



Welcome !

To the *Bryant University*
Six Sigma / PMBOK
Overview

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Six Sigma

Overview of Six Sigma Methodology



What is Six Sigma?

- A Structured Problem-Solving Approach
 - Phased Projects
 - Define-Measure-Analyze-Improve-Control
- A Program
 - Champions
 - Trained Black Belts / Green Belts
 - Teams- Process Participants & Owners



What is Six Sigma?

- A Philosophy
 - Customer Critical To Quality (CTQ) Criteria
 - Breakthrough Improvements
 - Fast-driven, Measurement-based, Statistically Analyzed Prioritization
 - Controlling the Input and Process Variations Yields a Predictable Product
- A Quality Level
 - Six Sigma = 3.4 defects per Million Opportunities

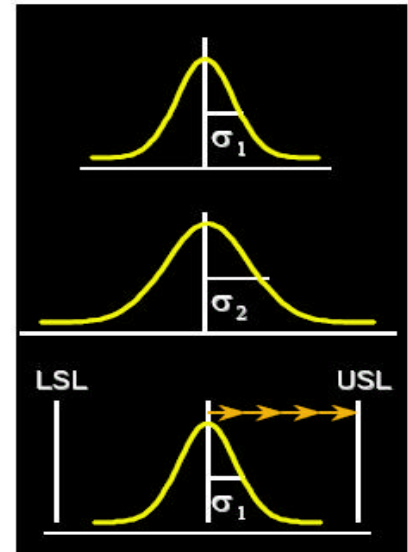


WHAT IS A SIGMA?

- A sigma value is a metric commonly used to relate the ability of a process to perform defect free work.
- The higher the sigma value the better the process is performing and the lower the probability that a defect will occur.
- As the sigma value of a process increases,
 - Costs decrease
 - Defects decrease
 - Cycle time decreases

What is a Sigma (σ)?

- A Sigma is:
 - The value of the process standard deviation for a given characteristic. This quantity is used to quantify the spread (around a mean) of some process or product characteristic.

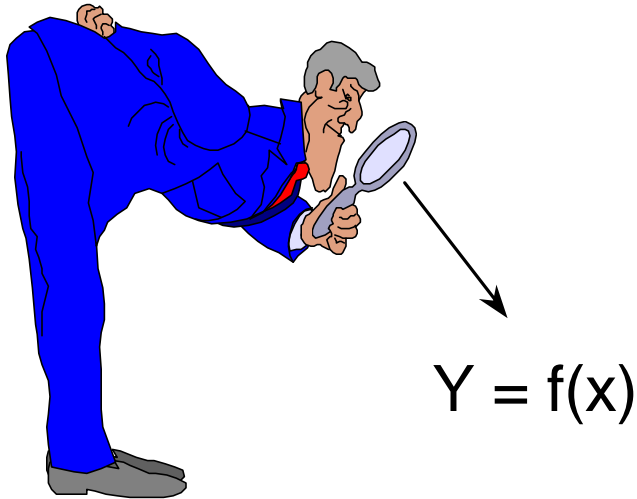




Six Sigma Process Capability

SIGMA	DPMO	COPQ	CAPABILITY
6 sigma	3.4	<10% of sales	World Class
5 sigma	230	10 to 15% of sales	
4 sigma	6200	15 to 20% of sales	Industry average
3 sigma	67,000	20 to 30% of sales	
2 sigma	310,000	30 to 40% of sales	Noncompetitive
1 sigma	700,000		

The Focus of Six Sigma.....



$$Y = f(x)$$

All critical characteristics (Y) are driven by factors (x) which are “upstream” from the results....

Attempting to manage results (Y) only causes increased costs due to rework, test and inspection...

Understanding and controlling the causative factors (x) is the real key to high quality at low cost...



Critical Elements For Success

- Executive involvement
- Benefits from each project verified by finance
- Reward system aligned to project success
- Formal executive level status reports
- Public recognition for successful projects
- Well-defined deployment plan linked to business strategy

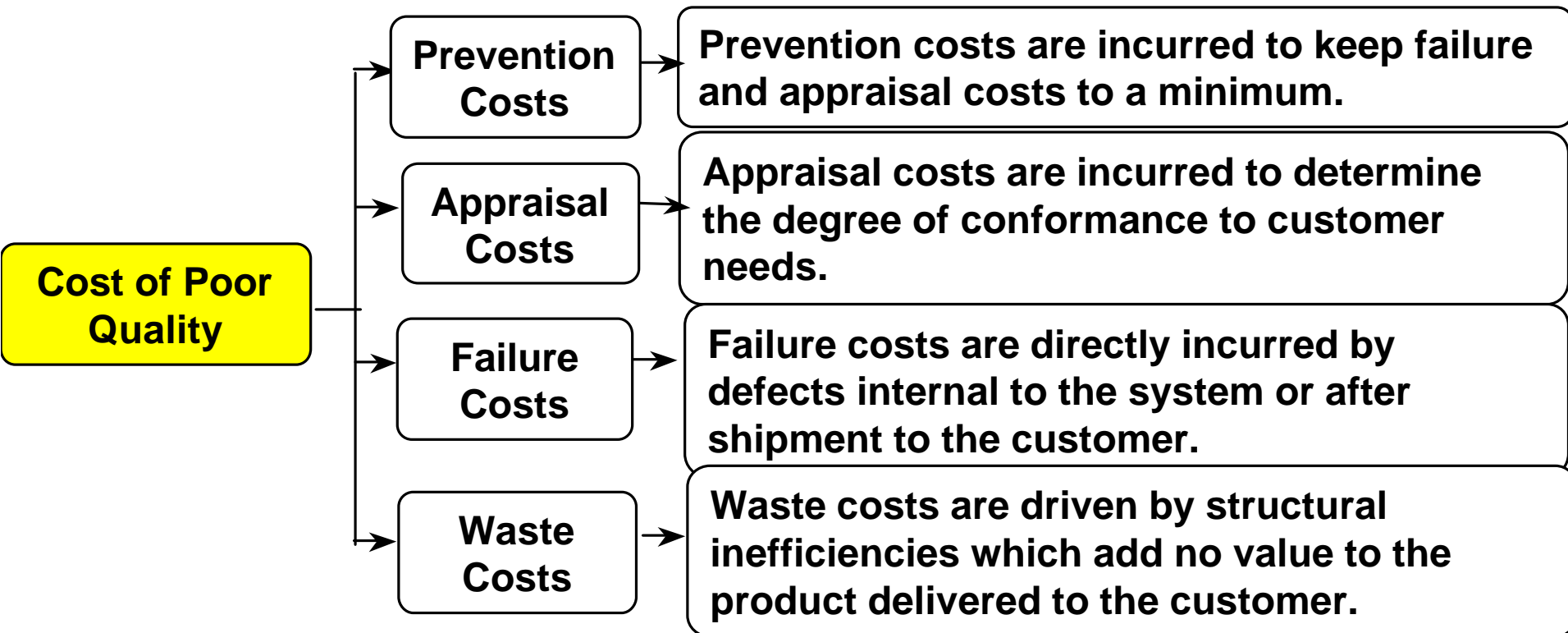


Why is Six Sigma Different

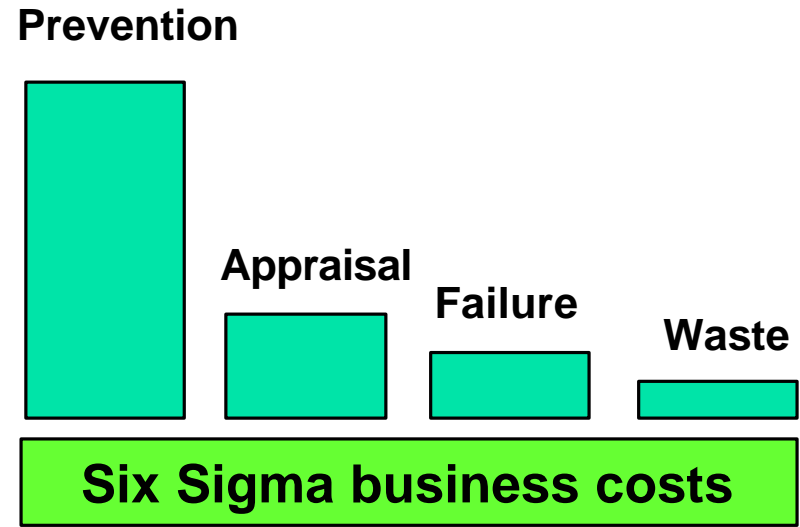
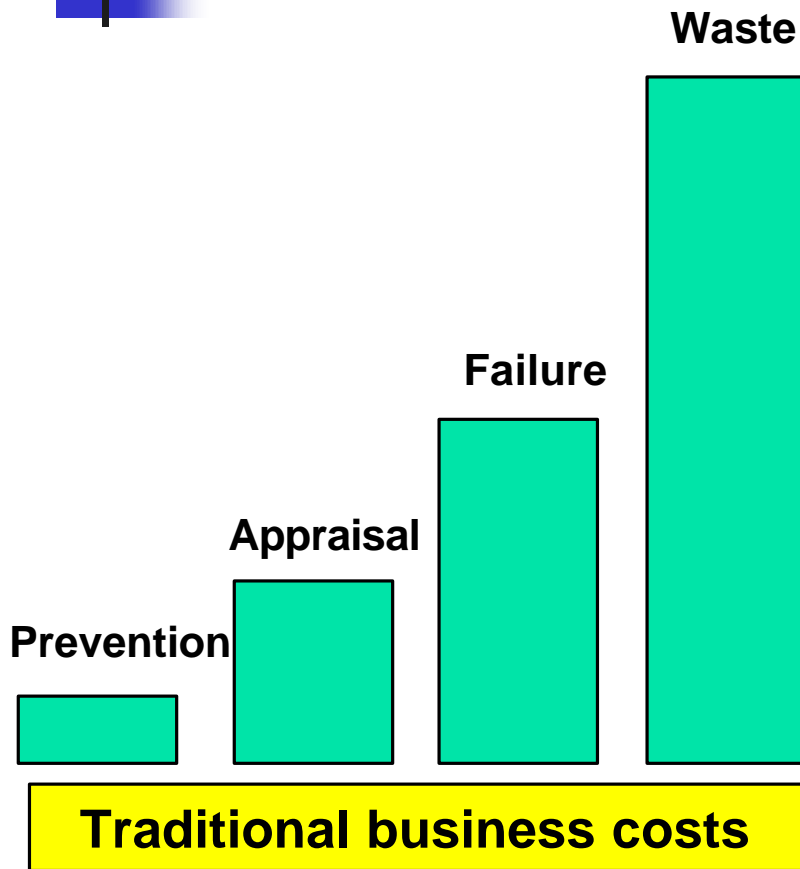
- Executive management leads the Six sigma effort
- Project results are tied directly to financial performance
- Applied throughout the organization not just in operations
- Promotes organizational cooperation

COST OF POOR QUALITY (COPOQ)

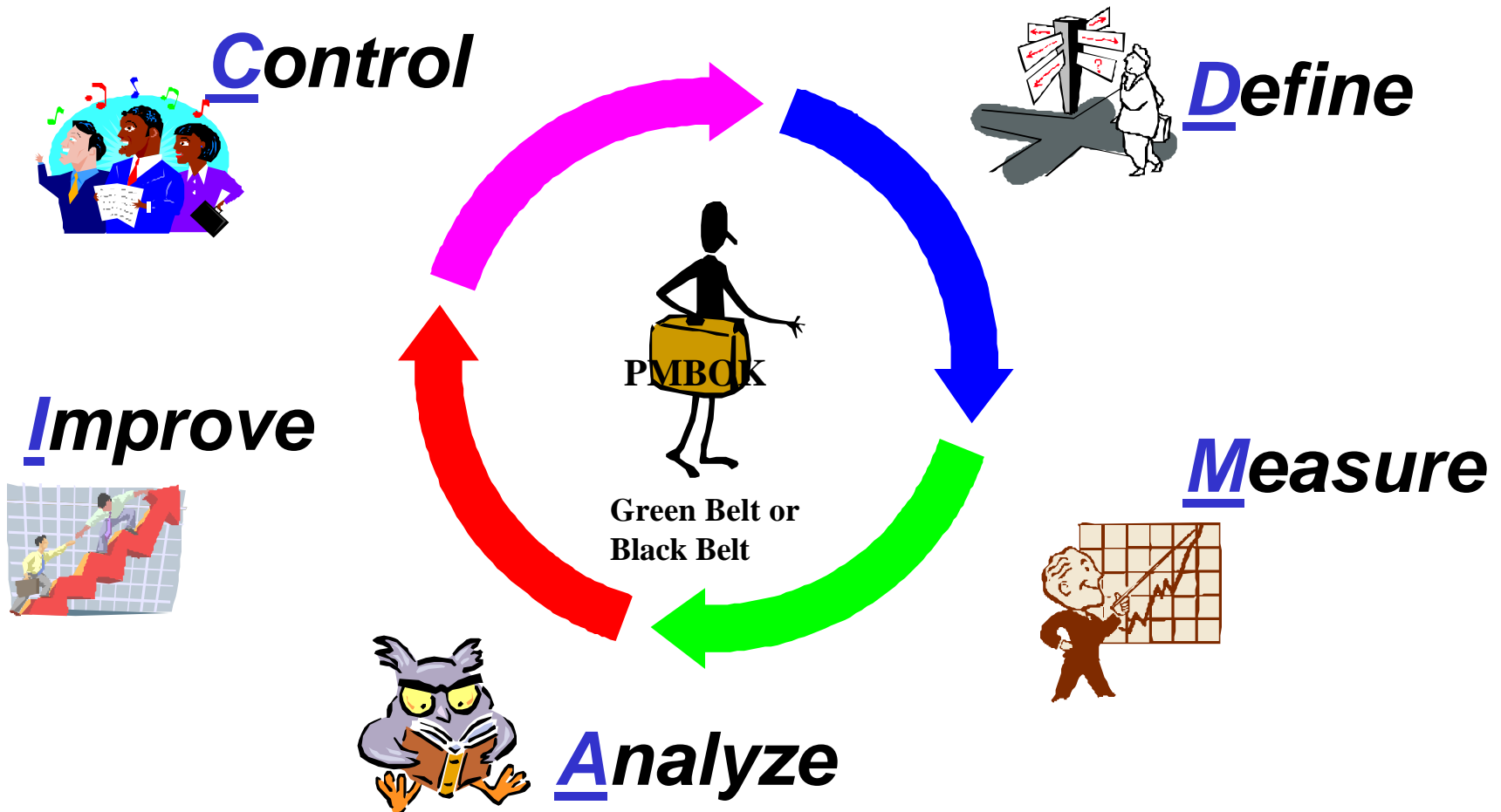
Costs incurred due to any situation in which there is not 100% confidence that product or process quality is perfect all the time.



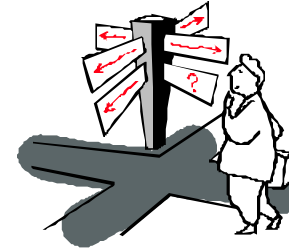
Typical business expenditure



Six Sigma DMAIC Project Life Cycle Relationship To PMBOK



Step One - Define



- **Objectives**

- Project's purpose and scope defined

- **Outputs**

- Clear statement of intended improvement (the business case and team charter)
- A high level map of the process (S-I-P-O-C)
- A list of what is important to the customer(s)

this solid definition links to the next phase 



Step Two - Measure




- **Objectives**

- Focus the improvement effort by gathering information on the current situation.

- **Outputs**

- Baseline data on current process performance.
- Data that pinpoints problem location or occurrence.
- A more focused problem statement.

*these outputs will provide the basis for
the next phase* 

Step Three - Analyze



- **Objectives**

- Identify root cause(s) and confirm them with data.

- **Outputs**

- Theory that has been tested and confirmed

the verified cause(s) will form the basis for solutions in the next phase →

Step Four - Improve

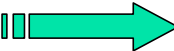


- **Objectives**

- Try out and implement solutions that address root causes

- **Outputs**

- Planned, tested actions that should eliminate or reduce the impact of the identified root causes.

*a plan is created for how results will be executed
in the next phase* 

Step Five - Control



■ Objectives

- Evaluate the solutions and the plan.
- Maintain the gains by standardizing the process.
- Outline steps for on-going improvements.

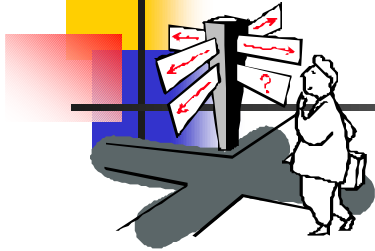
■ Outputs

- Before and after analysis.
- A monitoring system.
- Completed documentation of results, learnings, and recommendations.

completed project →

Six Sigma Tool Summary

Define



- SIPOC (Supplier-Input-Process-Output-Customer)
- Problem/Opportunity ID Techniques
- Prioritization Matrix
- Problem Statement
- Stakeholder Analysis

Measure



- Data Types and Measures
- Cost of Poor Quality
- Gage R & R (Reproducibility and Repeatability)
- Process Capability (Before

Analyze



- CSM (Characteristic Selection Matrix)
- Pareto Analysis
- Cause and Effect Diagram
- Hypothesis Testing
- Regression Analysis
- Correlation

Improve



- Countermeasure Matrix
- FMEA
- DOE
- Process Capability(After)
- Hypothesis Testing
- Implementation Planning

Control



- Control Plan
- Poka Yoke (Mistake Proofing) Considerations
- Control Charts



An Example

Six Sigma Project: Engineering Changes

Define: Large number of changes from client after approving engineering design. Schedule slipping.

Measure: Number of changes, time involved in changes, compliance to critical path schedule.

Analyze: No clear authority on client team to establish scope, any of client team could make changes, verbal communication of changes, conflicting changes by client team members. Language issues between client and engineers.

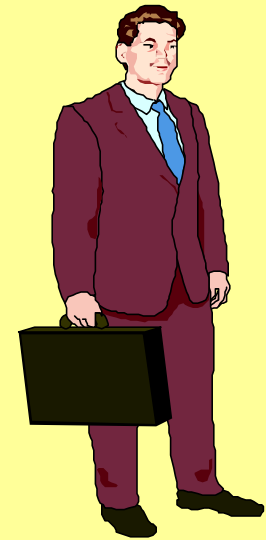
Improve: Regular engineering/client meetings where topics include: scope for each section and desired objective, known limitations defined, unclear requirements were questioned and options discussed. Written plan signed by client representative and engineering lead. Change requests in writing and signed by client representative. Changes decrease by factor of 4.7 and schedule met.

Control: Change requests all in writing. Shared approach with other disciplines on project.

ROLE OF CHAMPIONS

- Project Sponsor

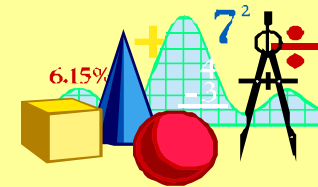
- **Create the vision**
- **Select meaningful business impact projects**
- **Ensure adequate resources are available**
- **Support and mentor the black belt / green belt**
- **Sustain the gains**



ROLE OF THE BLACK BELT

- Wide Area Project Manager

- Use the tools to quickly and efficiently drive improvement.
- Mentor and train Green Belts
- Share recognition with team members.
- Work with Champion to define additional opportunities for Improvement projects.
- Work with Champion to resolve any resource or implementation issues
- Keep Champion apprised of project(s) status and issues
- Help the team learn and understand the six sigma tools and techniques





ROLE OF GREEN BELT

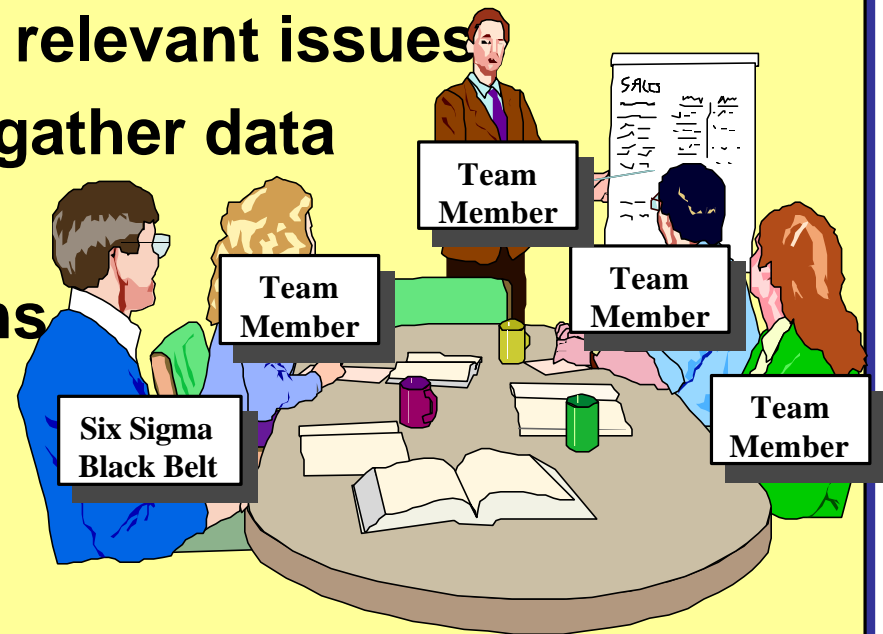
- Local Area Project Manager

- **Work on local business Six Sigma activities**
- **Use the tools to quickly and efficiently to drive improvement**
- **Utilize blackbelt/master blackbelt resources to assist in project(s)**
- **Share recognition with team members**
- **Work with Champion to resolve any resource or implementation issues**
- **Keep Champion apprised of project(s) status and issues**
- **Help the team learn and understand the Six Sigma tools and techniques**

ROLE OF TEAMS

- SMEs (Project Team)

- Learn the six sigma tools and methods
- Keep Belt informed on any relevant issues
- Conduct experiments and gather data
- Design solutions
- Analyze and solve problems





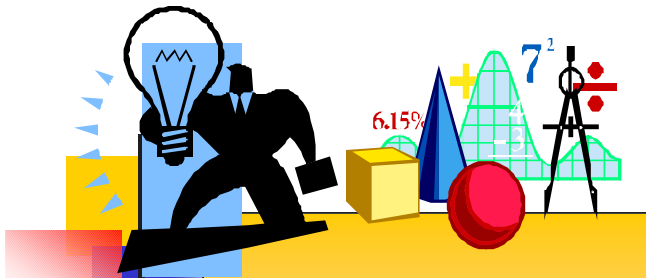
Why adopt Six Sigma?

- Six Sigma is the latest name for a comprehensive set of philosophies, tools, methods, that has been around for 16 years.
- It has shown the most endurance and return on investment of any such “program” to date.
- As your organization moves toward providing services at a “six sigma” level:
 - Defects are dramatically reduced
 - Customer Satisfaction is dramatically improved
 - Profit margin is dramatically improved
 - Employees will see a clear career path



What are the challenges of adopting Six Sigma?

- Culture change is slow and difficult.
- It is not a quick fix.
- Consultants can't make it happen.
- Reliability of data.
- People must not fear giving “bad news”
- Training is critical – especially management level.
- Takes careful preparation and a commitment to the foundational change efforts required.
- Lack of discipline and accountability.

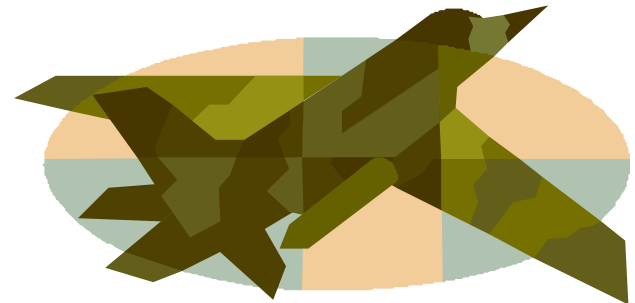
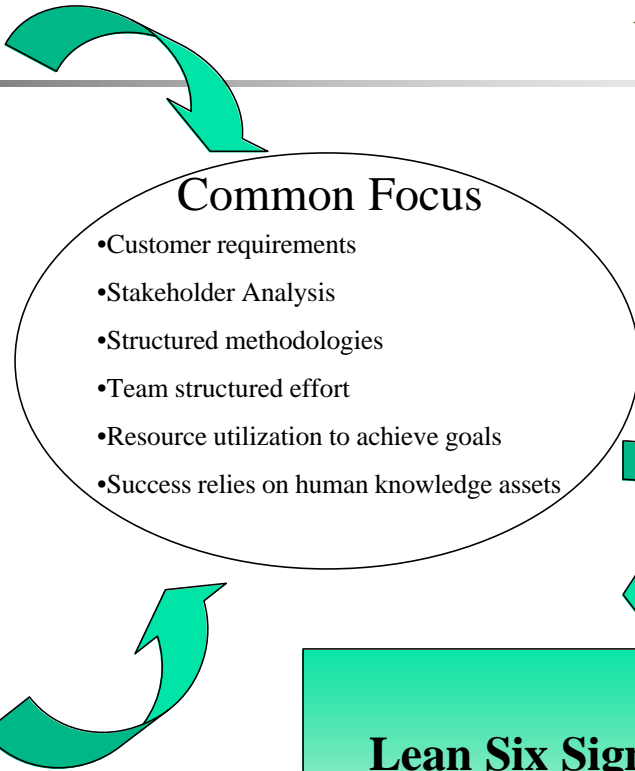
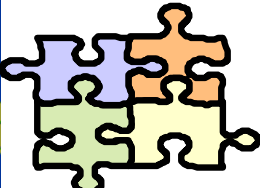


LEAN SIX SIGMA
DMAIC Problem Solving Process

- Remove Waste
- Remove Defects
- Increase Process Capability

PMBOK Project Management Methodology

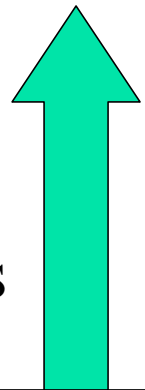
- Plan an initiative
- Integrate and coordinate plan activities
- Insure focus to project objectives:
 - Quality
 - Cost (Budget)
 - Schedule (Timing)



The Result:

A powerful organization weapon integrating LSS and PMBOK tools and techniques

Merge and Integrate LSS and PMBOK



Lean Six Sigma / PMBOK Synergies

Use PMBOK to guide Lean SIX Sigma (DMAIC) project

Use Lean Six Sigma to improve PMBOK processes as applied to various projects