

Key Ingredients for a Successful Six Sigma Program

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Six Sigma is a powerful breakthrough improvement business strategy that enables companies to use simple and powerful statistical methods to define, measure, analyse, improve and control processes for achieving and sustaining operational excellence. Six Sigma was originally developed by Motorola in the 1980's and has since been implemented by a number of world class organisations such as GE, Honeywell, ABB, Sony, Texas Instruments, Ford, Johnson Control Systems, etc. with the purpose of reducing variability in processes, reducing quality costs, improving process capability and enhancing process throughput yield. For the effective introduction, development and implementation of a Six Sigma program in any organisation, one should consider the following key ingredients which will drive the application of Six Sigma principles successful.

Strong leadership and top management commitment

Many previous quality initiatives, such as TQM, have been faced with a major difficulty, which has been a leadership attitude of 'Do as I say..... not as I do'. Some initiatives also faded out because the company leaders lost focus (Pande et al., 2000). In order to overcome this problem, company leaders have to ensure that the Six Sigma initiative is a momentum for process improvement and hence it must be sustained over the long term.

Good support from top management is imperative in the restructuring of the organisation and achieving the cultural change and motivation of employees towards quality and the Six Sigma strategy to the business. The leaders have to be strong advocates of Six Sigma. Eagerness and enthusiasm shown by the leaders can go a long way in getting the rest of the employees on board.

Organisational infrastructure

In addition to top management support, there also needs to be an effective organisational infrastructure to support the Six Sigma undertaking. A great deal of work in Six Sigma is done by teams. The various roles played and positions held by the team members are explained under the belt system. Pande et al (2000) suggest that a good number for any project team is between 5 to 8 people. Many of the project teams will require cross-functional teams in order to successfully tackle the problem and implement process improvements. In many organisations practising Six Sigma will have project sponsor and process owner in launching and supporting the projects. Sponsors (also called champions) are senior management staff that guide the team and negotiate resources for the team. Process owners, on the other hand, are individuals responsible for a particular process. The process owners are involved in identifying the opportunities for process improvement. The timing and readiness of the organisation is also important. This is because the introduction of Six Sigma within an organisation requires a great deal of resources, commitment of leadership, time, investment, etc.

Cultural change

The successful introduction of Six Sigma requires adjustments to the culture of the organisation and a change in the mindset of its employees. Employees have to be motivated towards the introduction and development of Six Sigma program through various reward and recognition schemes. There can also be a problem of employees dismissing Six Sigma as the latest fad or hype. To overcome this problem and also to allay the fears that employees may have, there has to be early and effective communication to all employees on the why and how of Six Sigma.

Eckes (2000) identifies four different factors of resistance, which are:

- ◆ Technical – frequently people find difficulties in understanding statistics within Six Sigma program. Education and involvement is needed.
- ◆ Political – it is based on seeking the solution to be implemented as a loss, real or imagined. The strategy to avoid this is creating the need for change and then showing how change can be beneficial for them

- ◆ Individual – it consists of employees who are highly stressed as a result of personal problems. The strategy could be to try to reduce stress with a less workload.
- ◆ Organisational – this occurs when an entire organisation is committed to certain beliefs, which are usually instituted and communicated by the management. Reluctance to change can be diminished by communicating to the managers the benefits of the initiative. Many authors and theories have been developed to reduce this behaviour (Rao, 1996; Bounds, 1994).

For many successful companies in Six Sigma (GE, Motorola, ABB, Sony, Honeywell), a key factor in communicating over the commitment and enthusiasm of Six Sigma has been the direct involvement of their top leaders.

Training

Training is a crucial factor in the successful introduction and development of Six Sigma program. It is important to communicate both the ‘why’ and ‘how’ of Six Sigma as early as possible, and provide the opportunity to people to improve their comfort level through training classes (Hendricks and Kelbaugh, 1998). There is usually a hierarchy of expertise, which is identified by the belt system. Within GE, the belt system is fundamentally divided into (Henderson and Evans, 2000):

- Champions – fully trained business leaders promoting and leading the Six Sigma deployment in significant or critical areas of the business
- Master Black Belts (MBBs) – fully trained quality leaders responsible for Six Sigma strategy, training, mentoring, deployment and results.
- Black Belts (BBs) – fully trained experts leading improvement teams across the business
- Green Belts (GBs) – individuals trained in Six Sigma supporting Six Sigma projects
- Team members – individuals supporting specific projects in their areas

The good thing about the belt system is that everyone in the organisation is speaking the same language. Another important by-product of such company-wide training is that it fosters a culture whereby the ownership of quality is viewed as the

responsibility of the entire organisation and not just of the quality department (Hoerl, 1998).

Although investment in training is a key factor, in order for people to successfully use the knowledge, it is important for the training to be structured such that it is relevant to employees' everyday jobs. The best way to achieve this is to provide 'hands-on' learning such that people can put key concepts and skills into immediate practice. Moreover, the examples and exercises used in the training have to reflect the needs and challenges faced by the particular business.

Understanding the Six Sigma Methodology, Tools, Techniques & Metrics

A healthy portion of the Six Sigma training involves learning of the theory and the principles behind the methodology, i.e., DMAIC cycle. The elements of the DMAIC cycle (which stands for Define, Measure, Analyse, Improve and Control) are explained below.

❖ Define Phase

This phase involves:

- Who are the customers and what are their needs and expectations?
- Understand the customer CTQs and transform them into project CTQs
- Develop a project team charter (who is doing what, determine project goals, what are the key deliverables, benefits of going the project, costs issues, etc.)
- Gather data from customers to understand what exactly they want from us (use of customer surveys, benchmarking data, Quality Function Deployment, etc.)
- What is the process? Use tool such as high level process mapping to map out core processes

❖ Measure Phase

This phase involves:

- How is the process measured and how is it performing?
- Decide what to measure and how do we measure it?

- Measure current performance of the process (Throughput yield, DPMO, capability , etc.)
- Do we have a capable measurement system?
- What is the variability contributed by the measurement system to the total variation?
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❖ **Analyse Phase**

This phase involves:

- Identify the root causes of defects or failures ?
- Understand the data (using simple statistical tools such as scatter plot, histograms, etc.
- Use of simple tools ANOVA, Hypothesis test, Regression analysis, etc. to analyse the data
- Select the ‘vital few’ causes from the trivial many for improvement phase

❖ **Improve Phase**

This phase involves:

- How can the causes of defects or failures be removed?
- Identify the key variables which causes the problem
- Document solution statements
- Test solutions and measure results

❖ **Control Phase**

This phase involves:

- How can the improvements be maintained or sustained?
- Document the new methods
- Select and establish standard measures to monitor performance

The employees must be capable of choosing the most appropriate tools and techniques for their situations. There are three major sets of tools/techniques that are required within the Six Sigma problem solving framework. These are outlined below (Henderson and Evans, 2000) .

- ◆ Team tools – responsibility grid, threat versus opportunity matrix, action workouts, etc.
- ◆ Process improvement tools/techniques – brainstorming, Pareto analysis, process mapping, cause and effect analysis, Design of Experiments, Process FMEA, etc,
- ◆ Statistical Tools – Hypothesis tests (t-test, F-test, Chi squared, test), ANOVA, scatter plots, capability analysis, control charts, regression analysis, etc.

In addition to the tools and techniques, we also need to have a clear understanding of the common metrics used within Six Sigma business strategy. Examples of these metrics include: costs of poor quality, number of customer complaints, defect rate, throughput yield to mention a few.

Linking Six Sigma to Customers

Six Sigma should begin and end with the customers. Projects should begin with the determination of customer requirements. The process of linking Six Sigma to the customers can be divided into two main steps:

- a. identifying the core processes, defining the key outputs, and defining the key customers that they serve.
- b. Defining the customer requirements

The first step is based on Porter's concept of value chains (Porter, 1985), which aims at representing the organisation as a collection of activities. Core processes are usually chains of tasks involving various departments and functions that deliver the products or services to the customer. Core processes are supported by a number of enabling processes that provide vital inputs to the value-generating activities. Therefore the companies first need to identify, define and prioritise its core business processes. The next stage would then be to define the key outputs from the core processes and the key customers that these outputs serve. Using this information, process maps can be produced for each of the core processes and how they interconnect. This helps to create a better understanding of the business and its interdependencies.

Having defined the core processes, the next step is to define the customer requirements. The organisations need to recognise the fact that the needs, demands and attitudes of customers change over time. The organisations therefore need to prioritise projects that enhance the ability to meet the customers' needs. In line with the data-driven philosophy of Six Sigma, the business needs to have a "Voice of the Customer (VOC)" system to gather customer data. This VOC system becomes valuable only if the data is analysed and acted upon. The insight gained from this data can then be used to establish guidelines for performance and customer satisfaction. The data can also be used to analyse and prioritise customer requirements and hence link these to the company strategy.

Project Prioritisation and Selection

Poorly selected and defined projects lead to delayed results and also a great deal of frustration. The following three generic criteria may be used for the selection of projects (Pande et al.).

- ◆ Business benefits criteria
 - Impact on meeting external customer requirement
 - Impact on core competencies
 - Financial impact
 - Urgency

- ◆ Feasibility criteria
 - Resources required
 - Complexity issues
 - Expertise available and required
 - Likelihood of success within a reasonable timeframe

- ◆ Organisational impact criteria
 - Learning benefits – new knowledge gained about the business, customers, processes, etc.
 - Cross-functional benefits

For many organisations, financial returns to the bottom-line is the main criterion. Therefore the projects should be selected in such a way that they are closely tied to the business objectives of the organisation (Ingle and Roe, 2001). The scope and the lead time of projects is crucial during the early stages of the Six Sigma effort. Many complex projects require long term efforts and huge investment leading to long lead times for payoffs. This can be sometimes frustrating and discouraging to many people in organisations. Hence it is imperative to keep projects small and focused so that they are meaningful and manageable.

Linking Six Sigma to Human Resources

Human resources-based actions need to be put into effect to promote desired behaviour and results. Some studies show that above 60% of the top performing companies practising Six Sigma link their rewards to their business strategies. At GE, for instance, for any manager to be considered for promotion, they have to be Six Sigma trained. Likewise, up to 40% of top management bonuses are tied to their specific Six Sigma success (Henderson, 2000).

IT infrastructure

Six Sigma is about change and change requires action from top management. Purposeful and useful action cannot occur without a system to monitor and control it. Hence effective Six Sigma implementation requires an IT system to receive, organise and help translate this information into effective decisions for the organisation. For such a system to be active and functional, it requires an underlying IT infrastructure. The following are some of the main roles an effective IT system would be required to play (Kendall and Fulenwider, 2000).

- ❖ Support the collection of data from the process
- ❖ Provide a means for effective communication and sharing of data/information across the organisation
- ❖ Provide an easily accessible database holding information regarding all ongoing and completed Six Sigma projects
- ❖ Provide an interactive training tool for employees to learn the Six Sigma methodology and the tools within the methodology for problem solving activities
- ❖ Provide on-line coaching for Six Sigma tools and techniques

- ❖ Provide software packages to assist with the selection and prioritisation of projects

Linking Six Sigma to Suppliers

Many organisations that implement Six Sigma find it beneficial to extend the application of Six Sigma principles to management of their supply chain. Referring back to Porter's idea of a value chain, for a business to be successful, it must ensure a seamless and effective chain of supply to satisfy market demand. This alignment of the business towards the customer is one of the principal goals of Six Sigma. Traditionally the approach was to have many suppliers in order to keep costs down. However, the trend now is to build strong partnerships and win-win relationships with fewer suppliers. Many companies such as Bose and AT & T have extended this even further by having their supplier representatives work their engineers. This has led to substantial improvement in their product quality. Therefore, strong supplier involvement on Six Sigma programs can be beneficial in bringing the supplier closer to the customers and hence improve the quality of the product/process.

Conclusion

Six Sigma provides a comprehensive and flexible system for maximising business success. It has been considered as a revolutionary approach to product and process improvement through the effective use of statistical methods. This paper illustrates the key ingredients one should consider before a Six Sigma program is initiated in their organisations. All these ingredients are essential for the successful application of Six Sigma principles to any business process. If any of these ingredients is missing during the introduction and development of Six Sigma program, it would be then the difference between a successful implementation and a waste of resources, energy, money and time.

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