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ADVANTAGES OF LEAN SIX SIGMA'S IMPLEMENTANTION IN THE ROMANIAN ECONOMY

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Abstract
This paper highlights the need for continuing and enhancing the implementation framework of Lean Six Sigma in Romania. A brief history of Lean, Six Sigma and the result of their merger precedes the introduction of the concept Lean Six Sigma. After pointing out the advantages of using Lean Six Sigma for improving business processes, as seen in literature by consecrated authors, DMAIC methodology and its specific tools are introduced. The paper presents the status of Lean Six Sigma's implementation in Romania, in large organizations as well as in SMEs, giving actual examples of successful Romanian companies.
Keywords: Lean Six Sigma, Lean, Six Sigma, SMEs, DMAIC.

1. INTRODUCTION

Nowadays business environment has reached a point where competition for survival and market share growth are essential. Each organization must strive for excellence in order to remain on the market and more than ever it is necessary to implement quality management systems within organization in order to achieve this goal.

Lean Manufacturing, Six Sigma and Lean Six Sigma are tools for process improvement used by organizations to reduce costs and improve quality of products.

Lean is a practice and a philosophy of identifying and eliminating non-value adding activities for more efficient production and thereby reduce production time and costs. Lean was developed for the first time in Sydney, at the British Motor Corporation plant, mid 1950s and known as „Just In Time" manufacturing. Nevertheless, Lean is based on Toyota Production System, used in Toyota automotive factory. Considered the father of Toyota Production System, Taiichi Ohno was linked to Lean since he was directly involved in production at Toyota, first as shop-floor supervisor in the engine manufacturing shop until he became a manager (Ohno, 2013). It is considered that Lean concept and philosophy was brought in US by Womack, Jones and Roos in 1990 (Womack, Jones & Roos, 1990). According to Eaton (2013) Lean is an approach to improving organizations that focuses on the needs of customers – and considers everything that is neither delivering value to customers nor ensuring the safety and security of the organization and its staff as waste and therefore a target for elimination.

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Six Sigma was developed in the middle of 1980s by Bill Smith, an engineer working at Motorola, as a method to improve the quality of products by reducind process variation and consequently defects. This new methodology helped Motorola to recover and win the quality Baldrige Award in 1988. After Motorola, major US companies as Allied-Signal, known today as Honeywell and General Electric, under the leadership of Jack Welch CEO by that time, have implemented Six Sigma. As mentioned by Snee & Hoerl (2003) there are three keys to success in the deployment strategy used for Six Sigma, and these are the top management commitment and involvement, the use of top talent and the supporting infrastructure.

Based on the synergism between Lean and Six Sigma metodologies, Lean Six Sigma was developed as a powerfull quality management tool (Pyzdek, 2000). Lean Six Sigma fundamentals can be summarized in four keys: delight customers —delivering higher quality service in less time, improve processes - eliminate defects and focus on how the work flowed through the process, work in teamwork, sharing ideas with each other so they could solve the problem and base decisions on data and facts (George, Rowlands & Kastle, 2006).

2. ADVANTAGES OF USING LEAN SIX SIGMA

Lean, dedicated to waste elimination and Six Sigma, dedicated to limit process variation, have merged based on their common synergies; the result of merger, Lean Six Sigma, was mentioned for the first time by Michael L. George in 2002 (George, 2002). While the fundamental principle of Six Sigma is to take an organization to an improved level of Sigma capability through the rigorous application of statistical tools and techniques, lean production has a role in eliminating waste and non-valued added activities across the entire supply chain (Antony, Escamilla & Cain, 2003).

Speaking about Lean and Six Sigma methodologies' application to improve processes Pyzdek (2000) emphasizes that lean approach offers a set of solutions to muda in a high-variety production environment. Six sigma applies to the problems addressed by lean but also seeks to solve other problems common to production. However, because both six sigma and lean address the problem of muda, there is a great deal of overlap. Approaches should be viewed as complements to one another. Most companies using the integrated approach began by applying the basic lean production tools techniques such as basic housekeeping using 5S practice, standardized work, total productive maintenance, etc. Once lean tools and techniques eliminate much of the noise from a process, Six Sigma then offers powerful solutions to chronic problems (Antony, Escamilla & Cain, 2003).

According to George (2003), figure 1 shows the combined effect of Lean and Six Sigma, on three axes, i.e. defect rate, followed by Six Sigma, cycle time, target of Lean, and Non Value Added costs.

The ideal state, characterized by lowest cost, can be achieved only improving simultaneously quality and speed using Lean Six Sigma. The nature of improvements that may occur in organization practicing either Lean management or Six Sigma, or their combination, is illustrated in figure 2 by Arnheiter & Maleyeff (2005). Axis

represents the customer's perspective of value, for the horizontal one and the producer's viewpoint concerning costs, for the vertical one. With Six Sigma alone, the leveling off of improvements may be due to the emphasis on optimizing measurable quality and delivery metrics, but ignoring changes in the basic operating systems to remove wasteful activities. With lean management alone, the leveling off of improvements may be due to the emphasis on streamlining product flow, but doing so in a less than scientific manner relating to the use of data and statistical quality control methods (Arnheiter & Maleyeff, 2005).

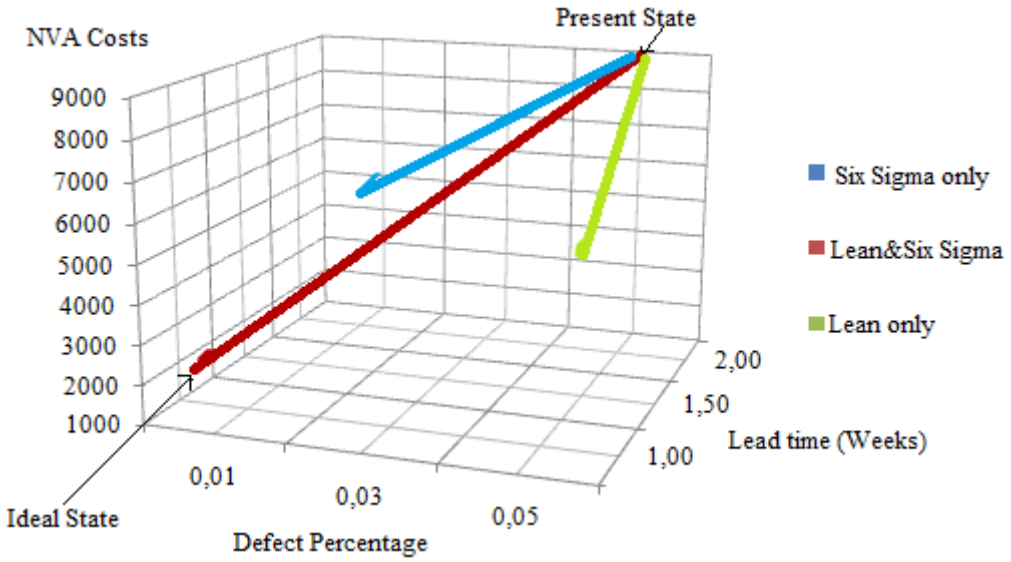

FIGURE 1 - LEAN AND SIX SIGMA ARE REQUIRED TO ACHIEVE THE LOWEST COST

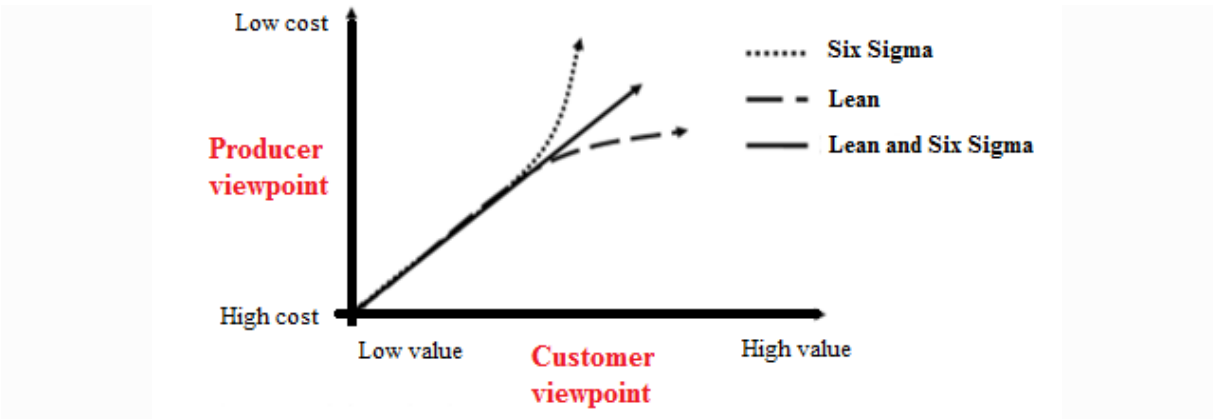

FIGURE 2 - NATURE OF COMPETITIVE ADVANTAGE

Lean complements Six Sigma because it implies continuous improvements that counter decreasing performance trends that follow the finalization of a Six Sigma project. Although Six Sigma may yield considerable improvements, the outputs of the improved processes seem to decrease gradually between projects (Assarlind, Gremyr & Backman, 2013). This idea, illustrated in figure 3, shows that while Lean bases its process changes through continuous incremental improvements, Six Sigma aims immediate breakthrough improvements; Lean Six Sigma represents the optimization of both methodologies.

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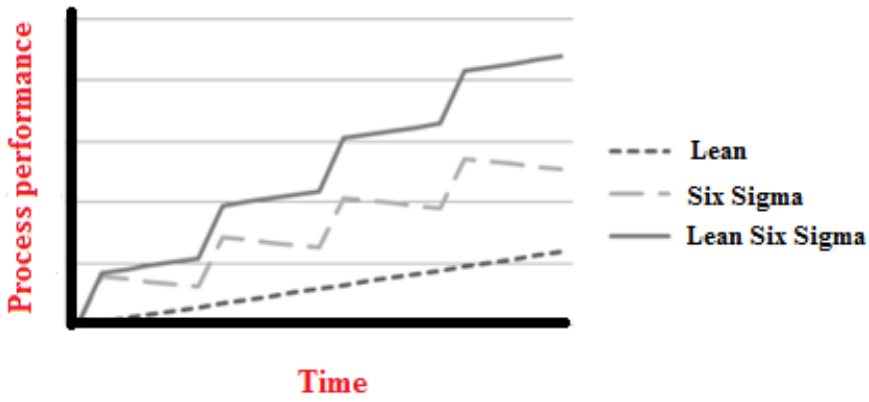

FIGURE 3 - SYNERGIES OF LEAN SIX SIGMA

Lean Six Sigma is not as a full integration of the two systems but rather as the simultaneous use of both through Company Production System… the tools from both methodologies are mixed in order to achieve the best results. Moreover, this expert does not consider his improvement projects to be exclusively Lean or Six Sigma projects; project members utilize what is appropriate from either methodology (Assarlind, Gremyr & Backman, 2013).

The implementation of Lean Six Sigma is done by an accredited project team following DMAIC methodology, including as main steps: define, measure, analyse, improve and control. Figure 4 presents the intake of Six Sigma and Lean to each DMAIC phase, according to Sunder (2013). The figure highlights the specific contribution brought either by Six Sigma or Lean methodology to the define, measure, analyse, improve and control phases of DMAIC methodology.

	Six Sigma element	Lean element
Define	Define and quantify the problem	Define value from customer perspective
Measure	Measure the process capability	Understand the end-end value stream
Analyse	Analyse the root causes of the problem	Perform waste analysis
Improve	Improve the process capability	Improve the process flow
Control	Sustain the improvement	Implement Pull system

FIGURE 4 - CONTRIBUTION OF SIX SIGMA AND LEAN TO LEAN SIX SIGMA'S DMAIC

Table 1 - Summarizes the main key tools for DMAIC, grouped by DMAIC phases.

TABLE 1 - KEY TOOLS FOR DMAIC

DMAIC Phase	Main Tools	Phase target	Origin
DEFINE	Benchmarking	Define critical to quality Define problem	Six Sigma
	Quality Function Deployment		
	Voice of Customer		
	Project Charter	Identify constraints Define value for customer	Lean
	Constrainst Analysis		
	SIPOC Model		
MEASURE	Measurement System Analysis	Measurement system analysis Process measurements	Six Sigma
	Process Capability Analysis		
	Process Flow Diagram		
	Time Value Map	Problem quantification Measure flow map	Lean
	Value Stream Mapping		
	Work Sampling		
ANALYZE	Root Cause Analysis	Root cause analysis	Six Sigma
	FMEA		
	Regression Analysis		
	Wastet Analysis	Waste analysis Analyze value and constrainsts	Lean
	Takt Time		
	5Whys'		
IMPROVE	Design of Experiments	Generating and testing optimal solutions Process improvement	Six Sigma
	Effort-Benefit Matrix		
	Theory of Constraints		
	Kaizen	Implement solutions to optimize flow map and value	Lean
	Kanban		
	Poka Yokee		
CONTROL	Control Charts	Process monitoring to maintain the gains	Six Sigma
	Control Plan		
	Reaction Plan		
	Benefits Capture	Controll flow with pull	Lean

3. IMPLEMENTATION STATUS IN ROMANIA'S ECONOMY

Due to the effects of the global financial and economic crisis started in 2008, the Romanian economy registered a regression, with a late effect until 2010-2011. This period marked a strong adverse effect on large organizations and a profoundly negative impact on SMEs in Romania. The economic crisis effects occurred for large enterprises faster than for SMEs; effects have been felt from 2009 for large organizations, compared with 2010 for SMEs. After overcoming the crisis, the economy development is characterized by a relatively slow but steady positive growth, by developing the competitiveness of the Romanian organizations and Romanian economy's integration in the EU and world economy.

Large organizations were the first ones to implement Lean Six Sigma in Romania and afterwards SMEs. Implementation was easier in large organization compared to SMEs, due to their large budgets and considerable human resources; involvement of top management was also important as managers were rewarded with financial incentives according to commercial and financial organizations' achievements.

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After Lean first implementation in Daewoo's company, other large organizations implemented Lean Six Sigma. Nowadays Lean Six Sigma is implemented in many large organizations operating in telecommunications such as Orange, RCS-RDS, in manufacturing industry, such as Timken, Cameron Romania, in automotive industry as Ford, Draexlmaier, Takata Romania, Pirelli Tyres Romania, in IT services such as Genpact, Honeywell, in trading such as Hewlett Packard Romania, in banking as ING Bank and in many other fields.

In which it concerns Lean Six Sigma's implementation in Romania and especially in SMEs there are no many mentions about this topic in literature. However, based on own studies, Munteanu (2015) states that implementation impacts positively the SME organization, through the greater efficiency of employees' deployment and also through the utilized techniques of operational management. We noticed also an enhanced employee productivity results for Six Sigma SMEs' rate of improvement relative to the rate of improvement of SMEs not using Six Sigma.

The difficulties of Lean Six Sigma's implementation in SMEs are connected with their restricted financial budgets and limited human resources. For SMEs problem of staff training may be insurmountable in terms of costs as well as coaching by external experts. For these reasons SMEs must pay special attention while selecting projects for implementation, choosing ideas for projects with high success probability and based on top management's commitment.

There are many medium-sized SMEs in Romania to have implemented Lean Six Sigma acting in fields such as automotive industry: Anvis Rom, Asam, Tess Conex, production industry as Alexandrion, Ceramica, services as Ceva Logistics, trading such as Transcarpatica and many others. A support for implementation assistance was given by the National Council of Private Small and Medium Enterprises in Romania. The National Council organized some actions as Lean Romania- Transnational cooperation for increased adaptability and promoting quality in supplier networks in the automotive sector, financed from Human Resources Development Operational Program within the grants of the European Social Fund and also Transylvania Forum, sponsored by Lean Competence Center, Association of Employers and Craftsmen from Cluj Napoca.

By these actions the National Council of Private Small and Medium Enterprises in Romania provided a boost to the morale of SMEs management and employees and helped SMEs to implement Lean Six Sigma for increasing their market competitiveness.

4. CONCLUSIONS

Lean Six Sigma is today applied in many large organizations and SMEs acting in Romania's economy. The implementation process of Lean Six Sigma is today more advanced in large organizations in Romania towards SMEs and therefore Lean Six Sigma's implementation must be accelerated particularly in SMEs.

For Romania, continuing and enhancing the implementation framework of Lean Six Sigma, in spite the difficulties and specific implementation problems, is a "must", as is the only long term option for growth and competitiveness.

Lean Six Sigma's implementation should be continued, in large organization as well as in SME's, in order to stabilize and strengthen their market position, due to organizational advantages achieved following the implementation of Lean Six Sigma.

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