

The use of Lean and Six Sigma Methodologies to Improve Performance

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Introduction Lean and Six Sigma methodologies have for some time been very fashionable. However both are 'umbrella' methodologies that incorporate tried and tested tools. Many of the tools are not particularly new and they shouldn't be considered 'the latest thing'. Treated as a fashion item they will inevitably be discarded in favour of the next best thing. Treated as good basic operational practice they are more likely to be introduced correctly, with the right amount of resource and commitment, with an eye to permanent, sustainable and ongoing improvement.

Pseudo implementation of Lean philosophies and Six Sigma is common place. Real implementation is hard work and requires continued commitment and usually a change in company-wide practices and thinking.

Summary Both methodologies require a 'total organisation' approach if they are to be introduced in totality. They use tried and tested tools, such as Continuous Improvement and Value Stream Mapping which can be, and in many cases should be introduced as standalone improvement programmes.

It is not possible to 'dip in and out' of either methodology nor is it possible to use either methodology effectively in parts of a company and not in others.

Over the last few years they have become increasingly popular with larger organisations and non manufacturing organisations. However, introducing either of these methodologies is a high profile company wide event and therefore the consequence of failure is significant. They are very 'resource hungry', and as with any major change initiative, will require total commitment from across the organisation and the infrastructure and organisation to support it.

Six Sigma is popular because it is very customer focused and has a strong emphasis on measurement and delivery of quantifiable benefit. However the focus of much of the approach is on advanced statistical techniques, which can be complex and inappropriate for the majority of organisations, where the real challenge is to build simple and robust foundations for improvement. The advanced tools have their uses within an organisation that has already put in place



the basic foundations of operational good practice.

Lean approaches the issue of waste from a total process/total organisation perspective, highlighting the need for capable processes, effective supply chains etc.

Lean challenges management mindset that exists within many organisations. It demands that the preoccupation with utilisation metrics, overhead recovery rates, economies of scale, economic batch sizes, unit cost and the economic value of WIP and finished goods stock is turned on its head.

Effective Lean and Six Sigma programmes build on organisational capability and culture such as Continuous Improvement, Best Practice, team working and a measurement focus.

For most organisations the introduction of basic operational good practice and improvement programmes is initially more appropriate than the introduction of either Lean or Six Sigma.

Six Sigma is attractive to many organisations because of its focus on the customer and on achieving quantifiable benefit. However, in the opinion of the author, Six Sigma is often not the best choice because the focus of much of the approach is on advanced statistical techniques, which can be complex and inappropriate for the majority of organisations, where the real challenge is to build simple and robust foundations for improvement. This is particular so for non manufacturing organisations because Six Sigma lends itself in particular to processes with easily measured and recognised outputs.

Lean processes are more inwardly looking but are relatively easier to implement. Many non manufacturing organisations have industrialised their processing operations in recent years which, in itself, supports the implementation of Lean practice and principles.



Six Sigma

Introduction Six Sigma is a highly customer focused improvement tool that is underpinned by a philosophy of rigorous measurement.

'a comprehensive and flexible system for achieving, sustaining and maximising business success. Six Sigma is uniquely driven by close understanding of customer needs, disciplined use of facts, data and statistical analysis and diligent attention to managing, improving and reinventing business processes'

The term 'sigma' means "Standard Deviation". Standard Deviation measures the variability in a given distribution or population of events and can therefore be applied to a process.

Motorola developed Six Sigma in the mid 80's. It was then successfully championed by Jack Welch at General Electric in the 1990's. Their success stories have prompted many western (and in particular USA) manufacturers to adopt Six Sigma. More recently companies in the service sector have started to introduce and adopt Six Sigma practices.

There are many aspects of Six Sigma that are similar to Total Quality Management (TQM), which preceded Six Sigma and in many peoples view has now been superseded by Six Sigma.

Overview Sigma can be translated into the number of defects per million "events". Six sigma represents 3.4 defects per million events and is regarded as the ultimate goal for process performance - as close to perfection as is practicable.

This following gives the sigma to defect conversion ratio:

Six Sigma = 3.4 Defects per Million
Five Sigma = 230 Defects per Million
Four Sigma = 6210 Defects per Million
Three Sigma = 66,800 Defects per Million
Two Sigma = 308,000 Defects per Million
One Sigma = 690,000 Defects per Million.

The ultimate goal of a Six Sigma programme is to reduce the number of defects per million opportunities to 3.4 - the equivalent of a 99.997% quality level.



Methodologies There are different approaches to implementing Six Sigma although the main principles are as follows:

1. Identify core processes and key customers.
2. Define customer requirements
3. Measure current performance
4. Prioritise, analyse and implement improvements
5. Expand and integrate the Six Sigma system.

The Six Sigma approach is strongly focused on ensuring effective processes from the perspective of the final customer. Critical processes are identified as part of the analysis of customer requirements, and statistical methods are applied to measure the variation of these processes against customer/market determined "tolerances". Techniques such as SPC and Design of Experiments are used to identify the root cause of poor process capability or to monitor processes in real time.

Improvement cycles are core to Six Sigma. An example being as follows:

1. Prioritise areas of improvement
2. Define processes that contribute to problems
3. Measure the capability of each process
4. Analyse the data
5. Control process variability
6. Standardise methods
7. Integrate methods into design/process cycle

There are many statistical tools that are used within Six Sigma including: Quality Function Deployment, Run Charts, Pareto Charts, Histograms, Fishbone diagrams, Process Mapping, Design of Experiments, Project Definition, F-tests, Chi-Square Tests, Multivariate Studies, Fractional Factorials and Failure Mode and Effect Analysis.

Summary Six Sigma pulls together well established operational tools and techniques that have been around for a number of decades. Over the last few years it has become increasingly popular with larger organisations and non manufacturing organisations. This is because it is very customer focused and has a strong emphasis on measurement and delivery of quantifiable benefit.



However, introducing Six Sigma is a high profile company wide event and therefore the consequence of failure is significant. It is very 'resource hungry', and as with any major change initiative, will require total commitment from across the organisation and the infrastructure and organisation to support it.

The focus of much of the approach is on advanced statistical techniques, which can be complex and inappropriate for the majority of organisations, where the real challenge is to build simple and robust foundations for improvement. The advanced tools have their uses within an organisation that has already put in place the basic foundations of operational good practice, but their premature introduction in the wrong circumstances can place Six Sigma in the 'next failed initiative' category, making further improvement even harder.

Success in a Six Sigma program is subject to the same influences as many other change programmes i.e. leadership commitment to the program, involvement of staff at an early stage, integration of the change programme into the business practices of the organisation, good change management skills, and a clear focus on the end goal. Six Sigma Programmes (and Lean Programmes) are usually total company initiatives involving significant roll out costs, training and dedicated resource.

Effective Six Sigma programmes build on organisational capability and culture such as Continuous Improvement, Best Practice, team working and a measurement focus.

Six Sigma should not be viewed as something new or revolutionary and distinct from the day to day disciplines that companies should build in to their operations.



Lean

Introduction Most of the tools and techniques that underpin Lean thinking originated in Japan in the 60's and 70's in companies such as Toyota. In the 80's and 90's they combined into what is now called Lean, and this broader concept of manufacturing has progressively been introduced to western manufacturers, and more recently to the service sector.

Lean is often described as an approach where waste is systematically eliminated from an organisation's processes. At its most basic level, it involves a systematic focus on rework, inventory, poor reliability, poor quality, and poor throughput throughout the organisation, and its supply chain.

A '... philosophy that shortens the time line between the customer order and the shipment by eliminating waste'.

Overview Lean is the term that was introduced to describe the philosophy and practices under-pinning the Toyota Production System (TPS). TPS (developed in the 1970's) was a vastly superior system of manufacturing than that found in most western automotive manufacturers. Fundamentally TPS was challenging the foundations of mass production, by creating systems and an operating culture that enabled the company to manufacture a considerable variety of products, with high levels of efficiency and quality.

'To be a lean manufacturer requires a way of thinking that focuses on making the product flow through production without interruption, a pull system that cascades back from customer demand by replenishing what the next operation takes away at short intervals, and a culture in which everyone is striving continuously to improve.'

A key ingredient of the Lean approach is its emphasis on the creation of customer focused 'value chains' to help focus its improvement efforts.

Lean Manufacturing has helped companies to overcome some of the difficulties they experienced with introducing Just In Time. In some instances, JIT was seen as a blunt instrument for reducing working capital requirements. This objective was often very dangerous in practice as forced reductions of stock levels often caused major



problems in businesses that lacked basic process dependability. This meant that companies de-stocked faster than they could improve, as a result serious customer service problems ensued.

JIT placed great pressure on supply chains. It is one thing to determine the capability of your own company but not so easy to ensure integrity of supply from a large and diverse supplier base. It soon became apparent that JIT required a partnership between supplier and customer.

Both of the examples above resulted in “pseudo” improvement programmes, as no attempt was made to approach the introduction of JIT in an organisation wide sense.

To be effective JIT needed waste reduction in all areas of an organisation, and in the supply chain. Lean Manufacturing approaches the issue of waste from a total process/total organisation perspective, and therefore addresses the need for capable processes, effective supply chains etc.

Methodologies Lean, like six sigma, is a combination of a number of tools and techniques which include:

- Continuous Improvement (Kaizen)
- Value Stream Mapping
- Standard Operating Procedures
- Just In Time
- Production Leveling
- SMED (Single Minute Exchange or Dies) – Set-up reduction

These improvement processes can be, and should be, implemented as standalone programs.

Continuous Improvement in particular forms the backbone of both Lean and Six Sigma programmes.

Summary Lean approaches the issue of waste from a total process/total organisation perspective, highlighting the need for capable processes, effective supply chains etc.

Lean challenges management mindset that exists within many organisations. It demands that the preoccupation with utilisation



metrics, overhead recovery rates, economies of scale, economic batch sizes, unit cost and the economic value of WIP and finished goods stock is turned on its head.

As with Six Sigma, Lean pulls together well established operational tools and techniques that have been around for a number of years. Over the last few years it has become increasingly popular with larger organisations and non manufacturing organisations. Also, as with Six Sigma, the introduction of Lean is a high profile company wide event and therefore the consequence of failure is significant. It is very 'resource hungry', and as with any major change initiative, will require total commitment from across the organisation and the infrastructure and organisation to support it.

Successful introduction of Lean programmes is subject to the same influences as many other change programmes i.e. leadership commitment to the program, involvement of staff at an early stage, integration of the change programme into the business practices of the organisation, good change management skills, and a clear focus on the end goal. Lean Programmes are usually total company initiatives involving significant roll out costs, training and dedicated resource.

Effective Lean programmes build on organisational capability and culture such as Continuous Improvement, Best Practice, team working and a measurement focus.

Lean should not be viewed as something new or revolutionary and distinct from the day to day disciplines that companies should build in to their operations.

Lean Manufacturing provides the total company environment that supports effective long-term JIT performance and Value Stream Mapping can help ensure that waste reduction activity is focused on those processes that deliver value to the customer.

As with other performance improvement initiatives such as Six Sigma, it is a "higher order" improvement initiative that builds upon the basic disciplines of standardisation, control and an effective improvement cycle.

