

Lean Six Sigma for Services

Introduction

Most executives intuitively know that some (if not many) of their service processes are inefficient. Yet, service process improvements are a barely touched frontier in the relentless corporate drive to lower costs and improve quality. One reason for this is the lack of objective process controls such as those developed for manufacturing over the last 50 years.

Everyone knows the prime directive of business: faster, better, cheaper. Of course, the directive applies to service processes as well. Yet, when pressed for an explanation most can say only that it means the most work in the least time with the fewest people and fewest mistakes.

What are the roadblocks to achieving the prime directive in services?

Responses to that question are varied but predictable: We need more people. The computer systems are lousy. The customer's demands are excessive, etc.

If our experiences in manufacturing tell us anything, it is that objective measurements and controlled improvements create a finely tuned process with the fewest non-value-added steps.

And here's the news: a new method, Lean Six Sigma for Services, is moving into the forefront to provide just that.

Like its industrial-strength manufacturing counterpart, Lean Six Sigma for Services uses objective, repeatable data to identify waste and complexity thus removing subjectivity from the equation.

Yet, mention "Lean Six Sigma for Services" and the response is likely a blank stare followed by a few quick responses: "Isn't that used in manufacturing or TQM?" "Don't see how it applies to a service business." Or, worse, out pops the inevitable horror story: "I know a guy that spent a million dollars on Full Factorial Experiments. What is a Full Factorial Experiment?"

This paper helps decision makers seeking a methodology best suited for service process improvement. It is a compendium of experience, personal notes and the readings of noted authors (described in the reference section). Inside you will find a description of Lean Six Sigma for Services – in general terms – along with a survey of the benefits, characteristics, approach, and tools.

I hope that the information herein will clear up some of the mysteries and misconceptions surrounding this excellent approach.

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Service Organization Processes

“Service” encompasses both service companies (healthcare, banking, government, retail) and the service infrastructure (marketing, sales, HR, accounting, engineering, production control, etc.).

It should be noted that approximately 80% of a company’s invested capital is the cost of people performing service related duties. So invested capital is really the “Cost of people.” Combined with empirical data that has shown that service costs are inflated by 30% to 80% waste, it makes logical sense to focus energy on service side processes.

The following are some fundamental truths about service processes:

- ◆ They are slow (hence expensive) because there is far too much “Work-in-Process”
- ◆ Less than 20% of the service process time adds value.
- ◆ 80% of the delays are caused by 20% of the activities
- ◆ Most companies use a **Push versus a Pull** system to control WIP velocity (i.e. they push work into the process without regard to work exiting the process)

The following are the challenges implementing process improvement for services:

- ◆ the less visible nature of service processes make problems harder to identify and fix (e.g. over processing, transportation, motion, inventory, waiting time, defects, and overproduction)
- ◆ they are usually complex and it is difficult to track the process flow
- ◆ they have a tradition of individuality, freedom, and creativity
- ◆ they are characterized by a lack of *meaningful* data for decision making
- ◆ people, your major asset, are also the major cause of process variation
- ◆ customers cannot be treated like inventory

Lean Six Sigma Definition

Lean Six Sigma for Services combines the best of Six Sigma and Lean techniques. It is a business improvement methodology that *maximizes shareholder value* by achieving the fastest rate of improvement in customer satisfaction, cost, quality, speed, and invested capital. **Lean** is a set of principles and tools that focus on accelerating the speed of all processes across the enterprise by eliminating waste and non-value added steps. **Six Sigma** is a disciplined, customer-centric, data-driven methodology that provides the tools and techniques to measure process errors, identify variances, and eliminate them.

Lean Six Sigma focuses on speed, efficiency, and quality:

- ◆ Lean principals focus on process **speed and efficiency**
 - Separate “value-added” from “non-value-added” work with tools that help eliminate the root causes of non-value-added activities and (thus) their cost
 - Provide a means for quantifying and eliminating the cost of complexity
- ◆ Six Sigma focuses on process **quality**
 - Emphasizes the need to recognize opportunities and eliminate customer-defined defects
 - Recognizes that variation hinders the ability to reliably deliver high-quality services
 - Requires data-driven decisions and incorporates a comprehensive set of quality tools under a powerful framework for effective problem solving
 - Provides a highly prescriptive cultural infrastructure for sustainable results

Organizations who have invested heavily in business process improvement have recognized several fundamental truths:

- ◆ Getting fast can actually improve quality
- ◆ Improving quality can actually make you faster
- ◆ Reducing *complexity* improves speed and quality

FOCUSING ON THE ABOVE THREE FUNDAMENTALS YIELDS OPTIMAL RESULTS

Service processes are typically littered with variation and performing below expectations. Therefore, it is better to bring a process into statistical control first (*Six Sigma*) then work on improving its capability (*Lean*). In other words, remove variation then raise performance level.

The characteristics of a Lean Six Sigma Process

Typically, a Lean Six Sigma process has the following characteristics:

- ◆ The process is under statistical control (assignable cause variation have been eliminated)
- ◆ The process operates at a cycle efficiency > 20%. Cycle efficiency is the *value-add time* within a process.
- ◆ It has a maximum cap on WIP to control velocity.
- ◆ Uses a *pull system* where new work is released into the process only when old work has exited.
- ◆ Uses visual controls to manage and monitor the process.

Improving Processes Using DMAIC (Define, Measure, Analyze, Improve, Control – DMAIC)

DMAIC is a disciplined and extremely beneficial model for process improvement because it provides a road map that addresses the intangible and unstructured nature of service processes. The Define Phase creates the action plan based on expected financial results. The measure phase identifies data collection requirements and collects data at critical points within the process to assist in the analysis. The Analyze Phase uses the collected data to move the problem from symptoms to root causes. The Improve Phase redesigns the process to eliminate root causes. During the Control Phase, the process is continually monitored to ensure it continues to meet expectations.

Define Phase

The Define Phase seeks agreement on the problem, how it affects the customer, and how the process fails to meet expectations. The team is defined, and roles and responsibilities are assigned. Key customer and business metrics and indicators used to evaluate success are identified. The team should exit the Define Phase with a mutually agreeable action plan.

The following tasks are typically performed during the Define Phase:

- ◆ Develop the Project Charter which consists of:
 - Business Case – rationale relative to strategic company goals
 - Problem Statement – extent, impact, opportunity
 - Goal Statement – expectations and outcomes (Specific, Measurable, Attainable, Relevant, Time Bound)
 - Roles and Responsibilities – Team identification (business unit and improvement team)
 - Project Scope – Contract between team and business unit
 - Preliminary Project Plan – Major activities tasks, expected completion dates, responsibilities
 - Communications Plan – roles and responsibilities for distribution
- ◆ Gather the Voice of the Customer and convert it to Critical To Quality (CTQ) requirements
- ◆ Develop a Preliminary Process Map which is the starting point in gaining an in-depth understanding of the current process, its performance, and critical inputs and outputs
- ◆ Define the expected Improvement phases

- ◆ Perform a Non-Value-Add Analysis and identify Customer Value-Add, Business Non-Value-Add, and Non-Value-Add activities
- ◆ Create a trained and committed team
- ◆ Optionally perform the following:
 - A Stakeholder Value Analysis – Compares how the company is performing in its marketplace in a broad sense
 - A Business Unit Analysis – Identifies how much value is being created by the business unit
 - A Value Stream Analysis – Identifies business unit value streams that have the greatest potential for increasing shareholder value
- ◆ Prepare and deliver the team presentation (Tollgate Review)

Define Phase deliverables typically consist of:

- ◆ Project Charter
- ◆ Communications Plan
- ◆ Preliminary Project Plan
- ◆ Multi-generational Plan (Improvement Phases)
- ◆ Customer Requirements Document (CTQ)
- ◆ Value-Stream Map
- ◆ A SIPOC Diagram (Supplier, Input, Process, Output, Customer)
- ◆ Detailed Process Map
- ◆ Measure Phase Action Plan
- ◆ Storyboard

Measure Phase

The Measure Phase identifies performance measurements, measures the current process against established targets, establishes baselines, optionally conducts "Best practice research", and expands on the preliminary process maps created in the Design Phase. The team should exit the Measure Phase with enough detail to allow the Analyze Phase to confirm the sources of delay, waste, and poor quality.

The following tasks are typically performed during the Measure Phase:

- ◆ Review and observe the process to determine what we want to learn about the problem and where we need to go to get the answers.
- ◆ Identify measurement types, points, and sample sizes
- ◆ Develop measurement templates, forms, programs, etc.
- ◆ Test measurement system to ensure valid representation
- ◆ Train collectors
- ◆ Collect the data
- ◆ Establish baselines
- ◆ Prepare and deliver the team presentation (Tollgate Review)

Measure Phase deliverables typically consist of:

- ◆ Measurement Plan
- ◆ Measurement forms, templates, programs, etc.
- ◆ *Six Sigma* Baseline Performance Measurements (Cycle Capability)
- ◆ *Lean* Baseline Performance Measurements (Cycle Efficiency & Sizing)
- ◆ Updated Detailed Process Map
- ◆ Analyze Phase Action Plan
- ◆ Updated Storyboard

Analyze Phase

The Analyze Phase uses the output from the Measurement Phase to confirm the sources of delay, waste, and poor quality. In this phase the team moves from problem symptoms to problem root causes (*moving from data to knowledge*). The team should exit the Analyze Phase with a clear understanding of the problems that prevent the process from meeting customer expectations identified in the Define Phase.

The following are the tasks typically performed in the Analyze Phase:

- ◆ Examine and update the process maps to ensure capture real process activities
- ◆ *Six Sigma* analysis of the data gathered in the measurement phase to stratify the problem and quantify process variation
- ◆ *Lean* analysis of the process and identify disconnects, non-value-added steps, reworks, bottlenecks, etc., that may be the potential cause for delays
- ◆ Develop a hypothesis about root causes, investigate, and confirm
- ◆ Investigate best practices and brainstorm solutions
- ◆ Prepare and deliver the team presentation (Tollgate Review)

Analyze Phase deliverables typically consist of:

- ◆ Root Cause Documentation
- ◆ Updated Detailed Process Map
- ◆ Improvement Phase Action Plan
- ◆ Updated Storyboard

Improve Phase

The Improve Phase redesigns the process wherever it is clear that the solutions close the gaps between the current process and the customers' requirements. It improves process efficiency, speed, and quality. The solution must increase the bottom line which is a Six Sigma fundamental.

The following are the tasks typically performed in the Improve Phase:

- ◆ Brainstorm
 - Look for opportunities to reduce setup
 - Identify any process related work that delays the start of a task, causes interruptions to value-add activities, workforce delays, and duplication of effort
 - Determine what interruptions and delays can be offloaded
 - Streamline or automate any interruptions and delays that cannot be offloaded
 - Bring the process under statistical control
 - Stick to basic re-engineering principles:
 - Minimize approvals, especially multiple levels of approval
 - Minimize handoffs
 - Assign clear responsibility for process steps
 - Build quality control into each process step
 - Minimize or eliminate inspections or approval activities
 - Balance the flow of work to avoid bottlenecks
 - Minimize batch sizes
 - Design the process to handle the routine rather than the exceptional
 - Question everything
 - Examine various methods to reduce congestion:
 - Queuing
 - Pooling
 - Triaging
 - Back-up strategy when at capacity

- Use the principals of the 5Ss to better organize the workplace and eliminate clutter:
 - Sort
 - Straighten
 - Shine
 - Standardize
 - Sustain
- ◆ Generate *Lean Six Sigma* improvement strategies and create a *Solution Statement* for a least two improvement alternatives
- ◆ Review with sponsor, make final choice, document recommendation
- ◆ Pilot and/or model process if appropriate and refine recommendations
- ◆ Perform a Failure Mode and Effects Analysis (FMEA) which documents the understanding of potential risks and includes plans to respond to those risks.
- ◆ Prepare implementation and control plan
- ◆ Prepare standard operating procedures and training/implementation aids
- ◆ Prepare and deliver the team presentation (Tollgate Review)
- ◆ Put controls in place (Balanced Scorecard, Process Scorecard, Statistical Process Control Charting)
- ◆ Execute implementation plan

Improve Phase deliverables typically consist of:

- ◆ Final Improvement Recommendation
- ◆ Process Documentation
- ◆ Training Materials, Standard Operating Procedures, and Implementation Aids
- ◆ Implementation Plan
- ◆ Control Phase Action Plan
- ◆ Updated Storyboard

Control Phase

The Control Phase determines whether the expected improvements actually occur. The project team takes on the role of monitoring the changes. There are several control areas that are important to service environments that are listed below. A control plan must be developed and maintained. Operation and financial results must be verified. An automated monitoring environment should be put in place wherever possible.

The following are the tasks typically performed in the Control Phase:

- ◆ Monitor the process activity against targets (divided into two sections: The *Customer* CTQs and the *business* CTQs):
 - Balanced Scorecard which is the key strategic measurement required for organization success (financial, customer knowledge, internal processes, learning and processes)
 - Process Scorecard which is the key tactical measurement required for determining the process performance relative to target
 - Statistical Process Control Charts which are used as an on-going measurement against standards (e.g. X-Bar R Charts, nP Charts, P Charts, C Charts, U Charts, etc.)
- ◆ Prepare the final project report and documentation which records for historical purposes the body of knowledge accumulated during the project. This report varies from company to company; However it should contain the following components:
 - Introduction
 - Project Plan
 - Define Phase summary: Project Charter, VOC, and SIPOC
 - Measure Phase summary: Critical Xs and Ys, baseline results, and key measurement summaries provided by tools (e.g. Pareto, Histograms, Control Charts, etc.)
 - Analyze Phase summary: Results of testing and conclusions (e.g. Cause and Effect Diagrams and Root Cause documentation)

- Improve Phase summary: Final improvement proposal and documented rationale supporting final proposal (e.g. cost/benefit analysis)
- Control Phase summary: Control plan, FMEA, Balanced Scorecard, Process Scorecard
- Implementation Plan
- Process documentation and training materials
- Regular Control Plan updates
- ◆ Prepare and deliver the team presentation (Tollgate Review). This review will be conducted three to six months from the start of implementation.

Control Phase deliverables typically consist of:

- ◆ Final Process documentation
- ◆ Ongoing reports
- ◆ Updated Storyboard

Designing for Six Sigma (DFSS) using Define, Measure, Analyze, Design, and Verify (DMADV)

Design for Six Sigma (DFSS) is a structured, discipline approach to build *new processes* that uses a Six Sigma framework referred to as DMADV. There are three situations where DMADV is preferred over DMAIC: 1) the process does not exist, 2) the process is a total failure, or 3) the process has reached a four-to-five Sigma level and cannot be taken any further under its existing architecture.

The following highlights the differences between DMADV and DMAIC:

- ◆ The Define Phase addresses more closely Customer Delighters, and Business Delighters
- ◆ The Measure Phase develops the metrics for the new process
- ◆ The Analyze Phase addresses the relative importance of each design feature, benchmarks other companies, defines performance standards, conceptualizes design, evaluates concepts, performs simulations, and selects best design
- ◆ The Design Phase focuses most of its attention on designing the new process taking into consideration the value-added activities, Design of Experiments, modeling/simulation, documentation, training plan, training materials, and small pilot.
- ◆ The Verify Phase brings together both Implementation and Control. During the Verify phase the team constructs the control plan and the transition plan, performs necessary training, implements support systems, transition, and handoffs the process to the users.

References

Useful Lean Six Sigma and Six Sigma Books

The following is a list of books I have found to be most useful in my daily activities:

<p>Six Sigma for Managers</p> <p>Publisher - McGraw-Hill Author - Greg Brue</p>	<p>Provides a good introduction and foundation for managers who are about to take on a Six Sigma project. It is written in layman' terms. It does not focus on "Service."</p>
<p>The Six Sigma Way</p> <p>Team Fieldbook – An Implementation Guide For Process Improvement Teams</p> <p>Publisher -- McGraw-Hill Authors -- Peter S. Pande, Robert P. Neuman, Roland R. Cavanagh</p>	<p>Does an effective job explaining the tools and procedures a project leader or Six Sigma Team needs. It does not focus on "Service."</p>
<p>The Six Sigma Handbook</p> <p>A Complete Guide for Green Belts, Black Belts, and Managers at all Levels</p> <p>Publisher -- McGraw-Hill Author -- Thomas Pyzdek</p>	<p>A comprehensive reference that includes a wealth of information on Six Sigma and Six Sigma tools. It is an essential companion for Six Sigma Black Belts. While not specifically targeted to "Service," many of the concepts apply.</p>
<p>Transactional Six Sigma and Lean Servicing</p> <p>Leveraging Manufacturing Concepts to Achieve World Class Service</p> <p>Publisher -- St. Lucie Press Author -- Betsi Harris Ehrlich</p>	<p>One of two books that is a must for Six Sigma teams embarking on improving service processes. It serves as a practical guide for implementing Six Sigma and Lean methods in a transaction service model. It is comprehensive and focused on service improvement. Case Studies are well written and relevant.</p>
<p>Lean Six Sigma for Service</p> <p>How to Use Lean Speed and Six Sigma Quality to Improve Services and Transactions</p> <p>Publisher – McGraw-Hill Author – Michael L. George</p>	<p>The second of two books that is a must for Six Sigma teams embarking on improving service processes. It compliments "Transactional Six Sigma and Lean Servicing" and does an exceptional job applying Six Sigma and Lean Techniques to improving the Service model. It does a nice job explaining the financial impact of Lean Six Sigma. Case studies are well written and relevant to services.</p>
<p>Selecting Statistical Techniques for Social Science Data</p> <p>A Guide for SAS Users</p> <p>Publisher – SAS Institute Authors – Frank Andrews, Laura Klem, Patrick O'Malley, Willard Rogers, Kathleen Welch, Terrence Davidson</p>	<p>This book helps the data analyst select from a vast array of statistical tools a technique or statistic that can be applied to a particular analysis. Although applicable to SAS, it is helpful regardless of the software tool you are using.</p>

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Betsi Harris Ehrlich, *Transactional Six Sigma and Lean Servicing: Leveraging Manufacturing Concepts to Achieve World Class Service*, St. Lucie Press, 2002

Michael L. George, *Lean Six Sigma for Service: How to Use Lean Speed and Six Sigma Quality to Improve Services and Transactions*, McGraw-Hill, 2003

Frank Andrews, Laura Klem, Patrick O'Malley, Willard Rogers, Kathleen Welch, Terrence Davidson, *Selecting Statistical Techniques for Social Science Data: A Guide for SAS Users*, SAS Institute

Raymond G. Carey, Ph.D., *Improving Healthcare with Control Charts: Basic and Advanced SPC Methods and Case Studies*, ASQ Quality Press

About the Author

James S. Pickens is the Managing Partner for James Pickens and Associates. Jim has over 30 years experience assisting companies maximize work force capabilities through the proper alignment of people, processes, and technology. Prior to JPA, Jim served as VP of IT Services and Business Engineering for MedQuist Corporation, CEO, for Convergent Solutions, a top 20 IBM SMB Premier Partner, specializing in work force collaboration strategies and CEO of PC Concepts, the largest PC training/end-user support company in the United States at the time. Jim and his companies have been recognized by the Philadelphia Business Journal Top 100 and Deloitte Touche Top 500 nationally.

Jim has served in a lead consulting capacity for process improvement for the Pennsylvania Insurance Commission, Provident American Insurance Company (a small group insurer), IOA Re (a Managing General Underwriter for reinsurance), and HealthAxis.com (an Internet based health insurance retailer). Complimenting his business expertise, Jim's technology background spans a broad range of architectures and disciplines including: the Internet (b2b, b2e, and b2c), middle tier technologies, groupware, IBM back office, database design, and data warehousing.

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