

The impact of lean implementation and benefits within Indian automotive component manufacturing SME

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ABSTRACT

Implementation of lean manufacturing in any type of organizations can bring many benefits, such as reducing waste and improving operating efficiency. However, lean implementation is not a straightforward process. Although a number of frameworks have been presented, still many companies find it difficult to implement lean. Furthermore, most of these roadmaps are for large manufacturing companies, and not for small and medium enterprises. Unfortunately, there is not a recipe that if used can guarantee a successful implementation. Furthermore, unsuccessful implementation can have a great impact on organization's resources, but even more importantly, affect employees and their confidence in lean philosophy. In the present paper, the most prominent lean implementation frameworks will be discussed, under the prism of the needs of SMEs. The challenges for the SMEs in their lean journey are discussed.

Keywords: manufacturing, implementation, organization, companies

INTRODUCTION

Lean manufacturing has a relevantly short history of about 60 years. The term "lean manufacturing" though is more recent, firstly proposed by Krafcik. Lean manufacturing thus is basically the Toyota Production System (TPS) that evolved at Japan in the automotive sector after the Second World War. A short, comprehensive definition for lean manufacturing is the following: "Lean manufacturing is an integrated socio-technical system, whose main objective is to eliminate waste by concurrently reducing or minimizing supplier, customer, and internal variability".

In a nutshell, lean manufacturing aims to achieve the same output with less input such as less time, less space, less human effort, less machinery, less material, less cost. Although there is a tendency of oversimplification indicating that lean is a set of tools to be used for improving productivity, the situation is not that simple. Lean affects all aspects of an organization, and can be rather considered as a new management philosophy. Introduction thus of lean philosophy into any organization is quite complex and difficult. Several factors need to be considered when setting out to implement lean with stakeholders having conflicting interests. In practice companies set out enthusiastically to implement lean, only to find out that this is not an easy journey with a guaranteed successful end.

Unsuccessful implementation can have a great impact on organization's resources, but even more importantly, affect employees and their confidence in lean philosophy. Roadmaps and frameworks have been developed that promise to guide organizations to fully implements a lean philosophy. The implementation of lean in Small and Medium Enterprises (SMEs) pose even more challenges. As indicated by Achanga et al., SMEs "require that the implementation costs and the subsequent benefits of lean manufacturing adoption, be projected upfront before they are able to commit". Further to this, SMEs compared to large organizations have limited resources, and in many cases the leadership lacks the long term commitment required. In the present paper, the most prominent lean implementation frameworks will be discussed, under the prism of the needs of SMEs. The challenges for the SMEs in their lean journey are discussed.

METHODOLOGY

The goal of the present paper is to assess the lean implementation framework from the SMEs perspective. Womack et al. claim that lean production is applicable in all companies despite their size. However, as highlighted in the introduction, SMEs have certain constraints that encounter problems regarding implementation of lean production in their organizations. To identify the problems, challenges and constraints that SMEs face, the methodology adopted was the structured literature review. The literature review is based on books, monographs, and mainly peer reviewed journal papers. The key topics under investigation was the existing lean implementation frameworks presented up to now and the key studies presented on SMEs and lean manufacturing.

Lean implementation framework

Several lean implementation frameworks have been presented in the last 20 years. These frameworks are usually roadmaps, guiding the organizations on how to implement lean manufacturing, highlighting the sequence of the lean tools to be introduced in the organization, and in some cases the success criteria. In the following two sections, frameworks developed from both academia and consultancy firms are presented.

Academic lean implementation frameworks

Probably the first roadmap presented, was proposed by Shingo suggesting the key lean initiatives that should be introduced within the first year of the lean journey of a company. He identified fifteen lean tools and techniques such as SMED, poke yoke, Kanban etc. to be implemented. Kowalski also suggested a 10-step approach focusing in the development of effective working systems and standardization of work. In a similar way, Beck suggested another 10-step model, focusing however in design and layout planning. Kowalski and Beck roadmaps.

For the implementation of lean, Hilbert suggested a two-phase model. The first phase is composed of seven steps that need to be completed, namely identifying a launch team, a production team and key leadership; establishing a shared vision among stakeholders; establishing a method of evaluating the performance of the change effort; establishing stability of current system; providing a definition for suitable policy to integrate social and technical aspects of “lean” elements; creating design process with regard to coordinating hardware and software resources to “leanness”; and offering necessary alternatives to solving the probable conflicts. The second phase is composed of four key stages: building a shared vision, planning and designing the change, managing the change, and celebration and continuous improvement. It is evident that Hilbert focus more on social, cultural, and educational aspects instead of just the use of tools and their operational components (in comparison to the approach proposed by Singo, Kowalski and Beck. Comparison of Kowalski (left) and Beck (right) roadmaps to leanness.

Åhlström presented his own sequence for implementation of lean principles. Zero defects and decentralization and integration of functions should be first steps in implementation of lean. He identified as core principles the elimination of waste, setting up multifunctional teams, and pull scheduling. In support to these core principles, he suggested vertical information system and team leaders. Both core and supporting principles need to be considered by managers during the whole implementation time.

Anvari et al. reviewed lean frameworks that have been presented between 1996 and 2001, and highlighted the key similarities that these frameworks exhibit. According to their study, three major stages can be identified when implementing a lean implementation framework: Preparation, design and Implementation. The lean steps that compose these stages are shown in table 1. Based on their findings the authors suggested a dynamic model for a lean roadmap to account for the volatile conditions and the high variability of the environment.

Lean Aerospace Initiative group at MIT, developed the “Enterprise Level Roadmap” as a set of processes and steps that senior management can use moving the enterprise to higher levels of lean performance. This roadmap is composed for three main stages, the “Entry”, the “Long term” and the “short term” cycle. For all these three stages, the roadmap provides requirements. A description of a top-level flow of primary activities is provided as a starting point. descriptions of key tasks required within each primary activity and finally it leads to discussion of issues, enablers, barriers, case studies and reference material relevant to each task in a common structured framework. This roadmap gives a holistic approach the whole of the enterprise. LAI also provides a roadmap for the transition of an existing production operation to a lean one, composed of seven phases.

The key advantage of this roadmap is the integration of engineering, human resources, and business viewpoints are for providing a systematic implementation process. Mostafa et al. proposed a lean implementation framework composed of four phases. The phases are defined as conceptual, implementation design, implementation and evaluation, and complete lean transformation phase. Monitoring and controlling are integrated to all phases to ensure that the expected results towards lean transformation are delivered. Each phase is presented as a model with input and output and a set of tools that can be used for achieving the output. Indicatively for the second phase “Implementation design” the tools that can be used include VSM, AHP, SWOT analysis, QFD etc.

Lean implementation frameworks proposed by industry

Wright presented a twenty-step implementation plan in the form of a roadmap. The various lean tools are sequenced in a logical order. Indicatively, the process starts with the formation of a team, and then several lean tools are to implemented such as 5S, TPM, Value stream mapping for the identification of the various types and sources of waste, etc. The idea behind the framework is to allow the introduction of line balancing the process line, introduction of pull (one-piece flow), and cellular manufacturing. The ultimate goal is to introduce a Kaizen philosophy in the organization. Obviously, the framework is not to be adapted as-is but requires adopting to the specific needs of the organisation. Harbour in a technical report oriented to the automotive industry, identified the importance of “people systems”, as the critical factor for success in a lean implementation programme. He acknowledges that lean tools and methods are valuable, but the success depends on the way these are implemented. Thus he states that the success lies on the

selection of the proper people's system, definition of the roles and responsibilities and the proper training. He has suggested four phases for the implementation of lean, namely: organizational development (phase I), discipline building (phase II), lean tools of quality, delivery and cost improvement (phase III) and continuous improvement and collaboration (phase IV). Obviously, this is not an exhaustive list of the various lean implementation frameworks and models presented in the literature.

However, the key finding out of this literature review is that there is no lean implementation framework developed specifically for the needs of SMEs.

Why lean initiatives fail?

Implementing lean manufacturing can be considered as any other change introduced to a company. Change is identified as the behavioural shift of "the organization as a whole, from one being to another". On the other hand management of change has been identified as "the process of continually renewing an organization's direction, structure, and capabilities to serve the ever-changing needs of external and internal customers".

Kotter indicated that only 30% of all change programs applied are successful. LaClai and Rao echoed Kotter's research, indicating that 58% of change initiatives fail to reach the expected return. Eaton presents even more dramatical data, based on Carmeron Group survey in 1997, stating that 75% of the change programmes eventually fail. In general, in literature it is easier to find reports of successful change programmes, rather than failures, as these are kept confidential due to the profound cost incurred. Some of the failures though are disclosed, mainly due to the high profile of the projects.

Therefore it is not a surprise that there are not many studies on lean manufacturing implementation failures, mainly since companies wish to protect and not disclose their investments that failed. However, it is a common understanding that many implementations do fail. In the few studies presented about failing implementations, the common root cases identified are related to:

- Lean suppliers
- Leadership
- Employee involvement
- Tools and techniques
- Business systems

Kumar and Kumar focused on the barriers in the implementation of lean manufacturing, and grouped them into seven categories: management, resource, knowledge, conflicts, employee, financial and past experience. Management can be both a barrier but also a driver for lean implementation. When considering management as a barrier, this is related to specific attitudes and behaviors such as exerting lack of focus for supporting lean manufacturing initiatives, failing to create urge of urgency, and does not have long term vision, to name few.

Per Kumar and Kumar, lack of necessary resources (labour, capital, communication etc.) prohibit the implementation of lean manufacturing. Furthermore, lots of companies that attempt to introduce lean practices (and eventually thinking) rely on consultants, thus resources for consultancy are key as well. The quality of the consultant is also critical, and in many cases superficial knowledge of the subject and lack of implementation practices results into confusion about Lean Manufacturing and can become an obstacle in Lean Manufacturing implementation. It is thus evident that knowledge of the subject is of paramount importance as well. Absence of knowledge on lean philosophy and the various tools can be a great barrier in the implementation.

Resistance to change by the employees is a common barrier as well. This is covered a lot in the following chapter about change management. This resistance can be rooted to the fear of the unknown, fear of failure and complacency. In several studies, the research was focused in identifying and ranking the critical success factors as means to overcome the barriers for the implementation of lean manufacturing. Hamid identified eight internal organizational factors and two external factors.

The literature thus review revealed a wide range of factors related to the successful implementation of Lean, that are summarized into:

- x Organisational culture and ownership
- x Developing organisational readiness
- x Management commitment and capability
- x Providing adequate resources to support change
- x External support from consultants in the first instance
- x Effective communication and engagement
- x Strategic approach to improvements

- x Teamwork and joined-up whole systems thinking
- x Timing to set realistic timescales for change and to make effective use of commitments and enthusiasm for change.

Drivers and Barriers to lean manufacturing

The review of the papers with regards implementation of lean manufacturing in SMEs indicated the key drivers and the main barriers for a company to introduce lean manufacturing. The drivers, besides the obvious and well-advertised benefits (increase market share, increase customer satisfaction, increase sustainability of the company), are also having to do with improving the internal performance of the company (such as increasing flexibility, introduction of realistic and meaningful key performance indicators, desire). In some more mature companies participated in these studies, the goal was simply to employ the best practices. The barriers in the implementation of lean manufacturing, can be linked to management, lack of necessary resources, resistance to change etc.

Management can be both a barrier but also a driver for lean implementation as discussed in a previous section. Resources are critical as well, and their lack is a major barrier. The way of introducing lean (internally or externally through a consultant) is critical as well. Absence of knowledge on lean philosophy and the various tools can be a great barrier in the implementation. Resistance to change by the employees is a common barrier as well. This resistance can be rooted to the fear of the unknown, fear of failure and complacency. Salonitis and Tsinopoulos [19] classified the barriers into four groups: financial, top management related, workforce related and other barriers.

CONCLUSION

In the present study, the challenges that SMEs face when they begin their lean journey have been discussed through a structured literature review. Various lean implementation frameworks were reviewed, as well several studies focused on the implementation of lean on SMEs in various countries around the globe. The article focuses on roadmap based lean implementation approaches. There are however lean implementation frameworks based more on the lean principles rather than on a series of steps. Examples of such approaches have been presented by Villalba-Diez and Fujimoto.

Drivers and barriers to the implementation were identified and presented in the form of a force field analysis. The key conclusion drawn is that is no unique roadmap to “leanness”; this needs to be tailored for every different organization.

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