quality management. All respondents were involved in the manufacture of electronic and electrical parts for the industry (Wong et al. 521). The investigated company was categorized as semi medium enterprise. The information was recorded in form of the electrical and electronic parts produced and the role played by the participants. Basically, most of them indicated that they were involved in management of the overall processes in their departments (Kumar et al. 407). As can be seen in the Table 1, most of the respondents (45%) were in other management positions in the company. Most of the respondents (77%) indicated that the company earlier had local ownership. When the results were examined in details it was found that 76% of the total responses indicated that the company was certified by ISO/9001.

ii) **Driving Forces to Lean Manufacturing Implementation:** In order to have a clear understanding of the lean manufacturing driving forces

in electronic and electrical industry respondents were asked to outline the factors that influenced their decisions in executing the program (Ruffa 21). Since the respondents studied in this study were from management spectrum it indicated that they were all aware of the implementation of the lean manufacturing program in the company (Vallespir & Alix 15). As can be learned from the responses, the organization's continuous improvement program was the main influencing factor that made the studied respondents to implement lean manufacturing program. This factor exhibited 63% of all the driving forces mentioned by the respondents in the study (Wong & Wong 30). Beside this factor, other driving forces included; desire to employ the best practice to the company (17%) and customers' satisfaction (13%) (Wong & Wong 2165). It is very astonishing to find from the study that the desire to increase market share was the least (7%) driving force for the execution of lean manufacturing system in the company. This information can be found in Fig 1.

Fig 1: Driving forces to implement lean manufacturing



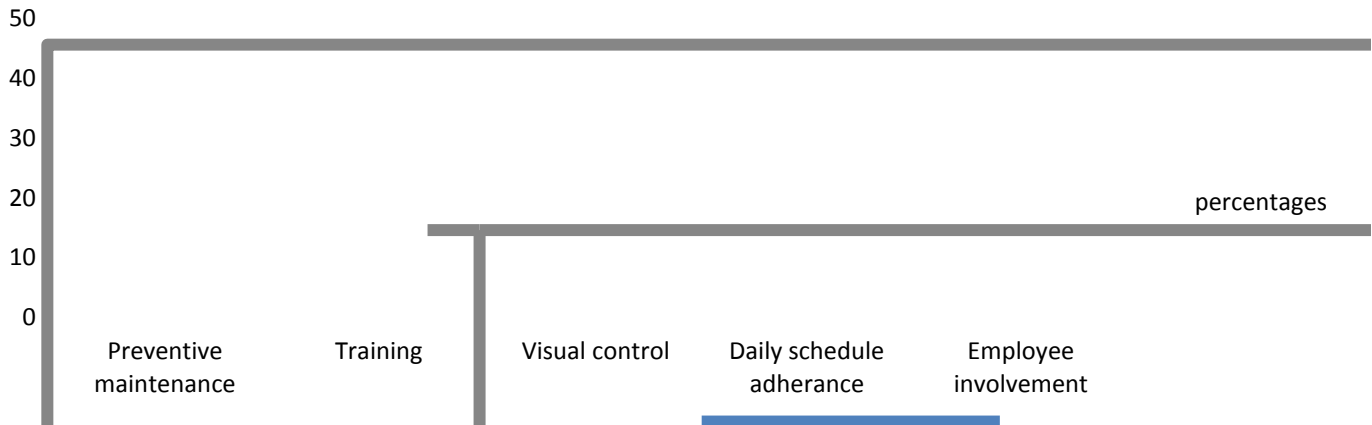
Continous improvement program
Desire to employ the best practice
Customers' satisfaction
Desire to increase market share

iii) **Lean Manufacturing Implementation:** In order to indicate the extent to which lean manufacturing system or program is employed or adopted, respondents were requested to give their ratings on the level of adoption. Among all the ratings given, preventive maintenance was the highly rated (45%) (Wong et al. 521). Other lean practices that were indicated by the respondents include training (25%), visual control (15%), daily schedule adherence and employee involvement 10% and 5% respectively (Kumar et al. 410). It should be noted that these lean manufacturing practices had a mean score of less than 3.5 indicating that there was a need for lean implementation in the company. The results of this study agree with a study conducted by Ramiya (709) which outlines that the highest implemented lean practice globally is in the automotive industry by the Toyota Company.

It should be noted that in this company, employee involvement is the least practice adopted

hence there is a need to increasingly involve employees in the process of implementing lean manufacturing in order to ensure that they are not left behind in technology (Dennis & Shook 23). The respondents indicated that the main practice that the company used was preventive maintenance. In this case, the main idea was to reduce cost through reduction of waste. Basically, when wastes are eliminated the costs of production are reduced (Wong & Wong 31). The other aspect that was indicated was training. When the responsible employees are well trained it means that they have the relevant knowledge required in elimination of wastes. As indicated earlier, wastes are eliminated when tests are conducted after each and every process or stage of manufacturing (Wong & Wong 2065). This is done to ensure there are no defects and in case of any, the whole process stops for the problem to be solved. This information is clearly indicated in Fig 2

Fig 2: Responses on the adoption of lean manufacturing practices



iv) **Lean Status:** A cluster analysis was performed according to the responses of respondents in order to identify the lean status of the company. Basically, these clusters were performed since different participants had different views on the status of lean manufacturing program in the company. In this case, similar data or responses were grouped together in order to arrange them effectively (Wong et al. 521). Notably, cluster is a category or group computed using the average values of the above mentioned lean practices from all the responses given by the respondents. This information was mainly effective in indicating the extent of implementation of lean manufacturing in the company.

The first group was comprised of responses as non-lean manufacturing program. The results for this group (A) were 12% of the total having low means of the presented lean practices variables. This indicates that these were the employees who were not involved in the process of lean manufacturing implementation (Dennis & Shook 33). In this case, despite that the study was mainly involved in studying employees who were in the management spectrum, some employees were not involved in the process of implementation of lean manufacturing.

The second group (B) comprises of respondents indicating that they were in transition to lean. This group comprised of 18% of the total having a moderate means of the presented lean practices variables (Nordin

Different respondents had different views hence clustering them was the best and simple method. Responses from respondents were classified as non-lean, in the transition towards lean, or lean on the basis of how they understand the concept and get involved in the processes of implementing it (Kumar et al. 410). In this case, the respondents who indicated non-lean were mainly those who were not completely involved in the implementation process, in-transition to lean were responses from respondents who were completely involved in the lean manufacturing implementation process (Ramiya 710).

et al. 374). The second group (B) indicated that there were employees who were in the transition of completely being involved in the execution of lean manufacturing. Responses categorized in this group showed that respondents had some information concerning the program.

The last group (C) comprised of lean respondents who indicated that they had adequate information concerning the program as they were completely involved in the implementation process. This group comprised of 70% of the total responses having high mean values of the lean practices variables measured (Vallespir & Alix 25). This group indicated that the respondents were part and parcel of the implementers of the lean manufacturing program. The chart below clearly indicates these results.

Fig 3: Mean analysis for three clusters for the lean manufacturing solutions

Group A

Group B

Group C

v) **Lean barriers:** Implementation of lean manufacturing system as learnt from the responses is not very simple. For any change to be effectively implemented in an organization, identification and understanding of barriers is very imperative. In this case, respondents were asked the problems they face in the process of implementing lean manufacturing system (Wong & Wong 32). The main barriers indicated in all the three groups included; lack of adequate information on the system (23%), lack of effective senior management (45), and negative attitudes of the middle management (32%). However, most of these barriers were occurring in the non-lean group (A) while least

From the results obtained from the study, it is clear that there is diverse information on the understanding of lean manufacturing. Many people indicated that they were heavily or completely involved in the process of implementing this system in the organization. Managers are challenged to ensure that their employees are well informed about lean

4. References

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occurred in group C. It can therefore be indicated that with effective management it becomes very easy for organizations to implement lean manufacturing (Wong & Wong 2165).

3. Conclusion

manufacturing in order to improve elimination of wastes. The study has shown that lean manufacturing is not adopted in order to win high market share in the international market but for preventive maintenance. Basically, organizations adopt this system in order to lower costs of production by elimination of wastes.

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