Certified Lean Six Sigma Green Belt

Accredited by: Council of Six Sigma Certification, USA
Course by: Institute for Industrial Performance & Engagement

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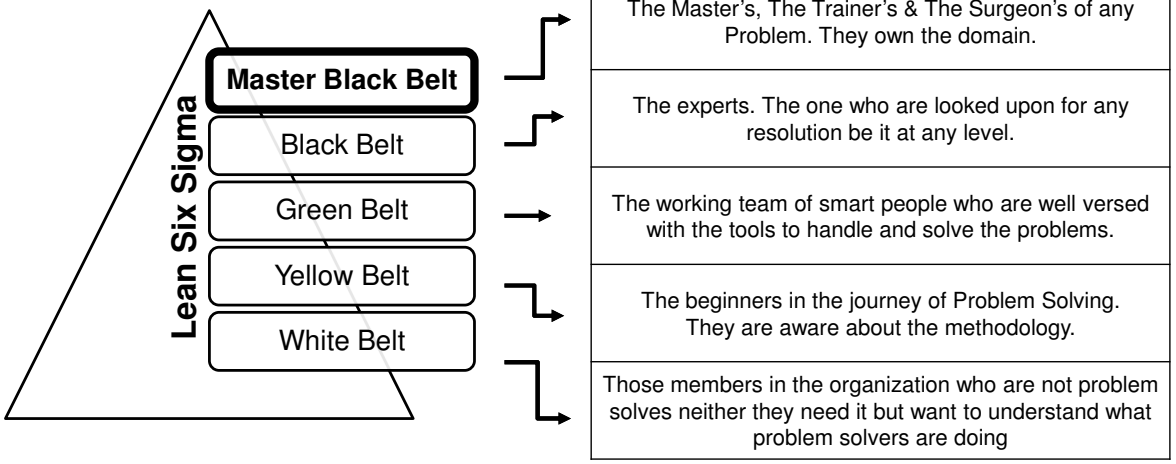
Let us start the journey

Lean Six Sigma

The level of expertise

Level of Expertise



Six Sigma Overview and Project Definition

Is 99% Good Enough?

99% Good (3.8 Sigma)		99.99966% Good (6 Sigma)
20k lost articles of mail per hour	⇨	Seven articles lost per hour
Unsafe drinking water for almost 15 minutes each day	⇨	One unsafe minute every seven months
5,000 incorrect surgical operations per week	⇨	1.7 incorrect surgical operations per week
Two short or long landings at most major airports each day	⇨	One short or long landing every five years
200,000 wrong drug prescriptions each year	⇨	68 wrong prescriptions per year
No electricity for almost seven hours each month	⇨	One hour without electricity every 34 years

What Is Six Sigma?

- Sigma (σ) is:
  - The 18th letter of the Greek alphabet
  - Sigma is the symbol for standard deviation
  - A measure of variation
- Six Sigma has a history and is:
  - A Vision
  - A Philosophy
  - A Management System
  - An Aggressive Goal
  - A Tool Box
  - A Vehicle for Customer Focus

Six Sigma is a comprehensive system.

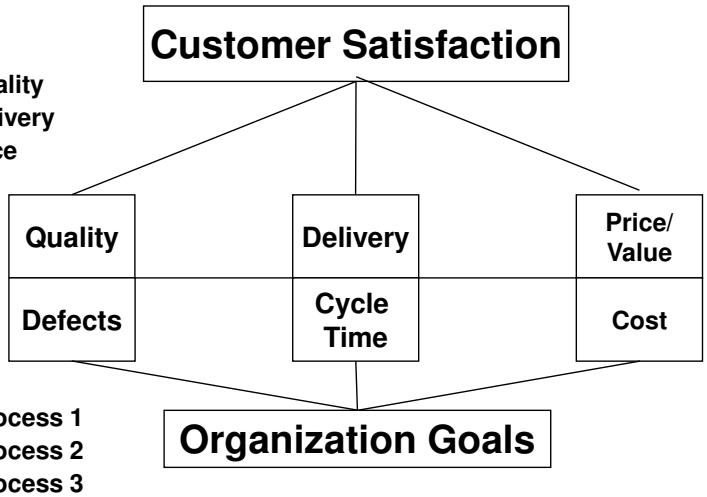
The History of Six Sigma

- 1987: Motorola Chief Executive declares Motorola will be at 6σ by 1992 (5-year goal)
- 1988: Original Six Sigma consortium is formed
  - ***Motorola, Raytheon, ABB, CDI, Kodak***
- 1989/1990: ***IBM, DEC*** try Six Sigma -- and fail
- 1993: Larry Bossidy of ***AlliedSignal*** embraces a new approach to Six Sigma: Dedicated Green Belts with a supporting infrastructure
- 1995: Jack Welch of ***General Electric*** adopts Six Sigma
- 1996/97: Six Sigma implementation begins enmass as companies observe the success of Allied and GE
  - ***Siebe, Bombardier, Whirlpool, Navistar, Gencorp, Lockheed Martin, Poloroid, Sony, Nokia, John Deere***
- 1997/98: Number of Six Sigma companies grows rapidly
  - ***Siemens, BBA, Seagate, Compaq, PACCAR, Toshiba, McKesson, AmEx****, ...*
- 1999: Starting to see exponential growth. ASQ begins offering Six Sigma training courses
  - ***Johnson & Johnson, Air Products, Maytag, Dow Chemical, Dupont, Honeywell, PraxAir, Ford, BMW, Johnston Controls, Samsung***
- 2000: **Onwards all progressive organizations across globe are Deploying Six Sigma**

Customer Satisfaction

Products

CTQ – Critical to Quality
CTD – Critical to Delivery
CTP – Critical to Price

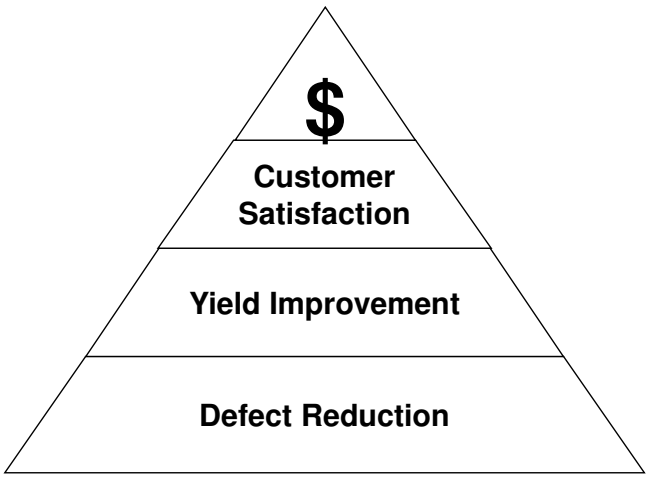


Processes

CTP_1 – Critical to Process 1
CTP_2 – Critical to Process 2
CTP_3 – Critical to Process 3

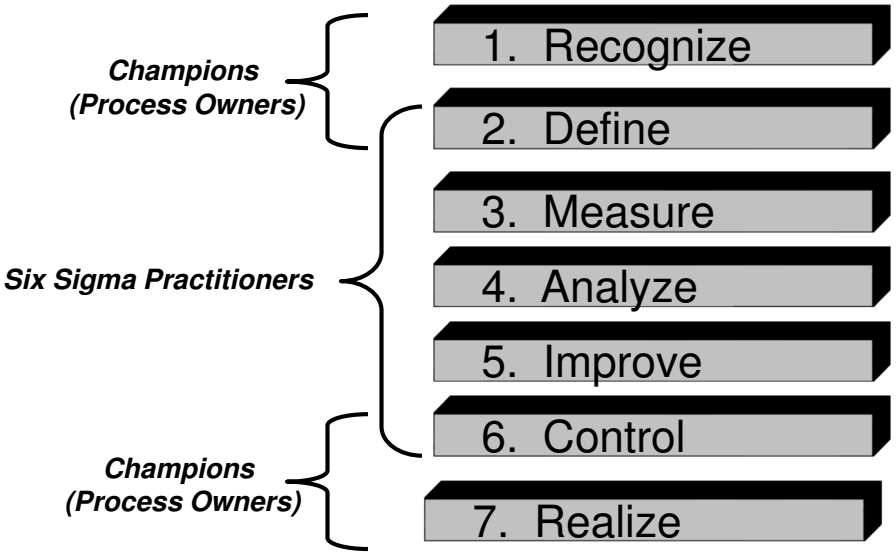
Find out what is critical to the customer.

The Goals of Six Sigma

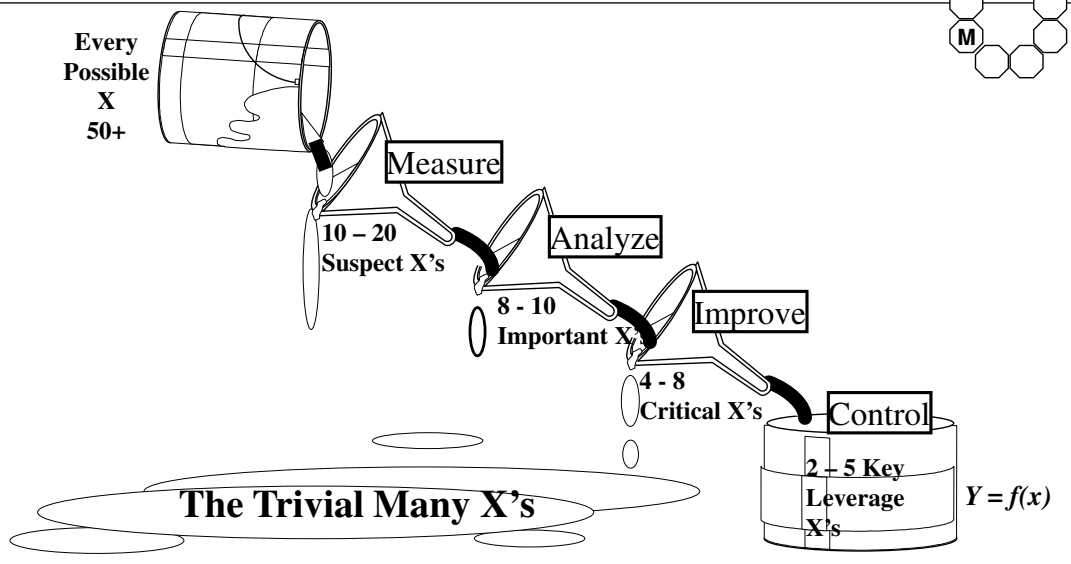


The bottom line: Higher net income

Six Sigma is a Methodology

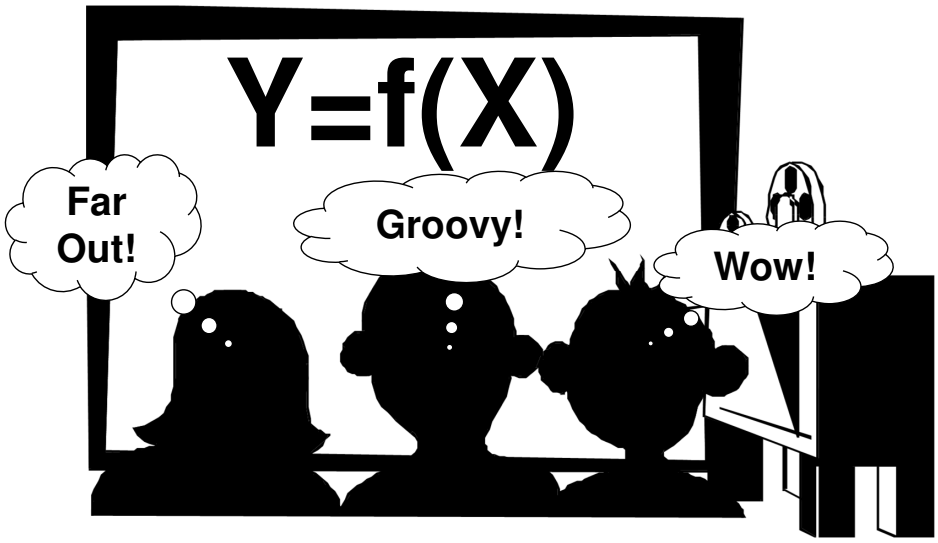


The Six Sigma Methodology - MAIC



85% of all process variation is controlled by 2 -5 variables

Focus Of Six Sigma



Six Sigma Magic: Y=f(X)

- Common Sense:
  - The output is a function of the inputs.
- The Magic:
  - Which inputs are significant?
  - What is the relationship between the output (Y) and the inputs (X's)?
- Six Sigma Process:
  - Establishes this relationship to be used for optimization and improvement

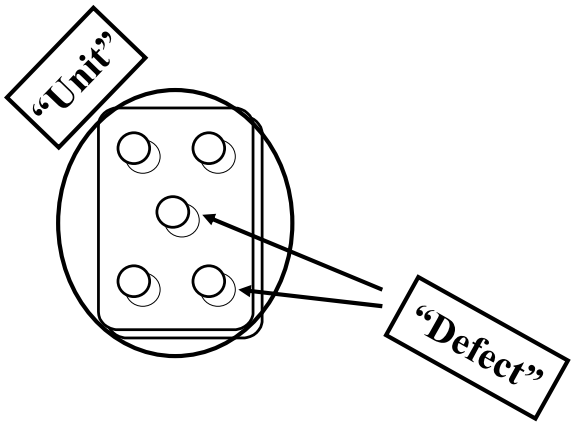
Project Metrics Are Key

- **Metrics are essential for:**
  - **Determining project priorities**
  - **Establishing product and process baselines**
  - **Tracking/reporting process improvements**

- **Six Sigma metrics:**
  - **DPU (defects per unit)**
  - **RTY (rolled throughput yield)**
  - **DPMO (defects per million opportunities)**
  - **Sigma level (and z-score)**

Defects Vs. Defectives

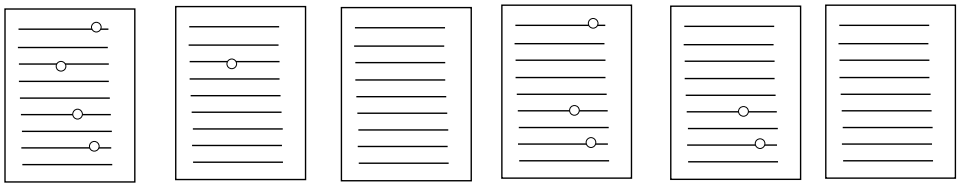
- Defective
  - A unit containing at least one defect.
- Defect
  - Any single non-conformance on a unit.
- The single defective unit shown here has 3 individual defects.



= nonconformance to standard (defect)

Defect Vs. Defective

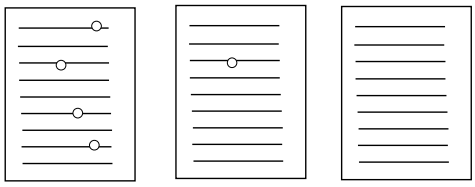
Certificates



How many defects? How many defectives?

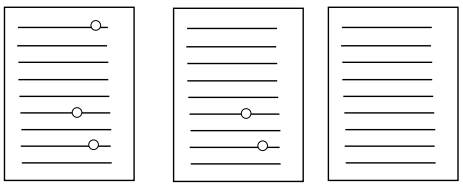
Classical Yield, % Defective, DPU

- ***What's the "Yield"?***
- ***% Defective?***
- ***Defects / Unit (dpu)***

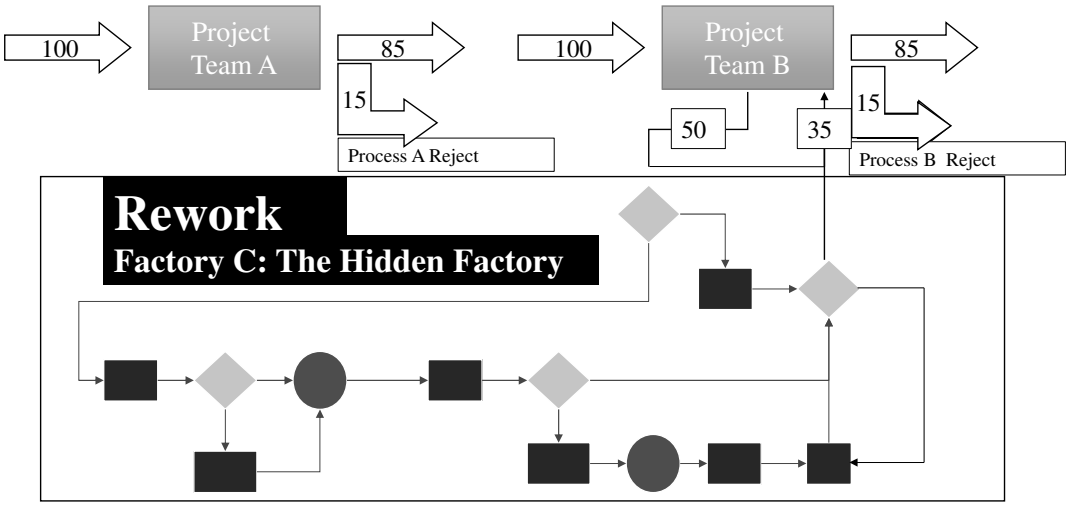


$$\%\text{Defective} = 1 - \text{Yield}$$

$$\text{Defects per unit} = \frac{\text{Total Defects}}{\text{Total Units}}$$



Classical Yield



Common Process Metrics

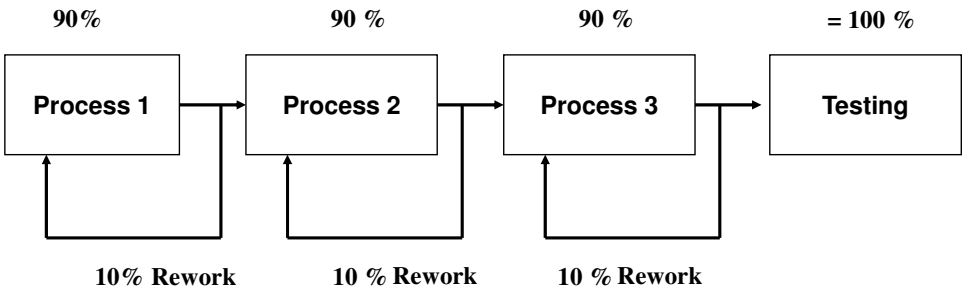
- IPY_{OLD} -- in-process yield
  - Many organizations count only defective units

$$\text{IPY} = \frac{\text{Units shipped to next process}}{\text{Units started in this process}}$$

  - Or sometimes they may account for rework

$$\text{IPY} = \frac{\text{Units processed without any defects}}{\text{Units started in this process}}$$

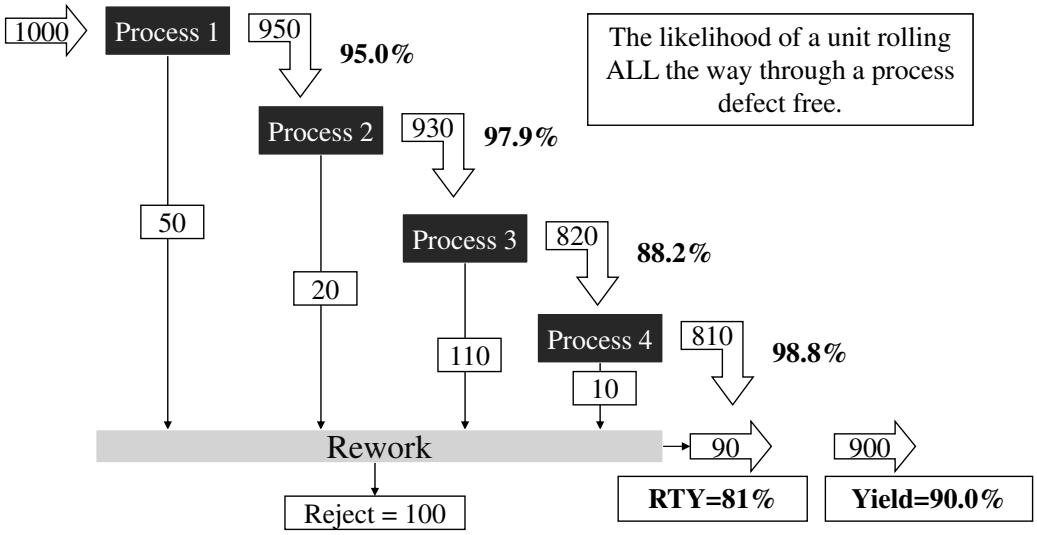
Rolled Throughput Yield



Yield of the process = No rejection has occurred = 100 %

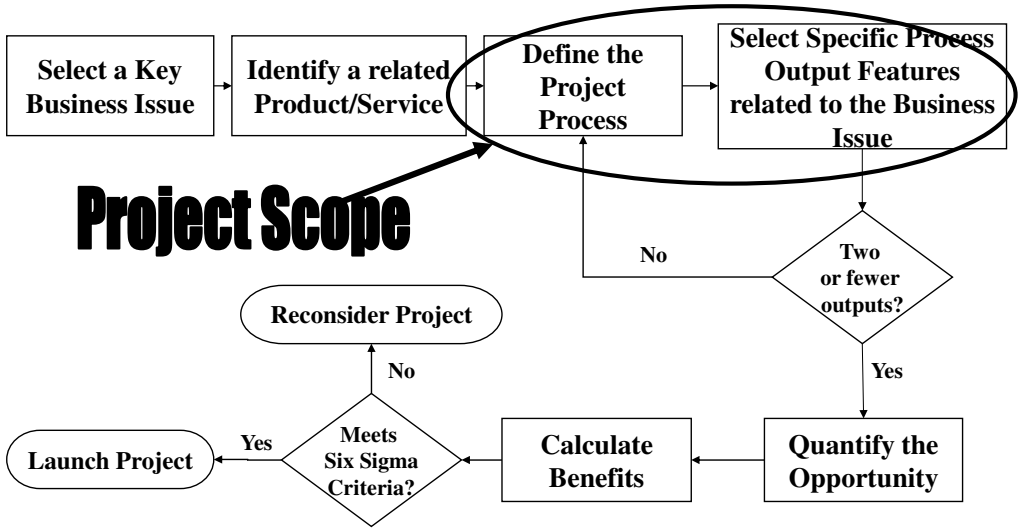
Rolled Throughput Yield of the process = .9 X.9 X .9 = 72.9 %

Rolled Throughput Yield



The likelihood of a unit rolling ALL the way through a process defect free.

Green Belt Project Definition



Six Sigma Problem Statements

- A problem statement has the form:

  "**WHAT** is wrong

  WHERE it happened

  WHEN it occurred

  TO WHAT EXTENT and

  I KNOW THAT BECAUSE…"

- A problem statement:
  - Does not include causes of the deficiency.
  - Does not include likely actions or solutions.
  - Is clear and concise and specific.

What is Wrong and Where Does it Happen?

- A good problem statement will clearly define **WHAT** is wrong. Examples:
  - "Customers are not satisfied with my ordering service…"
  - "Equipment availability is poor…"
  - "Document correctness is insufficient…"

- A good problem statement will clearly define **WHERE** the problem occurs. Examples:
  - "Customers ***in the Midwest Region*** are not satisfied with my ordering service…"
  - "Equipment availability ***for Urgent Care*** is poor…"
  - "Document correctness is insufficient ***in Billing***…"

When Was This Seen?

- A good problem statement will clearly explain **WHEN** the problem occurred.
  - "Customers in the Midwest Region are not satisfied with my ordering service. ***Starting in January***…"
  - "Equipment availability for Urgent Care is poor. ***Since the consolidation of services…"***
  - "Document correctness is insufficient in Billing ***after the introduction of flexi-forms"***

How Widespread is the Problem?

- A good problem statement will clearly explain the **EXTENT** of the problem.
  - "Customers in the Midwest Region are not satisfied with my ordering service. Starting in January, ***complaints have increased 15%…"***
  - "Equipment availability for Urgent Care is poor. Since the consolidation of services, delays caused by lack of availability ***have increased by 40%…"***
  - "Document correctness is insufficient in Billing after the introduction of flexi-forms. ***Errors have increased 28%…"***

What is the Standard?

- A good problem statement will clearly explain **HOW I KNOW** there is a problem. Examples:
  - "Customers in the Midwest Region are not satisfied with my ordering service. Starting in January, complaints have increased 15% ***at a time when complaint rates from other regions have remained static"***
  - "Equipment availability for Urgent Care is poor. Since the consolidation of services, delays caused by lack of availability have increased by 40% ***when the patient traffic has increased by only 5%"***
  - "Document correctness is insufficient in Billing after the introduction of flexi-forms. Errors have increased by 28% ***when the goal of the project was to reduce errors by 90%"***

Defining Project Metrics

- Baseline
  - Average of last 6-12 months
- Entitlement:
  - Entitlement is the best, potential performance of a process based on the process design
  - Practically, entitlement can be estimated by:
    - The best, short-term observation of the process
    - The best, short-term observation of a similar process
    - The performance after subtracting special-cause variation

Six Sigma Teams

- The purposes of Teams:
  - Large pool of process knowledge
  - Work distribution
  - Ease of communication
  - Incremental buy-in by the major players
  - Dissemination of the Six Sigma culture
- The problem solution will come from the team.
  Choose the members wisely.
- A Green Belt who works his project alone does his organization and himself a great disservice.

Team Selection

- Process Expert: The magician
- Process Owner: The department head
- Process Leader: Operations supervisor
- Process Do-er: Operator or implementer
- Project Leader: Green/Black Belt
- IT/IS Expert: Information systems representation

AND

- Supporters: Individuals external to the process but must buy-in to the solution in order for the project to be successful