Business Excellence and Management
Volume 7 Issue 2 / June 2017

LEAN SIX SIGMA: LONG TERM APPROACH FOR GROWTH AND COMPETITIVENESS IN ROMANIA

Alexandra Mirela Cristina MUNTEANU

The Bucharest University of Economic Studies, Bucharest, Romania

munteanu.alexandra.mirela@gmail.com

Abstract
This paper investigates the benefits of Lean Six Sigma's deploying in Romanian's economy. After a brief introduction pointing out the advantages of Lean Six Sigma, Lean Six Sigma concept is introduced. The synergy of Six Sigma and Lean is presented as well as a conceptual model that illustrates the possible way of their integration into a tool to optimize business processes. The paper introduces DMAIC methodology, incorporating key elements of both methodologies, Lean Six Sigma's main tools and application field. The paper presents the stage of Lean Six Sigma implementation in Romania, for large organizations and SMEs, their specific management quality's problems and evolution during the last period.
Keywords: Lean, Six Sigma, Lean Six Sigma, DMAIC, SMEs

1. INTRODUCTION

Lean Six Sigma has been used over the last period as a powerful management tool dedicated to increase customer satisfaction and meantime improving the level of products' quality.

Merging in Lean and Six Sigma, two consecrated quality improvement methodologies, Lean Six Sigma gets the advantages of both methodologies. Lean Six Sigma's foundation for improvement is based on the common parts of Lean and Six Sigma, such as focus on customer, improvement of process by eliminating waste and continuous effort to ensure improvements.

By capitalizing the strong points of both methodologies for Arnheiter and Maleyeff (2005) a Lean Six Sigma organization would include the following three primary tenets of lean management: (1) It would incorporate an overriding philosophy that seeks to maximize the value-added content of all operations; 2) It would constantly evaluate all incentive systems in place to ensure that they result in global optimization instead of local optimization.

(3) It would incorporate a management decision-making process…A Lean Six Sigma organization would include the following three primary tenets of Six Sigma: (1) It would stress data-driven methodologies in all decision making; (2) It would promote methodologies that strive to minimize variation of quality characteristics; (3) It would design and implement a company-wide and highly structured education and training regimen.

2. LEAN SIX SIGMA CONCEPT

Lean and Six Sigma are two important methodologies developed in the second half of last century until now, dedicated to improve the organizational processes. Each of the two methodologies evolved separately: on the one hand Lean, process focused on optimizing speed and waste elimination and on the other hand Six Sigma directed to improve the quality by eliminating variation that lead to defects in processes. Although both systems are addressed to improving organizational processes they have nevertheless essential different objectives and use different tools for treating processes. Breyfogle (2009) stated that in some situations, lean methods should be considered for process improvement, while for other situations Six Sigma techniques should be the tool of choice. Another situation is that both tools have application within a process improvement project.

The synergism between methodologies was mentioned, probably for the first time, by Pyzdek (2000); table 1 specifies for each significant Lean issue and method the contribution brought by Six Sigma.

TABLE 1. THE SYNERGY OF SIX SIGMA AND LEAN PRODUCTION

Lean	Six Sigma Contribution
Establish a methodology for improvement	Policy deployment methodology
Focus on customer value stream	Customer requirements measurement, cross-functional management
Use a project-based implementation	Project management skills
Understand current conditions	Knowledge discovery
Collect product and production data	Data collection and analysis tools
Document current layout and flow	Process mapping and flowcharting
Time the process	Data collection tools and techniques, SPC
Calculate process capacity and Takt time	Data collection tools and techniques, SPC
Create standard work combination sheets	Process control planning
Evaluate the options	Cause-and-effect, FMEA
Plan new layouts	Team skills, project management
Test to confirm improvement	Statistical methods for valid comparison
Reduce cycle times, product defects, changeover time, equipment failures	Seven management tools, seven quality, control tools, design of experiments

Business Excellence and Management
Volume 7 Issue 2 / June 2017

The synergies of Lean production strategies and Six Sigma business strategy were remarked by many authors such as Antony, Escamilla and Cain (2003), Assarlind, Gremyr and Backman (2013), Sunder (2013).

Lean Six Sigma was first mentioned by George M. in 2002 and afterwards Lean Six Sigma concept was widely used. Lean and Six Sigma integrated approach aimed at improving the performance of organization, Lean Six Sigma operating as a hybrid methodology that encompasses both treatment methods and elements. These elements should be used selectively depending on customer priorities to improve products' quality.

There is a general agreement that Lean and Six Sigma are complementary, not competing to organization. Thus, the term Lean Six Sigma is a combination of Lean used to improve the connections between processes and Six Sigma used to improve individual processes. For George (2002) the fusion of Lean and Six Sigma is required because: Lean cannot bring a process under statistical control. Six Sigma alone cannot dramatically improve process speed or reduce invested capital.

For Antony, Escamilla and Cain (2003) companies practicing the integrated approach will gain four major benefits: become faster and more responsive to customers, strive for Six Sigma capability level, operate at lowest costs of poor quality and achieve greater flexibility throughout the business.

As mentioned Snee (2010) Lean Six Sigma is a business strategy and methodology that increases process performance resulting in enhanced customer satisfaction and improved bottomline results. It is also being widely recognized that Lean Six Sigma is an effective leadership development tool.

A conceptual model that illustrates a possible way of integrating the two quality management methodologies into a tool to optimize business processes, was imagined by Pepper and Spedding (2009) and is represented, adapted by the author, in Figure 1.

To remark the consistent support of Lean philosophy, the foundation of this construction which provides guidance for process dynamics, based on its current condition. Lean finds process' "hot spots", identifying problems which disrupt its functioning. In order to solve these specific issues Six Sigma will treat and optimize them using specific instruments. Thus, the methodology Lean Six Sigma will improve the state of the process, which will be directed towards the future pursued state.

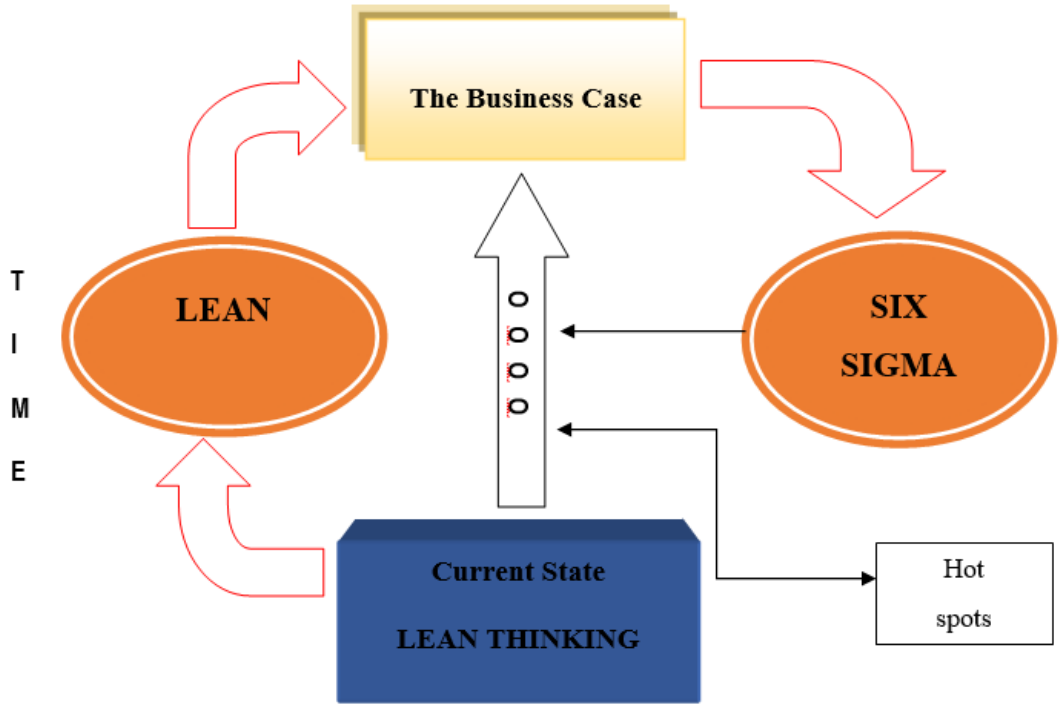

FIGURE 1 CONCEPTUAL MODEL FOR LEAN SIX SIGMA

3. METHODOLOGY, TOOLS, APPLICATION

Concerning the synergies Pepper and Spedding (2009) emphasized that Lean and Six Sigma are ideally suited for use in a comprehensive methodology incorporating the key elements of both, as each stage can gain from the respective techniques, both following the Six Sigma road map.

So, Lean Six Sigma relies on Six Sigma's methodology DMAIC, its improvement methodology which could be divided into five phases: define measure, analyze, improve and control. Main tools, techniques and principles are presented in table 2, as highlighted by Antony, Escamilla and Cain (2003).

Implementation of Lean Six Sigma requires the same infrastructure necessary for Six Sigma, which includes Green Belts, Black Belts, Experts, Master Black Belts, Champions and the top management.

In order to deploy successfully Lean Six Sigma it is necessary the full commitment of the company management as well as the involvement of company employees in the improvement process.

Business Excellence and Management
Volume 7 Issue 2 / June 2017

TABLE 2. TOOLS, TECHNIQUES AND PRINCIPLES OF THE INTEGRATED APPROACH

Six Sigma	Lean
Variability reduction	Workplace management
Belt system (MB, BB, GB, YB)	Set-up time reduction (SMED)
DMAIC methodology	Pull system (Kanban)
Statistical Process Control (SPC)	Total Productive Maintenance (TPM)
Process Capability Analysis	Mistake Proofing (Poka Yoke)
Measurement System Analysis (MSA)	5S Practice
Design Of Experiments (DOE)	Value Stream Mapping
Robust Design	SIPOC process diagram
Quality Function Deployment (QFD)	Just-in-Time (JIT)
Failure Mode Effects and Criticality Analysis (FMECA)	Visual Management
Project Management	One Piece flow (Takt time)
Regression Analysis	Standardized Procedures/work
Analysis of Means and Variance (ANOM and ANOVA)	Production flow balancing
Hypothesis tests	Waste identification and elimination
Root Cause Analysis	Kaizen
Process Mapping	Cellular manufacturing
Change management tools	Change management tools

Lean Six Sigma is a successful approach to quality management and has been adopted by a number of organizations working in various economic fields. Thus, Lean Six Sigma has applicability and formalization in many areas: Lean Six Sigma office, Lean Six Sigma supply chain, Lean Six Sigma administration, Lean Six Sigma healthcare, Lean Six Sigma hospital, Lean Six Sigma services, Lean Six Sigma education, Lean Six Sigma logistics, Lean Six Sigma transport and many others.

4. LEAN SIX SIGMA IN ROMANIA

After 2000 Lean Six Sigma has spread in Romanian organization, which became interested to develop new systems of quality management, in order to support the increased market competition.

First organizations to have implemented Lean Six Sigma in Romania were large organizations, based on the support of top management, necessary human resources and handy finance resources. So, for a large organization the coverage of salary for a Black Belt or Master Black Belt dedicated to organization is not a finance problem. Also, the top management of large organizations is directly interested in increasing turnover, competitiveness and market presence of their companies, as most times managers' salary packages include significant benefits related to financial organization performance. For state owned companies benefits for managers could be even bigger. Implementing modern methods of quality management in large organizations is also possible as their financial resources are important and allow the allocation of a certain percentage to development.

In 1996, the Lean concept was implemented in Daewoo Automobile Romania factory, located in Craiova; this was the first large organization to implement in Romania a modern quality management system. Today Lean Six Sigma is implemented in large organizations acting in the automotive industry, as in Automobile Dacia, Continental, Autoliv, Leoni Wiring Systems, in manufacturing industry in large organizations such as Bosch, Johnson Controls, in telephony and communications in organizations such as Vodafone, UPC, in audit companies such as Accenture, in service organizations like WNS Global services. Most of these organizations, applying Lean Six Sigma in their quality management, are present in the financial charts of the most powerful and profitable companies in the Romanian economy.

The implementation of Lean Six Sigma in SMEs is more difficult compared to larger organizations.

Main implementation issue is the finance associated cost, difficult to be covered by SMEs. The limited budgets of SMEs will hardly support the costs for training and even for the salary of a full time Black Belt or a Master Black Belt. So, basically the Lean Six Sigma infrastructure of SMEs will include Green Belts, coached by external experts. Another problem is SMEs' restricted human capital and its limited availability for problems connected to the implementation of Lean Six Sigma. SMEs must rely on the top management support and his deep involvement in Lean Six Sigma program. The selection of Lean Six Sigma projects must be very attentively done for choosing projects with a high success probability.

From our research we have not found micro and small enterprises using Lean Six Sigma quality management systems. However, in the medium-sized companies' area there are organizations that have implemented Lean Six Sigma principles. Among these there are SMEs operating in various sectors of the Romanian economy, such as: automotive field, like AKA Automotiv SRL, Autonova SA, manufacturing such as CNUD-EFCO Romania SRL, JRL Edition Ltd, food industry like Zeelandia SRL, service organizations like Xerox Equipment and Services.

In order to increase the profitability of SMEs in Romania, some support actions have been organized by the National Council of Private Small and Medium Enterprises in Romania and its territorial organizations. Among these actions, based on EU funds, granted to Romania from the European Regional Development Fund, there are: Performance management program for SMEs and Renault Consulting- best practices, success stories and lean six sigma vision. All these programs pursued the improvement of quality management in Romania by implementing Lean Six Sigma. Thus, using modern methods of quality management can contribute to achieve remarkable economic results, hence placing Lean Six Sigma companies among the successful ones in Romania.

Business Excellence and Management
Volume 7 Issue 2 / June 2017

5. CONCLUSIONS

Nowadays the principles of Lean Six Sigma are applied in many large Romanian organizations and also in many SMEs. The implementation of Lean Six Sigma in Romania is according to Munteanu (2015) a path to increase the customer loyalty as it increases employee's engagement; also increases the quality of the customer experience and at last but not at least it increases the benefits of the company.

Lean Six Sigma's implementation should be continued in large organization as well as in SME's, in spite the difficulties and specific problems, being a long term option for growth and competitiveness through its advantages. Lean Six Sigma, according to George (2002) maximizes shareholder value by achieving the fastest rate of improvement in customer satisfaction, cost, quality, process speed, and invested capital.

In Lean Six Sigma organizations Lean speed will enable Six Sigma quality, while Six Sigma quality will enable Lean speed. So, these companies have better quality products, no defects in manufacturing, reduced inventories, deliveries in time, quick response to change due to their flexibility and a better quality management. In Romania Lean Six Sigma's implementation must go on, based on top management commitment and employees' involvement, as is the only way to increase Romanian companies' competitiveness in order to face competition on the European market.

REFERENCES

Antony, J., Escamilla, J. and Cain, P. (2003). Lean Sigma. *Manufacturing Engineer*, April 2003, pp. 40-42.

Arnheiter, E. D. and Maleyeff, J. (2005). The integration of lean management and Six Sigma. *The TQM Magazine*, 17(1), pp. 5-18.

Assarlind, M., Gremyr, I. and Backman, K. (2013). Multi-Faceted Views on a Lean Six Sigma Application. *International Journal of Quality and Reliability Management*, 30(4), pp. 387-402.

Breyfogle, F. (2009). New Paradigms. Integrating Lean and Six Sigma Process Improvement Tools. *Quality Digest Magazine*, October.

George, M. (2002). *Lean Six Sigma. Combining Six Sigma Quality with Lean Speed.* The McGraw-Hill Companies Inc., SUA.

Munteanu, A.M. (2015). Six Sigma's implementation in Romanian SMEs. *Proceedings of the 9th International Management Conference "Management and Innovation for Competitive Advantage"*, Bucharest: Editura ASE, pp. 541-547.

Pepper, M.P.J. and Spedding, T.A. (2009). The evolution of lean Six Sigma. *International Journal of Quality and Reliability Management,* 27(2), pp. 138-155.

Pyzdek, T. (2000). Six Sigma and Lean Production. *Quality Digest*, January.

Snee, R.D. (2010). Lean Six Sigma – getting better all the time. *International Journal of Lean Six Sigma*, 1(1), pp. 9-29.

Sunder, V. (2013). Synergies of Lean Six Sigma. *Journal of Operations Management*, 12(1), pp. 21-31.