



## LEAN SIX SIGMA

### **Venturehaus Limited**

Liberty House, 222 Regent Street, London W1B 5TR, UK  
Wippertstr. 28, D-79100 Freiburg, Germany

UK	++44 (0)20 7297 2073
Germany	++49 (0)761 4534 955
E-mail	<a href="mailto:info@venturehaus.com">info@venturehaus.com</a>
Web	<a href="http://www.venturehaus.com">www.venturehaus.com</a>

## Six Sigma or Lean? - How to get the best of both worlds.

Recent evidence suggests that trends in the use of Six Sigma have evolved into an enhanced state, now known as “Lean Six Sigma”. More and more companies are combining the two approaches. GE now call their Six Sigma approach “Lean”, and Honeywell call theirs “Six Sigma *plus*”. This paper sets out to show how effectively to merge the techniques of Six Sigma with those of Lean in order to create an appropriate business improvement approach for different business situations.

### What is common between the two?

- Both concepts have exactly the same objective: Continuous Business Process Improvement.
- Both follow a structured approach to identify the root causes of a business problem and find the optimal solution to avoid recurrence of the problem.
- Both concepts are focused on business needs as defined by the customer.
- Both concepts approach issues from the perspective of business process, rather than striving for the optimum in a given business unit, department or function.
- Both concepts require the full participation of all interested parties supported by a well organised training and communications program. They are both founded on the belief that high performance can only be achieved in business processes if all the involved parties, regardless of hierarchical layers and including employees, suppliers and customers, participate in the activities of continuous improvement,
- Both concepts use cross-functional teams to address business problems in project work

Both concepts were initially developed to improve manufacturing processes, but today they are also being applied to transactional businesses. Hence they are being widely used in the services industries, particularly in the Financial Services sector.

### So what's the difference?

First, here's a quick overview of the key principles of each concept.

## The Lean Methodology

Developed initially by the Japanese manufacturing industry, Lean, as a management strategy, has evolved from the *Kaizen* philosophy of constant improvement. The mastery of *Kaizen*, resulting in revolutionary products with unbeatable prices on the world market, was a main contributor to Japan's economic success from the late 1950s to the early 1990s.

Toyota is a great example of this. Toyota has understood not only how to master Lean within its manufacturing plants, but also how to transfer the concept successfully to the entire supply chain, from suppliers to dealerships, and on top of that to all of the supporting processes, too. Continuous improvement has allowed Toyota to become arguably the world's most profitable car maker with the most reliable cars on the market.

### Description of the Lean concept

*Lean* means eliminating waste from everything we do in business or in virtually any type of organisation.

The first step is to identify the true Value Stream of a business process. A clearly defined and agreed upon Value Stream throughout the organisation is the basis for any improvement action to achieve high process performance and a significantly reduced cost base.

Using the *Lean* concept, the business processes are viewed from the customer's perspective. The value of an activity is solely defined by the customer. Activities that add value to the customer are those that make the product or service resemble more of what the customer actually wants and for which he is willing to pay.

Non value-added activities, however, do not create any value for the customer, and therefore all non value-added activities are considered as *waste*.

*Waste* is any activity in the workflow that adds time, effort or cost but does not create value. These activities include:

- Rework – any process steps that are not done correctly the first time
- Waste of material – any material that does not end up in the end product or is not needed actually to produce the item
- Overproduction – output produced in greater quantity, or faster than the subsequent process steps require

- Waste of Transportation – unnecessary movements of the process item
- Waste of Movement – unnecessary movements of the operator, for instance in searching for instructions, materials or equipment
- Waiting - operator or equipment idle time
- Waste of human skills - employees who are not fully utilised according to their skills, training and potential.

**Common Tools used in Lean:**

**Quality at source:**

- Avoid errors from being made (Poka Yoke)
- Prevent defects from being passed on to subsequent process steps
- Delegate responsibility and authority to the people who perform the process step.

**Workplace Organisation – (5S) the 5 S's:**

- **Seiri - Sort:** Remove any disarrangement
- **Seiton - Set in order:** Organise the work environment
- **Seiso - Shine:** Clean the work environment on an ongoing basis
- **Seiketsu - Standardise:** Use standard operating procedures to perform the process activities and to organise and clean the workplace
- **Shitsuke - Sustain:** Maintain the improved state by empowerment, clear responsibility and ownership.

**Visual management**

Visual management is a system that enables everyone, i.e. operators, middle management and executives, to assess the current status of a business process, at a glance. This includes:

Visual Controls - Clear separation of Work in Process, Defective Work Units, or transactions and process Output to be passed onto subsequent process steps; Indicators of bottlenecks and backlog; Alert signs where a process is down

Visual Indicators – Ongoing information and measurements of Volume, Defects, Cycle Time, Backlog, etc.

***Statistical Tools used in Lean:***

- Pareto Diagram
- Cause & effect diagram
- Histogram
- Control Charts
- Scatter diagram

A Lean process has eliminated all the waste that reduces the speed and efficacy of the operation. It focuses all activity solely on creating value for the customer.

In a Lean organisation no parts are produced that no one has asked for, no inventory is built up for material that is not needed right now, no work is duplicated on the same transaction, and no employees have to wait for deliveries in order to ship a customer order.

Lean achieves greater speed, reduced costs, and employees who are more highly motivated, because they understand their contribution to the organisation's success.

## The Six Sigma Methodology

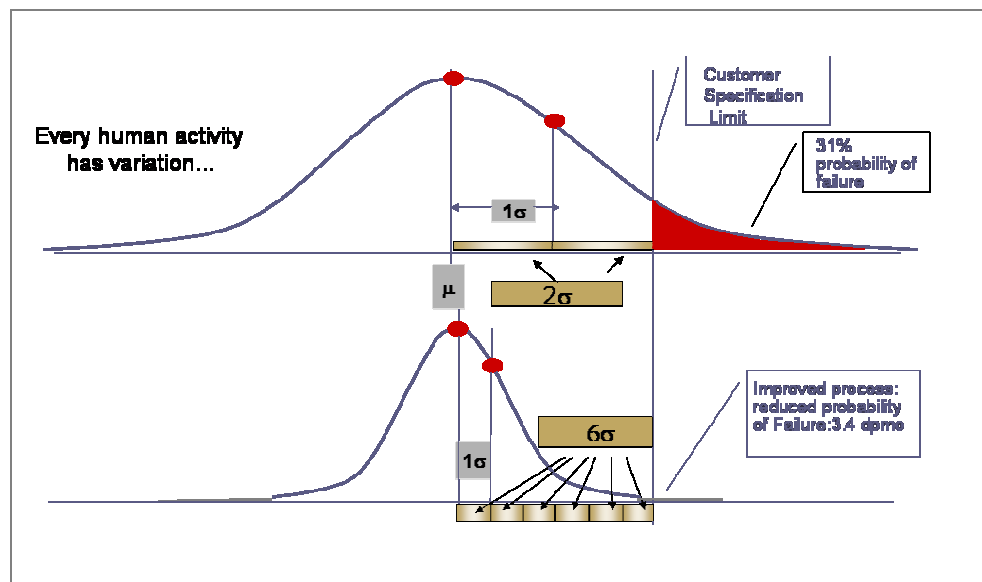
Six Sigma is a method for improving quality by removing defects and their causes in business process activities. The method concentrates on those outputs which are important to customers and translates these customer needs into measurable requirements, the so called CTQs (Critical To Quality).

An indicator for the CTQs is identified and a robust measurement system is established to obtain clean and precise data relating to the process. Once this is in place one can compare actual process behaviour to the customer-derived specification, and describe this in a statistical distribution (using mean, standard deviation [ $\sigma$ ] or other indicators, dependent on the type of distribution).

The Six Sigma drive for defect reduction, process improvement and customer satisfaction is based on the “statistical thinking” paradigm:

- All work occurs in a system of interconnected processes
- All processes have inherent variation
- Data analysis is used to understand the variation and to drive process improvement decisions.

***Six Sigma is all about reducing the variation of a process.***



The more standard deviations ( $\sigma$ ) – as an indicator of the variation of the process – fit between the mean of the distribution and the specification limits - as imposed by the customer - the more capable is the process. A Six Sigma

process means that 6 standard deviations fit on each side of the mean between the mean and the specification limits. 6 Sigma equates in percentage terms to 99.9997% accuracy or to 3.4 defects per million opportunities to make a defect. Six Sigma is particularly powerful when measuring the performance of processes with a high volume of outputs. It is an especially robust means of measuring process capability and performance because it enables the comparison and benchmarking of the performance of any business process against another and more importantly against industry standards.

The objective of the Six Sigma concept is to gain knowledge about the so called transfer function of the process, the understanding of the relationship between the independent input variables (Xs) and the dependent output variable (Y). If the process is modelled as a mathematical equation, where Y is a function of X ( $Y=f(x_1, x_2, \dots, x_i)$ ), then the Output variable (Y) can be controlled by steering the Input variables (Xs).

Which Sigma Level to strive for is dependent upon market conditions, competitors' performance and customer expectations, and may also be driven by laws and other regulations.

For many businesses, 98% or 99% accuracy in performance would delight their customers, but in others such performance would be woefully inadequate or even breach regulatory requirements. A good example is the airline industry, where it would be inconceivable that only 99% of flights landed safely. In contrast, most airline baggage handling processes are generally performing at 3 Sigma (93% accuracy).

### ***The structured problem solving approach***

Six Sigma is more than just a measurement scale and the application of some statistical analysis tools. Centred on a disciplined problem solving method, Six Sigma has evolved into a powerful business philosophy and an instrument for driving cultural change. As is the case with Lean, Six Sigma also relies on the application and deployment of best practice management in a structured manner.

The most common approach used in Six Sigma is DMAIC:

**Define** – Define the Project, the Customer Requirements (CTQ) and Map the Process on a high level.

**Measure** – Define the Measure, establish a valid Measurement System, collect the data and describe the distribution of the process data.

**Analyse** – Determine the Process Capability and identify and validate root causes of variation using Statistical Tools such as Hypothesis Testing, Regression Analysis and historical Design of Experiment

**Improve** – Develop and implement solutions using Creativity Techniques, decision making tools, Pilot testing, Design of Experiment and Simulations.

**Control** – Establish ongoing process controls to avoid the problem recurring by implementing Control Charts, assigning clear process ownership and documenting the improved workflow.

Six Sigma is normally executed by professionals known as Green Belts (part time), Black Belts (full time) and Master Black Belts (full time trainers and coaches) – terms created by Motorola. Each level has increasingly greater mastery of the skill set. Roles and responsibilities also grow from each level to the next, with Black Belts generally in project and team leadership roles and Master Black Belts often in mentoring or management roles. The infrastructure needed to support the Six Sigma environment varies. Some companies organise their Black Belts into a central Six Sigma group for deployment around the whole business whilst others decentralise the Black Belts into the functional areas of the business, where they take responsibility for improving that function and gain in specialist knowledge. Ultimately, companies seek to grow the skill set from within and promote their Master/Black Belts into leadership roles where Six Sigma becomes an inherent best practice in business management.

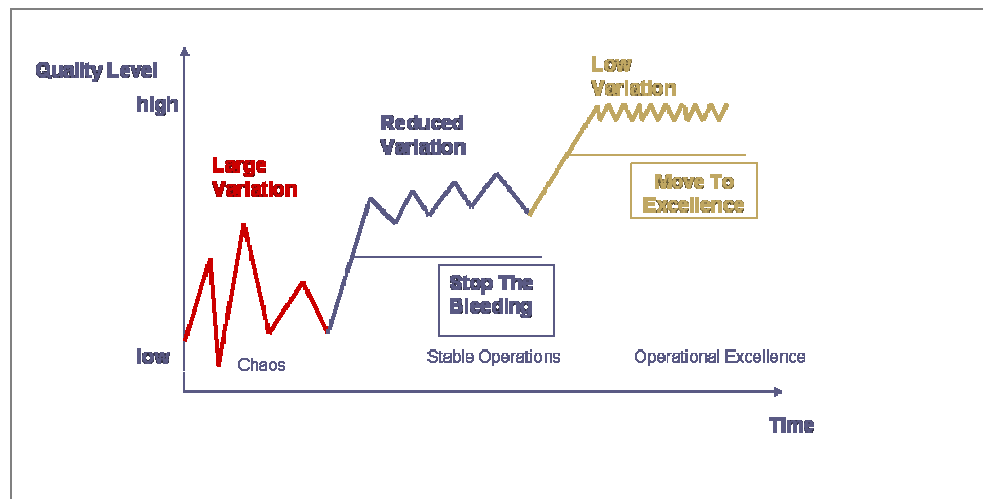


### When to use Lean and when to use Six Sigma?

There is no universal determinant of when to use Lean and when to use Six Sigma, especially since both methodologies use some common tools and techniques. For instance, Pareto Charts and Cause & Effect diagrams are part of both concepts. And it doesn't really matter what label one uses; the key to success in a Business Improvement programme is to establish a culture of continuous improvement and a culture of permanent change. The ultimate goal should always be to increase top line results, reduce costs and increase customer satisfaction using these concepts.

The pivotal prerequisite of both concepts is the commitment and support of the top management. A culture of continuous improvement cannot possibly evolve in an organisation where the leadership team does not actively believe in it and where the only support it gives to it is lip service.

Management is confronted with the decisions of which approach to take under which circumstances and which tools to use in order to improve specific business processes. Venturehaus has found that Six Sigma and Lean are complementary tool sets which, together with each other and together with other management best practices, offer a comprehensive means of transforming a business from total chaos at one extreme to Operational Excellence at the other. Wherever the business currently is on this spectrum, the appropriate techniques can be selected from both methodologies.



The road to operational Excellence © Venturehaus Limited 2003

Lean with its simple, logical and pragmatic approach is more appropriate in situations where a business process needs to be improved from a poor state to an acceptable level in a short time frame. In situations where it is relatively simple to identify causes of a problem it is often more than sufficient to use the Lean 5S's to organise the work environment, standardise the workflow and assign clear ownership. Lean tools are the appropriate means to stabilise a process, without the need for excessive data collection and sophisticated statistical analysis. By using simple data analysis - like Pareto - and simple root cause analysis - like a Cause & Effect diagram - combined with team effort and bold management decisions, a process can be significantly improved, rapidly.

Six Sigma, however, has its strengths in complex situations where the relationship between causes and the problem may be unknown and where more profound data analysis is required to identify the true causes of variation. With the use of statistical tools – usually supported by a statistical software package - Six Sigma is able to identify and validate root causes from a huge amount of data and deliver the right information to make better business decisions based on facts rather than gut feel.

Hypothesis testing can determine which factor has a statistically significant influence on the output and which factors do not. Regression analysis can prove if there is a statistically significant relationship between two or more variables. The Design of Experiment technique can determine the transfer function and calculate the optimal settings of the variables (Xs) in order to achieve the desired output value (Y). Six Sigma methods provide a given percentage of probability with parameters to adjust. This helps to prevent working on factors that actually do not have a significant impact on the problem.

If a business is in the “chaos state” Venturehaus usually does not recommend starting a full Six Sigma program. Six Sigma is not the most effective method to stabilise a business process rapidly and effectively. Lean, however, offers tools that support rapid change in a messy environment.

If a business process is already performing to high standards, but the market requires an even higher level of perfection, Six Sigma is definitely the best method to adjust the right parameters.

## Lean Six Sigma

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If one is to improve the abandonment rate of a call centre from 20% down to a more acceptable level one would use a different tool set than if one has the challenge of improving it from an already adequate 5% down to 2%.

If one faces the problem that 40% of spare parts for a customer order have run out of stock, one would use a different improvement strategy than if one seeks to become the market leader by boosting the availability of parts from 95% to 98%.

We firmly believe that before a company implements any quality programme, whether it is called 'Lean', 'Six Sigma' or even 'Lean Six Sigma', the business needs to understand and agree the key business goals and programme objectives. If a quality program is to be implemented within a business, the management must understand and articulate precisely what is to be achieved by it. Once this information is known, an appropriate plan can be developed.

Which tools to use, whether from Lean, Six Sigma, both or neither, will depend on existing performance levels and on customer and market requirements for the improved state. Even within a single business the approach can vary. Many businesses master their manufacturing process, but manage the supply chain poorly. In the service industry many businesses deliver high performing contract management processes but the set-up of new clients involving intermediaries is often erroneous and cumbersome.

Lean and Six Sigma together offer a comprehensive tool set to approach basically any business process. These are both practical methods proven in science. The real art is in selecting the right ones for each task.

## About Venturehaus

Venturehaus focuses specifically on the operations of Service Industries and Transaction Processing businesses. Our approach to operational improvement is inherently driven by both Six Sigma and Lean methods and tools. In addition to our operational experience as business managers with leading global companies, the Venturehaus team has extensive experience of managing and implementing large-scale operational restructuring and Six Sigma Programmes in the Financial Services and Transaction Processing industries.

For more detailed information on Six Sigma please download our paper "An Introduction to Six Sigma" from [www.venturehaus.com](http://www.venturehaus.com).

Venturehaus Limited, Liberty House, 222 Regent Street, London W1B 5TR, UK

Telephone 020 7297 2073

E-mail [info@venturehaus.com](mailto:info@venturehaus.com)

Web [www.venturehaus.com](http://www.venturehaus.com)