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Lean Six Sigma – Making It ‘Business as Usual’

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1. Introduction

This chapter discusses a new approach to implementing Lean Six Sigma that is sustainable. All too often we hear of horror stories of failure that could be easily avoided. The basis of this approach is neither rocket science nor brand new thinking; indeed the individual elements have been around a long time; DMAIC, structured problem-solving, governance, coaching, dashboards etc.

What is unique and very relevant in today’s fast moving e-business global market is the creation of a simple and effective process that brings all these elements together and then embeds them within the organisation as *‘business as usual’*. This process makes it easy to do the right things and difficult to fall back into old behaviours, and this is the difference that makes the difference.

This was one of the many challenges facing Oakland Consulting when engaged by several world leading large complex organisations. These companies were usually ‘ahead of the game’ and were already doing a lot of things right. They were typically expanding rapidly through acquisition or generic growth with a team of highly skilled, intellectual and creative staff. In many ways, an argument could be made for simply carrying on along this extremely successful path.

But in every case this was not the case as they recognised that to remain in the top slot also meant embracing even more competitive challenges to accelerate change, reduce costs, improve quality & delivery and protect reputation. This constitutes for many ‘redefining quality’ and was the basis on which we developed together a successful approach.

2. Lean Six Sigma – a brief step back in time

Some would argue that Lean Six Sigma is the hot topic of today, but this it is not an overnight phenomenon. Many of the tools & techniques have been around for a long time;

Dr Walter A Shewhart [1] in 1924, working in Western Electric Company first introduced the idea of preventing defects in manufacturing rather than inspecting finished product, using the *Control Chart* to predict failure and manage processes economically. Dr Edwards Deming [2] later took his work to Japan and, together with Joseph Juran, transformed their thinking about achieving quality and reducing failure costs.

The idea of Six Sigma has been attributed to Bill Smith [3] who, when working with Motorola in the 1980's as Quality Assurance Manager, first applied the principles that led to Motorola winning the first Malcolm Baldrige National Quality Award in 1988. Others followed and there have been many success stories.

Similarly, although the term Lean is often attributed to James Womack [4], the basic tools of Lean have been used since the 1950's. At Toyota Motor Company, Taichii Ohno [5] and Shigeo Shingo [6], began to incorporate Ford production ideas and other techniques learnt from Deming, Juran and the Japanese 'guru' Ishikawa [7] into an approach known as the Toyota Production System or Just-In-Time. This was the precursor to Lean as we know it today.

3. Approach

Even with all this history, there are several quite unique differences in the way we have learned how to introduce Lean Six Sigma into many different types of companies. Firstly, we do not simply embark on a training programme. If the Lean Six Sigma process is to be effective in reducing cost, improving margin and delivery performance, it needs to become part of '*business as usual*'.

This means there is a need to create a 'continuous improvement process' and a governance framework that firmly embeds into the company culture and structure. This is particularly important given the nature and characteristics of these businesses – usually global, highly innovative and responsive to rapid change with a highly skilled, technical and intellectual workforce.

The main areas of this chapter are presented under the following main headings:

- Continuous Improvement
- Training Materials and Workshops
- Coaching
- DMAIC Governance
- Talent Pool Utilisation

3.1. Continuous improvement

Right from the outset, it is critical that Lean Six Sigma is not a "here today, gone tomorrow" initiative. It has to become *business as usual* and part of a self sustaining process of continual improvement. With this in mind, it is important to create a continuous improvement process that embraces Lean Six Sigma and the DMAIC process in its entirety.

Lean Six Sigma projects need to be well led, managed and directed within the business, and a 9-step Continuous Improvement Process has been created for this purpose. This is a closed loop system that incorporates all the essential elements beginning with; Identified Projects, then Analysis & Rating, followed by developing the Mobilisation Charter and so on. This enables senior managers to steer effectively the Lean Six Sigma process within their strategic goals and is shown in Fig 1.

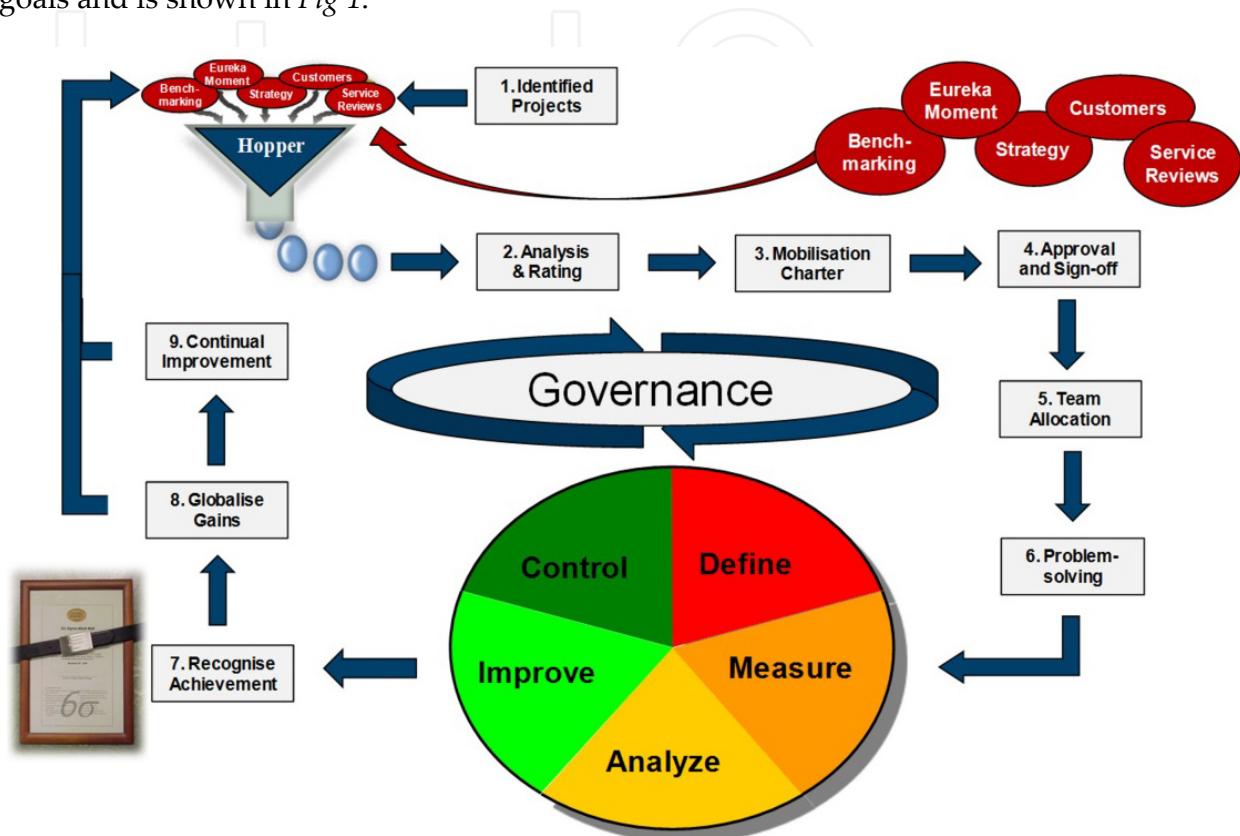


Figure 1. Continuous Improvement Process

For each of the 9-steps, a full description details explicitly what is required, when and who is responsible. Spreadsheet analysis tools are used as necessary. For example the *Analysis & Rating* step enables new project ideas to be assessed against their likely impact on criteria such as quality, margin and delivery as well as complexity and resource requirements.

In the *Recognise Achievement* step, a process is set up that embraces not only internal company policies, but also an external assessment by – say – the American Society for Quality [ASQ], or the British Quality Foundation [BQF] through which everyone who attends the training and completes their project[s] is entitled to register for an external accredited qualification. A final example, *Globalise Gains* step sets out how the Governance Body assesses the relevance and importance of completed projects in other parts of the business, in effect rolling out improvements already deemed to be successful.

The Governance Body comprises of senior managers, the Master Black Belt and Champion[s] who usually meet monthly to lead, manage and control the whole process. Their remit is summarised below;

Objectives

- To manage the 'Hopper' [quality and quantity of ideas], aligned to individual and strategic objectives captured within a Project Initiation Document [PID]
- To commit resources and ensure they are being well used
- To initiate good projects and ensure they deliver target savings within budget and timescale
- To create a culture of continuous improvement

Process:

- Reviews PID's and Projects
- Follows the guidelines set out in the 9-Step Process
- Decides on critical mass of Lean Six Sigma talent
- Manages talent pool utilisation
- Sets Strategic Business Unit PID rating criteria
- Agrees project savings targets & trend profile
- Reviews and uses DMAIC metrics to drive the process that delivers tangible benefits.

Embedding the continuous improvement process within the organisation's culture means typically utilising the company intranet; this is used across the whole organisation daily to carry out its business. Easy access buttons are created enabling anyone to get an update on Lean Six Sigma progress, upload new project ideas, review the projects hopper, download training materials, and gain access to the GB/BB community, training waves, external accreditation and so on. There are both open and restricted areas created to allow for confidentiality to be honoured in certain cases.

3.2. Training materials and workshops

All materials are fully developed and delivered in-house to reflect company issues and challenges and to make them specific and relevant; four training workshops are created that are shown in *Fig 2*. The Black Belt is typically a 4 x 4 day course spanning a period of about 4 months with numerous practical examples and exercises. The latest statistical analysis software is used, such as *MINTAB v16*, as appropriate.

The Green Belt workshop is effectively the first four day training session of the Black Belt course. Combining the first session has enormous benefits in bringing together staff from across the different functions of engineering, quality, service, finance and purchasing etc., cross fertilising ideas and enabling team relationships to develop with a common understanding of the tools & techniques. A much simplified Excel based analysis tool is used, called a *Toolbox Calculator*, for analysis as the types of problems that Green Belts usually tackle are far less complex.

A Yellow Belt one day training course is created from the Green Belt materials. The purpose of this is to enable a large cross section of the organisation to learn and understand Lean Six Sigma so that they too can make a valuable contribution to improvement in their own work area.

| Training Course | Objective | Roles & Responsibilities | Training Duration (days) |
|-----------------------------|--|---|--------------------------|
| Green Belt | That key employees have the latest basic skill set and competence to improve performance significantly | <ul style="list-style-type: none"> ▪ Support / Lead local improvement actions using DMAIC methodology ▪ Participate within BB improvement projects | 4 |
| Black Belt | That selected employees have a detailed understanding, skill & competence to address complex problems to make significant improvement | <ul style="list-style-type: none"> ▪ Lead improvement projects using DMAIC ▪ Coach and disseminate DMAIC methodology across business units | 16 |
| Executive Black Belt | That senior managers have a good understanding enabling them to commit to the BB programme | <ul style="list-style-type: none"> ▪ Support & deploy the BB improvement process across the business | 0.5 |
| Yellow Belt | That most of the organization are aware of the importance and relevance of Lean Six Sigma and therefore able to contribute to meaningful discussions | <ul style="list-style-type: none"> ▪ Support GB and BB projects within their own work area ▪ Generate ideas for potential GB / BB projects ▪ Improve own processes | 1 |

Figure 2. Training and Awareness modules

An Executive Black Belt workshop is designed and delivered for Senior Managers, so that they are aware of and understand the process, and therefore able to create the right environment for Lean Six Sigma to work effectively. After all, these people are responsible for sponsoring the projects, providing the resources and freeing up the barriers to change and improvement.

Additionally, a collection of ca 30 basic generic tools are delivered to the client as a *Tool-Kit* to accompany the training. These are problem-solving techniques structured under headings; What, Where, When, How and Why? This Tool-Kit is made available to everyone in the organisation to support the wider teams in contributing effectively to their projects, and includes tools such as; Affinity Diagrams, Brainstorming, Critical Path Analysis and Responsibility Charting.

3.3. Coaching

In our experience, coaching is one of the most misunderstood and undervalued elements of Lean Six Sigma initiatives. Time and resource is rarely budgeted for this at the outset, and is often seen as an unnecessary cost, with dire consequences. The need for coaching and recognising its importance in developing people skills and delivering great projects is paramount. To let loose newly trained Black Belts and Green Belts without this support can be a recipe for disaster.

Coaching is about harnessing the latent talent created during training to develop a confident and competent individual who can use effectively the new tools & techniques in developing the best solution. This is the “difference that makes the difference,” enabling the right solution to be found, as there are always many.

The fundamental principle is to first understand each person’s skill and competence and then to support them in their personal development in an agreed and structured way. This is such a worthwhile and vital part of applied learning. The company should set a minimum coaching requirement of 3 hours per Green / Black Belt per month as a high level figure for budgeting resource. Typically, coaching has been provided initially by Oakland consultants, to get the whole process moving swiftly and then we train a Master Black Belt[s], or a Black Belt[s] to impart the necessary coaching skills in close partnership with the HR department. A typical training and coaching ‘wave’ plan is given in Fig 3.

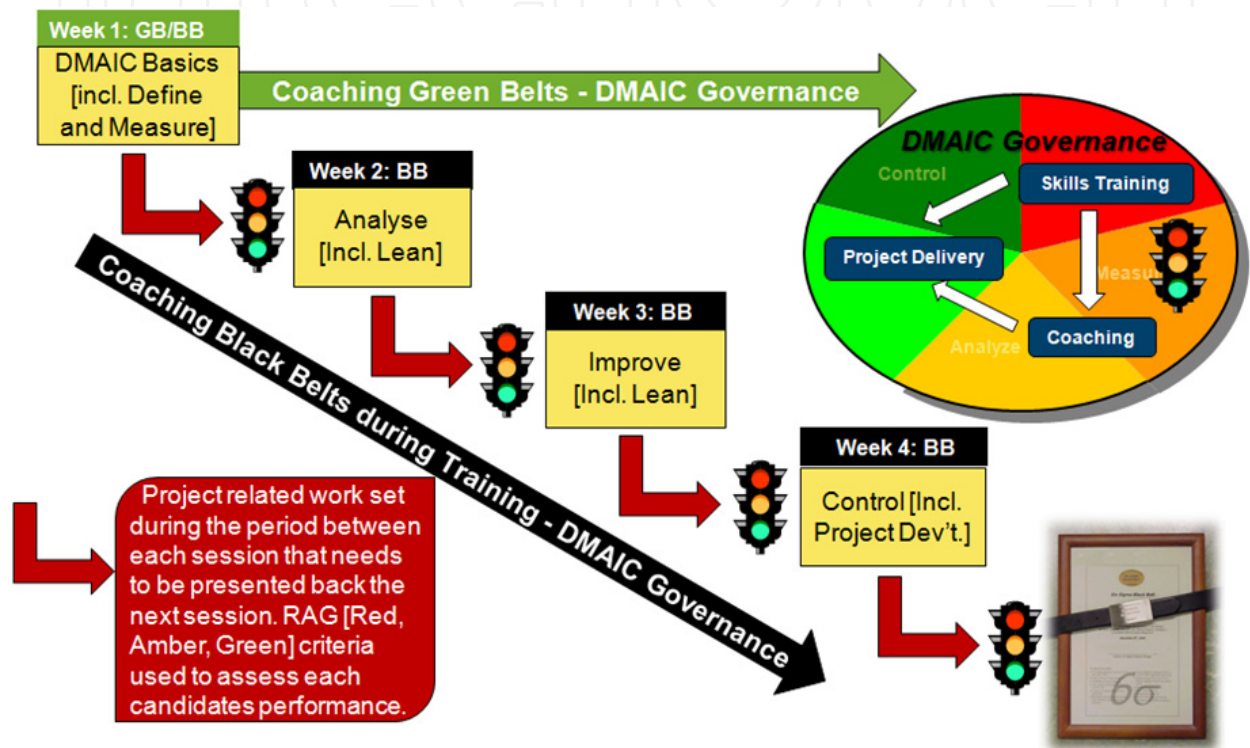


Figure 3. Overview of Wave Training and Coaching.

The Wave Training and Coaching plan depicts how the various elements are arranged. For those staff attending Black Belt training, their initial coaching is structured in between training sessions and is focused on them presenting back their work at the following sessions – in this way it is organised to follow the DMAIC pathway that leads them through to completing their projects. In contrast, the Green Belts receive coaching geared toward their individual needs, but of course based on the minimum requirement of 3 hours per month through to completion.

A RAG [red, amber and green] traffic light metric measures their achievement against agreed criteria and this is discussed more fully in the section headed *DMAIC Governance*.

To quote a practical example from one of our clients; the first two ‘waves’ saw 40 people being trained and then deployed part time on 25 projects [some in joint project teams]. Time allocated was budgeted for all 40 people x 3 hours or 120 hours per month, and not based on the 25 projects. This is because everyone working on joint projects must experience all

elements of DMAIC [avoiding the; “I’ll do Define, you do Measure” scenario]. This becomes critical in their eventual recognition as certified Green and Black Belts. The DMAIC process is given in Fig 4 described as a Lean Six Sigma Roadmap

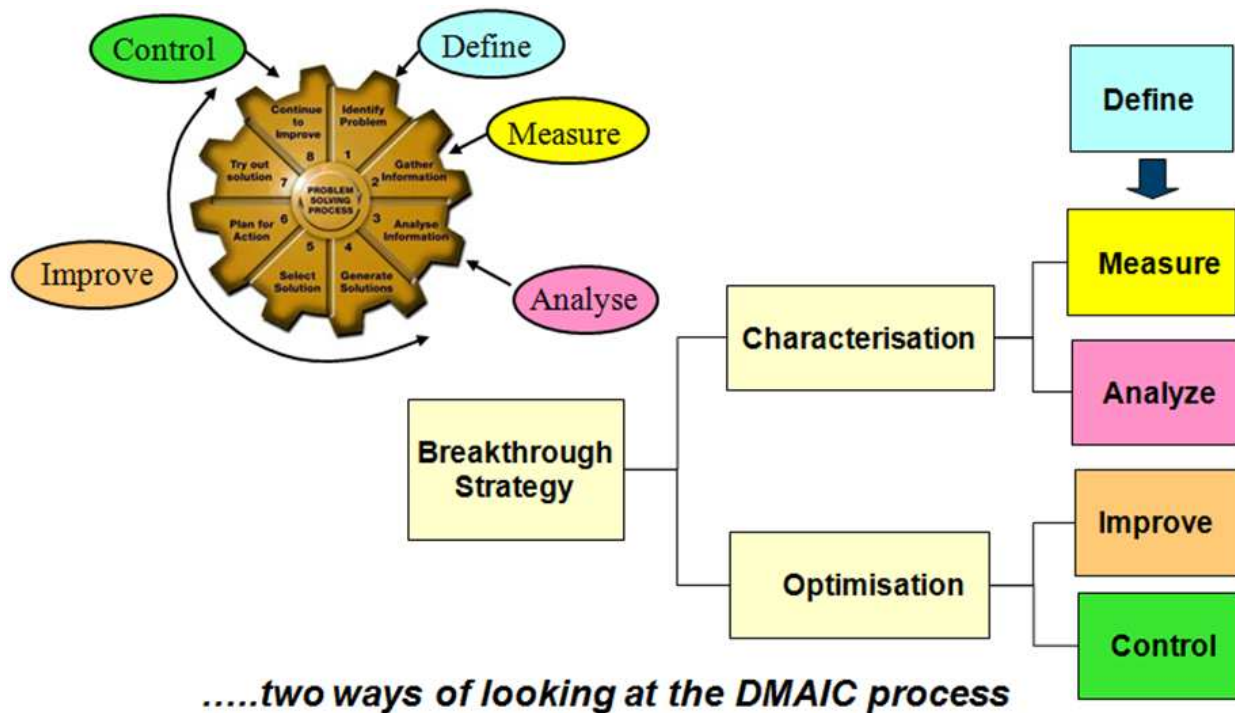


Figure 4. Lean Six Sigma Roadmap

The final sustainable element used within coaching is a unique Storyboard Workbook. This has enabled the Black Belts and Green Belts to work through the whole DMAIC process with a rigour and structure that ‘gold-plates’ and implements the best possible outcome. The Storyboard Workbook uses a worked-up template that gives clear instructions on what to do and when throughout the DMAIC process. Practical examples prompt formal sign-off at each stage, sample calculations of Sigma levels and financial savings etc enabling the coach and student to critique progress effectively.

The completed Storyboard Workbook is then be used as a record of the DMAIC project by other teams at a later date; for example, to see if these same improvements can also be made in their work area.

3.4. DMAIC governance

A usual question asked is; “How do we know how successfully we are leading and managing the Lean Sigma process?” To answer this question a set of metrics are created within Excel, which reports as a *dashboard* and becomes the ‘heart beat’ of the whole Lean Six Sigma process. This serves to report on and control how well desirable outcomes were being delivered. The spreadsheet model is then used as a framework to embed the dashboard within the companies own management information systems.

‘What gets measured gets done’ – is an all important axiom that is used as an underlying principle in building the dashboard. In all, 12 metrics are defined that measure the essential; 6 financial and 6 performance indices covering areas such as; aggregate and tracked savings, utilisation of talent pool, allocation of projects, coaching effectiveness and DMAIC progress. To ensure these metrics are easy to understand, RAG principles are used to measure achievement against agreed criteria and to report on trends.

The dashboard is updated real-time after each intervention / event by the Master Black Belt, whether a coaching or training session, or completion of a DMAIC element. This is then used by the Governance Body to lead and manage the whole process, as discussed more fully in the section on Continuous Improvement.

3.5. Talent pool utilisation

It is essential that the investment in training and coaching is harnessed and its impact on business performance optimised. Selecting the right staff for Black Belt training is a crucial element in creating a usable talent pool, as it is these same people who will predominantly lead projects and be key to achieving the savings. Aligning the right people with new project ideas is a top priority and guidelines for their selection are given in Fig 5.

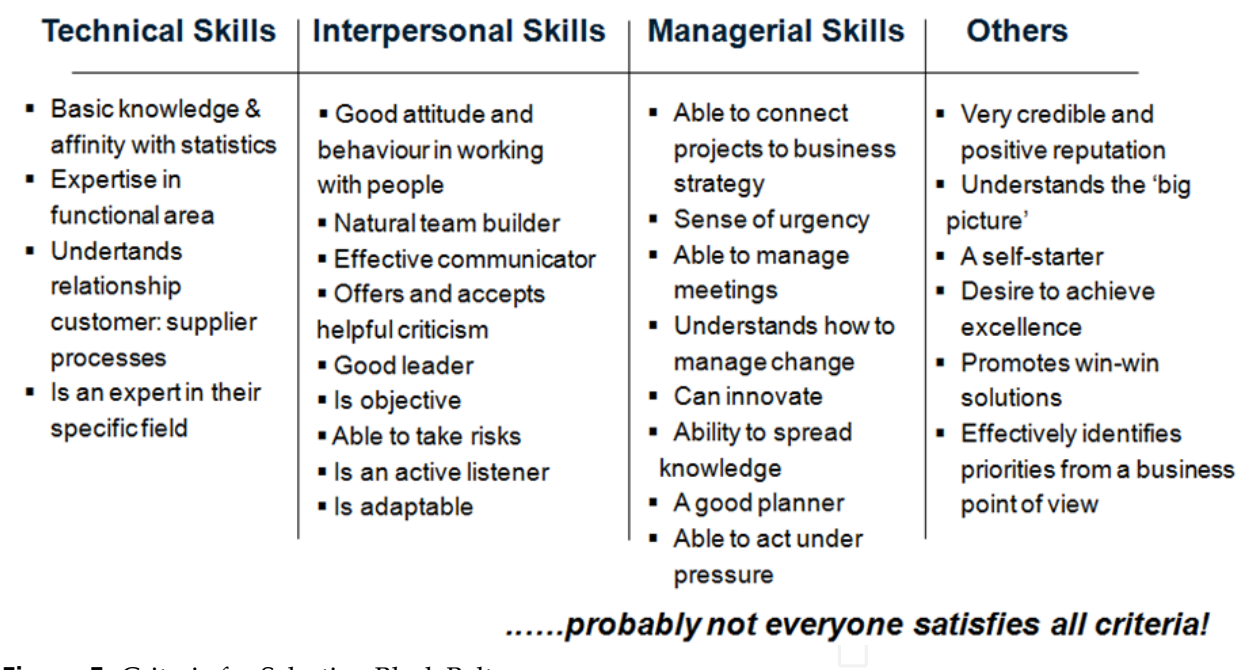


Figure 5. Criteria for Selecting Black Belts

An aspirational deployment and benefit strategy is developed that recognises the need to create a critical mass of Lean Six Sigma staff. Plans are discussed for between 2% to 5% of the organisation to become Black Belts – the wide variation reflects the different structures of the organisations we work with.

Similarly, the strategy articulates a need for circa 30% of the organisation to become Green Belts and over 75% Yellow Belt trained. Also, at any one time over 95% of the senior management team should have attended the Executive Black Belt workshop.

Guidelines are set for each Black Belt project to generate savings of at least 150k Euros and for a Green Belt project to achieve circa 50k Euros. In one ‘mature’ client whose improvement programme has been running for over five years, initial Black Belts projects are now averaging over 500k Euros, with total savings from the overall programme in hundreds of millions of Euros. Those Black Belts deployed full time would be expected to lead and deliver 8 projects over the first two years accruing target savings of around 1.5-2.0m Euros plus other non-financial / intangible benefits. Suitable HR policies are needed to support such programmes with back-filling of previous roles and/or clear career and personal development plans in place. By the same token, development planning through the Belt grades is also seen as an important element Yellow to Green to Black to Master Black Belt.

4. A final note

There is no easy route to success, but by using tried and tested principles and processes and introducing them in a structured and manageable way, sustainable change is possible provided that new behaviours and learning are well embedded into ‘*business as usual*’. The bottom line is enabling the organisation to make it easier to do the new right things, rather than to fall back into old ways of working.

Einstein was accredited to have said; “Make things as simple as possible, but not simpler” and this is an important underlying principle in such programmes. Being able to recognise and develop new ways of working at the right level of detail, and then build the continuous improvement process that embraces DMAIC Governance, the training programme and coaching processes to fit for the organisation’s culture is a crucial factor in its success.

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5. References

- [1] Shewhart, Walter A. (1931). *Economic Control of Quality of Manufactured Product*. New York: D. Van Nostrand Company. ISBN 0-87389-076-0
- [2] Dr Edwards Deming (2000). *Out of the Crisis*. MIT Press, Centre for Advanced Engineering Study.
- [3] Mikel Harry and Richard Schroeder (2000). *Six Sigma The Breakthrough Management Strategy Revolutionizing The World’s Top Corporation*.

- [4] James P Womack and Daniel T Jones (1996). *Lean Thinking*. Simon & Schuster. ISBN 0-684-81035-2
- [5] Taiichi Ohno (1988). *Toyota Production System: Beyond Large-Scale Production*, Productivity Press, ISBN 0-915299-14-3
- [6] Shigeo Shingo (1990). *Modern Approaches to Manufacturing Improvement: The Shingo System*. Productivity Press, ISBN 0-915299-64-X
- [7] Kaoru Ishikawa (1976). *Guide to Quality Control*. Asian Productivity Organization, UNIPUB. ISBN 92-833-1036-5