

## When a set of tools is not enough- lean placed strategically

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### Abstract

*This study aims at the identification of lean manufacturing implementation challenges in small and medium enterprises. The adoption of lean principles and ultimately a change into a lean enterprise is becoming more and more important for companies that are concerned about improving their overall performance. In current times of severe competition and pressure for shortening lead times while cutting production costs, lean manufacturing has become an interesting improvement opportunity. It can be stated that the reality of SMEs, to a certain degree, resembles the Japan's situation back in the days when the concept of lean was invented- the challenge of limited resources and the need for flexibility. Furthermore, the publications on lean deliver a clear message that reaching a lean enterprise is achievable regardless of company's profile. The promised universality of the concept combined with splendid results it might bring leaves SMEs in particular in a state of dichotomy. While being short on resources and having large "lean giants" as a benchmark, small organizations find it particularly challenging to initiate the process of lean implementation. Therefore, the aim of this article is to provide an overview of the current research in the field of lean, with Toyota case as a reference, and contrast it with the characteristics of SMEs as outlined during the course of empirical research. The comparison is further developed into the analysis of the crucial factors that affect the lean implementation. The study is based on Finnish manufacturing organizations however, the conclusions bear a certain degree of universality which allows claiming that they can be stretched to other types of SMEs.*

**Key words:** *lean manufacturing, SMEs, strategic planning*

### 1. INTRODUCTION

Lean as a concept can been growing in popularity and scientific literature presents numerous examples of the successful implementation. While success stories concern mainly the automotive industry, the research concerning lean implementation in small and medium enterprises (SMEs) is still being somewhat underdeveloped. Scientific resources often quote the success stories of major players, within the automotive industry in particular, while lacking the more complex perception that includes SMEs. Moreover, the existing research on lean tends to divide into two streams of lean seen as a toolbox and as a philosophy. This article presents different approaches to lean as well as the empirical evidence illustrating the weaknesses of seeing lean as a set of tools.

The benefits of lean philosophy have become widespread with the popularization of Toyota's success. Nowadays, in the conditions of economic downturn many companies, disregarding their profile, are seeking for solutions that would enable effective utilization of available resources as well as effective cost management. The scientific literature presents numerous examples of the successful adoption of lean. However, the presented success stories concern mainly automotive industry and are heavily dependent on quantitative results expressed mainly through increased profit [1]. The qualitative research concerning small and medium enterprises in particular, still remains somewhat underdeveloped. Moreover, the examination

of scientific literature proved that there exists a division in terms of classification of lean. Presenting and the perception of lean as a set of tools or as a philosophy is common, frequently contributing to false perception of organizational leanness as well to implementation failures. Moreover, the universality of the lean concept is still being questioned. The main critique being directed to lean's is the fact that it ignores the external factors to which management must respond when steering a business [2].

This paper presents different approaches to lean in more detail. The aim is to provide empirical evidence regarding the lean implementation in a manufacturing company. The paper highlights the weaknesses of the approach that assumes treating lean as a toolbox rather than a philosophy that encompasses both manufacturing and management systems. Moreover, the paper discusses the further development of the lean initiatives in the organization chosen for the study.

### 2. THEORETICAL BACKGROUND

The examination of scientific literature in the field of lean aims at briefly outlining the historical development of lean, presenting different approaches to the concept as well as emphasizing the importance of perceiving lean in a specific context of the overall management philosophy rather than a toolbox for manufacturing improvements.

## 2.1 A brief history of lean

Lean as a manufacturing and management concept has a history that goes back to Japan in post 2nd World War times and the manufacturing improvements ignited in Toyota. The importance of lean production in terms of its abilities to address the trade-offs between productivity and quality is emphasized by [3]. The author also refers to the very origins of the lean concept and its "critique" of the manufacturing methods of the West. The common flaws identified consisted of large-batches manufacturing (leading to the unnecessary inventory build-up) as well as the inability to translate customer requirements into a ready product that would offer a considerable range of variety. Having those inefficiencies as a starting point, the idea of lean manufacturing was established upon the small-lot concept and the elimination of waste. In order to be able to achieve the practical realization of the aforementioned concepts, lean gradually evolved towards a quick changeover techniques and just-in-time.

Bearing in mind all the benefits that stem from addressing the weaknesses of mass production as well as a change in customers' needs (request for greater variety), [3] emphasizes the dubious innovativeness of the lean concept. The author refers to the fact that lean might as well be seen as a result of mindfully addressing the aforementioned challenges. In the particular case of Toyota, the success can also be attributed to the characteristics of Japan particularly back in the post 2nd World War times. According to [4] the war-ravaged country with almost no natural resources at hand had little chance while competing with Ford. Therefore, based both on country's characteristics, economic situation as well as the mistakes made by Ford, Toyota was able to create and develop not only a manufacturing method but also management philosophy that became a paradigm shift and a new development path for many companies that decided to follow.

## 2.2 The holistic approach to lean

It is vital to recognize that the research into lean is not limited to manufacturing improvements. According to [5] the success story of Toyota is largely caused by its management system, based on the lean principles, which have been developing over the years. [5] emphasizes the importance of a long-term philosophy. Focus on a long-term perspective lies at the heart of the lean management system. Moreover, the principles of lean management refer to a broad context of operations, not only to manufacturing.

This paper emphasizes the importance of placing the adoption of lean in a broader context of company's strategy and development in a long- term perspective. [6] claim that the successful lean implementation in manufacturing companies should be considered as two-dimensional. Along with technical requirements the cultural requirements are equally important. The latter group of requirements is defined as a change in organizational culture that can be achieved by the improvements of such areas as:

- Decision making processes
- Specification of company's mission and vision
- Supporting a strategy of change and communication of objectives
- Assigning responsibility and employee empowerment
- Development of supplier relationships
- Creation and fostering of a learning environment
- Customer focus
- Lean leadership
- Focus on the regular assessment of lean initiatives

[6] outline yet another factor that should be addressed when developing the cultural environment fostering lean improvements. Long-term commitment and awareness of the fact that benefits of implementing lean might need time and iterations to achieve desired results is a crucial element of understanding lean. Such thinking is also supported by [7] who emphasizes the importance of the parallel introduction of lean manufacturing and lean management. The author emphasizes the importance of creating a lean culture that is an essential requirement for achieving sustainable results. According to [7] the lean culture refers to the way work is being done in an organization. Therefore, it is an intangible idea that remains unnoticed. [7] suggests that the identification of a lean culture within production can be explored by addressing the following issues:

- Inventory practices
- Controlling the production status
- The status of process improvement activities
- Typical responses when problems arise

[7] claims that recognition of the "old habits" and changing them is a necessary prerequisite for the introduction of sustainable lean improvements. The author focuses on the importance of lean management that should be introduced in parallel with manufacturing improvements. The principal elements of lean management comprise of the following:

- The role of leader and standardized work
- Visual controls
- Daily accountability process
- Discipline to execute the introduced lean elements

[8] focuses on the performance of organizations that treat lean as an ideology and emphasizes the importance of being able to distinguish between different forms of lean implementation. The author claims that the approach to lean that assumes its ideological traits, comprise of the following elements:

- Lean becoming a way of thinking
- Integration of lean into a complete system
- Lean as a profit generator
- The importance of developing people
- Tools that are considered to be means for seeing problems, not for solving them
- Lean extended to the whole value chain, including outsourcing
- The clarity of vision regarding lean is a must
- Cultural changes in terms of employee empowerment are needed

In summary, this paper emphasizes the importance of treating lean as a long-term commitment to organizational turnaround as well as strategic planning of the general lean development. This claim is further justified by the empirical part presented in chapter four. This article assumes that a sustainable lean implementation can be achieved by addressing not only shop floor improvements but also management systems of organizations. In other words, lean should be treated as a philosophy that guides even strategic planning. The holistic approach to lean as presented in this paper promotes perception of lean in a broader context of organizational culture and strategy development in a long term. This paper aims at supporting the claim that lean implementation cannot be successful without the aforementioned approach.

### 3. METHODOLOGY

Case study approach was implemented in order to address the aforementioned research aims. Single case approach was chosen in order to address the depth rather than the breadth. [9] suggest that single cases are generally recommended for gaining an in-depth and detailed understanding. The study presented in this paper comprises of data collection through in-depth interviews and shop-floor visits. The emphasis was put on gathering qualitative evidence as well as providing description of the situation in a given point of time. The implemented approach aimed at theory testing and therefore, a deductive research approach has been utilized.

According to [10] case study method is particularly useful for providing answers to how and why questions, as well as for theory developing, testing and refinement. The case study method was chosen in order to study the phenomenon in its natural setting. Moreover, the method allows for exploration which was necessary to

sharpen the research objective. Theory testing was also an important for the presented research. [10] claim that the case study method is a suitable when complicated issues are being studied. The implementation of lean can be classified as a complex issue since it involves not only usually visible shop-floor improvements but also less tangible issues such as relationships with suppliers.

#### 3.1 Crafting and conducting the research

The research was conducted in based on a set of logical steps. Firstly, based on the author's experience from the previous projects, the potentially challenging area in the process of lean implementation was identified. Secondly, literature review was conducted in order to identify the different scientific approaches to the research in lean with particular attention being paid to the approach that assumes that successful lean implementation requires long-term commitment to the lean change as well as the awareness that becoming a truly lean enterprise requires a change affecting management systems, not only the introduction of several shop-floor improvements. The research into scientific literature facilitated the process of preparing the in-depth interview questions. The company chosen for the study was previously identified as a lean adopter. While simultaneously being a medium-sized, manufacturing company, the organization proved to be a suitable case for the further exploration. The in-depth interview was conducted with the company's lean leader responsible for planning, implementing and monitoring lean initiatives within the studied organization. Based on the identified implementation challenges, the conclusions and managerial implications were drawn. Figure 1 presents the logical flow of the research process.



Figure 1. Logical flow of the research process

### 4. THE CASE COMPANY

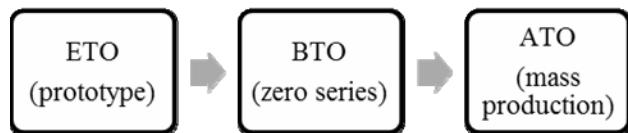
The company chosen for the study is a manufacturer and a supplier of megawatt-class permanent generator and full-power converters with headquarters in the Ostrobothnia, Finland. The company is active in wind power and other renewable energy sectors. The organization falls into the category of small and medium enterprises (SMEs) in terms of headcount and turnover. However, it has been consequently establishing its global presence (units in India, Germany, China, Spain, Korea and USA).

The products offered by the case company are highly complex and require a considerable degree of customization. Moreover, the company needs to face the challenge of unpredictable demand. The implementation of platform-based products and modularity is one of the means to address demand fluctuations as well as the degree of customization required by customers. In reality almost every customer order is different and therefore, the company does not keep inventories.

The company operates largely based on the engineering-to-order (ETO) and build-to-order (BTO) model. Moreover, it has an interesting model of

operating which is based on flexible factory model which is expected to be transferable to other parts of the world relatively easy. The company also relies on line workers employed indirectly through an outsourcing agency. Line workers are employed based on fixed-term contracts. The smartly standardized procedures enable them to start the assembly within a short time.

The specifics of the offered products determine the company's operating mode. The company based its manufacturing upon the three stages presented by Figure 2.



**Figure 2.** Manufacturing process in the case company

In the first stage, the company needs to be proactive in winning new orders and therefore invest in creating a prototype. Based on the principle of build-to-order company organizes the manufacturing of "zero series" that are sold to customers based on the previous orders ignited by the interest in prototypes. The "mass production" occurs when customers order a product that can be assembled-to-order. The "mass production" series are fairly unpredictable and the company experiences moments when production lines need to be stopped since there are no orders. The next chapters will discuss the lean improvements undertaken in order to increase company's effectiveness as well as the challenges encountered.

#### 4.1 The adoption of lean

The adoption of lean occurred as an internal stimuli and strong belief that things can be done better and more effective. Moreover, the drive towards lean was also dictated by the need to facilitate the establishment of model factories. Standardization that lean promotes was the crucial issue determining the decision of becoming lean. The company began the adoption of lean five years ago and the benefits have become noticeable. However, they can be mainly observed in the context of manufacturing improvements. The factory tour, that occurred as a part of the data collection process, revealed that the principles of visual management, the logic of one piece flow, as well as 5s, have been adopted successfully. Still, the gradual diffusion of lean thinking needs to occur within the whole value chain of the studied organization.

The company focused introducing lean to manufacturing processes. Such approach has both its advantages and drawbacks. As it was mentioned in the early part of this paper, the adoption of lean should be seen as a holistic undertaking, otherwise a company cannot describe itself as a lean enterprise. However, the process of lean implementation requires dedicated leaders as well as a deep and thorough understanding of the changes that should occur. It can be stated that

the case company took the "safe and rational" route while making a best use of available resources and company's characteristics. Table 1 summarizes the lean improvements introduced in the case company. The improvements have been divided into two main areas that focus on standardization and visual presentation. However, it can be argued that the introduced improvements are the intersection of both.

[8] identifies seven consecutive stages of a lean journey, which starts with planning (where no implementation benefits are evident and no infrastructure and organizational decisions have been implemented) and ultimately reaches a stage in where lean becomes an ideology (where lean tools, culture and organizational practices are present, and lean thinking is applied to every component of the value chain). Based on the stages of the lean journey outlined by [8], the studied company can be classified somewhere half-way on its journey towards becoming a truly lean enterprise. The studied company can be classified at the enhanced stage of a lean journey, which defines an organization that has successfully implemented a pilot project in lean, lean initiatives manufacturing based, and the remaining need to address the cultural and organizational practices.

**Table 1.** Lean implementation in the case company

Lean initiative	Aim
<b>Standardization</b>	
Standardized work procedures with reduced setup time	Moderating the effects of high employee turnover; enabling the employment of outsourced workforce; newly employed workers capable of starting the assembly process after a brief training
Standardized documentation: <ul style="list-style-type: none"> <li>- Templates for internal documents and reports</li> <li>- Templates for product information</li> </ul>	Simplification of procedures and decreasing time needed for producing documentation; the idea based on Toyota's A3 reports
Streamlined sequence	Elimination of non-value adding and wasteful activities
Kanban system for suppliers (pull replenishment system) <ul style="list-style-type: none"> <li>- Kanban cards for components clearly marked</li> </ul>	Cutting costs and delivery times of components
Point of use storage	Eliminated wasteful activities like excess time needed for e.g. tool retrieval
One piece flow/cell manufacturing/small batch size	Easier distinction between value adding and wasteful activities
<b>Visual control</b>	

Lean initiative	Aim
Andon lights	Assigning responsibility to line workers; improved communication thanks to production figures updated weekly
5s (+ safety): <ul style="list-style-type: none"> <li>- Color coded tools</li> <li>- Unnecessary tools eliminated</li> <li>- Each item in a designated space</li> <li>- Floors clearly marked</li> <li>- Assembly instructions available on screen- focus on visual presentation</li> <li>- Identical workstations for each assembly line</li> <li>- Clearly marked shelves</li> <li>- Visual instructions</li> </ul>	Decreasing lead times; eliminating wasteful activities such as locating the right tool and the movement needed to retrieve it; simplification of assembly procedures in order to reduce setup times; increasing the workplace safety by eliminating risks of accidents

#### 4.2 Implementation challenges

[5] claims that lean manufacturing improvement initiatives should be supported by the lean management system based on several principles, out of which the most crucial are long-term orientation, choosing the right processes that produce the right results, adding value by developing people, as well as investing in the organizational learning. This paper highlights the importance of addressing lean from a strategic viewpoint that assumes that lean improvements needs to be embedded in company's strategic development plan. The lack of careful planning might result in the introduction of some random improvements that will ultimately result in a false impression of being a lean enterprise while, in fact, not being able to fully benefit from the improvements that lean potentially offers.

The lean initiatives presented in the previous section refer to the organization of the manufacturing processes. Nevertheless, the studied company is still experiencing difficulties in diffusing and sustaining lean initiatives. After five years of "doing lean" the reached development is noticeable but rather modest, especially in the context of gradually diffusing lean within the whole value chain. The company managed to introduce the aforementioned lean initiatives in their model factory visited during the data collection. Moreover, the interviewed lean leader stated that factories in other countries such as China (where the mass production takes place) have also reached a satisfactory degree of leanness. The studied company also gradually realizes that close collaboration with supplier is necessary for the further development of leanness. In summary, the studied organization has reached a stage in which lean journey needs to be continued and developed while lacking the clarity regarding the future state.

In the specific case of the studied organization, the most important implementation challenge stems from the fact that the company's operations are

characterized by high product mix, high variety and unpredictable demand. Many scholars claim that the principles of lean will not work in such conditions. Moreover, the company struggles with high employee turnover, which makes both the employee empowerment and assigning responsibility even more challenging. Workforce fluctuation also limits the opportunities for building team spirit and common understanding of what lean really is as well as the ultimate aim of the improvements. On the top management level, there is still a certain degree of reluctance regarding further development of lean, which means the creation of a lean organizational culture and the introduction of lean management. The insufficient communication of the benefits that lean would bring in a long- term could serve as the justification of such behaviours.

Even though the case company has been successful in improving manufacturing operations, the sustainability of the improvements still remains an open issue. The greatest challenge identified during the interviews was the lack of seeing lean in a long-term strategy of company's development. The introduction of lean is still perceived in terms of ad hoc set of tools, rather than a journey that requires a breakthrough in company's mind set. The change in terms how lean is currently being perceived and what are the expectations regarding the adoption of a new paradigm, needs to take place if the company is to develop lean improvements. During the process of gathering the empirical data, the reluctance regarding the ability of sustaining the lean improvements in a long term was identified. Even though the adoption of lean has been initiated around five years ago, the company is still somehow lacking the commitment and dedication.

The top management reluctance towards lean could also be caused by the lack of consistent key performance indicators that would clearly communicate whether the company is heading in the right direction or not. Moreover, the implementation of lean is too dependent upon the leader who is expected to guide the process and monitor the progress. Nevertheless, without the understanding and support even the most charismatic leader will not be able to guide the change process.

#### 5. CONCLUSIONS

The adoption of lean is nowadays becoming an interesting option for many companies as it promotes more effective utilization of resources, elimination of waste and focus on creating value to customer. This paper supports seeing lean in a broader context affecting not only manufacturing processes but also organizational culture.

The studied company decided to step upon the journey towards lean and according to interviewees the results are already visible. However, the observed results refer specifically to the manufacturing processes rather than to the way the company is being managed. If lean is to be treated as a journey it can be stated that the case

company still has a long way to go before it can call itself a lean enterprise. Nevertheless, the awareness of the need for change is already an important starting point for further development. Within the studied company the suggested future steps should comprise of focusing on the gradual conversion to lean management and seeing lean as a part of strategic development in a long-term. According to [7] the concepts of lean are easy to understand but nevertheless, in many cases the journey towards lean ends abruptly without success if there is a lack of understanding and dedication. The case company should focus on the creation of a shared working culture both on the level of line workers and top management. The gradual creation of intangible yet well understood "rules of conduct" could, according to [7], facilitate the process of creating a sustained lean culture within an organization. In the particular case of the studied company the workforce fluctuation is a serious constraint. Combined with too much responsibility assigned to the leader there is a risk that the lean conversions are not being built upon firm foundations. Ultimately, the company will have to face a situation when leaders are changed, and whether the adoption of lean would still be maintained remains an open question.

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## Kada niz alata nije dovoljan – strateški postavljen lean

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### Rezime

Ova studija teži da identifikuje izazove implementacije lean proizvodnje u malim i srednjim preduzećima. Usvajanje lean principa i, kao konačan cilj, promena u lean preduzeće, postaje sve više značajno za kompanije koje teže da poboljšaju svoje sveukupne performanse. U vreme oštре konkurenције i pritisaka za skraćivanje vremena uz smanjenje proizvodnih troškova, lean proizvodnja je postala interesantna mogućnost za poboljšanje. Može se reći da realnost malih i srednjih preduzeća (MSP), u određenoj meri, liči na japansku situaciju iz dana kada je lean koncept nastao – izazov ograničenih resursa i potreba za fleksibilnošću. Nadalje, radovi vezani za lean iskazuju jasnu poruku da je postizanje lean preduzeća ostvarivo bez obzira na profil kompanije. Obećana univerzalnost koncepta kombinovana s izvanrednim rezultatima koje može da donese ostavlja posebno MSP u stanju dihotomije. Dok im nedostaje resursa i dok imaju velike „lean džinove“ kao benchmark, poseban izazov za male organizacije jeste da pokrenu proces lean implementacije. Stoga, cilj ovog rada jeste da pruži pregled trenutnih istraživanja u oblasti lean, sa slučajem Tojote kao reference, kao i da to uporedi sa karakteristikama MSP koje su istaknute tokom niza empirijskih istraživanja. Poređenje se dalje razvija u analizu ključnih faktora koji utiču na lean implementaciju. Studija je zaslovana na finskim proizvodnim organizacijama, ali ipak, zaključci nose određeni stepen univerzalnosti koji dozvoljava tvrdnju da mogu da se primene na druge tipove malih i srednjih preduzeća.

**Ključne reči:** lean proizvodnja, mala i srednja preduzeća (MSP), strateško planiranje