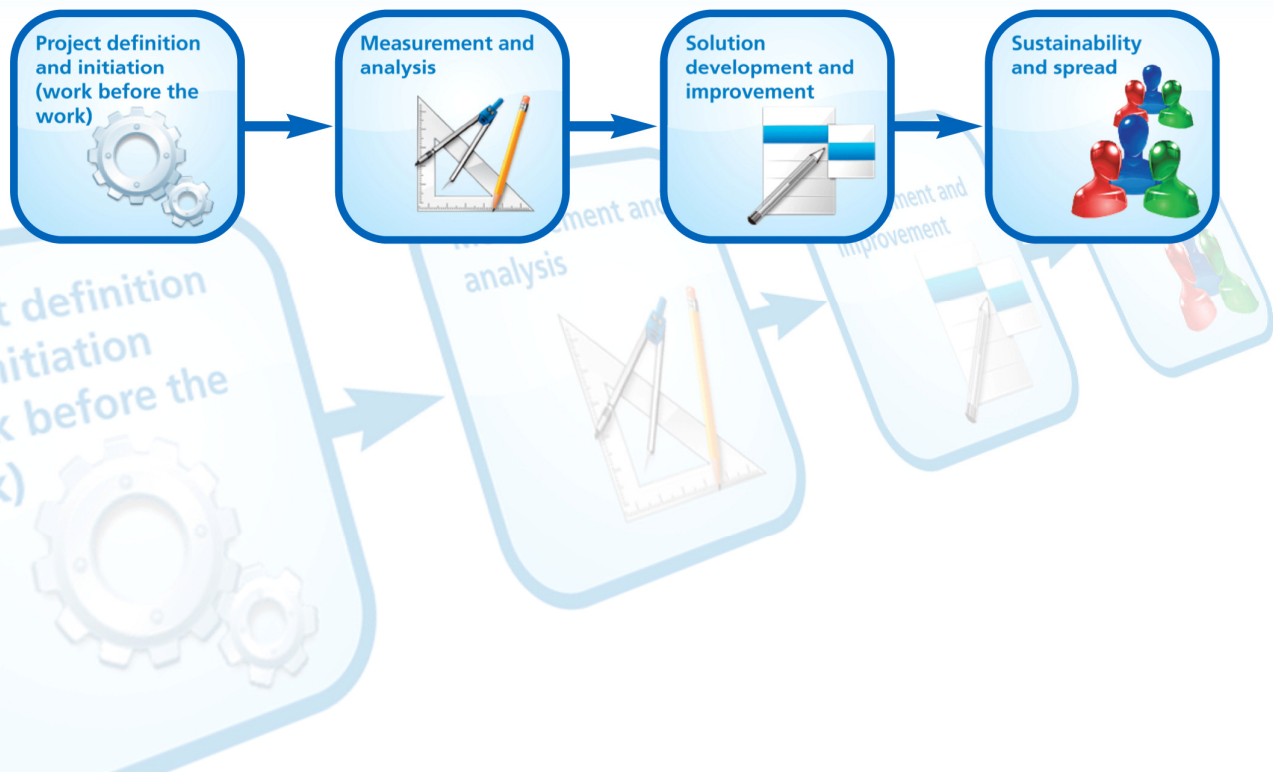




NHS Improvement An Overview of Six Sigma

October 2011





What is 'Six Sigma'?

'Six Sigma' is a continuous improvement philosophy, methodology and toolkit that has a proven commercial pedigree that can be traced back to the quality revolution of the 1940's.

- As a business strategy it focuses on the requirements of the customer and of improving processes, products and reducing costs. It enables organisations to improve performance by eliminating unnecessary processes and delays.
- As a methodology it provides a robust multistage framework with which to control improvement efforts. This framework typically has the following stages; Define, Measure, Analyse, Improve and Control. This is often referred to by its acronym 'D.M.A.I.C'.
- Six Sigma projects emphasise the importance of fully understanding customer needs and of the identification of 'problem' root causes (rather than reacting to problem symptoms). Six Sigma projects concentrate on facts rather than management anecdote or opinion and most importantly ensure that improvement is underpinned and sustained by rigorous statistical measurement and analysis.
- Six Sigma seeks to improve process performance, decrease variation and maintain consistent quality of the output of the process. It provides a disciplined data driven approach to quality and a method for eliminating defects.
- As a statistical concept, Sigma represents the amount of variation present in a process relative to customer requirements or specifications. When a process operates at the six-sigma level the variation is so small that the resulting products and services are 99.9997% defect free. (Equivalent to 3.4 defects per million opportunities).
- Typically the ideas, concepts and the methodology that are Six Sigma are formally incorporated into the business and operational strategies of an organisation. This requires a substantial investment in training at all levels within the business.

Once trained, different improvement methodologies are available which can be aimed at either improving existing processes (D.M.A.I.C) or in the design of brand new processes (Define, Research, Analyse, Define, Validate – D.R.A.D.V).



The D.M.A.I.C. methodology

The 5 step D.M.A.I.C approach



The five steps of the DMAIC method are as follows;

1) Define the project

- Define the project's purpose and scope.
- Collect background information on the process and your customer's needs and requirements.

2) Measure the current situation

- Gather information on the current situation in order to provide a clearer focus for the improvement effort.

3) Analyse to identify causes

- Identify the root causes of problems.
- Confirm them with data.

4) Improve

- Develop, improve and implement solutions that address root causes.
- Use data to evaluate results for the solutions and the plans to carry them out.

5) Control

- Maintain the gains by standardising work methods or processes.
- Anticipate future improvements and make plans to capture the lessons learned from the improvement effort.

The table below illustrates each stage of the process together with the types of activities the project teams will carry out. Note that the tools and techniques listing is by way of example and is not exhaustive.



Step	Purpose	Main Activities	Tools & Techniques
Define	Defines the problem, develops a clear mandate based on a real problem	<ul style="list-style-type: none"> Identify improvement opportunity Develop Charter Listen to Voice of the Customer Define critical customer requirements Map processes 	<ul style="list-style-type: none"> Charter Milestone plan Project plan Customer surveys Process maps Affinity diagrams
Measure	To understand the baseline and current levels of performance	<ul style="list-style-type: none"> Identify measures Develop operational definitions Develop & implement measurement plan Collect other baseline information 	<ul style="list-style-type: none"> Detailed process mapping Measurement plan (existing versus new data)
Analyse	To establish problem root causes and understand their effect on the process	<ul style="list-style-type: none"> Identify root causes Validate root causes Determine true sources of variation Process control and capability Analysis of detailed process maps for improvement opportunities Plot and analyse data Determine the amount of variation within processes Determine sigma score 	<ul style="list-style-type: none"> Statistical process control Process capability calculations Defects per million calculations Fish bone diagrams X & Y analysis Cause & effect matrix 5 whys Pareto analysis Hot spot matrix, value/non value added analysis Histograms
Improve	To develop, select and implement the best solutions	<ul style="list-style-type: none"> Generate solution ideas Evaluate & select solutions Develop process map for solution Initiate measure and evaluate pilot Communicate solutions to stakeholders and evaluate plan 	<ul style="list-style-type: none"> Process mapping Brain storming Chain letter/ideas box Affinity diagrams Force field analysis Solution screening PDSA/pilot studies



Control	To ensure the solutions are embedded, that the process has robust controls	<ul style="list-style-type: none"> • Verify reduction in variation and sigma score • Develop standard practices • Monitor performance • Integrate lessons learned • Recommend future plans • Identify next steps and remaining opportunities 	<ul style="list-style-type: none"> • Control plan/dashboard • Procedures and standards • Process control systems • Statistical process control • On going training & education
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Relevance to the NHS and 18 weeks

A study jointly conducted by the CHD Collaborative and the NHS Modernisation Agency over a two year period (and some 20 projects) identified that the strength of Six Sigma lay in the five stage DMAIC process which guides the improvement process, together with rigorous statistical measurement, analysis and control that exists at the core of the methodology. It was also recognised that the comprehensive nature of Six Sigma training provides an opportunity for improvement practitioners (and project team members) to gain new skills and also to enhance and consolidate existing skills. These benefits provide the platform for the delivery of quantifiable service improvement based on hard data (customer requirements, process performance, root cause analysis and so on) rather than ‘soft’ management anecdote.

A recent Six Sigma project conducted at Sherwood Forest NHS Trust with regard to outpatient department and diagnostic improvements has demonstrated the methodology’s applicability to the 18 week outcomes. Set up correctly, Six Sigma projects will balance the process or output requirements of all customers (patients, clinicians, diagnostic technicians and so on) with the resources available to deliver that process or output both efficiently and effectively.

What makes for successful NHS Six Sigma projects?

The study identified a number of areas in the application of the methodology that required refocusing together with a number of recommendations as to the required skill sets of the Six Sigma practitioners.

1) Skill sets

In addition to full Six Sigma training practitioners must be competent in project planning, project leadership and team facilitation. Without these complementary skills, projects will fail as they are needed to support the DMAIC methodology. The tool kit is only a means to an end and not an end in itself. Of fundamental importance is the ability of the practitioner to use discretion in the application of the methodology and tools; most NHS problems will not need advanced statistical analysis or hypothesis testing to gain significant improvement.

2) Application of the methodology

Commercial Six Sigma projects are typically run within Six Sigma organisations whose business strategy has been created to support this methodology. This means that organisations will have



a Six Sigma trained workforce together with a board level mandate to pursue improvement in order to gain competitive advantage. In short, Six Sigma will be part of the culture of the organisation.

The NHS environment does not have this type of platform to conduct improvement from. There is little in the way of coherent improvement strategies and it suffers from competing priorities and limited resources.

With this in mind, it is imperative that projects are set up ‘for success’ and that time is taken prior to the ‘define’ stage to ensure that all parties/stakeholders connected with the initiative are clear as to the extent of the commitment and risks involved with the proposed undertaking. It is vitally important that these issues are surfaced as early as possible as they may determine the timing of the project, (i.e. not during waiting list initiatives) or indeed whether the project will run at all (conflicting priorities, no clear change imperative – lack of buy in).

See Top Tips Section on Successful Projects ‘Work before the work’

The table below details the type of activities that help set the project up for success;

Step	Purpose	Main activities	Tools & Techniques
Preplanning	To set and communicate the purpose and content requirements/expectations of the project within the context of the organisation.	<ul style="list-style-type: none"> • Team selection, obtaining commitment & buy-in • Assess the position of all stakeholders regarding commitment and reaction to project. (joint expectations) • Assess the most appropriate (or required) approach to service improvement (i.e full or partial application of methodology – low hanging V high fault) • Assess organisation requirements – high level identification of quick win versus low-level detailed projects (optional appraisal) • Develop communication plan • Develop project risk assessment plan • Identify & appoint project champion (recommend medical director) 	<ul style="list-style-type: none"> • Strategic option appraisal • Stakeholder attitude analysis • Stakeholder influence strategy • Project risk assessment plan • Communication plan • Pre charter • Draft charter • Draft milestone plan • Train champion



Hints and tips

- The charter forms the contract for improvement and as such is the single most important document in the project set up;
- Business case and opportunity.
- Team requirements and backfill.
- Risk assessments.

The charter will go through a number of iterations during the life of the project as the problem is refined.

- Be prepared to cancel the project if the basic support criteria aren't evident.
- Initial projects should be small and simple.
- People get hung up on the Sigma score and 'defect' – its less important than achieving improvement.
- Clinicians like the statistical element of Six Sigma. However, be aware of the potential for evidence to emerge that will challenge the way individuals and departments work. This will make for some interesting team meetings.
- Use only the tools that are needed for the job, you don't need a statistical sledge hammer to crack a nut!
- Clinical problems always require consultant buy in.
- Ensure that a degree of 'redundancy' is built into the project team as it is highly likely that key individuals will be 'lost to the service' during the life of the project. Ensure team members have deputy or 'buddy' arrangements in place to ensure project continuity.
- Data collection and analysis can be time consuming especially where manual data trawls are required and/or they impact on clinical areas; plan accordingly. This also applies to 'Voice of the Customer' questionnaires (which are likely to require Research and Ethics Committee approval prior to being issued). Staff involved in any manual data collection process will need training to ensure that data is collected in line with the measurement plan, is consistent and follows the data operational definition. Staff may need training in the measurement device which may need calibrating.
- Improvement project solutions that require new or different ways of working need careful planning and the total commitment of operational staff if they are to be successful (especially in clinical and public areas). The testing stage may actually increase the workload as the 'bugs' are being ironed out of the processes (particularly where the test is being run in parallel with existing processes). Ensure that plans are robust and have been accurately risk assessed. Completion of a 'Failure Mode and Effects' analysis on the revised processes will ensure that risks are appropriately mitigated. Ensure that measurement plans together with arrangements to collect review data are in place and that any measurement devices are correctly set up and synchronised. This may require the collection staff to be trained.



Links to further resources

Isixsigma – contains articles, frequently asked questions, and explains how to use the tools & techniques. Also contains a healthcare section with examples at: www.isixsigma.co.uk

For further information regarding Six Sigma in healthcare, contact: garry.white@improvement.nhs.uk

Further information on all service improvement tools and techniques are also available at: www.institute.nhs.uk



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