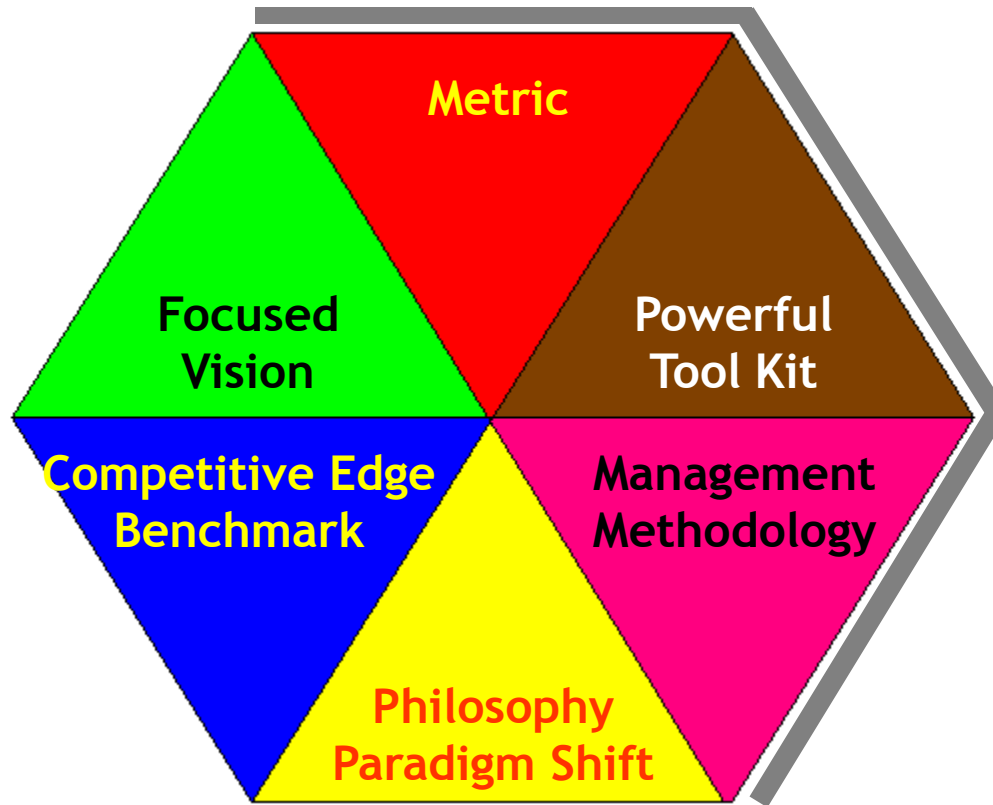# Accelerated Introduction to Six Sigma

What Six Sigma IS ?

(The method)

Collection of
Tools & Techniques,

Encapsulated within a Methodology
Driven by a Rigorous Framework
with
Organization Structure/Support
&
Governance Mechanisms
to

Improve Existing or
Design New
Products or Processes

Governance Systems

Methodologies
DMAIC – to improve existing
DMADV (DFSS) to design new

Tools &
Techniques
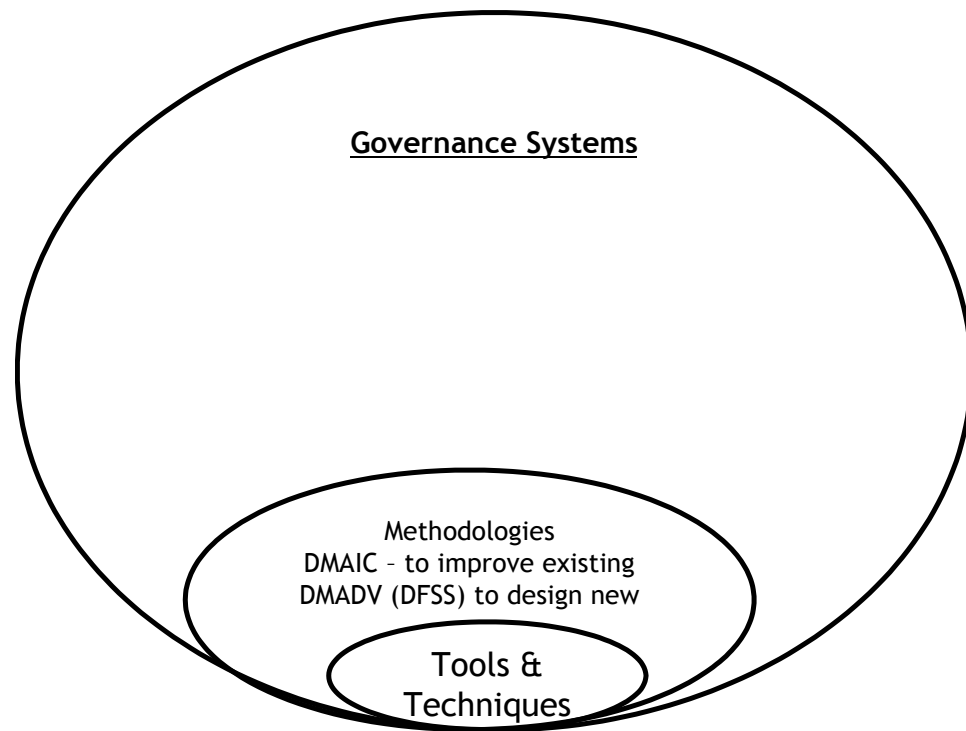
What Six Sigma IS ?

(The metric)

Sigma Level is
A *Better* Metric
of Performance

That
Reflects the capability to
Produce outcomes
'Within Specifications'

on
Quantifiable & Measurable Parameters

That are critical to / Driven by
Business as well as Customers
Consistently, Over long periods of time

*Observed in the Long Term assumes 1.5 sigma LT Drift

Sigma Level (Reported)	Defects Per Million Opportunities (Observed in Long Term)*	Performance (Long Term)
1.0	691,462.5	30.85375%
2.0	308,537.5	69.14625%
3.0	66,807.2	93.31928%
4.0	6,209.7	99.37903%
5.0	232.7	99.97673%
6.0	3.4	99.99966%

Why GO Six Sigma?

Revolutionary – Not Evolutionary Improvements
A 6 Sigma Process/Product is 20,000 Times Better to a 3 Sigma
Target 10X reduction in Defects (Not 10%)

Sigma Reported (Short Term)	Long Term DPMO*
1.0	691,462.5
2.0	308,537.5
3.0	66,807.2
4.0	6,209.7
5.0	232.7
6.0	3.4

19,650 X Improved

*assumes 1.5 sigma LT Drift

10.75 X Improvement

26.69 X Improvement

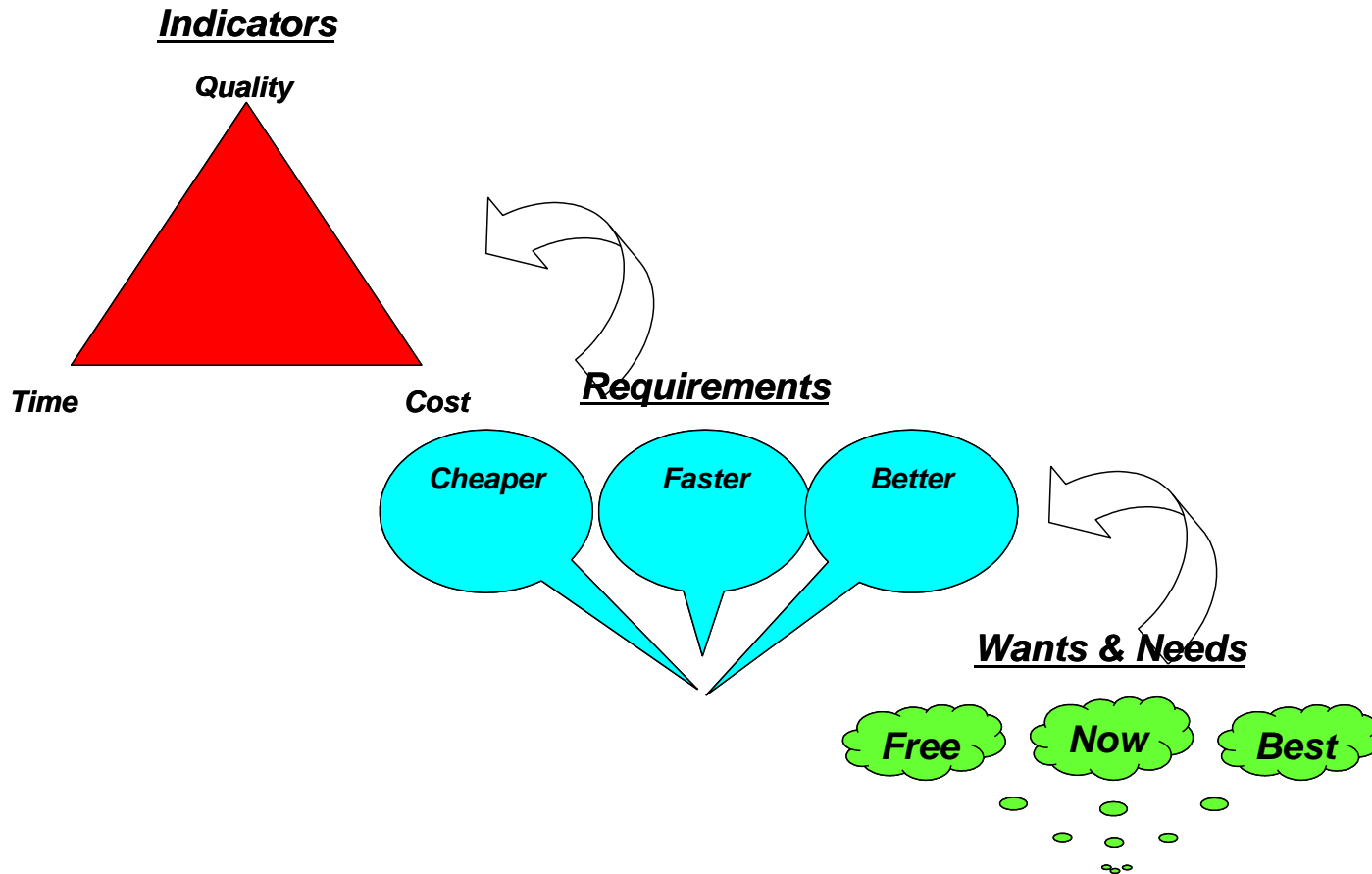68.44 X Improvement

A typical 'well-managed' Firm at 3 Sigma drains 30% of revenues
In Rework/Repairs/Waste, Non Value Added Activities, Productivity Loss etc.
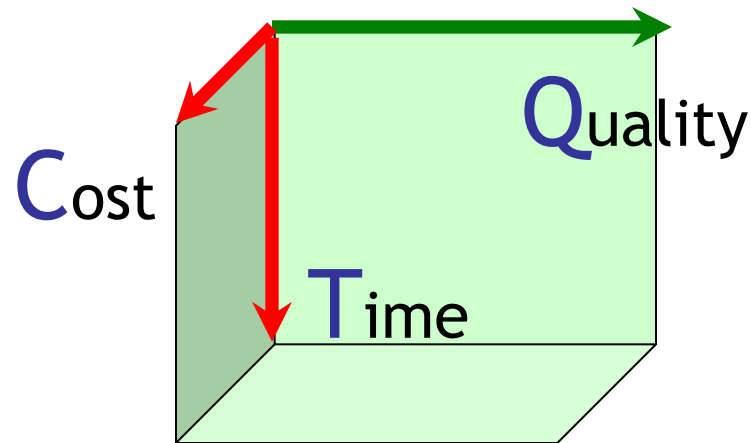While one at 6 Sigma only less than 1%

What Six Sigma IS NOT ?

- Six Sigma Is Not:
  - NOT A Quality Standard
    - Unlike ISO or COPC or CMMI or..
- Hence:
  - No Rule Books
  - No Global Bodies to Govern it
  - No Audits or Assessments
  - No Particular Target Performance levels

- Which Means: Organization decides
  - When to Use Six Sigma (vis-à-vis other methods & models)
  - Where to Deploy Six Sigma (Which Division, Location.. Etc.)
  - What Six Sigma must focus (Process or Product)
  - What Sigma Level to Target
  - What Pace Should Six Sigma Be Deployed

What is the FOCUS of Six Sigma?

Indicators

Quality

Time **Cost**

Requirements

Cheaper **Faster** **Better**

Wants & Needs

Free **Now** **Best**

Six Sigma is used to Improve Cost, Time, and Quality of Processes as well as Products
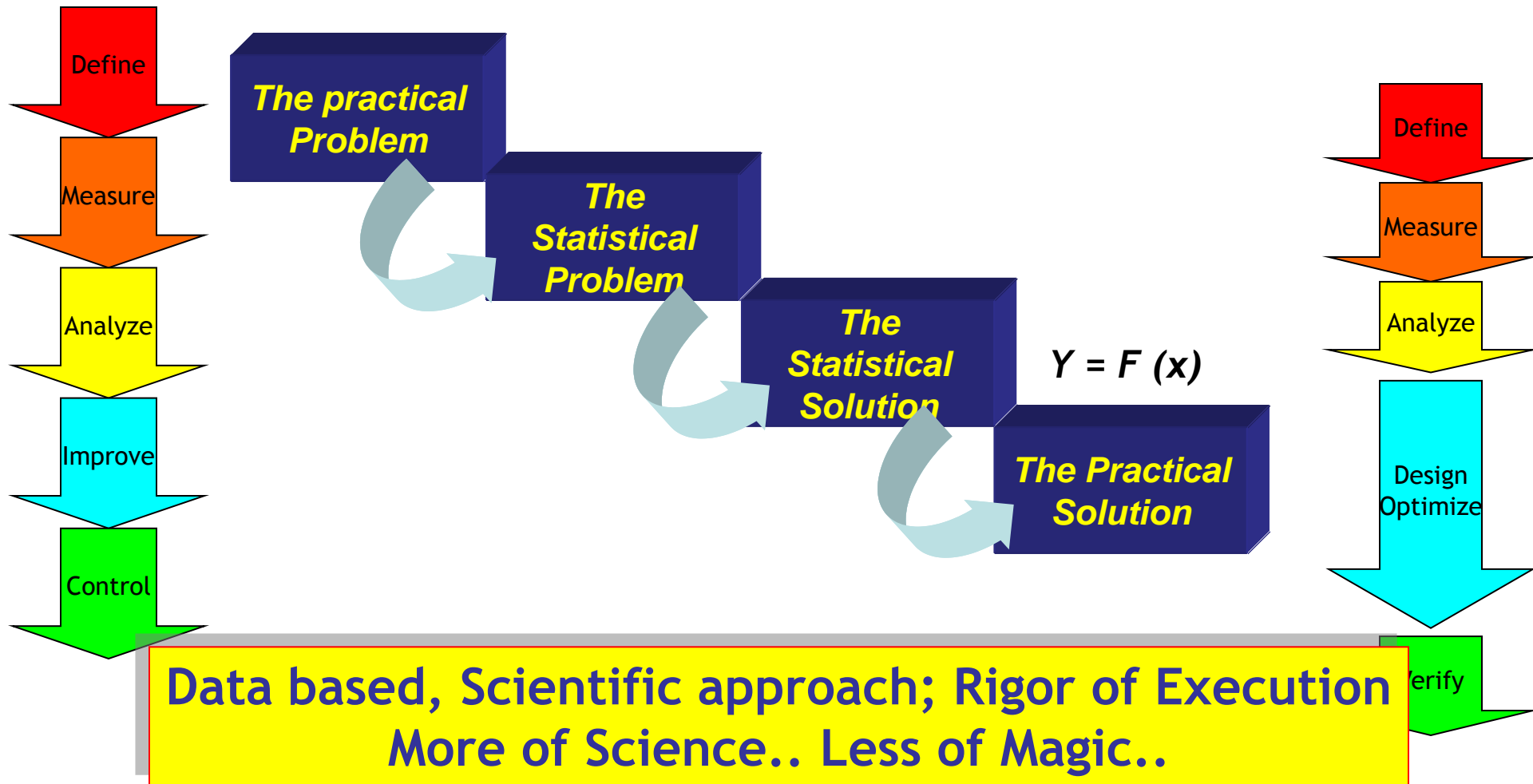
Cost

Quality

Time

Any Business or Customer Objective (I.e Y)
can be Defined in terms of Cost, Time or Quality

Achieving **All** Goals in **All** the types of Ys **At the Same Time** is the Challenge

Six Sigma Aims for Optimizing Multiple Objectives to their Relative Priorities

The Performance Triad

Project Concept of Six Sigma : DMAIC & DMADV Methodologies

Define
Measure
Analyze
Improve
Control

The practical Problem

The Statistical Problem

The Statistical Solution

$Y = F(x)$

The Practical Solution

Define
Measure
Analyze
Design Optimize
Verify

Data based, Scientific approach; Rigor of Execution More of Science.. Less of Magic..

When to use Which Six Sigma Methodology?

- DMAIC to improve existing processes or products
- DMAD(O)V to design new processes or products
- Combinations address transfer of processes & products
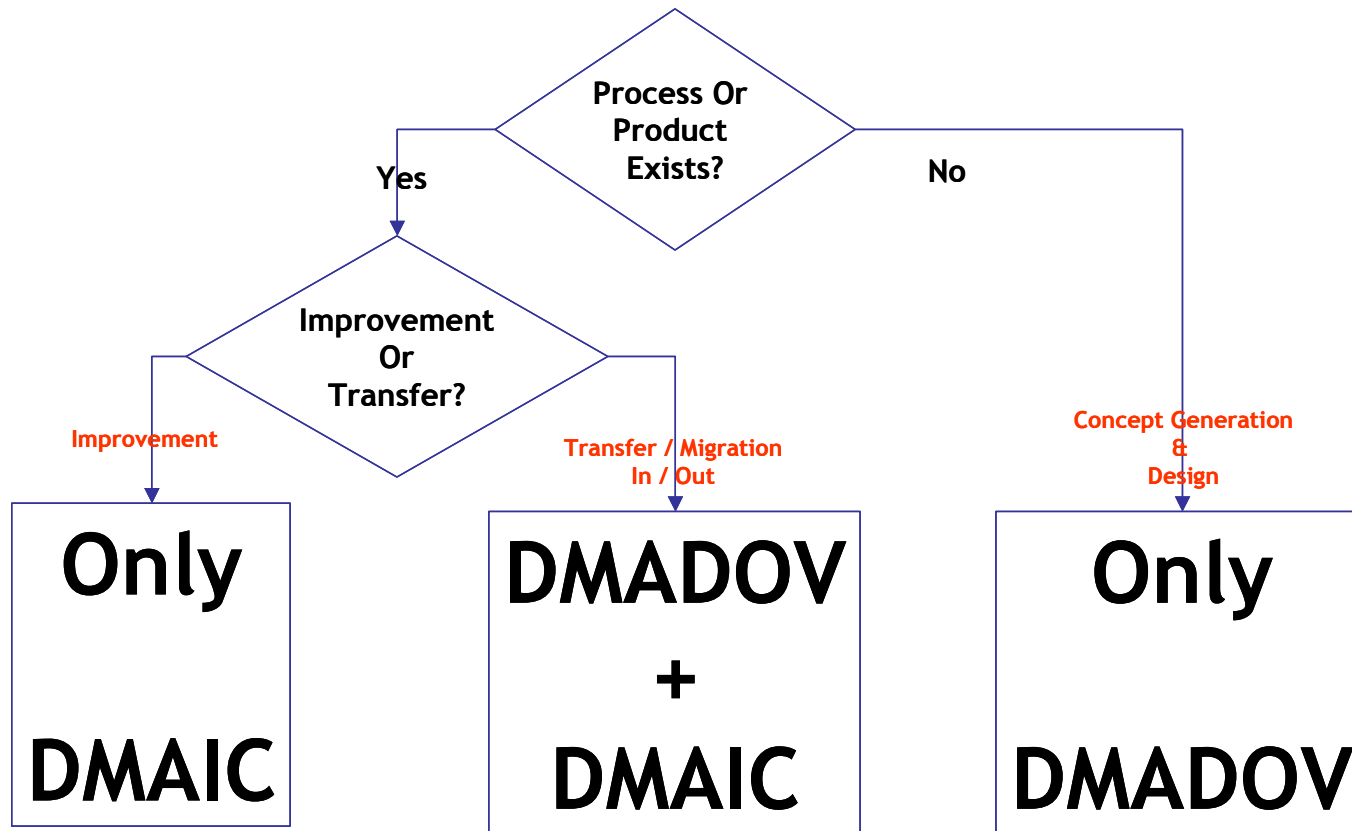
FOCUS ON THE PRODUCT/SERVICE AS WELL AS THE PROCESS THAT DELIVERS IT

Define

1. Sign Off Project Charter with Well defined Scope, Baseline, Goals

Measure

2. Collect Data & Baseline Performance in Statistical Terms

Analyze

3. Vital Few Factors Identified in Re-Segmented Problem Area
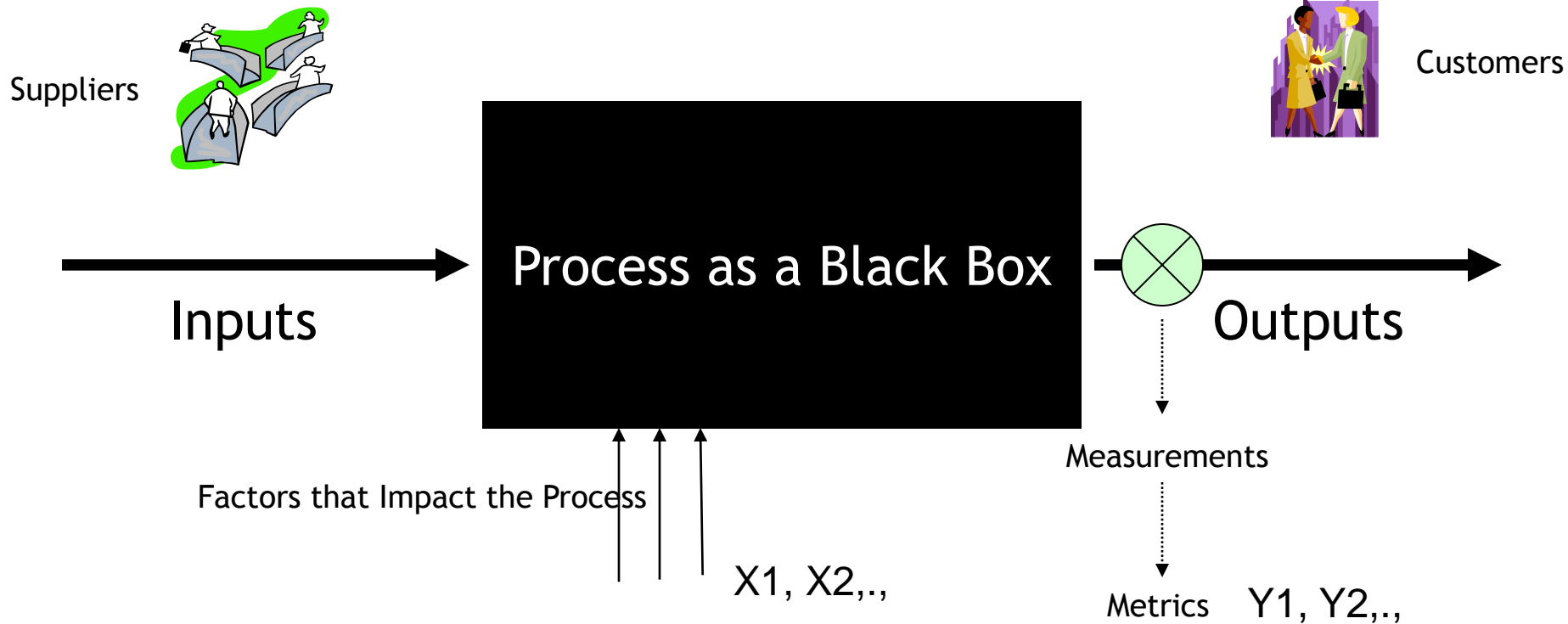
Improve

4. Generate & Prioritize a List of Improvement Ideas by Cost/Benefit
5. Implement ideas, Collect Post Improve data
6. Show proof of concept

Control

7. Collect Longer term data from Enterprise wide deployment
8. Proof of Sustenance

Closure

9. Management Control Systems in Place – Periodic reviews, IT etc.
10. Compute Financial Savings, Document Project, Approve Closure

Suppliers

Customers

Inputs

Process as a Black Box

Outputs

Factors that Impact the Process

X1, X2,.,

Measurements

Metrics   Y1, Y2,.,

$Y=F (x)$

Quality of the product/service is a function of the Quality of Processes Used to Develop/Deliver it

5 Types of Xs in Y = F (x) Analysis

Y Data   **Distribution of data**

- **Histograms**

Time   **Trends**

- **Run Charts**
- **Control Charts**

Segmentation analysis   **Category Xs**

- **Pie Charts**
- **Pivot Tables**
- **Box Plots**

Causal Analysis   **Boolean (1/0) Xs**

- **Pareto Charts**

Correlation Analysis   **Continuous Xs**

- **Scatter Plots**
- **Matrix Plots**
- **Bar Charts**

y = f (x): Process Example
Cycle Time to Hire Resources – Segmentation

$$Y = f(X_1, X_2, X_3, X_4, X_5, \dots)$$

Cycle Time

Segmentation Factors which impact cycle time to hire

Exp Level

Technology Domain

Source Company

Six Sigma Champions

Senior Management

Project Sponsors
"Have Pain - Want Gain"

Mentors Coaches

Master Black Belts

Middle Management

Identify & Lead Large Cross Functional Projects

Black Belts

Line Managers

Lead/Participate in Simpler, Less Complex Well Scoped/Defined Projects

Green Belts

Process Leads

Team Members

White/Yellow Belts

How to Deploy Six Sigma?

- **Senior Management**
  - Undergo Awareness Program / Champions Training
  - Ideate, Prioritize & Six Sigma Projects
    - Analyze Present Weaknesses/Threats in Biz Unit/Firm
    - Set KPI or Key Performance Indicators (quantifiable & measurable)
    - Link one or more Business Processes to each KPIs
    - Measure ASIS Baseline Present Performance & Set TOBE Targets
    - Select 'Project Areas' – when ASIS vs. TOBE gap is high
    - Establish ROI Goals based on Benefits Vs. Complexity*(See Project Selection)
  - Select Teams & Assign to Projects
  - Monitor Progress of teams

- **Project Teams**
  - Undergo Customized (to Industry, Functional Area) Training
  - Execute Projects : With Online Mentoring from Consultants
  - Complete Projects : Quantify Improvements & Benefits
  - Get Certified By Qualifying in an Examination
  - Institutionalize Learning & Leverage / Reuse Ideas

What Color must be My Belt?

The Width: i.e. number of six sigma tools & techniques required and

The Depth: i.e. detail/skill required in six sigma tools & techniques

Depends on

- – The methodology of Project (Improve with DMAIC or Design with DMADV),
- – The Objective (s) (Cost, Time, Quality or Combinations of these)
- – The Change management Complexity & The Scope

Hence teams are trained on typically 3 levels

Yellow   Belts   - **Fundamental** Knowledge, 20+ Tools & Techniques, Concepts & Methods
Can solve Problems of Low Complexity/Scope

Green   Belts   - **Deep** Knowledge *in particular methodology*, 60+ Tools & Techniques
Can solve Problems of Medium Complexity/Scope
Can lead a team of Yellow Belts

Black   Belts   - **Expertise** of Knowledge *in both methodologies*, 100+ & Techniques
Can Solve Problems of High Complexity/Scope
Can lead a team of Green/Yellow Belts

Who should attend What Course?

- ## Six Sigma Champions Program (1 day Class + 1 day Break-Out)
  - **Those who want to sponsor / lead Six Sigma Implementation in their firm/group**

  - CEO and his direct reports
  - Heads of Functional Groups & Business Units

- ## Six Sigma Yellow Belt Program : (2 Days Class)
  - **Those who plan be part of a six sigma Project**
  - **Those who plan to use the Power of Data Analysis Toolkit of Six Sigma**

  - Group/Project/Team Leaders engaged in Process/System improvements
  - Members of Quality Group

- ## Six Sigma Green Belt Program (4 Days Class)
  - **Those who would lead a semi-complex six sigma project**

  - Team Leaders of any functional / business group engaged in Process/Product Design

- ## Six Sigma Black Belt Program (10 days)
  - *Certified Green Belts*
  - **Who would now lead a Complex/Cross-Functional six sigma project**

  - Team Leaders of any functional / business group

How does Six Sigma Deliver$ Benefits?

- **Reduction of Variable Costs**   (Hard)
  - Reduction in rework/repair or Cost of Poor Quality (COPQ)
  - Reduction in checking / inspections / reviews or Cost of Quality (COQ)
  - Reduction in team size due to higher productivity or Cost of Production.

- **Reduction of Fixed Costs**   (Hard)
  - Reduction in office space due to better workflow design

- **Cash-flow Benefits**   (Soft)
  - Collecting receivables from customers on time

- **Cost Avoidance Benefits**   (Soft)
  - Avoiding penalties imposed by customer for delayed/bad quality deliverables.

- **Revenue Generation / Opportunity Benefits**   (Soft)
  - Faster 'Closure' of a deal in Sales Process.

- **Customer Benefits**   (Soft)
  - Lesser Customer Escalations
  - Faster Turn around to customer queries
  - Lesser Customer Complaints