DE GRUYTER OPEN

DOI: 10.1515/aucts-2015-0076

ACTA UNIVERSITATIS CIBINIENSIS – TECHNICAL SERIES
Vol. LXVII 2015

SUCCESFUL LEAN MANUFACTURING IMPLEMENTATION: INTERNAL KEY INFLUENCING FACTORS

VIRGINIA IUGA
Eng./S.C. Marquardt SCS Sibiu, Ph.D. student, Faculty of Engineering/ Department of Engineering and Management, "Lucian Blaga" University, Sibiu, Romania, virginiaiuga@gmail.com

CLAUDIU KIFOR
Professor/Ph.D., Faculty of Engineering/ Department of Engineering and Management, "Lucian Blaga" University, Sibiu, Romania, claudiu.kifor@ulbsibiu.ro

Abstract: *Manufacturing sectors and companies all over the world are successfully implementing lean principles within their processes. Nowadays, lean has become an indispensable part of global players. Companies worldwide need to be aware of multiple factors which weigh heavily on the success or failure of lean implementation. This paper focuses on giving a brief and structured overview over the fundamental organizational factors which play a substantial role for the lean manufacturing (LM) implementation process. The study below focuses on internal factors which are indispensable for a successful LM implementation within organizations. It is imperative that these internal factors are known, recognized and taken into consideration during the whole LM implementation process. Ignoring their influence on the process's implementation may lead to endangering the expected results or to making the process more difficult which could result in much higher human resource consumption.*

Key words: lean manufacturing, Toyota Production System (TPS), influences

1. Introduction

The idea of lean for the current manufacturing environment is to work and therefore produce with a focus on the perspective of the customer. Therefore, LM aims to define value as a variable which directly depends on the consumer of the respective goods or services. This study presents a series of factors identified during a literature review, which heavily influence the LM implementation process from its first phases until the end. Being aware of the existence and impact of these factors creates a huge implementation advantage through helping companies avoid unnecessary failure traps and therefore ease the implementation process.

The following chapters, two to six, present the five internal factors which have a substantial role for the successful LM implementation: structured analysis, management, technology, organizational culture and employee commitment. The seventh chapter structures these factors into a general conclusion.

2. Role of structured analysis of the start point

The initial analysis is the fundamental part of the implementing a lean production model. A good analysis will be the main pillar in defining a personalized strategy for any organization. According to current documentation, this analysis should be performed from two perspectives: the material and the information flow within the organization [1].

The tool used for analysing the material and informational flow is VSM (Value Stream Mapping). This is the classical tool to analyse waste [2]. Value stream mapping is the tool used to locate waste in the process flow and is an economical method for presenting and improving process based material flow. It is divided into two steps: VSM and VSD. Value stream mapping (VSM) displays the Current State Map, meaning the current situation. This step identifies the non-value added process steps. Value Stream Design (VSD) creates and designs the Future State Map, meaning the target situation. An improved value stream is created in which the non-value adding activities and unnecessary waiting times are eliminated. The main objective of using VSM are reduction of lead times, reduction of work in progress (WIP) and creation of simple and lean processes. The advantages of this method are the comprehensive approach, the simple and rapid possibility of presentation, waste identification and the possibility of short-term success.

3. Role of management

Research and whole industries have shown that the optimal way to implement a lean management system is to start from one point (isolated process) and expand to the entire organization. One of the main managerial tasks is to assure employee involvement, which has a decisive role for the implementation, is happening [3]. The managerial approach of maintaining the implementation of lean manufacturing in TPS vision is schematically visualized in Figure 1.

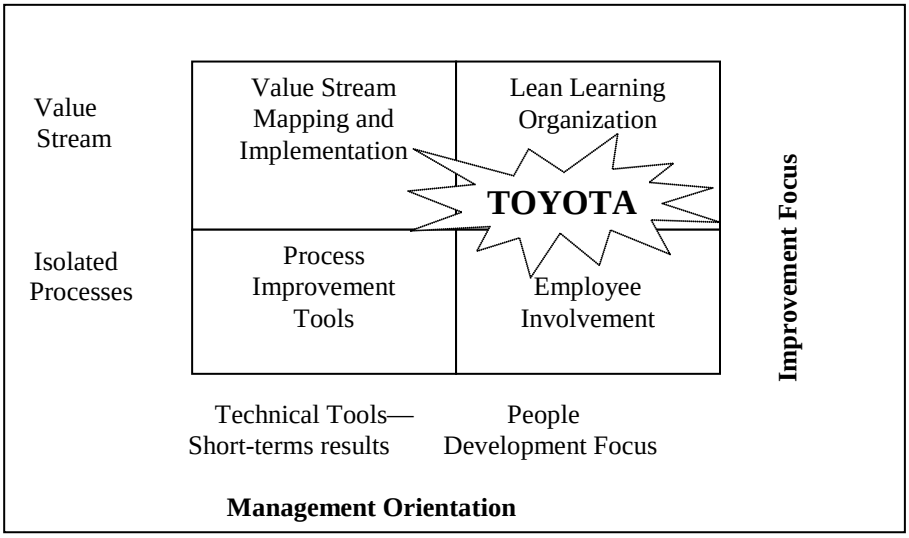

Figure 1: Managerial approach towards LM implementation
Source: Liker and Meier, (2006)

As a focus throughout all the researched materials, the importance of the leader comes up very high. More than that the importance of a leadership culture which makes the difference between success and failure of a lean organization.

There are several studies showing that if management neglects to inform employees on the benefits of lean production, this was not implemented fully [4]. Also, if lean implementation is not fully integrated into a company's management system, it is often unsuccessful. People are the most important asset and for that reason management must have a shop floor focus in order to identify non-value adding tasks [5].

According to studies, the strongest managerial points related to lean manufacturing organizations can be summed up into five main areas as followed. Managers need to be highly competent in technical work as well. Also, managers need to have a clear definition of their own customers. Two other important points are that managers should have visual display boards available and in use as well as be actively engaged in process improvement. Last but not least, managers do their best to recognize accomplishments [6].

It's vital to have cleared the role of the top management. Even if this focus on clear definition on the role of management begins with the top, eventually those who work the middle line, supporting the value-adding workers and conduct the activity need to be aligned. In several establishments these mid-level administrators have an obligation to maintain the current direction of operations.

In some businesses nowadays the middle manager or supervisor is frequently regarded as a mundane regulator or routine watchdog. Proper leadership should arise from advanced heights, where smart choices can be created and carried through. The manager needs to concentrate on minimal issues and maintain smooth operations. This view creates a narrow-minded idea where the main leaders are affected by an unintended expense.

Toyota has a dissimilar outlook on front line leaders and lays more attention on them. It is accepted that the group leader will have a personal relationship with each member in the group and help further develop them. The supervisor will be the mentor and cultivate each employee with a ratio of about one leader to 20 workers. The organizational configuration at Toyota is reasonably flat with the exclusion of many layers of management. Separation of responsibility to the bare minimum is the idea behind Toyota management [7].

Actually, there are many multinational companies implementing lean as a corporate approach. Companies like Ford, General Motors, Delphi, Boeing, Northup Grumman, The U.S. Air Force and Navy and many more. In all cases there is a clear trend: individual manufacturing plants take off with lean and get way ahead of the pack, and many lag behind and implement lean in ritual and superficial ways. The difference between them is always leadership [8]. In at least 90 percent of the cases where the lean effort has been successful, there is a plant manager who believes in lean, has a vision, and knows how to lead. In the remaining ten percent, another high-level manager in the plant-perhaps the manufacturing or assistant plant manager-has led the charge and the plant manager did not interfere. The clear conclusion is that is essential to have leaders who know how to lead.

Management support places a key role in the successful application of lean management systems within a company. This conclusion was e.g. highlighted in a study that took place within a three month period with an electronics company in north-western USA. It was demonstrated that management support and communication are important variables in a lean manufacturing implementation. Additionally, it was confirmed that due to the implementation of lean manufacturing an improvement in communication occurred [9].

According to the TPS Philosophy the main actions which the companies should do are carefully selecting leaders, mentoring potential leaders though effective leaders, provide opportunities to challenge people to allow leaders to emerge and provide leaders the support and tools to be effective [10].

It is essential to have appropriate leaders to continuously implement, maintain and develop a lean management system in an organization. The problems that might cause a company to stumble may root from the perceptions of management and employees toward lean manufacturing [11]. Research shows that the reason for failure regarding the lean manufacturing implementation are managers which do not know the real meaning of lean production [12]. The TPS management has the main role of motivating and engaging large number of people to work together toward a common goal [13].

Yet another conclusion is that managers need to "be the change" themselves by practicing the methods of lean culture personally. This means that managers as well need intensive trainings regarding problem solving and employee motivation. Currently, in most organizations, the trust between managers and employees is poorly rated. The conclusion is that if managers are not practicing what they preach, this alone will lead to low trust [14].

4. Role of technology

In the current industry there are numerous investments in the latest technology. Technology has to be highly efficient and safe in terms of ensuring the requirements of quality. Firms are often in a position of constantly searching for new technical applications to ensure their quality and productivity requirements to withstand a market that is becoming increasingly competitive. What these firms are forgetting is that the technology has a support role and not replacement role of the human factor and that a technological system, no matter how professional, will not compensate managerial and executive-level disruption. Using the lean perspective, the technology is frequently undependable, unyielding and produces too much material. This is due to that fact that it is not entirely dependable and the corporation should rationalize the price of the equipment by keeping it running [15].

Labor costs, just like stated by the labor cost philosophy, should be reduced by automating processes or in other words by acquisition of technology. This way performance is measured through the produced quantity of pieces within a certain time frame without taking into consideration the demanded quantity. Therefore the acquired technology leads to savings regarding the direct labor costs but in the same time to increase of investment costs and also to increase of stocks. Further on, in order to avoid the creation of stocks, organizations often use technology only at a partial capacity. Using technology at a partial capacity leads to the increase of the amortization period. Moreover, the acquisition of high technology equipment could lead to employees feeling insecure about their own jobs. These effects are displayed in Figure 2.

In conclusion the vision for any new technology should be always build as a human-machine system. Equipment must support the people doing continuous improvements (kaizen). Any new technology must meet a specific need and fit within the total TPS system. This conclusion demonstrates that the technology approach is another key to a successful lean implementation.

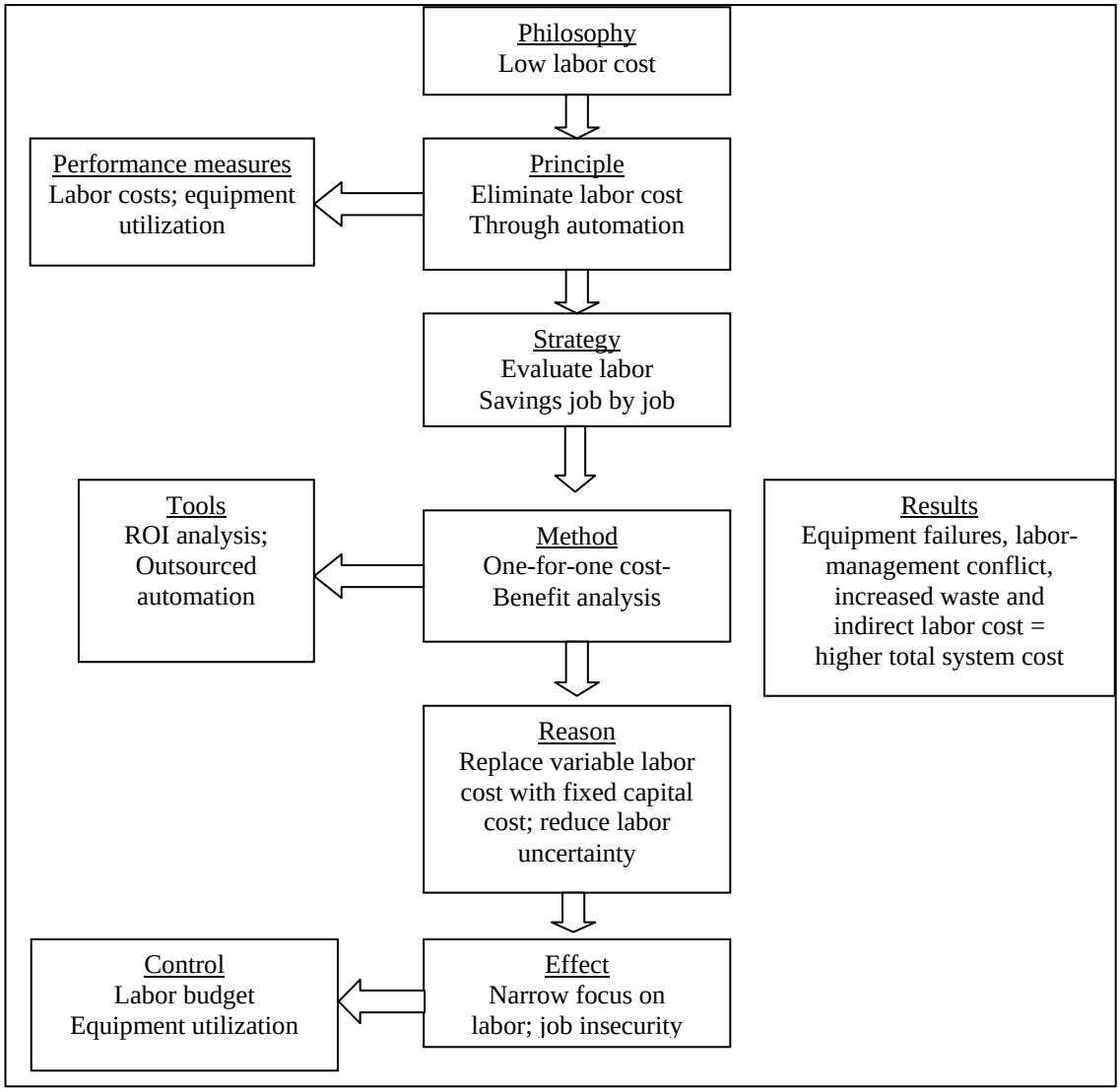

Figure 2: The risk of technology
Source: Liker and Meier, (2006)

5. Role of organizational culture

More and more studies about lean manufacturing conclude that the main issue are cultural and leadership aspects which seem to play a more important role than the TPS tools itself. Convis, a American Toyota Motor Manufacturing president, shows that TPS is not simply a set of tools and concepts, which can be implemented by command, but rather a fully integrated management philosophy and approach. The human dimension is the single most important element for success [16]. This was a new aspect that has not been mentioned by either Ohno or Shingo [17], [18]. In Convis' model, TPS was described as an integrated and interdependent system involving 3 main elements: technology; philosophy and management [19].

Many organizations only concentrate on the techniques, which may have led to the misunderstanding that the tools are the most important aspect, and not the fundamental manufacturing philosophy. That can be one of the reasons for which companies around the world only copied these tools, concluding that the TPS does not work in their environments. Technology has a vital function but true success is performed through the personnel. Many organizations fail to utilize this attribute. The principles above are directed at acquiring the most efficient gain from the abilities and talents of those who create a system of efficiency within the organization. The personnel who possess these skills are the ones who can recognize progressive prospects and foster a culture of innovation. Relying solely on consultancy to implement the system can lead to failure. It is the responsibility of managers and workers to ascertain the system collectively [20]. Human development is at the very core of the TPS. It is implemented through example, coaching, understanding and helping others to achieve their goals.

There are several risks in implementing lean methods and processes in organizations where there is no background culture and mentality necessary for the sustainability of this new improvement. In the absence of such a culture, the sustainability of the results can be achieved only under an enormous organizational effort and under huge resource consumption, especially human capital indispensable for the constant supervision and motivation of the organizational human resources resulting in a major effort to keep these structures.

Organizational culture is the number one barrier in implementing successful lean strategies. The key thought is to create a learning organization, an organization in which the implementation of a lean mentality is a first an indispensable step followed by a training process of this new organizational way of thinking so that the classical but also modern lean tools can be efficiently introduced into manufacturing organizations.

6. Role of employee commitment

The role of employees` commitment is one of the main success factors of lean implementation. Employee commitment was defined as ‘‘the relative strength of an individual’s identification with and an involvement in a particular organization’’ [21], [22]. Before any radical changes occur, management should secure the commitment of employees through positive belief and trust in the change process. On the basis of elements of successful transformation policies, there was built a model to analyze the factors determining perceptions of lean success, as shown in Figure 3.

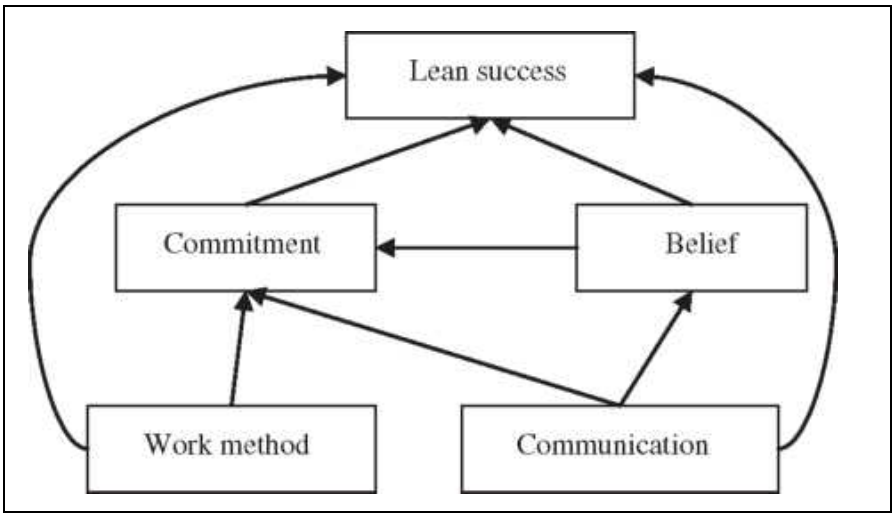

Figure 3: Predictors of lean success
Source: Losonci, Demeter and Jenei, (2011)

Belief; commitment, work method and communication all have a considerable direct effect on workers’ perceptions regarding the lean success. Belief can have a significant effect on perceptions of success. It is critical during the initial phase of any transformation process to make sure that employees without any personal experience believe in the new initiatives. Enabling identification with company beliefs may enhance commitment among employees[23]. Communication is a key external element of the organizational change process. Good communication leads to greater worker commitment. If the new work methods improve the people’s own work (in terms of speed, quality, and ergonomics) and are used to effectively resolve everyday production problems, than they can have a positive effect on an employee`s feelings of success and additionally effect on the lean success.

7. Conclusions

The above study gave a brief structured overview of the most important internal influencing factors regarding LM implementation. First of all, a structured analysis of the initial situation is mandatory as this will be the main pillar in defining a personalized strategy for any organization. Second, management plays a key role for any LM process. The absence of a positive alignment between management and the rest of the organization regarding the implementation will in most cases lead to the failure of the project. It is essential that management continuously implements, maintains and develops a coaching and mentoring attitude within the organization. Third, technology must also be aligned with the lean philosophy. It needs to be implemented in a lean way which means that it will have a support function of

the human factor leading to cost reductions. Moreover, the organizational culture is the one which sets apart organizations succeeding in successfully implementing LM and organizations failing on the way. Last but not least, employee commitment must be present and ensured in order to ensure LM will be successfully implemented.

As a conclusion, companies and lean manufacturers should create a high focus around the awareness of these five internal aspects as they are critical to a successful LM implementation. Neglecting one or more of these internal success factors could lead to either failure of the LM implementation or the consumption of more human resources than needed.

8. Acknowledgements

This work was supported by the strategic grant POSDRU/159/1.5/S/133255, Project ID 133255 (2014), co-financed by the European Social Fund within the Sectorial Operational Program Human Resources Development 2007-2013.

References

1. Liker, J., Meier, D., *The Toyota Way Fieldbook*, New York, (2006).
2. Haque, K., Chakrabortty, R.K., Mosharraf Md., Mondal P., Anwarul S. Implementation of Lean Tools in RMG Sector through Value Stream Mapping (VSM) For Increasing Value-Added Activities , *World Journal of Social Sciences*, Vol. 2. No. 5. August 2012, pp. 225 – 234, (2012).
3. Liker, J., Meier, D., *The Toyota Way Fieldbook*, New York, (2006).
4. Phillips, E.J., *The Pros and Cons of Lean Manufacturing for the Small to Medium Size Fabrication Shop*, The Sims Consulting Group, Inc., at http://www.simsconsult.com/ProsConsLeanManuf/FORMFAB2.pdf, last accessed on 20.11.2013, (2002).
5. Ahrens, T., *Successful implementation of organisational change in operations instead of short term cost reduction efforts*, Lean Alliance, at http://www.lean-alliance.com/de/images/pdf/la_lean_survey.pdf, last accessed on 20.11.2013, (2006).
6. Miller, L. M., Lean Culture and Leadership Factors A Survey of Lean Implementers' Perceptions of Execution, http://www.lmmiller.com/wp-content/uploads/2011/06/Report-Lean-Culture-and-Leadership-Factors4.pdf
7. Liker, J., Meier, D., *The Toyota Way Fieldbook*, New York, (2006).
8. Liker, J., Meier, D., *The Toyota Way Fieldbook*, New York, (2006).
9. Worley, J.M., Doolen, T.L., The role of communication and management support in a lean manufacturing implementation, *Management Decision*, Vol. 44, No. 2, pp. 228-245, (2006).
10. Liker, J., Meier, D., *The Toyota Way Fieldbook*, New York, (2006).
11. Banhan, L.A., Survey on Implementation of the Lean Manufacturing in Automotive Manufacturers in the Eastern Region of Thailand, *2nd International Conference on Industrial Technology and Management*, ICITM 2012, IPCSIT Press, Singapore Vol. 49, pp. 43-48, (2012).
12. Yang Pingyu, A., Yu Y.B., The Barriers to SMEs' Implementation of Lean Production and Countermeasures-Based on SMS in Wenzhou, *International Journal of Innovation, Management and Technology*, Vol. 1, No. 2, pp. 220-225, (2010).
13. Convis, G., *Role of management in a lean manufacturing environment, Learning to think lean*, 01-1014, at http://www.bxlnc.com/download/Role-of-Management-in-a-Lean-Manufacturing-Environment.pdf, last accessed on 29.04.2015, (2001)
14. Liker, J., Meier, D., *The Toyota Way Fieldbook*, New York, (2006).
15. Liker, J., Meier, D., *The Toyota Way Fieldbook*, New York, (2006).
16. Ohno, T., *Toyota Production System – Beyond Large-scale Production*, Portland, Oregon, Productivity Press, (1988).
17. Shingo, S., A *Study of the Toyota Production System; Productivity Press*, Portland, Oregon, USA., (1989).
18. Ahrens, T., *Successful implementation of organisational change in operations instead of short term cost reduction efforts*, Lean Alliance, at http://www.lean-alliance.com/de/images/pdf/la_lean_survey.pdf, last accessed on 20.11.2013, (2006).
19. Convis, G., *Role of management in a lean manufacturing environment, Learning to think lean*, 01-1014, at http://www.bxlnc.com/download/Role-of-Management-in-a-Lean-Manufacturing-Environment.pdf, last accessed on 29.04.2015, (2001)
20. Black, J., Miller, D., *The Toyota way to healthcare excellence*, Foundation of the American College of Healthcare Executives, (2008).
21. Mowday, R.T., Steers, R.M., Porter, L.W., *Employee-organizational Linkages: The Psychology of Commitment, Absenteeism, and Turnover*, Academic Press, New York, (1992).
22. Losonci, D., Demeter, K., Jenei, I., Factors influencing employee perceptions in lean transformations, *International Journal of Production Economics*, No. 131, pp. 30–43, (2011).
23. Iuga, M. V., Kifor, C. V. Lean manufacturing and its transfer to non-Japanese organizations, *Quality: access to success*, Vol.15, No.139, pp : 75-79, (2014).