

55th EOQ Congress
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"Navigating Global Quality in a New Era"



June 22, 2011 (Wednesday) 55th EOQ Congress

CONCURRENT SESSIONS
KEMPINSKI HOTEL CORVINUS

Wednesday 8:30 – 12:30
Erzsébet tér 7-8, Budapest V.

REGINA BALLROOM I.

Wednesday 11:00 – 12:30

18.1. SIX SIGMA AND LEAN MANAGEMENT

Session Chair: *Charles Aubrey, Anderson Pharmaceutical Packaging an AmeriSource Bergen Company, USA*

11.40 Critical Success Factors of Lean and Six Sigma Projects: Differences and Commonalities

Balázs Németh, Kvalikon Consulting, Hungary

Németh, Balázs (Hungary)

He is Managing Director and shareholder of Kvalikon Management Consulting & Systems Development Ltd. In 1995 he earned MSc degree in Mechanical Engineering at the Technical University of Budapest, Hungary specialized to Production Systems Engineering. He learned at different American universities Total Quality Management, Production Planning & Control, Strategic Management, Production Systems, Management Consulting, Top Management Processes, Management of Innovation and Change, Management Information Systems, Organizational Behavior, Marketing and Human Resource Management. Now he is involved in the organization of the Best Practice Forum focusing on sharing best practice in different topics such as Lean Management implementation, Human Resources best practices in Hungary, Crisis Management etc. He was giving Lean Management and Kaizen trainings for several companies in Hungary. In 2005 he was involved among others in the development of the problem solving methodology for Philips Consumer Electronics (CE) Distribution Center, in several Lean Management implementation projects and in EFQM Business Excellence Assessments. In 2003 he was working as a lecturer for Central European University, Graduate Business School and gave lectures and seminars in Operations Management. He is Vice President of the Lean Six Sigma Section of the European Organization for Quality, Hungarian National Committee.

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Author: Balázs Németh, PhD.
Managing Director, Kvalikon Consulting
www.kvalikon.hu

Title: Critical success factors of Lean and Six Sigma projects: differences and commonalities

Most of organizations are applying some or several improvement methods to improve their business performance. There is a long and never ending debate on the best approach. Lean management and Six Sigma have proved to be viable, effective methods for improving business performance by applying problem solving methods, with different focus and approach. Lean Management philosophy and projects are mainly focusing on improving value added, reducing order fulfillment lead time by eliminating waste from the processes.

Six Sigma is aiming at improving quality and reducing costs by reducing variability in the processes. Both methods can substantially contribute to improve productivity at the companies, but the success of these projects requires the existence of several preconditions (in the areas of goals, systems, resources, management, timing, knowledge, behaviors).

This paper discusses the most important features and critical success factors of Lean and Six Sigma projects, based upon the author's several years consulting and research experiences.

Six Sigma and Lean Management, are both aiming at improving organizational performance.

Lean management is more of a philosophy and system change that is a long term change program (process) at a company. The major goal of lean management is to increase value added content in the operations by reducing lead time from receiving an order from the customer until the product is delivered, by identifying and eliminating waste in the value stream.

The major goal of Lean management is the flexible adaptation to market demand changes (and utilization of resources) by continuously aligning and optimizing organizational resources, and processes according to the market requirements.

Six Sigma is well developed methodology to improve business processes by reducing variations, improving quality and reducing costs. The major goal of Sigma is to achieve Six Sigma level quality in the processes (meeting requirements, customer expectations, and specifications) by reducing variations. The Six Sigma team identifies root causes for variance, test hypotheses for possible solutions, and validate the analysis, before implementing the solution and monitoring for effectiveness.

If we want to compare Six Sigma and Lean we can compare Lean process improvement (change and problem solving) methods to Six Sigma.

Six Sigma improvements are carried out in a well structured framework of projects. Lean implementation is not a project, but a long term change process, that may also consist of some project type improvement actions. Both Lean and Six Sigma are aiming at changing (improving) the existing processes or sometimes creating new processes in accordance with the customers' expectations. The most important method for change in Lean management is Kaizen (continuous improvement). Kaizen can be carried out in three different levels, individual Kaizen can be handled in the suggestion systems, group level Kaizens can be managed in Quality Circles or in management driven Kaizen workshops.

Six Sigma is always carried out in a well defined project management structure of DMAIC or DMAIDV cycle. Lean implementation may also require sometimes project approach, when new systems have to be implemented (new processes have to be created) for example: changing the production scheduling system, implementing suggestion system, implementing kanban system.

Both Six Sigma and Lean are following the Management by facts principle, but while Six Sigma is more reliant on data collection, measurement systems and statistics, Lean management is following the “Go to Gemba” principle, where the information is collected by direct observation and data collection of the process at the place where the process takes place. Six Sigma places more attention on planning and analysis of the projects, a thorough planning and analysis is carried out before changes are made to the processes. Lean (and Kaizen) has a “learning by doing” approach where new ideas (and assumptions) are always tested in practice and the experiences are used for finding the best solution for the problem. If the cost or risk of changing the processes is higher than Six Sigma approach is preferred, if not than the Lean (Kaizen) approach is preferred (because it is faster and pays more attention to people involvement).

| Features | Lean Management | Six Sigma |
|------------------------|---|---|
| Focus | Value Added, Flow, Lead time | Process Variations, Quality Problems |
| Goal | Reduce waste, improve flow | Reduce Variation |
| Participants | Total Participation (every one), employee involvement | Six Sigma organization (MBB, BB, GB), Selected experts |
| Problem identification | Go to Gemba (Observation) | Data collection, measurement and analysis |
| Area | Any process or area where problem exists | Repetitive process, where statistical sample is available |
| Improvement focus | System and Culture development, improve standards and behaviors | Process improvement, process development |
| Improvement method | Kaizen, PDCA, VSM | DMAIC, DMADV |
| Implementation | Long Term Cultural Change, Kaizen | Short Term results, Project based |
| Approach | Learning by doing | Analytical, Statistical |
| Tools | Value Stream Mapping, PDCA, Kaizen, 5 Why? 5S, Standard work, 5W1H, 7QC tools, Heijunka, Takt time, line balancing, 3MU, Waste elimination, SMED, Visual management, Poka-Yoke, Lean audit | Process Mapping, SIPOC, DMAIC, project charter, 7QC tools, 7 Management tools, MSA, statistical analysis, hypothesis testing, ANOVA, FMEA, QFD, SPC, DOE, control plan, cost-benefit analysis |
| Knowledge sharing | Lean knowledge is shared among employees by trainings, on the job trainings and participation in different Kaizen (continuous improvement) activities (learning by doing). Standard work is one of the most important tools to share knowledge within the organization. | Six Sigma knowledge is shared within the organization through the Black Belt system and Six Sigma pilot projects. A well defined training and project methodology is supporting employee development. Process description and specification are supporting knowledge sharing. |

| Common elements, and principles |
|--|
| Process thinking |
| Customer Focus |
| Continuous improvement, Problem solving |
| PDCA |
| Management by Facts |
| Management participation |
| Business Driven (Clear business objectives are required) |
| Team work |
| Training program |

| Critical Success Factors | Lean Management | Six Sigma |
|----------------------------------|---|--|
| Goals | Clear strategy and strategic goal deployment is required at the beginning of the program | Project goals and, Customer expectations should be clearly defined at the beginning of the project. |
| Systems | Requires changes in organizational systems (like performance appraisal, rewarding, production scheduling, training, logistics, data collection) | Some systems should be changed: training, data collection and quality control & improvement systems should be in place (or developed) |
| Resources | Human Resource intensive, Every employee should be involved. People should be trained and involved, Time and budget should be allocated to Lean program every year to successfully implement lean elements. Physical layout changes, machine improvement and logistics may require intensive participation of Maintenance department and process engineering. | Only a limited number of people are involved in the program. Full time Master Black Belt and part time Black Belt should be trained, intensive training program. Six Sigma project should be defined and a budget should be allocated to the project according to cost benefit analysis. Appropriate data collection and measurement system should be implemented. |
| Prerequisites of problem solving | Clear expectations (requirements) and standards, visualization, feedback | Clear expectations (requirements), Reliable data, measurement systems |
| Software | Not required | Minitab or another statistical software |
| Management role | Management is leading changes, setting example | Management is supporting and evaluating the projects (Champions) |

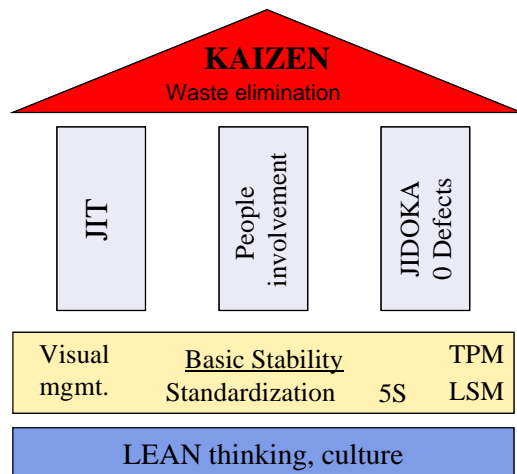
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|------------------|---|--|
| Employees role | Employee involvement (crucial), team leaders and shift leaders have crucial role in involving employees, every one is responsible for improving his area, methods | Employee are not involved, they may only partly be involved in (some project phases) implementing the new processes or collecting data |
| Organization | Lean committee, Champion, Lean coordinators should be nominated and trained (usually part time job) | Six Sigma Organization (Lean Champion, Master Black Belt, BB, GB) should be established and trained |
| Timing | Long term program, consisting of short term Kaizen actions, workshops.. | Short team projects (few months, less then half year) |
| Knowledge | Practical experiences, Kaizen (No theoretical knowledge is required) | Theoretical Knowledge Statistical knowledge, Process Management, Quality knowledge (Expertise in methodology is required) |
| Behaviors | Value Added focus Go to Gemba, learning by doing, Maintain and Continuously Improve Standards Discipline, follow the standards and rules Problem awareness, Problem solving, Continuous learning Kaizen, continuous improvement Participation, team work Information & Knowledge sharing | Customer focus Management by Facts, quantify problems and results Improve Processes Analytical thinking Engineering thinking Mentoring Problem solving Team work Project management Gain stakeholders commitment “Prove it to me” |
| Required studies | Short lean principles, Kaizen training, Common sense and practical experience is required | Strong statistical background, Basic Quality knowledge |

Both Lean and Six Sigma project has the following critical success factors:

- Top Management Commitment
- Case For Change
- Clear Business Objectives (Management expectations)
- Clear Responsibilities should be defined
- Change Champion
- Change Agent
- Available time and resources
- Financial budget
- Expertise in methodology

- Involvement of key stakeholders
- Short term (visible) results
- Cooperation and team work
- Communication
- Practical training program

In my understanding Six Sigma is a process improvement method, a project which has a start and an end. Lean management is a long term (3-5 years) cultural and system change program. In lean implementation employee involvement has a crucial role. Lean aims at continuous improvement across the entire value-stream of operations by encouraging and empowering the entire workforce to identify and eliminate waste in their sphere of activity. It is an on-going activity involving all levels of employees to improve their processes and operations. Lean implementation requires behavior change in every level of the organization. In Six Sigma, a selected team of experts and stakeholders participates in the project, where the participants are carrying out a problem solving activity and a process improvement in a selected topic. Implementation of six sigma requires change in the knowledge (rather than behaviors) of the organization.



Since Lean implementation requires change in behavior of the employees in every level of the organization, the existing systems, having effect on performance and behaviors (performance appraisal, measurement, rewarding, training, production scheduling, logistics..) have to be changed. Lean implementation will only be really successful, if we follow an integrated (holistic) approach, where the goals and improvement targets and activities are deployed down from strategy, and several systems are implemented and changed parallely according to the Lean (Toyota) house.

Lean implementation is a not a quick fix problem solving method, but a long term change program. First of all “Lean thinking” and philosophy has to be introduced and accepted by the management and employees of the company. Management has to define clear business goals and expectations based upon strategic goals and current state analysis (Value Stream Mapping, Lean Assessment). Then a lean implementation program can be created by involving the key stakeholders.

Then basic stability has to be created it the 4M (Man, Machine, Material, Methods) within the organization. Stability can be created by laying down the foundations of 5S, Standard work, Visual control, where people can identify problems (abnormal states) and start initiate Kaizen (continuous improvement, problem solving) actions. The next step is usually, moving towards continuous flow of materials, and pull system, by changing the layout, balancing the operations and creating pull systems between the operations. In order to move toward JIT, pull systems, where the work in process inventory is lower, we need to improve are systems (process) capability machine reliability, process capability, quality. 0 defects and TPM and both striving toward zero defects and waste (in processes and on the machines). In this phase of the Lean implementation program Six Sigma projects can be a very useful method to improve process and system capability. Kaizen is the improvement and implementation

method of Lean management, depending on the level of change Kaizen activities are carried out in 1-6 weeks period.

Six Sigma, on the other hand is a well structure process improvement and problem solving method that aims to eliminate variations in a specific project or area of operations, and the results remain confined to such specific area instead of permeating to the entire organization.

The steps of Six Sigma process improvement projects are the following:

1. Define the project goals and customer (internal and external) deliverables
2. Measure the process to determine current performance
3. Analyze and determine the root cause(s) of the defects
4. Improve the process by eliminating defects
5. Control future process performance

Implementation of Six Sigma doesn't require the change of whole organization and its systems, but it may also have impacts on the existing systems (like data collection, training, process management, project management, quality control). Usual Six Sigma projects are carried out and bring (quantifiable) results in 12-16 weeks.

The onus on implementation of Six Sigma falls on special purpose teams such as lead time reduction team, manufacturing scrap reduction team and others formed specifically for the purpose. Such teams have Green Belts led by a Black Belt or Master Black Belt, who remain exclusively responsible for the implementation of Six Sigma.

Both Lean and Six Sigma have their uses and very often go hand in hand. While Six Sigma focuses more on process improvement on a selected area, Lean management focuses more on system improvement and cultural change in the organization. Basic lean methods can be applied by anyone in the organization for simple problems. Six Sigma methods are usually applied by selected experts for more complicated (recurring) problems where reliable statistical data is available. In my understanding Six Sigma and Lean management are two complementary approaches to improve business performance, which have several common elements and principles. If someone understands the benefits and preconditions of both methods, than they can be applied in parallel to achieve the same business objectives of customer satisfaction, lead time reduction, waste, cost reduction, by involving different levels of the organization and attacking different problems.