



UNIT-1

Six Sigma Basics

Learning Outcomes

By the end of this unit the learner will be able to:

- ✓ Understand the Basics of Six Sigma.
- ✓ Describe the seven quality tools to solve process problems.

DMAIC and DMADV?

Six Sigma initiatives are used by organizations to provide a structured approach to improving and developing process excellence. A number of tools to accomplish this will be discussed in subsequent sessions. The Six Sigma tools are used within a specific organizational framework. The two most used frameworks are the DMAIC (Define, Measure, Analyze, Improve, Control) and DMADV (Define, Measure, Analyze, Design, Verify) approaches to problem solving. These data-driven process approaches to improving processes are also used in Lean and other quality initiatives.

The following table shows the characteristics of each approach.

DMAIC	DMADV
Used when an existing process or product does not meet customer expectations or is not performing adequately.	Used to develop a new process or product or, when after using DMAIC, the process still does not meet the customer's expectation or Six Sigma.
Define the problem in the current process, the improvement project goals, and internal and external customer expectations/ requirements.	Define the new process project goals and internal and external customer deliverables.
Measure the current performance of the process.	Determine and Measure customer requirements and specifications.
Analyze the process data to determine root causes of the poor performance of the process.	Analyze the process requirements and alternatives to meet the customer requirements and specifications.
Improve the performance of the process by eliminating the root causes of the problems.	Design the new process to meet the customer requirements and specifications.
Control the improved process.	Verify the design performance and ability to meet customer requirements and specifications.

How Does Typical Project Management Differ from Six Sigma Project Management?

Established and introduced by the Project Management Institute, the Project Management Body of Knowledge (PMBOK) was quickly adopted as an international standard in key markets worldwide. Even today, PMBOK remains the project management framework of choice for many businesses worldwide.

In terms of the fundamentals, Six Sigma and PMBOK share a great many similarities. For example, both methodologies are implemented to formulate plans, identify stakeholders, maintain strong

communication standards, conduct regular reviews, carefully manage costs/resources, meet deadlines effectively and so on.

Nevertheless, Six Sigma isn't just another generic initiative for enhanced project management or process improvement. Nor is it a reintroduction of the same concepts and standards under a different name. Instead, it is a standalone continuous improvement strategy with its own unique statistical and cultural methodologies.

Six Sigma can be applied in conjunction with other project management initiatives and standards as a complementary framework. Most project management initiatives seek to reduce the risk of failure, control costs, avoid defects, minimise risk and keep important deadlines. In most organisational settings, project management seeks to accomplish these objectives by identifying and following best practices on a project-by-project basis. It is typically the responsibility of the project office to create and implement a policy, offer advice and support for contributors, make available the required resources and perhaps carry out periodic reviews.

An Imperfect Approach to Project Management

The problem being that project management initiatives regularly fail for the simple reason that the effectiveness of the methodology couldn't be accurately measured. Nor could any potential value be added by way of process changes. This is where the unique effectiveness of Six Sigma comes into the equation.

Six Sigma provides project managers and stakeholders with a much more structured, data-driven project management methodology. A framework that provides the tools and techniques needed to accurately gauge performance before, during and after the project. Implementation of Six Sigma enables project managers to establish the baseline performance of activities and processes, in order to identify opportunities for improvement and optimise every aspect of their performance.

Essentially, therefore, Six Sigma provides the opportunity to inject a higher level of discipline and control into any project. For projects of little importance, approaching things ad-hoc and learning as you go is an option. But you can't implement Six Sigma in a half-hearted manner. If you intend to put Six Sigma to practical use, you need to accept the time, effort and commitment required to make it work. Which is a good thing, given the importance of ensuring everyone involved and the project is equally committed and determined to achieve the best possible results.

Project Management: A Challenging Field

The field of project management is uniquely challenging, incorporating a variety of responsibilities that demand equal priority. Collection and analysis of data, problem solving, the evaluation of current processes, creating and tracking measurements, making quantitative evaluations and so on. The tools and techniques provided by Six Sigma enable project managers to succeed in all of these areas and more.

Six Sigma is not to be viewed as a slightly tweaked or modified alternative to the current management methods followed by the organisation. Instead, it is a radically different management methodology that

replaces existing standards for determining, evaluating and avoiding/resolving problems. All while ensuring the business meet its financial and operational objectives in a methodical manner. Six Sigma comprises various tools and features that can be applied across a much broader and more dynamic area of operations than those common to more traditional project management.

In a nutshell, Six Sigma seeks to tackle problems at their root cause and proactively prevent them from occurring or reoccurring, as opposed to controlling possible causes of failure on a project-by-project basis.

Six Sigma is also significantly more precise and deeper than more conventional project management. The methodology used uses a defined project charter to detail the project scope, financial targets, benefits anticipated, key milestones along the way and so on. The Six Sigma framework is based on hard data and measurements. Traditionally, projects have typically been entered into with no concrete knowledge as to its potential for delivering of financial gains. The control phase of Six Sigma (DMAIC: Define-Measure-Analyse-Improve-Control) uses more defined and robust measurements, helps identify potential problems and allows for the creation of measurable solutions.

Apply effectively, Six Sigma can drive an organisation towards improved performance and profitability. Nevertheless, it is important to acknowledge Six Sigma is more than just a set of tools. Instead, Six Sigma is about the systematic and strategic application of the tools in the right places and at the right time, in order to build towards positive business-wide change.

Integrating Project Management Into a Six Sigma System

Most businesses share the desire to reduce operational costs, improve process efficiencies and drive higher profits through an increased market share in a competitive environment. On the opposite side of the spectrum, consumers share the desire for affordable products that are easily accessible and consistently satisfy their expectations.

Various philosophies and frameworks - including total quality control (TCM), total quality management (TQM) and Six Sigma - have been adopted by businesses worldwide to assist with the development of new products, minimisation of production costs, enhancement of manufacturing operations, entering new markets and so on. Within such systems, teams are tasked with identifying and measuring demand within a target audience and considering the company's competencies. A continuous portfolio of projects is also required, focusing on cost reduction or revenue enhancement.

Not every business implements these systems true to their original forms, but may nonetheless work in accordance with their core frameworks or methodologies. It's not uncommon for an organisation to implement one or more systems at the same time. One example of an amalgamation of systems that has shown remarkable capacity to drive improve performance is the integration of Six Sigma with the processes and tools of project management.

The Six Sigma DMAIC Methodology

The Six Sigma DMAIC methodology (Define, Measure, Analyze, Improve, Control) provides managers with a structured and disciplined framework for identifying and addressing a variety of issues. Six Sigma can help project managers effectively identify the causes of defects or inefficiencies in processes which may be preventing the company from delivering on its customers' expectations, or meeting its own financial or operational goals. Six Sigma is typically performed by cross-function teams who oversee the project. Yet Six Sigma does not take control of the project itself, rather providing invaluable insights for its improvement.

Within the Six Sigma DMAIC framework, problems are first identified, defined and quantified. The collection of measurement data enables the problem to be clarified, after which a series of analytical tools and processes allow managers to trace the issue back to its cause. This then allows for a solution to the cause of the problem to be created and implemented. The activity or process that has been improved is then continuously monitored, in order to prevent recurrence of the same issue.

Six Sigma comprises a variety of tools and techniques, which include design of experiments (DOE), failure mode and effects analysis (FMEA), cause-and-effect diagrams, process flow diagrams and gage repeatability and reproducibility (R&R) Studies.

Six Sigma Challenges

Implemented effectively, Six Sigma has the potential to outperform almost any other process improvement or troubleshooting framework. Nevertheless, the Six Sigma DMAIC approach is not without its challenges. If an organisation relies exclusively on Six Sigma for each project management requirements, it may encounter issues controlling the project process. Relying solely on Six Sigma could prompt issues regarding resource availability, lack of management support of the inability to fully understand the voice of consumer (VOC).

Once again, it's important to acknowledge that while Six Sigma DMAIC can identify issues and drive improved performance, it does not control the project management process itself.

As stated by the risk management institute: "Project management is the application of knowledge, skills, tools, and techniques to project activities to meet project requirements." Project management is a complex and dynamic field, incorporating tasks such as risk analysis, schedule development, work breakdown analysis, cost budgeting, status reporting, scope definition and so on. All of which are used by project managers to plan, implement, optimise and control projects. This list of processes is far from exhaustive, but gives good idea of the processes and tools required to successfully complete a project.

The Integration of the Two Approaches

In essence, you could argue that while traditional project management focuses on the physical planning and implementation of the project, Six Sigma is the more data-driven troubleshooting process operated in the background. By combining Six Sigma with traditional project management, the organisation can

benefit from a controlled, consistent and predictable project from start to finish. All of which begins with the development of a project life cycle.

A detailed example of a project life cycle you'll find in the table below, in which Six Sigma DMAIC activities have been assigned to the various phases of project management:

The Project Life Cycle					
Phase I Concept	Phase II Requirements	Phase III Validation	Phase IV Implementation Planning	Phase V Implementation	Phase VI Post Implementation
Define	Define	Measure/Analyze Improve/Control	Improve/Control	Improve/Control	Control
<ul style="list-style-type: none"> > VOC – statement of work > Pareto diagrams > Fishbone diagram > FMEA > Process flow > Control plan > Scope definition, objectives > Assumptions > Risk process > Project deliverable checklist 	<ul style="list-style-type: none"> > Requirements writing > Criteria for project completion > Communication plan > Responsibility assignment matrix > Risk process > Change management > Lessons learned > Weekly team meeting 	<ul style="list-style-type: none"> > Cost estimating > Work breakdown structure – Cost budget – Schedule > Gage R&R > Pareto analysis > FMEA > DOE > Risk process > Change management > Earned value analysis > Lessons learned > Weekly team meeting 	<ul style="list-style-type: none"> > Recommend solutions > Recommend controls of solutions > Design recommended solution > Design controls > Risk process > Change management > Earned value analysis > Lessons learned > Weekly team meeting 	<ul style="list-style-type: none"> > Implement process improvements > Project process monitoring with countermeasures and controls > Purchase capital > Test solution > Risk process management > Earned value analysis > Lessons learned > Weekly team meeting 	<ul style="list-style-type: none"> > Measure for completion of objectives > Repeat at 3 months then again at 6 months > Controls review > Close project > Project book archive > Risk process management > Lessons learned > Weekly team meeting
Senior management approval to continue the project	Stakeholder approval to continue the project	Project Sponsor approval to continue the project	Stakeholder approval to continue the project	Project Sponsor approval to continue the project	Project success or failure

Working with Six Sigma tools and resources at various stages of the project life cycle allows for effective troubleshooting and the avoidance of issues. Typical examples of issues that may occur in the absence of such controls include new products with a high defect rate, insufficient demand in a specific market or elevated material costs affecting the profitability of the proposed product.

In a working example, a business operates a website that is generating a steady stream of complaints regarding its accessibility and general functionality. As a result, fewer the visitors are converting and the organisation's reputation is taking a hit. To address the issue, Six Sigma tools such as Pareto analysis, fishbone diagrams and FMEA can be implemented to find the cause of the problem. After which, potential solutions can be identified and their respective costs considered. The development of a project management scope, charter and breakdown of work required follows, after which the project can be implemented. The necessary corrective measures are executed and control measures eliminate the risk of recurrence of the same issue.

A Refined Approach to Project Management

Ultimately, Six Sigma addresses the growing requirement among organisations for continuous improvement of project management systems, minimization of costs and the elimination of waste. Six Sigma is a uniquely wide-reaching project management framework that can drive the improvement of processes and activities in almost any organisational setting.

Further Reading:

- ✓ *Fundamentals of Six Sigma, David M. Levine, (2006)*
- ✓ *Essentials of Lean Six Sigma, 1st edition, Salman Taghizadegan*