

Lean management implementation: Determinant factors and experience

PIOTR JEDYNAK¹

The Jagiellonian University in Kraków, Institute of Economics, Finance and Management

Abstract

The article concerns the issue of implementation of lean management in organizations. Based on the literature review and its critical analysis key determinant factors for successful implementation such as: methodology of implementation, management support and communication, application of adequate change strategy, managing risk and suppliers integration have been identified.

Moreover, thanks to the carried out research experience connected with implementation of lean management has been found. These experiences have sector, region or problem character. For organizations implementing or improving lean management practices they can be helpful in terms of avoiding mistakes or applying tested and positive solutions.

Paper type: review article

Keywords: management, lean, implementation, manufacturing systems, small and medium enterprises

Introduction

The concept of lean management is nowadays very popular. It can be seen both in its frequent implementation in various organizations and in the great number of scientific papers focusing on its different aspects. The significance of the lean concept, both for theory and practice of management, and its viability, demonstrated

¹ piotr.jedynak@uj.edu.pl

in continuous development of the concept itself and its applications, form a justification for undertaking further scientific studies focused on it.

The objectives of the present paper result from the stage of life cycle of the lean concept observed by the author. These are:

- identification of the essence and framework structure of the lean concept,
- identification and presentation of the most important determinant factors for implementation of the lean concept (including those influencing efficiency of implementation),
- recognition of the subject and issues of the to-date studies dedicated to experience related to implementation of lean in organizations.

The author applies mostly method of critical analysis of literature and synthesis.

1. Lean management – the essence and sources of the concept

Today's organizations apply numerous, traditional and modern management concepts the purpose of which is ensuring competitive advantage and increasing probability of survival and development. Among these concepts lean takes a prominent position. Arlbjorn and Freytag (2013), concisely discussing the origin of lean indicates several key stages. They detect prototypes of the concept already in the works of F.W. Taylor, in particular *The Principles of Scientific Management*, where he was searching for the answer to the question about efficient ways of optimization of production processes. *The Machine that Changed the World* (Womack, Jones, & Roos) published in 1990 was in turn a milestone in formalization and popularization of lean. Later years represent development of the concept both in terms of size and multiplication of applications to problems and sectors.

It is generally recognized that the main inspirations for present studies on lean management were provided mostly by the Japanese automotive industry, especially management solutions of Toyota commonly known as Toyota production system (Worley & Doolen, 2006).

However Arlbjorn, Freytag and de Haas (2011) draw attention to the changes which occurred in lean design over the years. According to them lean was designed in the following stages:

- cells and assembly lines (1980–1990),
- a shop-floor focus (1990–mid-1990),
- value stream (mid-1990–1999), and
- value system (2000+).

Table 1 includes selected definitions allowing to study the essence of lean.

Table 1 *Conceptualization of lean*

Author	Interpretation
Worley & Doolen (2006)	Lean is the systematic removal of waste by all members of the organization from all areas of value stream.
Emiliani (2006)	Lean is regarded by most of managers and consultants as a quick way to achieve the so-called zero-sum outcomes that benefit the company at the expense of the workers.
Rymaszewska (2014)	Lean is to be understood as a management system which brings best results in a long-term perspective. As in the short term too strong profit orientation may be demonstrated. What is more, lean approach does not have to be efficient in all its applications.
Karim & Arif-Uz-Zaman (2013)	Lean process is an integrated socio-technical system whose main objective is to eliminate waste by concurrently reducing or minimizing supplier, customer and internal variability. Lean philosophy seeks to reduce waste anywhere in the company, optimize core resources and establish a corporate culture dedicated to identifying and continuously fostering customer satisfaction.
Al-Balushi, Sohal, Singh, Al Hajri, Al Farsi, & Al Abri (2014)	Lean is a process reengineering philosophy composed of a strategic guiding principles and a set of tools at the operational level. Lean is a system which requires less time, less human effort, less cost, less space, with fewer injuries, and less mistakes, to create an organization that accomplishes more and does these better.

Source: own.

Content analysis of the listed views on lean allows to formulate twofold conclusions. Firstly, it is worth noting that lean researchers understand its formal status in different ways. Hence, lean can be regarded as a process, philosophy, concept or management system. Secondly, while summarizing the presented views it can be concluded that lean has the following qualities:

- holistic character,
- orientation on improving efficiency,
- orientation on improving use of available resources.

Also the categorization of approaches to lean developed by Pettersen (2009) proves the complexity of lean. He employed two classification dimensions: (1) practical or philosophical perspective, (2) operational or strategic level. Based on this he distinguished:

- toolbox lean – practical and operational,
- becoming lean – practical and strategic,

- leanness – philosophical and operational, and
- lean thinking – philosophical and strategic.

A typical tendency of recent years is to analyse lean concepts in relation to other management concepts, e.g. TQM or Six Sigma (Kollberg, Dahlgaard, & Brehmer, 2007). It is caused among others by frequent attempts to integrate management concepts.

2. Lean management – structural approach to the concept

Efforts undertaken by various researchers to structure the concept are one of the vital steps concerning lean management. By defining lean components and establishing relations between them understanding of the concept is increasing. In the literature of the subject there are two titles worth attention.

Thus Simons and Zokaei (2005) distinguish the following three elements forming lean:

- Lean practices (tools and techniques). Standardized work, Takt-time, Just-in-Time, Heijunka (levelled production), kanban, 5S, Jidoka (autonomation/stop system).
- Lean policies. Total productive maintenance, long-term relationship with customer, co-operation and transparency across the supply chain, Visual Control, Poka-Yoke, enhanced problem-solving ability of employees, enhanced employee participation.
- Lean philosophies. Waste elimination, striving on perfection, Kaizen.

In turn Arlbjorn et al. (2011) believe that holistic perception of lean embraces three fundamental elements: (1) philosophy, (2) principles, (3) tools and techniques. Lean philosophy is superior and concerns two stipulations: to reduce waste and to create customer value. They are followed by lean principles:

- Specify what does and does not create value from the customer's perspective and not from the perspective of individual firms, functions and departments.
- Identify all the steps necessary to design order and produce the product across the whole value stream to highlight non value adding waste.
- Make those actions that create value from without interruption, detours, backflows, waiting or scrap.
- Only make what is pulled by the customer.
- Strive for perfection by continually removing successive layers of waste as they uncovered.

And finally the two above mentioned elements are complemented with tool and techniques, among which Arlbjorn et al. (2011) list: value stream mapping, 5S, kanban, pull production, reduced change over time (SMED), group layout, tack time, Total Preventive Maintenance, bottleneck and constraint management, Poka-Yoke, information board, performance management, kaizen, cause and effect analysis, overall equipment effectiveness.

It is worth noting that the structural conclusions made above require modification in case of integration of lean with other management concepts which takes place especially when part of implemented practices and tools is common to all concepts.

3. Determinant factors for implementation of lean management

The up-to-date scientific research confirm that implementation of lean is a relatively complex undertaking. Below there are presented selected, identified in the course of research, determinant factors for efficiency of the implementation.

Methodology of implementation

The studies on the stipulated methodology of implementation are focused around two approaches. The first one aims at cataloguing key success factors in implementation process. According to one of the proposals (Anvari, Norzima, Rosnay, Hojjati, & Ismail, 2010) such factors include: management and leadership, organizational cultures, goals and objectives, problem solving, skills, continuous improvement, financial capabilities, performance measure, change, education and plan. The other approach is related to the postulated order of proceedings in the process of implementation. Anvari et al. (2010) suggest a three-stage approach (preparation, design and implementation), which however should be then complemented with activities related to results measurement and continuous improvement. Karim and Arif-Uz-Zaman (2013) demonstrate that application of the P-D-C-A cycle can be the adequate formula for continuous improvement. Parry, Mills and Turner (2010) in turn suggest a four-stage methodology consisting of: market analysis, visible values stream, customer value analysis and financial modelling. Correct application of methodological approach to lean implementation increases probability of success.

Management support and communication

The role of managers in lean implementation is, in the unanimous opinion of many researchers, grave. Worley and Doolen (2006) present two opposing attitudes of managers along with their consequences. On the one hand they identify the attitudes related to managers' concerns. They note that in such situations managers consciously, or not, sabotage lean. On the other one however a catalogue of required behaviours of managers is created. According to this catalogue demonstrating commitment and leadership is regarded as highly insufficient (Boyer & Sovilla, 2003). Managers should additionally work to create interest in the implementation and communicate the change to everyone within the organization. Thus, adequate communication is an essential complement of management support. It is observed that (Worley & Doolen, 2006):

- lean requires clear communication, not only between shifts, but also between all value streams,
- all customer-supplier connections must have a direct connection and there must be a clear method for sending and receiving responses to problems, and
- lean enterprises must have communication pathways that are efficient and broad.

Application of adequate change strategy

Recognizing the need for application of adequate change strategy in the course of lean implementation results from two fundamental prerequisites. The first one being analysis of success/failure rates of implementation processes (e.g. in the UK only one in ten lean projects ends with success), the other is the conviction that each case of lean implementation is unique and requires to a great extent an individualized approach (Bhasin, 2012). Among the postulated qualities of change strategy applied during lean implementation there can be mentioned:

- achieving required level of mutual trust (Henderson & Larco, 2003),
- empowerment of employees as imperative requirement (Lee, 2007),
- total commitment of employees in the project (Hines, Found, Griffiths, & Harrison, 2008),
- introducing a general training programme (Bhasin, 2012).

The great emphasis on the role of employees in the change strategy is explained by the results of empirical studies in which lean starter were identified. In 25% these are specialists, in 18% other employees and in 24% managers (Bhasin, 2012).

Managing risk of lean implementation

Based on synthesis of scientific texts including findings about risk of lean implementation, Marodin and Aurin (2015) specified 14 leading types of risk:

- People seem demotivated after a few years.
- Lack of technical knowledge of lean by the support areas.
- Lack of human and/or financial resources.
- Lack of communication throughout the company.
- Difficulties in seeing the financial benefits.
- Middle management not giving enough support.
- Top management not giving enough support.
- Lack of support on the shop floor.
- Operators are insecure in carrying out new attributions.
- Operators are afraid of layoffs due to improvements.
- The operators do not feel responsible for using lean practices and solving problems.
- Managers lack of technical knowledge and skills to guide the project.
- Not sustaining the improvements in the medium and long term.
- Having difficulties to keep the pace of the ongoing lean activities.

As it can be noticed the presented catalogue of risk consists of very diversified and important threats. In relation to this adequate proceeding should be made by professional management process of risk of lean implementation. In this process it is worth to note the following guidelines: risk analysis should refer to the project objectives (Marodin & Aurin, 2015), the incomplete knowledge of organization about the future will be an inherent element of the risk management process and activities aiming at risk reduction should depend of its significance for the project success (Mikkelsen, 1990).

Implementation of lean in small and medium enterprises

In studies on lean implementation there can be noticed a current related to studying specifics of small and medium enterprises. It is assumed that universal guidelines for lean implementation might not work each time in this group of enterprises due to their already known specifics. Rymaszewska (2014) has identified these factors typical for small and medium enterprises and which are not neutral to lean implementation by either fostering or inhibiting it (see Table 2).

Table 2 *Factors characterizing small and medium enterprises influencing lean implementation*

Supporting factors	Hindering factors
Faster communication	Inadequate financial resources
Quick decision making process	Shortage of skilled employees
Unified organizational culture	Fluctuations in raw materials availability and prices
Greater flexibility	Reliability upon on-person management
Quicker response to customer needs	Inadequate education and training of entrepreneurs
More authority and power to employees	Inadequate time and cash flow management
Innovative environment	Intuitive rather than analytical decision-making
Support to change initiatives	Reliance upon outdated, labour intensive technologies and traditional management practices

Source: own.

Similar problems typical for small and medium companies are signalled by Emiliani (2000). At the same time he expresses his view that a real lean implementation in small and medium companies can take place thanks to suppliers development programmes of clients of these companies. In such a situation small and medium enterprises implement lean being one of the links of supply chain.

Suppliers integration

Integration of suppliers is currently an action undertaken in many production sectors. Empirical studies on key success factors in suppliers integration have shown that supply network performance is positively influenced by the effectiveness of information technology used and the depth of supplier integration which showed significant positive relationship (So & Sun, 2010). Cagliano, Caniato, and Spina (2006) in turn have carried out studies which show that lean manufacturing adoption has a strong association with the integration of information flows and external suppliers. In production sectors suppliers integration is regarded as a key stage of strategy of lean implementation which is proven by experience of numerous enterprises (So & Sun, 2010).

4. Selected experience in processes of lean management implementation

Among scientific texts addressing lean implementation there are also those which discuss experience in implementation process. The given experience has threefold form; sector, regional and problem.

Sector experience

Sector experience embraces issues related to lean implementation in organizations representing selected sectors. Table 3 lists leading research issues concerning experience in applying lean in organizations of chosen sectors.

Table 3 *Researchers' subject of interest as part of experience related to application of lean in organizations from selected sectors*

Author	Sector	Issues related to implementation
Delgado, Ferreira, & Branco (2010)	Financial	Level of engagement of top management in the implementation process Scope of trainings carried out among employees Needs and directions of change in organization culture Measurement of financial and non-financial effects of implementation Specification of difficulty of implementation Principles of implementation on international scale
Al-Balushi et al. (2014) Curatolo, Lamouri, Huet, & Rieutord (2014) Kollberg et al. (2007)	Health-care	Factors of organization readiness to implement lean Measurement of maturity of lean practices applied in organizations Activities and techniques used by organization as part of the lean concept Measurement of basic indicators defining results of application of lean
Arlbjorn et al. (2011)	Municipal	Prerequisites for implementation of lean in the sector Perception of lean by employees and managers of organization Scope of application of lean practices
Simons, Zokaei (2005)	Food	Results of application of the Takt-time technique Standardization of production practices

Source: own.

As it can be seen the scope of themes tackled in empirical studies related to lean implementation is extremely vast. These themes cover basically the entire life cycle of lean in organizations, i.e. stages from the decision stage to measurement of results and improvements. The themes differ also in their level of detail.

Regional experience

As much as sector experience accentuated sector specifics, regional experience emphasises specifics of a region where the studied organizations operate. Table 4 includes listing of researched problems related to implementation of lean in organizations representing various geographical areas.

Table 4 *Researchers' subject of interest as part of experience related to application of lean in organizations representing selected regions*

Author	Region	Issues related to implementation
Emiliani (2006)	USA	Evolution of objectives of lean implementation in organizations Cultural barriers in lean implementation Standardization of key principles for lean implementation Role of industry organizations in lean promotion
Taj & Morosan (2011)	China	Operational practices used as part of lean Course of designing and improving production systems Measurement of operational results of lean application Similarities and differences of applying lean in organizations of selected sectors
Bhasin (2013)	UK	Order of lean implementation (course of the process, stages) Identification of lean implementation and maturity of organization Expectations related to lean implementation Used lean tools Dominating types of organization cultures Results of applying lean
Lucato Calarge, Loureiro, & Calado (2014)	Brazil	Level of implementation of lean principles Types of used models and lean standards

Source: own.

The issues presented in Table 4 once again indicate a wide scope of interests of lean researchers. The cognitive grid they use covers at the same time cultural as well as purely methodological issues. Similarly to the sector context the researchers are interested in confronting expectations from lean implementation with its results.

Problem experience

Experience with problems express scientific studies focused on selected aspects of functioning of organizations implementing lean. Table 5 illustrates selected issues related to experience accompanying lean implementation in problem approach.

Table 5 *Researchers' subject of interest as part of experience related to application of lean in organizations (problem approach)*

Author	Problem	Issues related to implementation
Boyle & Scherrer-Rathje (2009)	Manufacturing flexibility	Good practices for improving flexibility Tools and techniques for ensuring flexibility
Forrester (1995)	HR strategy	Impact of lean on change of dominating management styles Modification of the set of organization roles Modification of criteria and methods of recruitment and selection Change in training needs Implications for HR departments
Rahman, Laosirihongthong, & Sohal (2010)	Operational Performance	Relations between adopted lean strategy and operational results Construction of indicators for measuring lean operational results Relation between the applied lean practices and operational results Relation between operational results and type of ownership of organization

Source: own.

Problem experience, compares to sector and region ones, is presented on a far higher level of detail. It is connected with the fact that researchers' optics is already at the outset directed at a selected aspect of functioning of an organization.

Conclusions

The literature studies carried out by the author allow to formulate the following key conclusions:

- The current shape of the lean management concept is strongly influenced on the one hand by practices for organization of production systems initiated by Toyota and on the other one numerous and diversified management practices in later years.
- Lean management is a management concept with a series of similarities to other management concepts, e.g. Six Sigma or TQM. Even though the set of objectives related to applying lean management may be wide and diversified, the first place is however occupied by improvement of efficiency. In this sense lean refers with its intentions to early management concepts, including Taylor.

- Lean Management is a concept already sufficiently mature that it is possible to define its structure which is created among others by: philosophy, principles, practices and tools. Lean has thus a slightly general and abstract dimension as well as pragmatic and detailed.
- The carried out scientific studies indicate numerous and important determinants for efficient lean implementation. The group of the most important ones includes: application of adequate methodology of implementation, support of the undertaking by management and adequate communication processes, application of adequate change strategy in the course of the undertaking, managing project risk, taking into account strengths and weaknesses of organization resulting from its size, activities aiming at integration of suppliers.
- Hitherto experience related to implementation of lean rather does not have a universal character but depend on sector, region or problem context. However it does not mean that the mentioned experience cannot be applied in other sector or country as a potential path to follow.

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Note about the Author

PROFESSOR PIOTR JEDYNAK, Ph.D. – Director of Institute of Economics, Finance and Management, the Jagiellonian University in Krakow. Head of Department of Standardized Management Systems. Lead Auditor of Quality Management Systems (registered in IRCA). Areas of research: theory of management science, standardized management systems, design and implementation of management systems and concepts, risk management.

