

EVOLUTION OF *LEAN* MANAGEMENT CONCEPT AND EVALUATION OF EXPERIENCE IN ITS APPLICATION

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Abstract

The purpose of this article is to explain what lean management concept is and to evaluate its effectiveness from different points of view. The article attempts at evaluating the effect of using lean management, not only referring to economic impacts but also to other criteria. It also includes an analysis of hazards that may result from implementing the concept and in particular from its improper implementation. The author also points out gaps in the studies concerning lean management.

Keywords: *Japanese methods, manufacturing management, lean management, lean manufacturing.*

1. Introduction

Lean management is a relatively new concept, however, introduced by global business giants it shows that it brings the desired results and introduces new quality into the field of management. Expansion of the area of management causes creation of newer and newer Lean concepts. It allows a company to increase profits, reduce costs and be considered as a modern company. On the other hand, there are plenty of opponents of the discussed concept, as for example Gendo and Korschak, who criticize it. In the article the author tries to explain the lean management concept with reference to its beginnings and rules it is based on. The main purpose of the article is to study the consequences of lean management implementation in companies. The first part concentrates on origins of the lean concept as well as on rules of its application. The next part analyses positive and negative effects of implementing Lean concept and identifies risks that may occur during its implementation. The article ends with conclusions and indication for further research directions.

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2. The origin and the concept of lean management

Lean management is a concept connected with economical management of the organisation. It belongs to the family of newer concepts of small organisations management and it has found application in many branches of industry in the world, including: automotive, aircraft, food processing industry or in administration. Lean management concept comes from lean thinking philosophy that was introduced to management dictionary by Womack, Jones and Roos¹, scientists from Massachusetts Institute of Technology. They were the first ones to use the term “lean production” (Lisiecka and Burka, 2011, p. 19). The first attempt to organise production as a set of subsequent operations were made in 1855 in Colt factory in Hartford, Connecticut. In 1915 Henry Ford fully implemented the term of “flowing productivity” (Jones, 2007, p. 73). Production in Ford factory in Highland Park was organised in such a way that each machine producing car parts was forming an element of one single flowing manufacturing process. Thus within a few minutes a finished product was created from rough casting. Lean management term is intrinsically linked with Toyota company, where the beginnings of conscious implementation of this concept may be found. Source of management system of TPS (Toyota Production System) dates back to 1890, when Sakichi Toyoda designed and patented a handloom. A partially automated handloom greatly improved performance of the employees and quality of products. However, Toyoda was still improving the handlooms and as a result he managed to design highly reliable, automatic looms, whose power source was combustion engine. Special attention should be given to an automatic stop system of the loom in case of a breakdown, e.g. thread break. It is the described mechanism that is treated as a starting point of Toyota Production System. In the 1930s the founders of Toyota, Sakichi Toyoda and his son Kiichiro, taking their inspiration from Ford issues, were working on their own version of flowing productivity in the automotive sector. As a result of these works they defined two frameworks that the TPS concept was based on (Lisiecka and Burka, 2011, p. 19):

- immediate stop of the line when defective product is noticed; in order to prevent damaged parts from getting into further stages of production (Jidoka rule),
- using pull system assuming that only such amount of parts should be created as it is needed for current production (defined as just-in-time). Later one more framework was added to the above that targeted distribution of work in a mixed production flow (defined as Heijunka).

¹ Authors of „lean production” term, representatives of Massachusetts Institute of Technology (MIT), whose book is regarded as a peak in discussion over the reasons of Japanese car companies success on American market (Zimniewicz, 2000).

This led to achieving production of different goods in small batches by means of simple tools described in technological description of manufacturing process. Toyota has progressed steadily and it has finally become the largest car manufacturer all over the world that encouraged other manufacturers to use its solutions. Lean production is a general version of the TPS system applied not only during production process but also in the whole Toyota business system, including product development, coordination of suppliers and relationship with customers. For many years Toyota Production System was unnoticed in management theory and practice. Probably the main reason of that was the fact that it was not formally documented until 1965. The first signs of interest in Toyota Production System appeared in connection with the first fuel crisis. In 1990 Womack, Jones and Roos, after many discussions about differences between American and Japanese automotive industry, published a book titled “The Machine that changed the World”. This book describes the phenomenon of Japanese car production system that proved to be a base of numerous “lean” systems and concepts. Currently Lean concept has evolved into different areas, e.g. lean office, lean and green, lean in healthcare, lean administration or lean accounting (Lisiecka and Burka 2011, pp. 22-24). Lean concept is successfully applied in banking, where each element of the customer service process is lean and improved despite the fact that in most cases full elimination of waste in this sector is not possible (Chlebicki and Siciak 2011, pp. 70-72). Lean management is also used during restructuring of companies (Nalepka, 1997; Kozłowski and Zakrzewska Bielawska, 2005; Bartusik and Cabula, 2006), including any changes in company regarding in particular changes of organisational structure and management process, working processes organisation or production and line issues (Marona 2005).

The essence of this method while restructuring large companies (e.g. state-owned enterprise, state enterprises) is continuous, slow but thorough leaning of a company as well as avoiding and preventing any waste (Bitkowska, Wojcik and Kolterman 2010, p. 115). Lean management term concerns the whole system of business, organising and management of product development, operations, suppliers, relationships with customers and general enterprise, which needs less human effort, less space, less capital, less materials, less time for goods production and services with fewer defects in order to meet the customers’ requirements in a more precise way in comparison to traditional management system. Lean management concept is based on a number of assumptions. The most important of them are described by K. Bartusik (2000, p. 96):

- combining high performance with quality of production,
- integration of tasks and functions,

- shortening of ways of information flow by making organisational structures flat,
- introducing far-reaching changes in the scope of business (the scope of changes may include the structure of property, methods of organisation and management, professional training, shaping the employees attitudes, organisational culture, etc.),
- reaching higher productivity and quality of work with less time, money and work,
- decentralisation of responsibilities and competences in connection with decentralisation of information system and self-control,
- arranging small organisational units working according to team structure,
- flexibility of organisational structure,
- creating appropriate atmosphere in organisation,
- continuous learning and improving of the organisation as well as its employees.

Lean management successfully used by different kinds of companies is characterised mainly by team work and it is the fundamental condition of this concept (Bartusik, 2000, p. 97). Collaborative decisions of all team members account for the fact that each of them is jointly responsible for company operations. Work in groups that are appropriately organised, e.g. by exchanging task between team members, allows each of the member to familiarize with and perform all kind of team operations. Another characteristic feature of Lean Management is application of quality control (Total Quality Control) modelled on Japanese concept ensuring that errors committed during assembly are eliminated (it is typical for production companies), error sources are searched at the place of their creation and the quality is differentiated and continuously improved according to the criteria defined by the customer. TQC is one of the most important issues connected with lean management, which is underlined by one of its originator, Taiichi Ohno. He said that production control system (kanban²) will not work in the areas where TQC does not work properly. Quality control has fundamental importance (Shimokawa and Fujimoto, 2009, p. 69).

Next feature of lean management is market based production, which means that the producers concentrate on regular customers, who are systematically “researched” in order to get information about current market trends. Collected information is taken into account while planning development of new products. Owing to this, the manufacturer has current information about requirements of the market and the customer gets products according to their specific expectations. The basis is direct cooperation

² **Kanban** is a Japanese word that means sheet (board), ticket or sign. It is a tool for managing of material production flow of similar to Toyota production management type(Liker 2004)

between sellers and manufacturers. *Direct contact with suppliers* is one of the main characteristics of the Japanese concept as well. It is worth drawing the reader's attention to the method of carrying out research and implementation studies using *Simultaneous Engineering*. The concept of this approach is simultaneous involvement of all departments taking part in a new process of product development starting from the earliest stages, cooperating with each other and covering particular stages. In this approach, each operation is started with information coming from the previous operation and thanks to that the time needed for development and costs are reduced and quality improvement is achieved (Minguela-Rata, 2011, p. 81). Thanks to using *Simultaneous Engineering* there are some benefits like: parallel development of products and means of production, early market determination of crucial features of a new product, including into the new product development process development potential of the manufacturers of means of production and suppliers of these means (Bartusik 2000, p. 97). The next feature is *relating to flatness of the organisational structures (decentralisation) and delegating power of decision to the lower structures*. One type of decentralisation is delegation of powers that means authorising subordinates to make certain decisions, perform particular operations and devolution of responsibilities in matters belonging to the principal's competences.

Decentralisation of decisions brings several benefits, such as:

- greater flexibility in the context of market requirements,
- better knowledge of recipients and current transactions,
- greater efficiency in development and in implementation of innovations,
- better motivation of employees thanks to awareness of one's scope of activities and influence on company development.

Other features of *Lean Management*, which are also important, are (Lisiecka and Burka, 2011, p. 21]: *strong customer focus, constant improvement in the scope of kaizen³, use of continuous flow of materials or market orientation to producing goods in small batches*. The concept of *Lean Management* is very broad and includes all aspects of company functionality. For its proper implementation and functioning, new solutions must be accepted by the whole organisation (Trenker, 2011, p. 388). Managers and employees of Toyota use *Muda* term when they talk about any types of waste and are trying to eliminate it. There are two other "M" functioning in Toyota corporation and, despite the fact that they are slightly different, they are as important as the previous and the function as a whole in the form of "3M" (Figure 1). A document "The

³ **Kaizen** is a philosophy of striving for perfection and maintaining it everyday during production (it originates from Toyota production system) (Liker, 2004).

Toyota Way” refers to “3M”, that is **Muda**, **Muri** and **Mura** (Liker, 2004, p. 88).

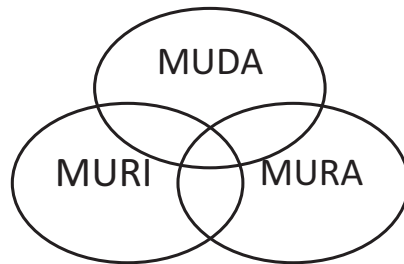


Figure 1. Muda, Muri, Mura as a whole in 3M concept.

Source: Self-study based on Liker, K. J. (2004, pp. 114-115).

- **Muda**- in other words: waste, especially all activities that need labour input instead of creating value.
- **Mura** in Japanese means irregularity. It occurs when work of operator, machine or material flow is interrupted.
- **Muri** in Japanese means an excessive burden of employees, machines and processes. A signal denoting *muri* is exhaustion of employees, strange machine noises, etc.

In practice, implementation of the *Lean Management* assumptions is allowed by expanded collection of techniques and tools defined as *Lean Toolbox* in literature (Bicheno and Holweg, 2008). The most popular Toolbox tools are: 5S, Just-in-time, Kanban, SMED, Poka Yoke, TPM, Heijunka, Six Sigma, Jidoka (Bicheno and Holweg, 2008; Faron, 2011).

2. Efficiency and evaluation of *Lean Management*

There are many books describing activities that must be taken during implementation of the *Lean Management* concept but the realization of this concept requires a lot of time and work. It is a long process that needs consistency and outlay of appropriate means. Understanding of the need for change is also very important. This need must be understood both by management level and by employees who are lower in company hierarchy. However, it should be remembered that the discussed concept is only one of many concepts which may be chosen for implementation in the company. The choice of a proper method is dictated by both conditions in a company and effects that one wants to reach. *Lean Management* is chosen mainly as a concept that determines reduction of costs in a company. In order to check

this condition there is a need to test efficiency of lean management. Not only economical results of implementing this concept should be analysed but also other aspects.

In Poland, a relatively small amount of research on efficiency of *Lean Management* is conducted on a large scale in comparison to foreign analyses. Among the Polish thesis on efficiency of *Lean Management* studies of such authors like: Piasecka-Głuszak (2013), Nogalski, Szreder, Walentynowicz (2005), Walentynowicz (2013), Czerska (2009) may be highlighted. In order to analyse the efficiency of *Lean Management* the results of some studies were compared (Table 1).

Table 1. Comparison of the studies regarding *Lean Management* effectiveness

Source and remarks	Effects of Lean Management implementation
Nogalski B., Walentynowicz P. (2011) (In: Faron 2011)	<ul style="list-style-type: none"> - reducing production area, - limiting the costs of production tooling even by half, - reducing production cycle by 40% on average, - reducing the number of defects by more than a half, - reducing the time of set-up by 40%, - reducing the need for staff by 30%, - ensuring much greater variety of goods, - getting significantly higher level of customer service.
Czerska J. (2009)	<ul style="list-style-type: none"> - growth of labour productivity by 180%, - growth of added value by 100%, - growth of sales by 200%, - growth of material rotation by 186%.
Haus B. (2006) (Studies conducted in 1994 on over 150 German companies)	<ul style="list-style-type: none"> - reducing inventory, which leads to decreasing of involved capital by 40%, - shortening the time of adjusting the devices by 40%, - shortening the production cycle on average by 37%, - increasing productivity (within 2 years) by 35%, - reducing the need for staff (within 2 years) by 30%, - reducing absences from work due to a sickness to less than 3 %, - reducing the number of damaged products from 2,5% to 0,4%.
Walentynowicz P. (2013) (Studies conducted on 20 production companies in Poland over the period 2008-2011)	<ul style="list-style-type: none"> - reducing inventory, - reducing the costs of manufacturing, - shortening the production time, - increasing the speed of reaction to market needs, - increasing the quality of products, - increasing staff motivation - growth of labour productivity, - positive impact on organisational culture, - increasing economic and financial effectiveness.

Source and remarks	Effects of Lean Management implementation
Bożek M., Handzelewicz A. (2012) (Studies conducted on American companies after II World War concerning employees training within the scope of one of the <i>Lean Management</i> tools)	- 86% of the surveyed companies noticed increasing of productivity by at least 25%, - 100% of them reduced time for employees training minimum by 25%, - 55% of them reduced the number of deficiencies by at least 25%, - 100% of them improved customer satisfaction by at least 25%.
Faron A. (2011) (Studies conducted by S. Sussmann and P. Kraus in 1994 carried out on 500 big German concerns)	- increasing competitive ability thanks to reducing the costs, - reduction of wastefulness and higher quality, - growth of labour productivity, - flattening of hierarchy, - shortening time for making decisions, - paying special attention to customer needs and requests, - increasing staff satisfaction thanks to better communication between supervisors and subordinates, - better motivation of employees and their identification with company success.
Zarzycka E., Michalak M. (2013) (Case study conducted in international company providing accounting services, where a tool from the scope of Lean Accounting has been introduced)	- the quantity of processed data decreased by 70%, - time needed for closing account books and for preparing reports was shortened by 40%, - overall production efficiency increased by 30%, - the costs of financial reporting decreased by 25%, - lower litigation expenses and transaction costs, - shorter and less labour-intensive processes, - less time for generating information (reports).

The above results show that *Lean Management* has beneficial effect on the situation of both manufacturing and service companies. The benefits are impressive and in these results there are no negative effects. However, we may wonder why relatively few companies still introduce this concept in their activities. Lean management brings many economic benefits but the consequence of its implementation may be e.g. social costs that are usually omitted. Survey evidence shows that lean organisations have weaknesses, the same as other management concepts and only some elements are timeless and they may induce positive effects for company (Haus, 2006, pp. 47-48). Some of the positive results may also be connected with risks that may not always be predicted by leadership. As Haus (2006) points out:

- reducing of inventory needs careful examination of the production process, so there is no need to stop the production cycle due to lack of materials or there is no delay in shipping the products to a customer,

- shortening the time of adjusting the devices is usually connected with the need to replace equipment currently used by new machines. Another option is to reprogram the entire production cycle so the analysed process of moving devices will not be required very often,
- reduction of production cycle means transition from a linear organisation to a parallel one so it needs modernisation of production line, purchasing new machines and devices and it is often connected with increasing production scale to cover financial commitments resulting from creating new production network,
- reducing the need for staff is, on one hand, a positive aspect because it allows saving financial resources by an organisation, however, it is not as simple anymore as it requires some time and it is negatively perceived by the society.

Bąchor (2012, p. 284), however, lists some mistakes during implementation of *lean manufacturing* (that refers to the entire concept *Lean* as well) that may also result in unintended negative effects:

- *not understanding Lean philosophy* - *Lean Management* is a process of continuous improvement, not single counter-measure,
- *wrong approach of leadership* - crucial issue is involvement of the entire management staff and defining a direction in which an organisation and all employees are heading,
- *economic profits* - achieving the profits is not the main reason for implementing new management system but it is a consequence,
- *results* – it is essential to obtain results immediately, however, if targets were wrongly defined (which is very likely) it can lead to a lack of confidence to the entire *Lean* system,
- *introduction* - starting and spreading *Lean* rules without having a well-trained employee in the organisation hierarchy,
- *finishing* - *Lean Management* is not a simple operation, it is a journey that never ends - kaizen.

The results of implementing *Lean Management* are dependable on both organisation and employees as well as on surroundings. Special focus must be put on leadership that has a strong influence on taken actions. In literature on the subject the objection is raised that lean organisation is only combination of other management methods and as a concept it is not modern and innovative (Zimniewicz, 2009). It can be also stated that many changes are difficult to introduce, which causes significant costs. Therefore, in the world of science there are critical opinions regarding management of *Lean* type. According to Zimniewicz (2009, pp. 47-50) the people who raised objections against *Lean Management* concept were Genso and Konschak. They entered into a sharp polemic with Womack, et al. stating that “*Lean Management has no scientific basis and it is a product of imagination*” and that “*Lean Management is not the basis of Japanese success but certain expression without keynote*”. Other

authors also spoke rather negatively about *Lean* concept (Zimniewicz, 2000, 2009; Faron, 2011). That criticism of *Lean Management* may be also relevant to employees' behaviour, delegation of tasks and decentralisation of decisions, or even flat organisational structure. It is worth adding, however, that those critical objections were not raised against customer focus and delivery of high-quality products and services. In the *Lean* concept it is emphasized that an employee is a self-reliant, innovative person, who carries great responsibility. However, this does not apply because in fact employees perform their activities imitatively and there is no time for being innovative and creative. Tasks performed by employees are also an element that denies the idea of *Lean Management* assuming decentralisation of decisions. In a lean organisation, a director or a manager should promote the development of each employee, who has greater independence in action and larger scope of decision making. This independence should improve employees' motivation. In the fact there are often situations when an employee is encumbered with too many tasks and in the same time he must spend more time on performing them, without any additional payment for this work. Greater scope of duties means greater accountability for additional tasks. Therefore, increased responsibilities lead to fatigue, irritation and annoyance instead of motivating (Zimniewicz, 2000, p. 475). This may result in negligence of performed tasks and in the consequence it may influence the quality of produced goods or offered services. To avoid this, very strong work standardisation with an accurate job description developed in organisations. Also improvement proposals, including kaizen, leading to constant improvement, must be reported to supervisors, who have to decide whether to implement them or not. Another aspect that may be treated as a risk during implementing *Lean* concept is cultural barrier. Despite the fact that there are opinions assuming that at the level of philosophy cultural barriers are not important in Polish companies there is reluctance to introduce changes (Kraśiński, 2014, p. 98).

The reaction of employees to changes in Polish companies is well presented by two quotations mentioned by Kraśiński (2014, p. 98): "*You must raise our salary; otherwise, we do not want to perform any additional tasks!*", "*It is good as it is. We do not have any problems!*". It should be pointed out that the same author at the same time pays attention to the fact that "*unwillingness to reject the status quo and continuous search for improvement may be explained in the best way by cultural barriers on which in theory people do not have any effect. However, taking into account successful cooperation within many Polish-Japanese projects and others in which Polish cooperate with representatives of foreign countries it may be stated that the reason for not taking over the Japanese philosophy of management is laziness, which due to cultural barriers (in a general sense) and certain stereotypes connected*

with Japan may be easily hidden and justified". However, regardless of the type of reasons of employees' unwillingness to changes they may impede introduction of *Lean* concept in a company and limit its efficiency.

4. Conclusion

Since the 1980s, when literature on the subject began to draw more attention to *Lean Management* concept, this method has been constantly developing and it has become popular almost in every branch. The study results in most cases highlight positive effects of the method. It is successfully used not only in production but also in management or accounting. The question arises, however, if all results of "lean" company were studied in an exact way?

Most of the authors study production and sales increase or costs reduction, whereas costs, both economic and social, of *Lean Management* implementation are not presented. A long period of time has to elapse to adequately prepare managerial staff and employees or to modify or exchange production lines in a proper way. Employees at all levels are required to be more responsible and to undertake additional duties, which constitute additional pressure for them. It would be interesting to study whether increasing responsibilities, as the result of lean management introduction, has any influence on increasing employees' salary. The studies usually do not include opinions of employees of the lowest level, who perform most of duties in an organisation. Moral issues of such an action on the company may also raise doubts.

Therefore, it is important to conduct studies among employees of the lowest level in the scope of *Lean* concept awareness as well as consequences of its implementation. *Lean* concept is a relatively new method so the results examined over a long period of time may differ from the results reported just after its application. This can be based on experiences of Toyota company that has been analysed and described for many years but no other company has reached such spectacular effects as Toyota. However, Toyota success cannot be treated the same as the success of *Lean Management* all over the world. It is difficult to notice in scientific literature studies regarding companies' persistence in applying *Lean Management*. There is therefore a need for verification of how companies using lean management cope over a long period of time and whether it was a single action of improving results or, as *Lean Management* concept assumes, organisation's consistent policy of moving towards constant improvement of the processes and striving for excellence.

It follows from the above considerations that *Lean Management* implementation is undoubtedly the method that effectively influences cost reduction, that is why it is so readily chosen by companies. The results of the study dominated by economical results arouse companies interest in this

method, however, they do not show other, not fully investigated, effects of its implementation. It should be pointed out that information and conclusions presented above rather indicate a problem and their aim is to show complexity and specificity of *Lean Management* concept. They also indicate a need for further development within this scope.

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