

# Engineering Management

EE470



# Learning Objectives

At the end of this module you will have learned:

- To recognise different types of engineering projects and the associated project frameworks and methodologies to use
- Common pitfalls on why projects (and managers) fail and how to avoid them
- Theory of key project management skills including
  - Six Sigma DMAIC 12 Step Process
  - Change Acceleration Process (CAP) for leading effective change and stakeholder management
  - Business case development
  - Goal setting and project tracking
  - Project finance basics
  - Project presentation and communication skills
  - Organising for success: GRPI Project planning and resourcing tools
  - Project ethics
- Theory & tools for Engineering Management
  - A day in the life of an Engineering Manager
  - Environmental, Health & Safety (EHS) management
  - KPI management & operating rhythm
  - Supply chain management
  - Performance management & industrial relations
  - ESG (Environmental, Social, Governance) principles
  - Managing cyber security risk )
- Application of key project management skills
  - Complete a Six Sigma DMAIC project incorporating project management theory learned in class

# Engineering Management

- What falls under Engineering Management?
- **Projects** / Business / Operations / People / Finance / Ethics / Contracts
- What type of projects?
  - Problem Solving
  - Solution Delivery
  - New Product Introduction
  - Process Improvement
  - Product Design

# Teaching Methodology

- Course Material
  - Project (30%)
  - Class Participation (10%)
  - End Exam (60%)
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- Course will be delivered as a mixture of on-line and in-person classes
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- 2 x guest speakers; experts in Engineering Management. Advanced notice will be given. In-person attendance requested.

# Course Layout (1-5)

Session	Theory	Tools	Case Studies	Project
1	Introduction: Module DMAIC CAP		Six Sigma at GE	Discussion on potential projects
2	DEFINE: Step 0 & 1 CAP: Leading Change	Project Charter Continuous Data GRPI	Stable Operations: "Free Chemical Plant"	Project Selection
3	MEASURE: Step 2 & 3 CAP: Creating Shared Need	GR&R Stakeholder Analysis	"Wing to Wing"	Review Step 0 & 1
4	MEASURE: Step 4 & 5 CAP: Shaping a Vision	Minitab	Revolving Credit	Review Step 2 & 3
5	ANALYSE: Step 6 & 7 & 8 CAP: Mobilising Commitment	Probability Plots ARMI	Absenteeism in Manufacturing Plant	Review Step 4 & 5

# Course Layout (6-10)

Session	Theory	Tools	Case Studies	Project
6	IMPROVE: Step 9 & 10 & 11 CAP: Making Change Last Project Finance Project Ethics	ROI FMEA	Hakker Rollen	Review Step 6 & 7 & 8
7	CONTROL: Step 12 CAP: Monitoring Progress Presentation Skills	PowerPoint	TBC	Review Step 9 & 10 & 11
8	CAP: Changing Systems & Structures Organising for Success	GRPI	TBC	Review Step 12
9	Module Review			Final Project Review
10	Exam Preparation			

# Why Projects Fail

- Discussion

# Managing for success

## “Define”

- “If I had an hour to solve a problem I'd spend **55 minutes thinking about the problem and five minutes thinking about solutions.**”





# Effective Change

$$\bullet Q * A = E$$

# Q

## Six Sigma DMAIC Methodology

- DEFINE
- MEASURE
- ANALYSE
- IMPROVE
- CONTROL

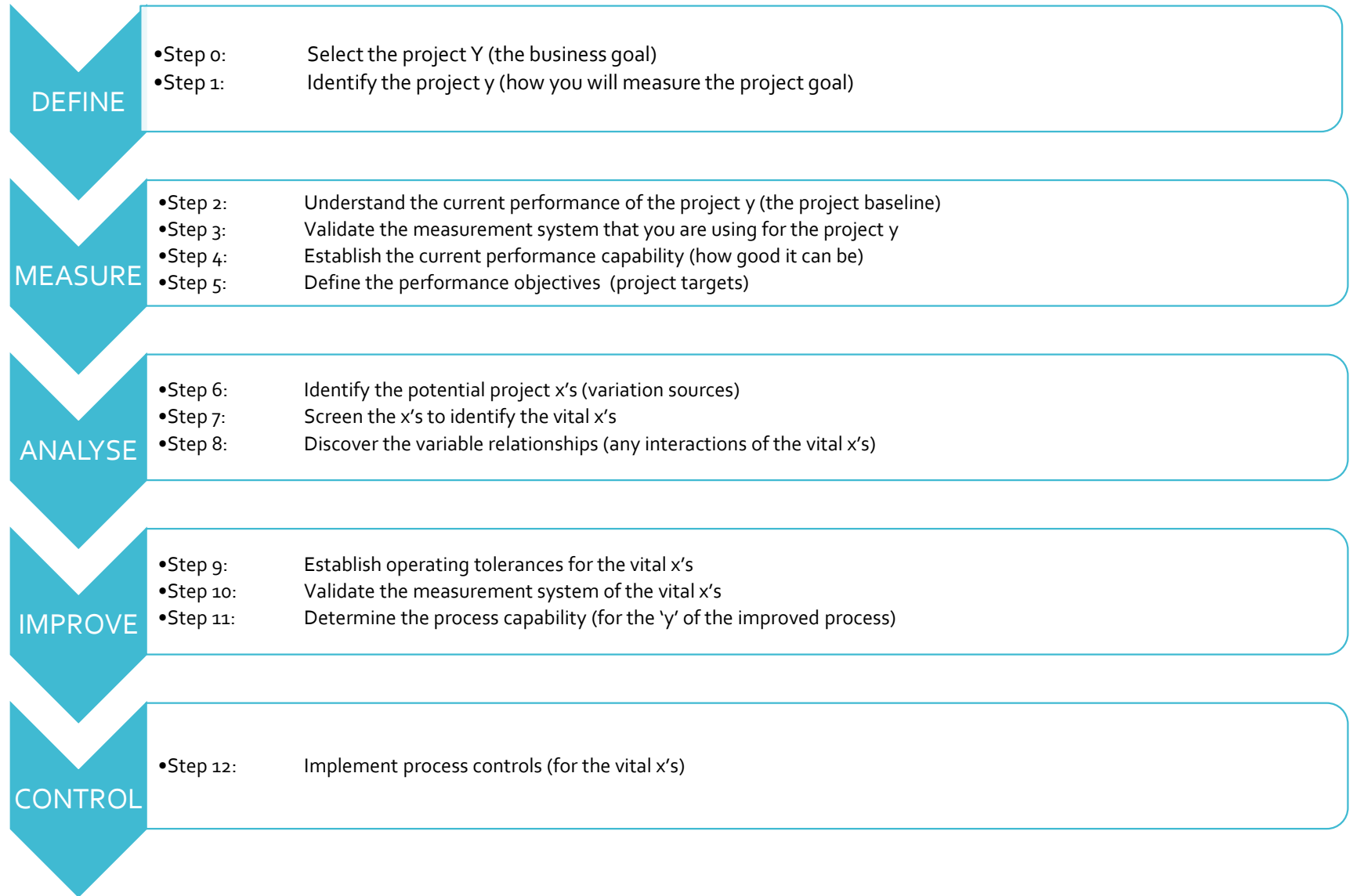


<https://www.youtube.com/watch?v=aNMULFcLuIM>

# Six Sigma at GE

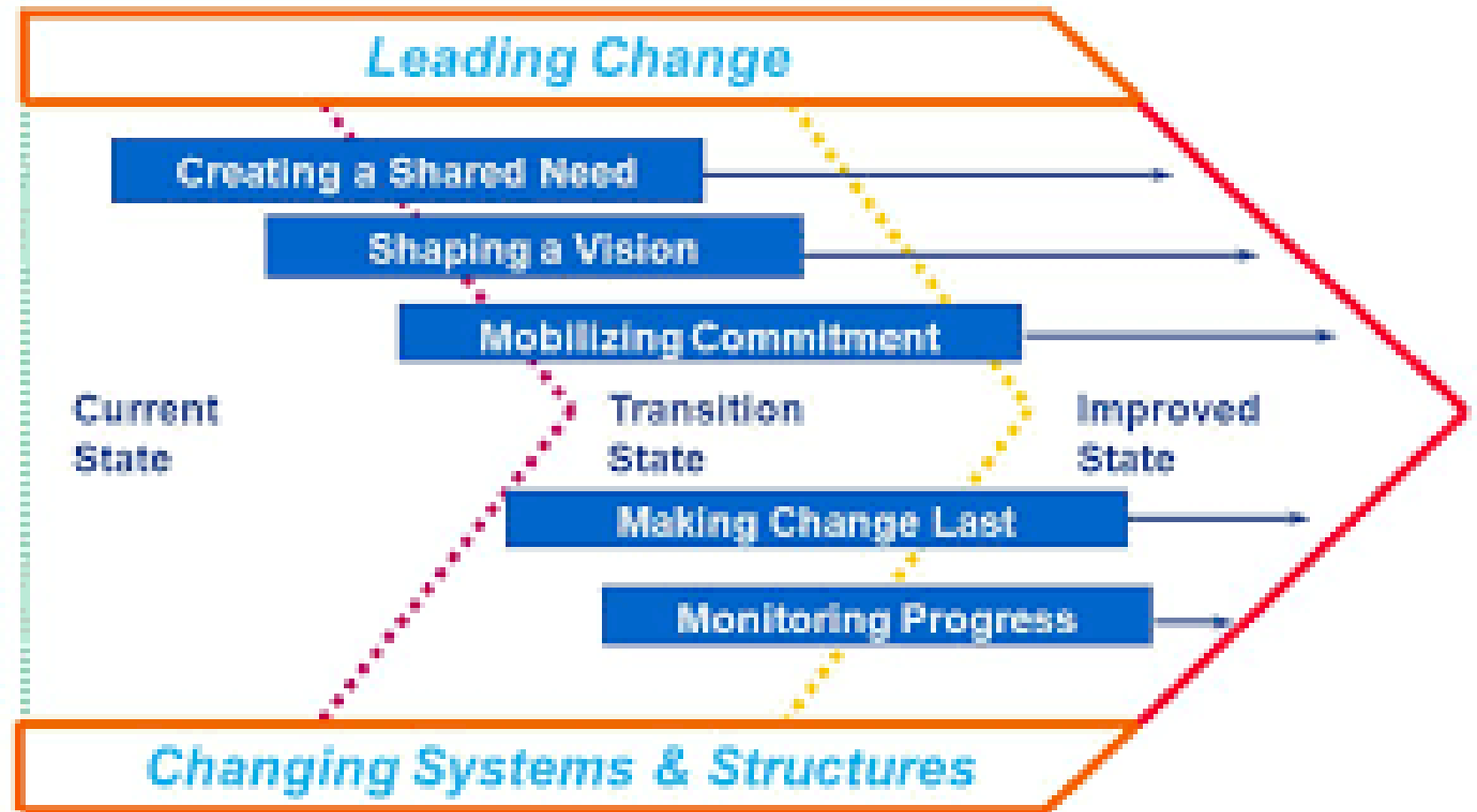


# Six Sigma DMAIC 12 Steps



# A

## Change Acceleration Process (CAP)

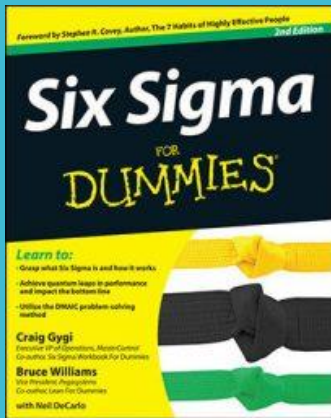


# Simplified Video Explanation!



# Appendices

# Companion Text Book



## What is Six Sigma?

Generally, Six Sigma is a set of techniques and tools that help businesses improve their processes. It's a problem-solving methodology that helps enhance business and organizational operations. It can also be defined in a number of other ways:

- A quality level of 3.4 defects per million opportunities
- A rate of improvement of 70 percent or better
- A data-driven, problem-solving methodology of Define-Measure-Analyze-Improve-Control
- An initiative taken on by organizations to create bottom-line breakthrough change

## Six Sigma principles

Six Sigma is based on a handful of basic principles, and these principles create the entire Six Sigma arrangement. Here are Six Sigma's fundamental principles:

- $Y=f(X) + \epsilon$ : All outcomes and results (the Y) are determined by inputs (the Xs) with some degree of uncertainty ( $\epsilon$ ).
- To change or improve results (the Y), you have to focus on the inputs (the Xs), modify them, and control them.
- Variation is everywhere, and it degrades consistent, good performance. Your job is to find it and minimize it!
- Valid measurements and data are required foundations for consistent, breakthrough improvement.
- Only a critical few inputs have significant effect on the output. Concentrate on the critical few.
- Every decision and conclusion has risk ( $\epsilon$ ), which must be weighed against the context of the decision.



# Course Layout

- Project Definition
- Project Frameworks
  - Hard Skills
  - Soft Skills
- Stakeholder Management
- Organising for Success
- Team Management
- Finance for Non-Finance Managers
- Communication and Presentation Skills

# Engineering Management

- Management vs Leadership
- Knowledge and understanding of basic engineering management principles relevant to the branch of engineering and an ability to apply these to one's own work
- Indicative graduate attributes include: (i) basic knowledge and understanding of organisational structures, commercial governance and relevant legal principles and contractual arrangements; (ii) basic knowledge and understanding of the management of resources; (iii) knowledge and understanding of work planning and monitoring tools.
- **The three pillars of ESG**
  - Environmental – this has to do with an organisation's impact on the planet.
  - Social – this has to do with the impact an organisation has on people, including staff and customers and the community.
  - Governance – this has to do with how an organisation is governed. Is it governed transparently?

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