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Application of lean techniques within SMEs in Kosovo Manufacturing Industry and benefits of implementation

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Abstract. *By changing the way of production with the same resources engineers and managers are always trying to increase outcomes. Lean is a method which is focused on reducing waste, it is used by manufacturing industries to reduce waste and in the meantime, the quality is higher. Application of lean manufacturing into enterprises may bring many benefits and advantages such as time reduction to the customers, less utilization of inventory, efficient usage of processes, cost savings, improvement of knowledge management and rework reduction.. This paper has attempted to understand how lean manufacturing is being used in the Kosovo Manufacturing Industry, and benefits implementation of lean manufacturing techniques and their facilities.*

Keywords: Benefits, Kosovo Manufacturing Industry, Lean Techniques, Small and Middle Enterprises.

1 Introduction

Lean principles has been developed by Toyota as an evolving concept for integrated production and structuring of production practices, so they have adopted Lean Manufacturing in their production. Therefore, based on the Toyota Production Systems (TPS)[1], lean manufacturing is a management philosophy. This philosophy and management approach was summarized in five principles: value, value stream, flow, pull production and perfection [2].

To understand how lean manufacturing is being used in Kosovo Manufacturing Industry, a study of its practice across the industry was investigated. To collect data, the questionnaire is used into manufacturers about the utilization of lean methods, implementation and benefits within SMEs in Kosovo Manufacturing Industry.

There are a lot of lean tools and principles which are used recently into enterprises all around the world. Essential lean methods include 5S (Sort, Set in order, Shine, Standardize, Sustain) workplace organization, Kaizen (Continuous Improvement), Just-In-Time (JIT), PDCA (Plan, Do, Check, Act), Kanban (Pull System), Poka-Yoke (Error Proofing), Heijunka (Leveling the Workload), Standardized Work, Jidoka

(Autonomation), Total Productive Maintenance (TPM), Value Stream Mapping (VSM), etc.

This investigation provides a brief description and explanation of how lean principles are used within SMEs of Kosovo Manufacturing Industry and benefits of implementation. Provides approaches which are the most useful lean tools implications on systems by producing exactly what the customer wants, at the minimum cost with minimum or zero defects.

2 Literature review and theoretical framework

Studies on the implementation and use of the Lean Manufacturing are already widely reported in the international literature, but few of them has been reported about the implementation and use of the lean manufacturing in Kosovo Manufacturing Industry, there are some papers related to usage of lean principles about administrative processes.

2.1 Lean Manufacturing

The purpose of lean manufacturing is reducing the waste in inventory, time to market, human effort, producing products with the right quality, economically and efficiently [3].

2.2 Lean Manufacturing benefits

According to Melton (2005) [4], the main improvements related to Lean were efficient usage of processes, time reduction to the customers, cost savings, less utilization of inventory, improvement of knowledge management and rework reduction. Additional benefits of Lean are improving financial position, achieving competitive advantage, improving services, process standardization and increasing in quality. Some other positive factors are the increasing competence of employees, reducing disappointments with increasing satisfaction of customers, financial benefits to the organization and faster work completion. Also, Lean manufacturing helps organizations in changing their approach to problem-solving abilities and standardization [5].

3 Research Methodology

This investigation has been done in the SMEs (manufacturing companies) across the industry of Kosovo. It is a process of our initiatives to create a model of the Smart Factory for Kosovo enterprises [6][7][8].

It has included companies that have effectively adopted the Lean Manufacturing system and companies that are in the process of implementing Lean Manufacturing and also companies that are not using Lean Manufacturing.

The project was designed as a survey, questionnaire and interviews with managers and staff like this to evaluate the implementation of Lean Manufacturing Principles and level of usage. For that, a questionnaire has been prepared both for companies which

already implemented lean or are in process and for companies which have not implemented lean or any other improvement practices like that. There have been delivered 186 questionnaires, most of them have been sent by electronic mail (e-mail), and some of them I have delivered personally at the companies and in the meantime have been developed interviews with managers or the personnel who is responsible for the project in the implementation of lean principles. Questionnaires were sent to email addresses of correspondent to 125 companies and 61 companies by hand. However, 26 of the emails were not delivered which can be because of an address change, wrong address or other reasons. After almost three and a half months of sending questionnaires to companies, 123 responses were received; 35 from companies which have implemented lean, 88 from ones which have not used lean. Were answered in the right way 95 questionnaires and have been accepted as the sample size. The response rate is 51.07%.

4 Results and analyses

4.1 Descriptive analysis of surveyed companies

Spreadsheet and SPSS packet programme are used to analyse collected data and inferential statistical analyses are done to draw some conclusion. As just stated, the purpose of this part of the study was to determine to what extent do Kosovo SME manufacturers use LMTs, which lean tools (techniques) are companies using or have been using and what advantages could the company gain through Lean Production or any other improvement programs.

In the question “To what extent do Kosovo SME manufacturers use Lean Manufacturing Techniques”?

Figure 1 shows the percentage that are using LMTs: 33.34% (32 of the 95 companies responding) and 66.66% (63 of the 95 companies responding) that are not using LMT.

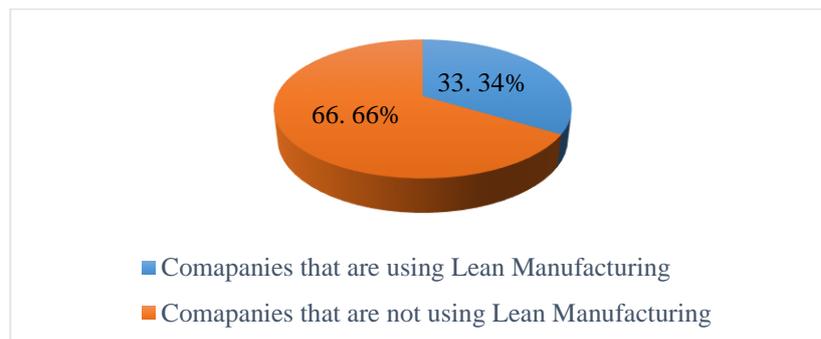


Figure 1. The usage of LMTs in Kosovo Manufacturing Industry

Figure 2 below presents Lean tools that companies currently are using or have been using in their process of manufacturing.

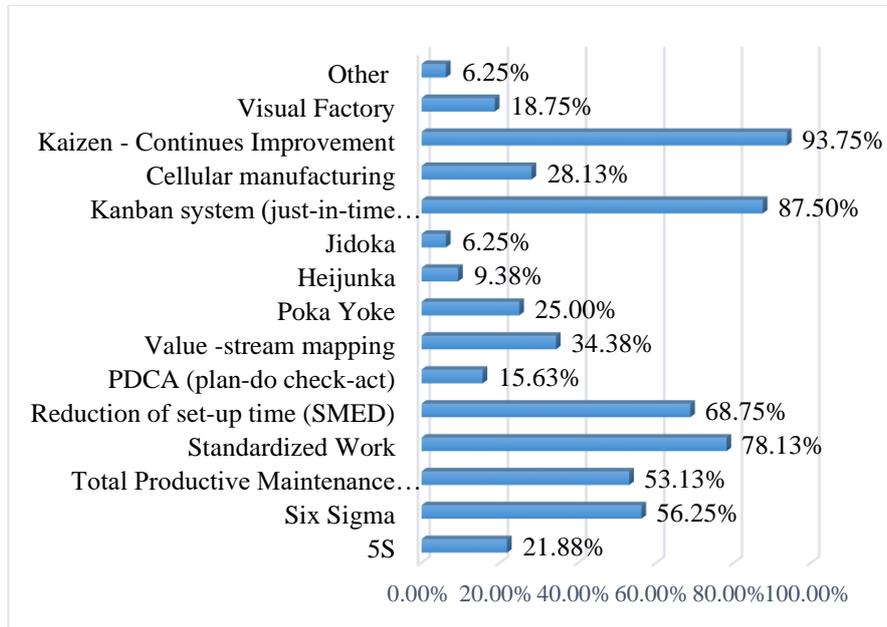


Figure 2. Lean tools that companies are using or have been using

For companies that are using LMTs, what level is the implementation of Lean Manufacturing Techniques? Figure 3 shows the percentage of the implementation level of Lean Manufacturing Techniques.

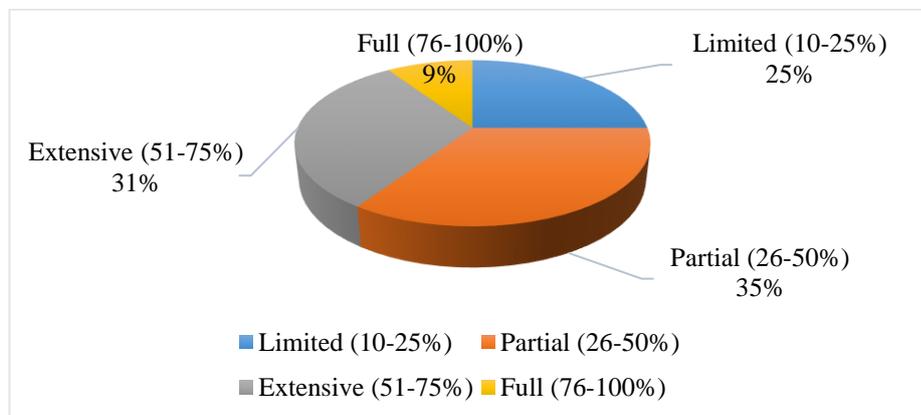


Figure 3. Implementation level of Lean Manufacturing Techniques at the companies that are using or have been using them

4.2 Benefits of Lean manufacturing implementation

Lean manufacturing focuses on lowering cycle time, waste reduction, reducing defects and reduction of response time and work in progress inventory. By implementation of

Lean Manufacturing, the organization can achieve reduced cycle time, increased labour productivity [9], [10], decreased lead time with the impact of reduced cycle time and work in developing inventory, lead time to manufacture and to deliver the product is drastically reduced [11]. Reduced inventory levels at all phases of production, particularly works-in-progress between production phases, decrease defects and unneeded physical wastage, including excessive use of raw material inputs, costs associated with reprocessing defective items, preventable defects, and unnecessary product characteristics which are not required by customers [12].

Figure 4 presents the advantages of Lean production or any other improvement program in Kosovo Manufacturing Industry based on the responses from questionnaires.

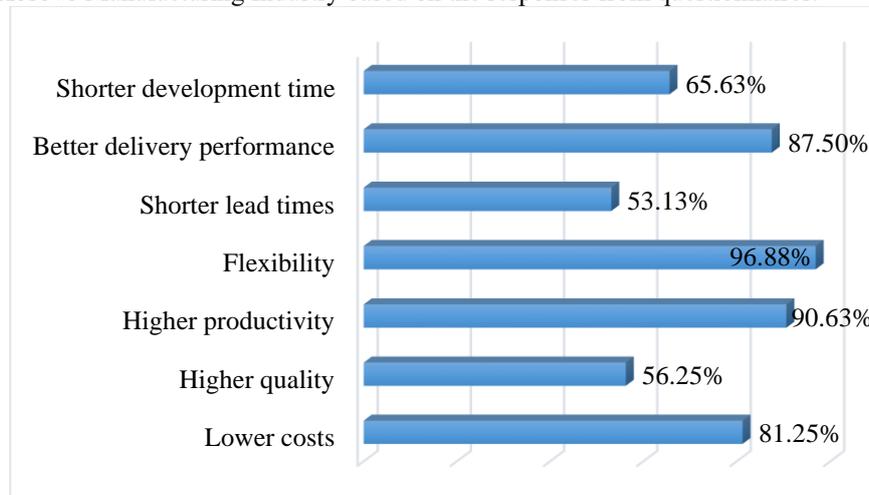


Figure 4. Benefits of Lean tools

Flexibility, higher production, better delivery performance, lower cost, shorter development time are the most common benefits of Lean tools that the respondents have answered from Kosovo enterprises.

4 Conclusion

Most of the respondents agreed on the importance of lean practices in their companies. The results show that almost all the lean production principles are applicable by SMEs of Kosovo, but the percentage of usage of Lean Manufacturing in Kosovo Manufacturing Industry is at a low level. However, based on the interview survey most of the companies that are not using Lean Manufacturing Techniques tend to implement lean in the future.

Furthermore, the analysis showed that 66% of enterprises do not use Lean principles at all, from those that are using Lean principles none of them has implemented principles completely but in partial and limited level. Those facts represent the main obstacles in the journey of Kosovo Manufacturing Industries toward Industry 4.0

Kaizen, Kanban System, Standardized Work, Reduction of Set-Up-Time, and Six Sigma are the most used lean principles in Kosovo enterprises based on the respondents' answers.

Flexibility, higher production, better delivery performance, lower cost, shorter development time are the most significant benefits of Lean tools that the respondents have answered from Kosovo enterprises. Hopefully, the next investigation will be able to enhance the findings and provide new information towards developing a feasible and systematic Lean Manufacturing.

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