Lean Six Sigma Training

Employee Training

Key Outcomes

- Build awareness of Lean Six Sigma (L6S) at the NSSC
- Gain an understanding of why L6S is critical to the NSSC's success
- Gain an understanding of the concepts and methodology of L6S

Why L6S?

- NSSC vision is to deliver unparalleled service. The Senior Team identified opportunity to use disciplined approach to help drive and sustain excellence.

Key Criteria

- Provide a common methodology for process improvement
- Be scalable and flexible
- Tailored to NSSC environment
- Have strong focus on quality
- Easily integrated into NSSC

- In 2009, NSSC Committee established to research various continuous improvement approaches.

- The team concluded that L6S was the “best fit” solution for the NSSC.

Lean Six Sigma Positioning in Process Life Cycle

Process Stability

- Achieve Predictable Results
- Sustain Performance Over Time
- Implement Risk Management

Process Management

- Measure Appropriate KPI's aligned to Customer Requirements
- Develop Dashboards and Monitoring Plan
- Align Roles and Responsibilities

Process Improvement

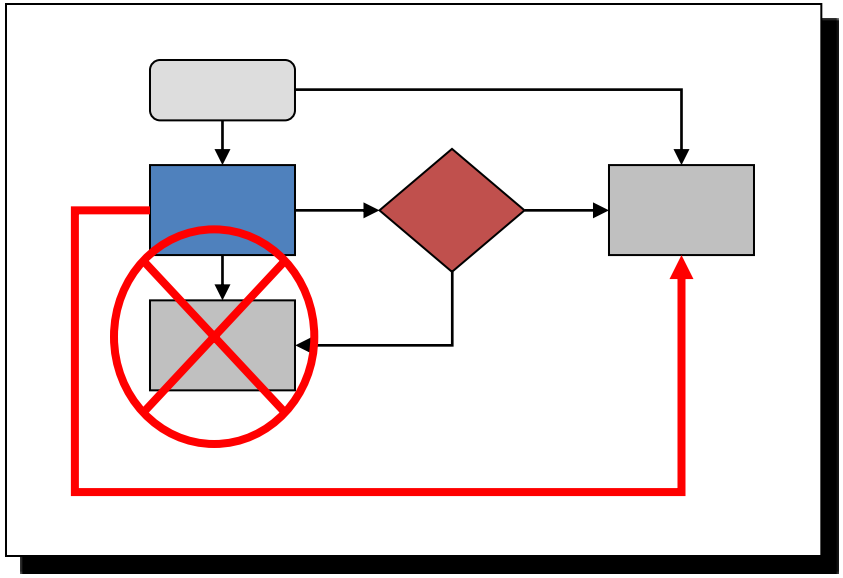
- Improve Process Performance
- Eliminate Defects, Reduce Variation and remove Non-Value Activities
- Drive Efficiency & Effectiveness

Lean Six Sigma Objectives

- Satisfy customers effectively and efficiently
  - Remove wasteful / non-value added activities
  - Decrease defects (errors) and improve cycle time
- Improve performance through the use of a common methodology, teamwork and communication
- Link organization initiatives to NSSC vision
- Develop and empower employees

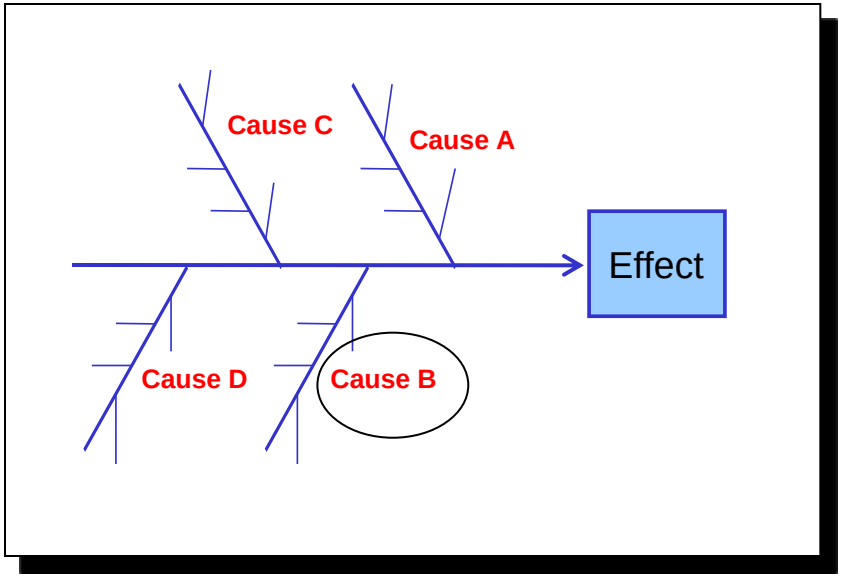
Improvement Techniques – Lean and Six Sigma

Lean



Efficiency
Improvement

Six Sigma

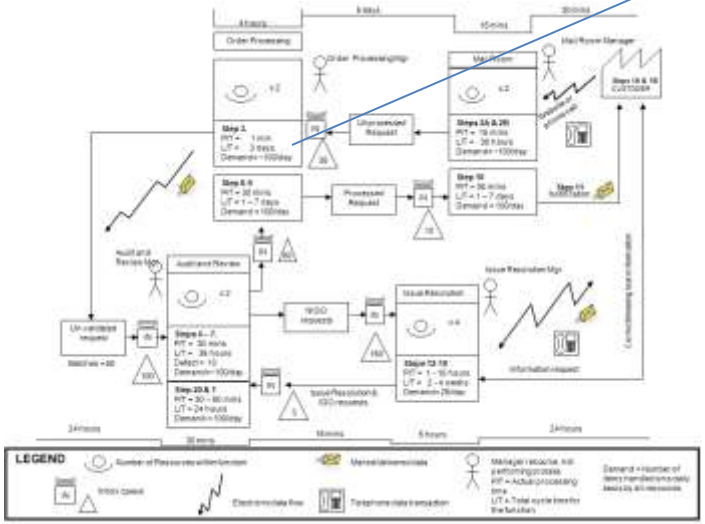


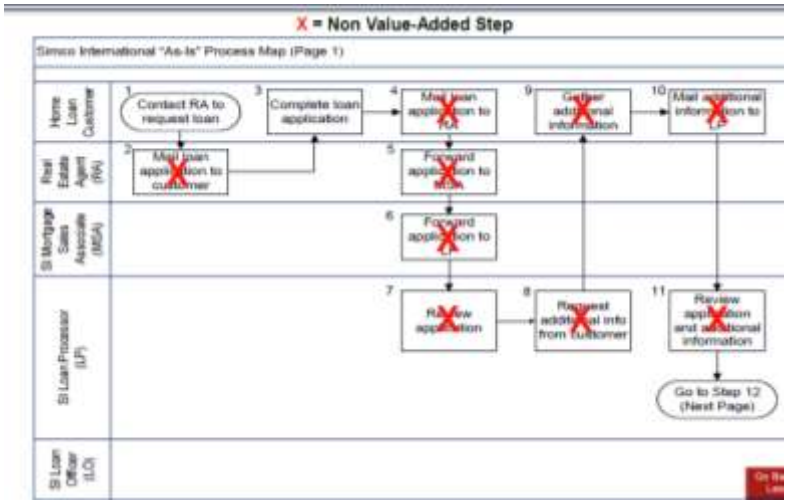
Quality and Efficiency
Improvement

Combining Lean and Six Sigma is <u>Best in Class</u>

Lean Six Sigma Focuses on Reducing Waste

- It is estimated that 80% of steps involved in a process are not adding value to the product or service
- Understanding the process and the ‘Critical Path’ reveals areas of opportunity
- Complicated and unclear processes hide costs and true drivers of cycle time issues





Lean Six Sigma Focuses on Reducing Waste

The aim is to **eliminate waste** …..

- Rework
- Waiting
- Reviewing
- Defects
- Overproduction

In every area including:

- Customer service
- Process design
- Office management

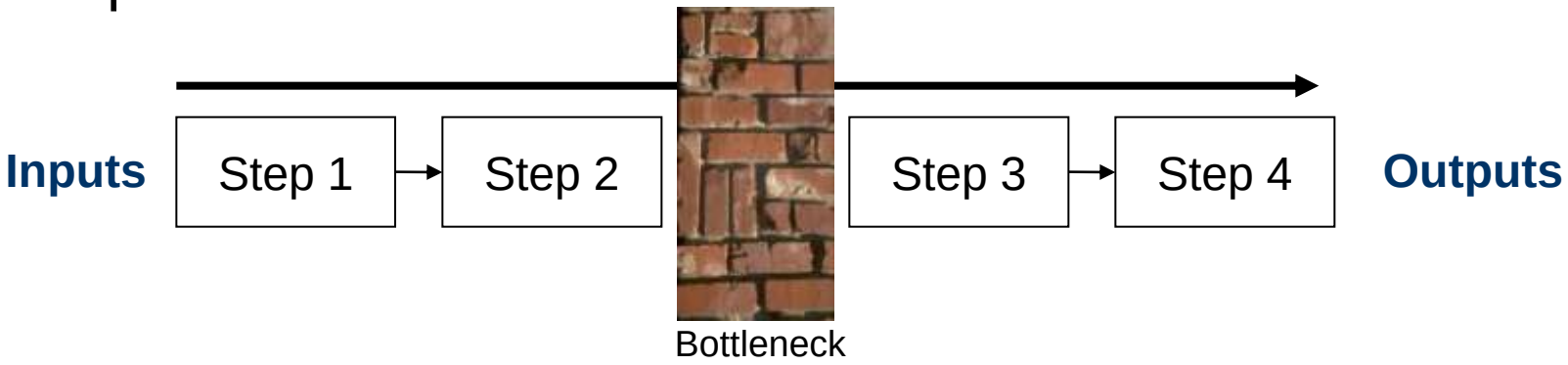
Its goal is to **incorporate:**

- Less human effort
- Less backlog
- Less time to develop processes and deliver services
- The most efficient and economical process needed to deliver top quality services

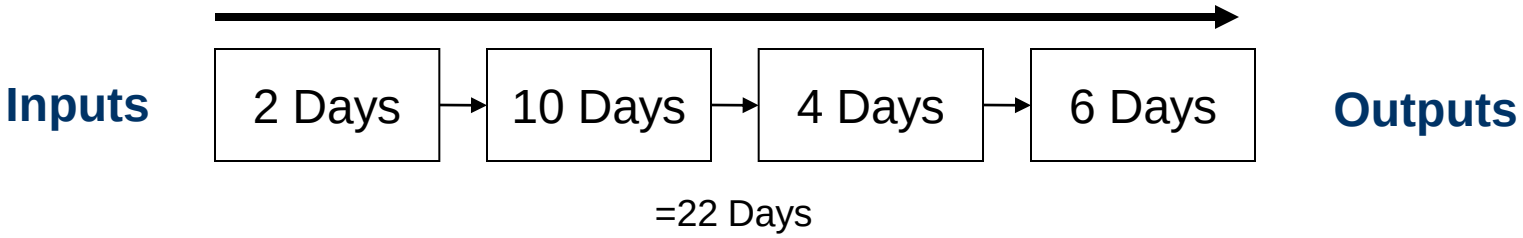
Lean Six Sigma Focuses on Process Flow

L6S is utilized for the following purposes:

- To reduce or eliminate capacity constraints of the process

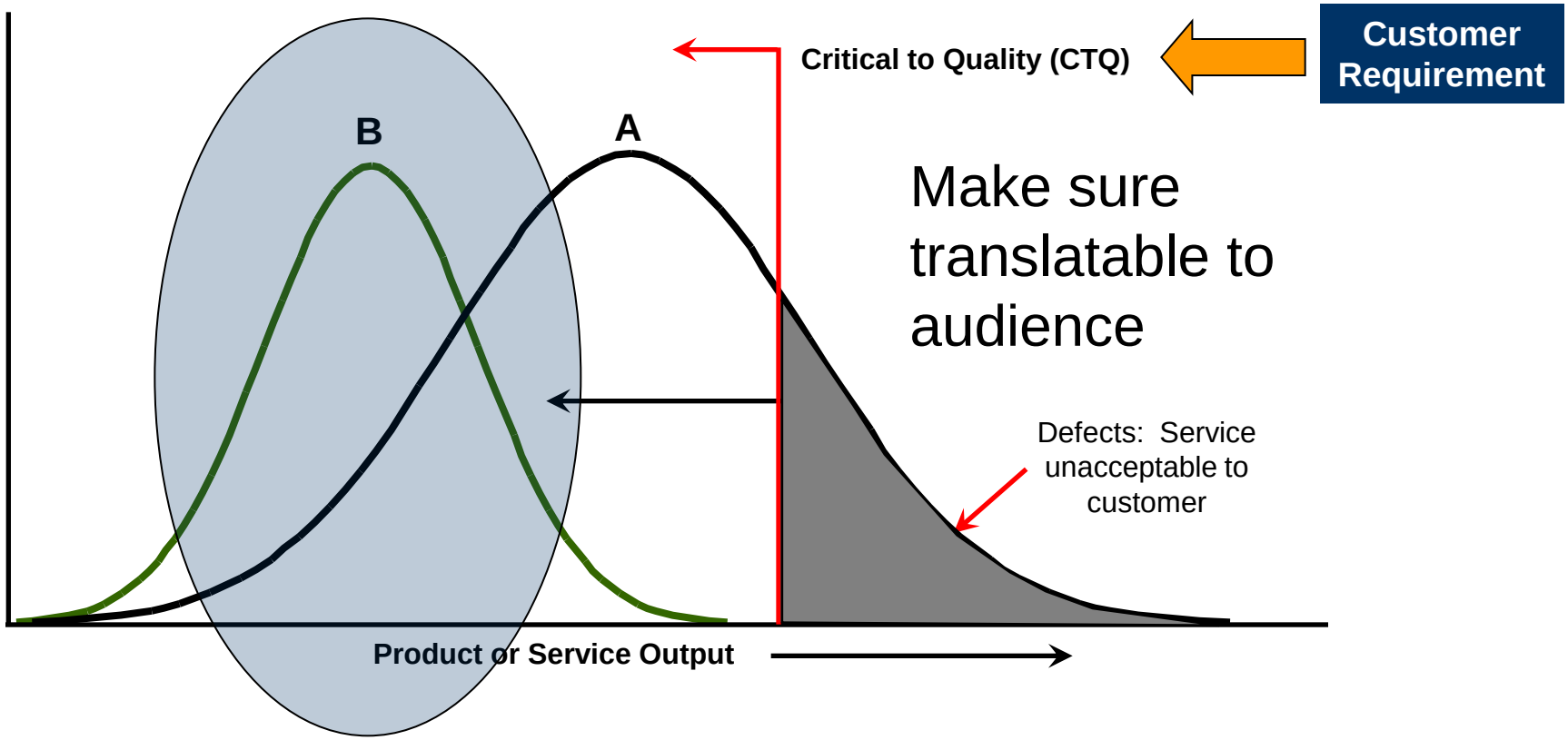


- To reduce the cycle time of the process



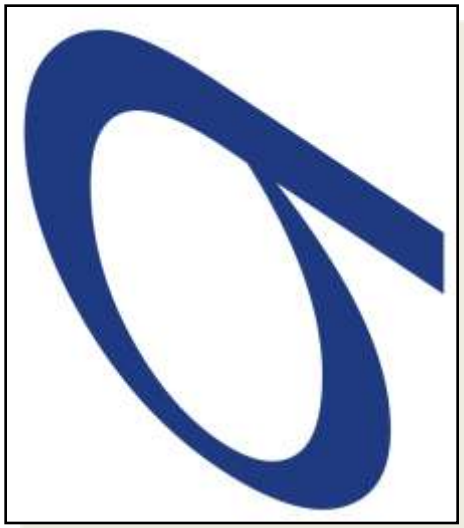
Lean Six Sigma Focuses on Reducing Variation

The number of occurrences (defects) that fall outside of the customer requirement (for Process A) are defects.. **Process B** represents the ***optimal performance*** with no occurrences outside of the requirement.



Optimal Performance

“Sigma” Defined



Sigma is a Greek letter that is a statistical unit of measurement used to define the standard deviation of a population. It measures the variability or spread of the data.

Sigma is a name given to indicate how much of the data falls within the customers’ requirements. ***The higher the process sigma, the more the process outputs, products and services, meet customers’ requirements – or, the fewer the defects.***

Six Sigma in Practical Terms

100 Rounds of Golf a Year

2σ <6 missed putts per round

3σ 1 missed putt per round

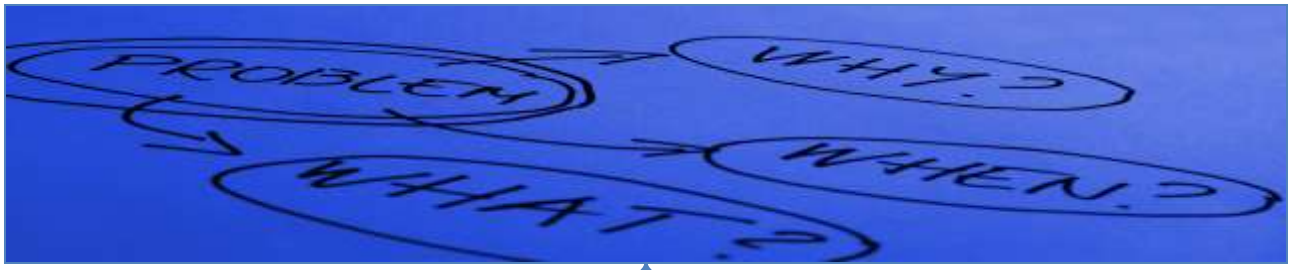
4σ 1 missed putt every 9th round

5σ 1 missed putt in 2.33 years

6σ 1 missed putt in 163 years

Is there any way to reduce missed putts…increase Sigma?

Types of Improvement Methodologies



Process Management

- Process performance is unknown or not understood
- Implement a process monitoring dashboard to decide what to do next

Just Do It

- Problem identified and solution is known
- Implement a fix and establish a dashboard to continuously monitor process

Kaizen

- Problem identified and solution is unknown.
- Small in scale or urgency needed for process improvement
- Initiate 2-5 day Kaizen Event to analyze the process and implement improvements

L6S DMAIC

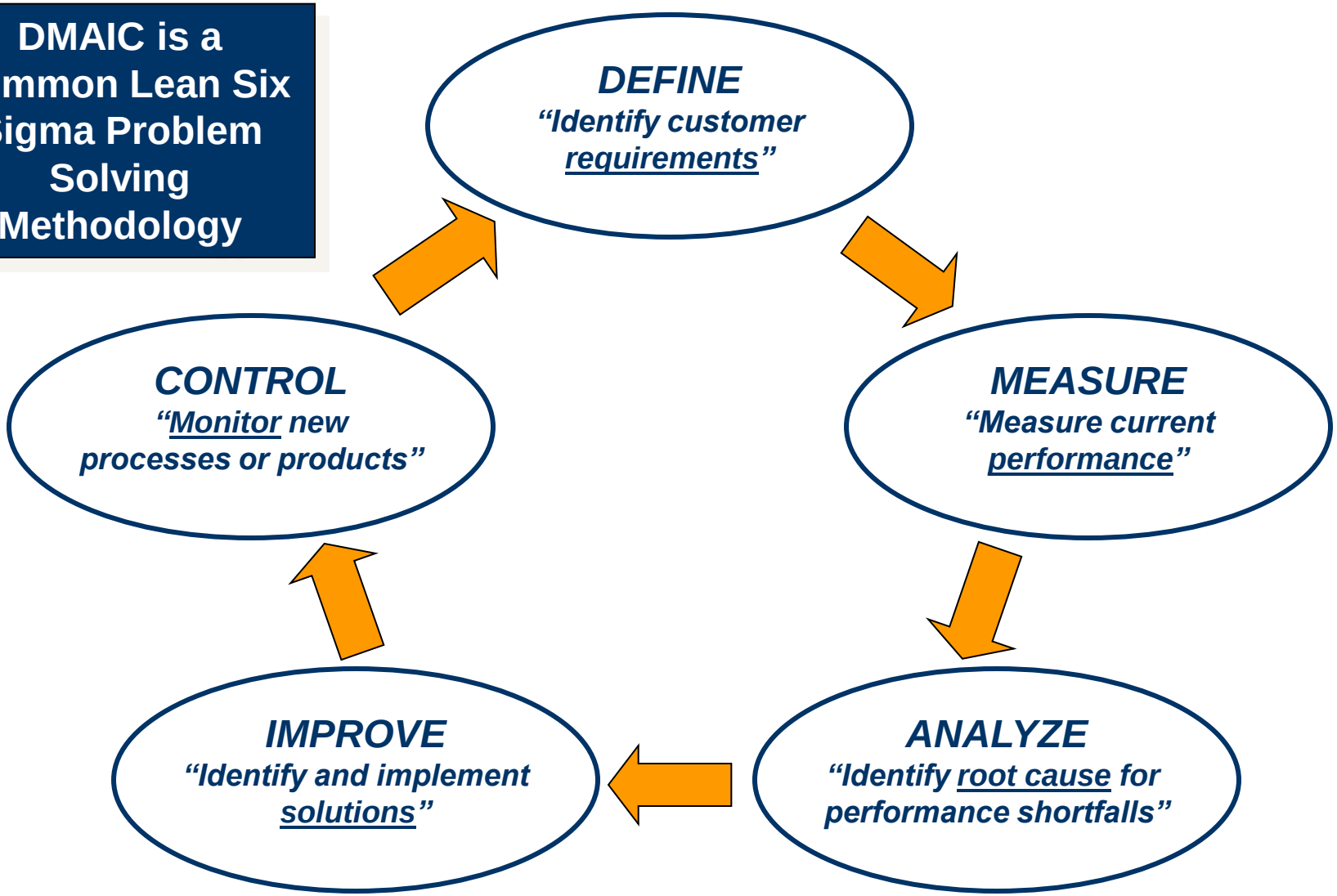
- Process is inefficient and contains wasteful activities
- Identify non value-add activities and remove waste from the process
- Existing process is not meeting customer requirements or business objectives
- Initiate a DMAIC project to identify root causes of the problem and initiate breakthrough improvements

L6S DFLSS

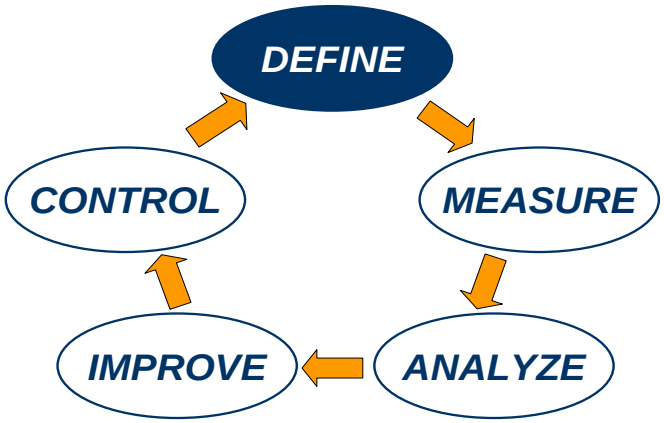
- New product or process that need to be designed or significant problems to the current process exist
- Initiate DFLSS project to design processes to meet customer requirements

Lean Six Sigma DMAIC Methodology Defined

DMAIC is a Common Lean Six Sigma Problem Solving Methodology



DMAIC - Define Phase Overview



PROJECT OVERVIEW

Project Name			
Department			
Green Belt			
MBB/Coach			
Project Sponsor			
Project Timeline	Start Date:	Target Completion Date:	
Charter Revision Date			

PROJECT DESCRIPTION

Project Description / Opportunity Statement		
Business Case		
Goal Statement		
Estimated Benefits ($$)		
Project Scope	Area of Focus	
	Includes	
	Excludes	
	Start Point	
	Stop Point	

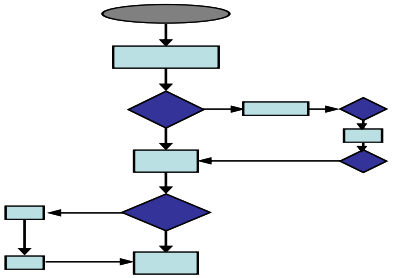
TEAM SELECTION

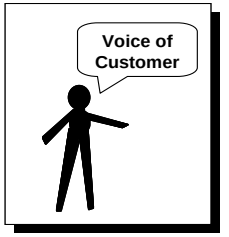
Team Members	Function in the Business	Project Role	Time Dedicated to Project (hrs/week)
Additional Support			

PROJECT PLAN

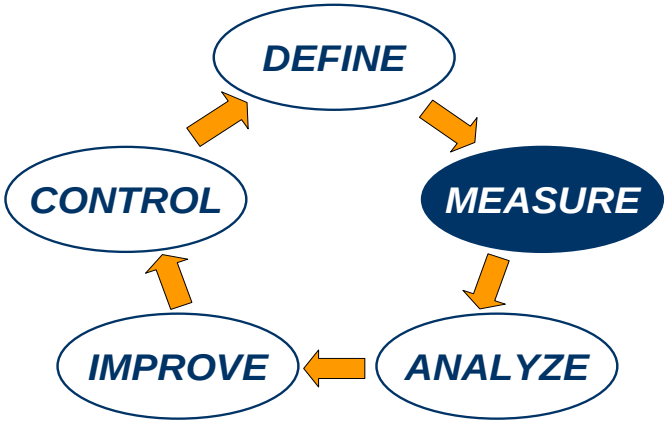
Milestone Phase	Start Date	Completion Date
Define		
Measure		
Analyze		
Improve		
Control		
Closure		

- Develop Project Charter for Business Problem/Case, Roles and Project Plan
- Key Characteristics of Effective Teams
- Document and Understand the Current Process
- Identify Quick Win Opportunities
- Understand How to Manage Stakeholders
- Identify Customer Requirements (CTQ's) through Voice of Customer (VOC)





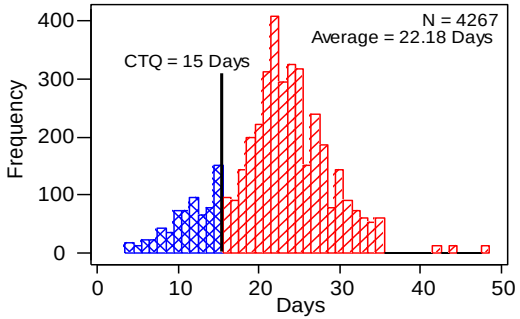
DMAIC - Measure Phase Overview



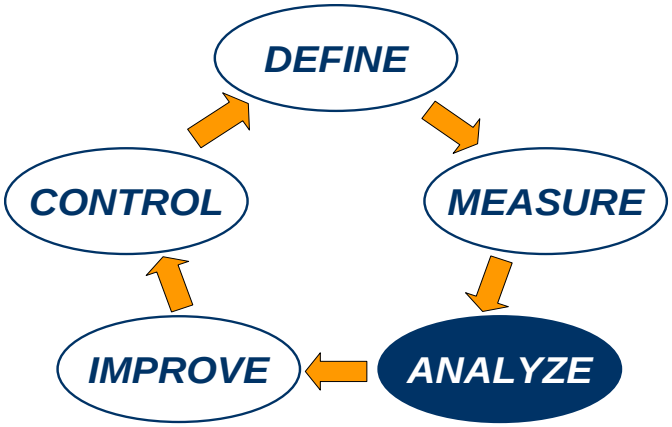
Measure	Type of Measure	Type of Data	Operational Definition	Sample	Display
Number of Customer Calls	Input	Continuous	The number of inbound calls to the call resolution group (January 1 – December 31)	Population of Calls	Run Chart
Types of Complaints	Output	Discrete	The types of complaints received from customers (January 1 – December 31)	Population of Calls	Pareto Diagram

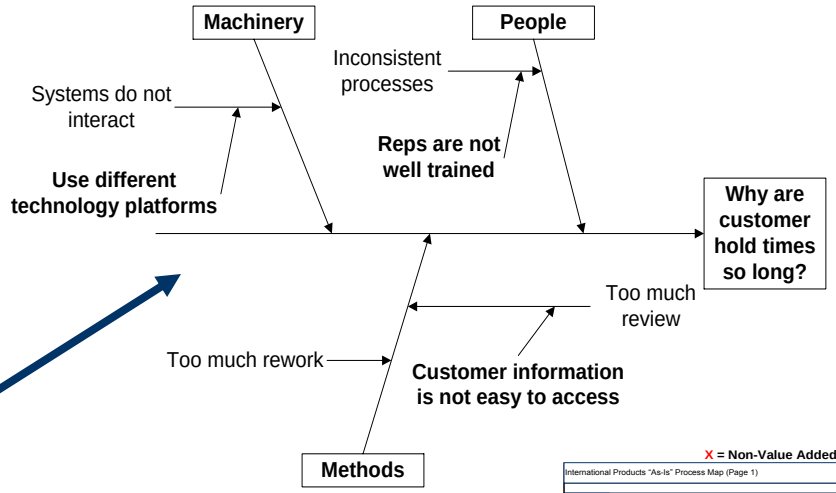
- Identify and Define Key Indicators of Process Performance
- Develop Data Collection Plan
- Calculate Baseline Performance (Sigma)
- Display Performance Data
- Promote Productive Team and Change Management Atmosphere

Defects: 102
Opportunities: 4
Units: 221
DPMO: 115,385
Sigma: 2.7

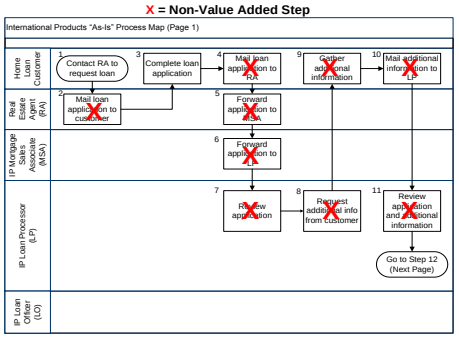


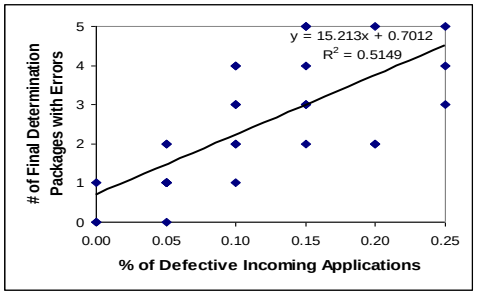
DMAIC - Analyze Phase Overview



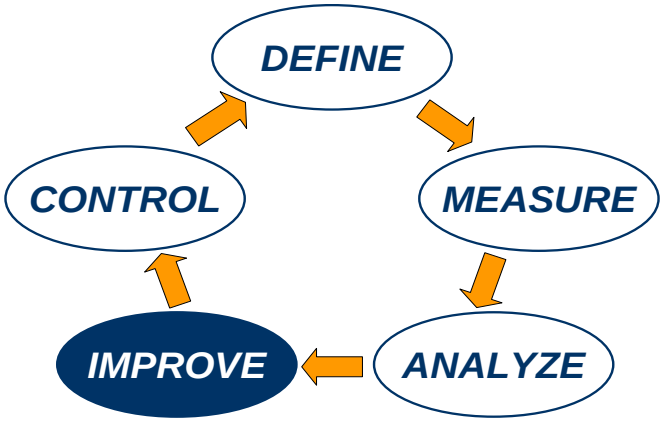


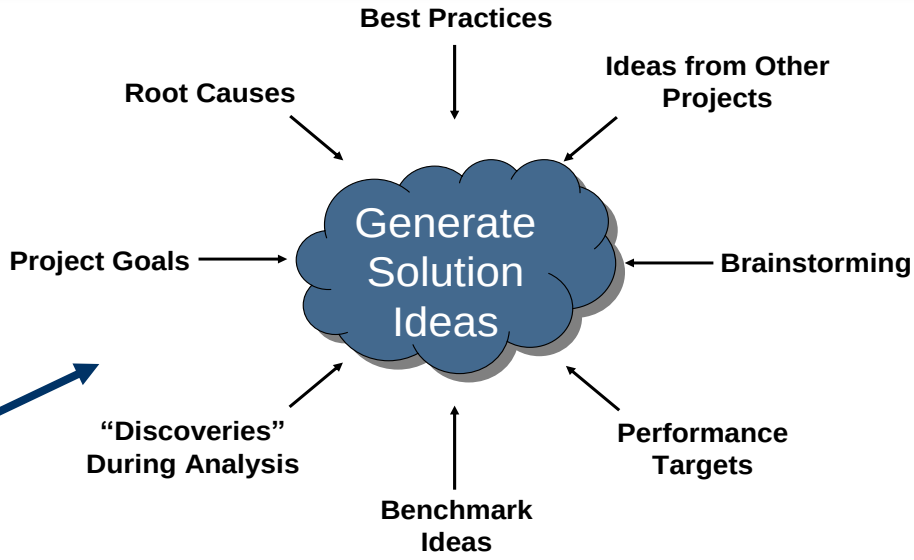
- Identify Potential Root Causes
- Identify Value Added and Non-Value Added Processes
- Identify Cause and Effect Relationships
- Analyze the Data and Process to Determine Root Causes





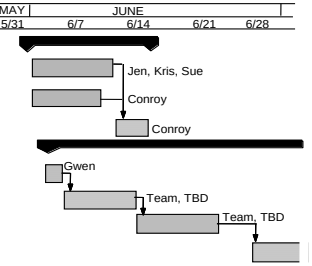
DMAIC - Improve Phase Overview



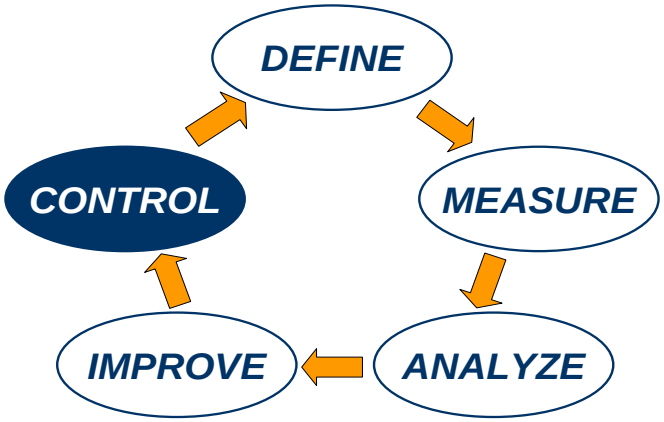


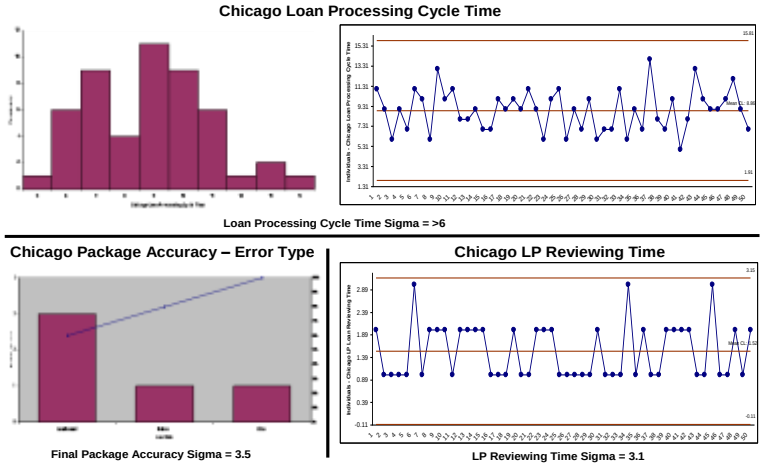
- Generate Solutions
- Prioritize and Document Improved Process
- Document Solution Impacts and Cost/Benefits
- Pilot Solutions and Identify Potential Problem Analysis
- Develop Implementation Plan

ID	Task Name
1	**Implement Solution**
2	Install new hardware
3	Install new software
4	Revalidate System
5	**Train Processing Staff**
6	Update documentation
7	Develop Training Plan
8	Train Staff
9	Test

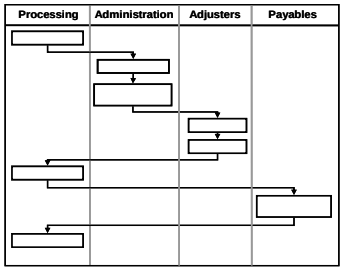


DMAIC - Control Phase Overview





- Develop Process Control Monitoring Plan
- Standardize Processes and Develop Change Implementation Plans
- Create Storyboards of Improvement
- Identify Replication Opportunities
- Complete Project Closure and Celebrate Success



Organizations Deploying Lean Six Sigma (a sample)

Lockheed Martin	Department of Defense	Military Health Services
Allied Signal	NASA	Johnson & Johnson
Motorola	American Express	Bank of America
Honda	General Electric	Jaguar
Maytag	Dow	Polaroid
Raytheon	Texas Instruments	Digital Electronics
Bombardier	DuPont	Kodak
Canon	IBM	Fidelity Investments

Functional Areas Deploying Lean Six Sigma (a sample)

Sales	Marketing & NPI	Business Development
IT Development	IT Support	Financial Reporting
Human Resources	Customer Service	Supply Chain
Fulfillment	Accounts Payable	Accounts Receivable
Order Processing	R&D	Medical
Legal	Regulatory	Manufacturing
Shipping	Packaging	Mail Processing
Systems	Forecasting	Underwriting / Risk

Lean Six Sigma Applies to All Areas of the Business

NSSC L6S Deployment: Key Milestones

- The NSSC Senior Leadership Team (SLT) approved the implementation plan and governance structure in January 2010.
- L6S Board Established
- Senior Leaders participated in L6S training June 2010
- Functional Manager and Supervisors completed training August 2010
- Key areas of opportunities identified during the training session
- L6S experts selected; Donald St Germain and Paul Rydeen are completing certification
- Initial projects are being selected and will be initiated FY 2011

= Complete

= In Progress

L6S Board

The L6S Board held its first meeting on March 1, 2010.

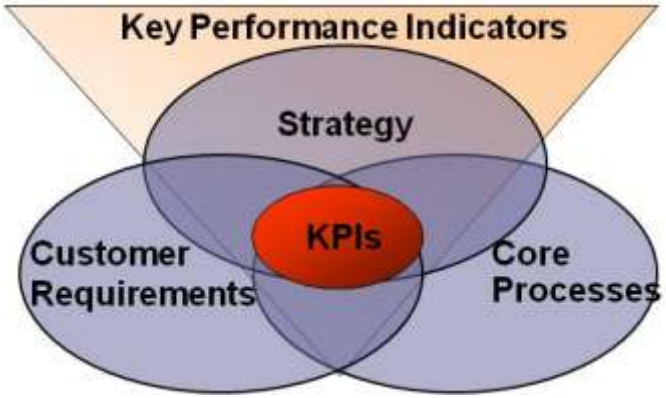
Board membership includes:

- Deputy Director, NSSC (Chair)
- Director, Business and Administration
- Deputy Director, Service Delivery
- Deputy Program Manager (SP)
- Service Delivery Manager (SP)
- Business Manager (SP)

It is the responsibility of the Board to:

- Recommend L6S policy
- Promote the institutionalization of L6S
- Oversee the roll out of the program
- Approve and prioritize L6S projects

L6S Project Selection



Select key improvement areas that will drive key performance indicators (KPIs), strategy, and improve customer satisfaction	Prioritize potential projects	Select projects	Develop Charters and Assign Resources

- An important thing to remember about this formal improvement program is that not all projects will be subject to formal L6S tools and applications.
  - There may only be two or three L6S projects each year
- Many employees currently participate in sessions within their organizations to identify process improvements
- Lean Six Sigma is a way of thinking, a mindset that seeks opportunities to continuously improve processes and the customer experience
- Instructions will be forthcoming on where to filter ideas

Upcoming L6S Initiatives

External Training Purchases

Excessive staff overtime and stress is being experienced by the Training Purchases staff due to the fact that up to 90% of the External Training Requests requiring a procurement (training purchase) action are processed on or after the 5th business day.

The metric for this activity requires procurement, registration, and notification to the student within 5 business days of receipt at the NSSC.

L6S event targeted for November 2010.

Upcoming L6S Initiatives

Invoice Payment Process

Invoices come in all shapes and sizes through several intake points (US mail, email, fax, ftp) and are manually loaded into SAP. Numerous steps (performed by SP and CS at the NSSC and Centers) are required before an invoice can be posted for payment. All of this must occur within the parameters of the Prompt Payment Act to avoid paying interest penalties.

A Value Stream Mapping event will be conducted to identify opportunities for improvement. Those opportunities will be prioritized and Kaizen events will follow.

NSSC Reversals Process Kaizen - Summary

The way we used to do it...

- **Multiple manual steps**
- **Triplication of storage**
- **Excessive rework**
- **Time intensive**
- **Multiple processes by function**

The changes we made…

- **Paper-less process**
  - **Checklist**
  - **Utilize Remedy**
  - **Screen shots gone**
  - **Printing and manual transportation to notifies and approvals**
- **Reduction in approvals and notification**
- **Created process awareness across functions**
- **Reduced multiple processes to 1 repeatable process**
- **Captured required information and one place and made available for "pull"**
- **Identified metrics and tracking items**
- **Reduced search and queue time**
- **Reduced multiple storage procedures**
- **NSR for all reversals – enabling metrics**
- **Single point of entry/input for internal and external requests**

	Current	Future
1- Steps	12	
Cycle Time	1263	
Touch Time	123	
FPY	84%	
2- Steps	14	
Cycle Time	2383	
Touch Time	142	
FPY	79%	Single Procedure
3- Steps	21	11
Cycle Time	8042	869
Touch Time	166	113
FPY	93%	55%
4- Steps	28	
Cycle Time	239	
Touch Time	92	
FPY	86%	

Team
Champion: Cindy Epperson
Sponsor: Jim Caldwell
Team Leader: Jim Caldwell
Team Members: Marsha Franklin, Gail Barnes, Demaris Cox
Theresa Morgerson, Jennifer Meyers Margaret Furey, Donald St. Germain,
Stephanie Neal, Paul Hebert, Karen Hill, Sharif Kharuf
OE Facilitators: Mason Gordon-BB/coach, Debbie Dale – GB, Beth Keith - GB

L6S is not a stand-alone NSSC program. We are also participating in the Agency's L6S program.

The main intent of NASA's Lean Six Sigma Program is to

1. Apply Lean principles and Six Sigma methodology to respective projects and work areas, to
   - Remove non-value added activities from existing processes that create NASA products and services, via Kaizens (initial NSSC focus)
   - Design new processes, via Process Development Kaizens (PDKs)
   - Develop strategic plans and plan execution, via Program Excellence Plans (PEPs)
2. Develop in-house Lean Six Sigma Green Belts and Black Belts to serve as facilitators and part time leaders of process improvement teams, to help NASA improve NASA

Achieving NASA Operating Excellence…

- **Main Objectives**
  - **Enhances Mission Success**
  - **Focuses on Cost, Quality, and Schedule**
  - **Reduces variability and "down time"**
  - **Enables consistent, high quality products and services**

- **May 26, 2010, Quote from NASA Administrator, Charlie Bolden, at the Hearing on "Review of the Proposed NASA Human Space Flight Plan" before the Committee on Science and Technology, United States House of Representatives:** "private entities or the commercial entities are telling me they have learned through the years ways to be more efficient in their operations. They have in place programs like Lean and Six Sigma and other kinds of programs that have proven to be effective in bringing down cost. That's the way they make money. NASA is trying to drive those inefficiencies out by programs like Lean and Six Sigma and other programs."

NASA Training & Certifications by Center

Center	Certifications as of 6/15/10		# of L6S Events as of 6/15/10
	Green Belt	Black Belt	
NASA HQ	19	4	32
ARC	1	0	2
DFRC	0	0	0
GRC	45	4	17
GSFC	0	0	0
JPL	20	2	11
JSC	15	0	22
KSC	1	1	1
LaRC	25	7	36
MSFC	93	29	208
SSC	0	0	2

Projected ROI to date: Designed and improved 331 NASA processes; cost avoidance of $1,284,009

L6S and You

- Stay informed on what is happening with L6S
  - Website: http://internal.nssc.nasa.gov/lean6sigma/index.htm
  - *The Communicator* Articles
  - Review NSSC Work Instruction NSWI-1280-0001 (February 26, 2010).
- Participate in L6S projects as SMEs and team members
- Identify areas and ideas of improvement and begin talking continuous improvement within your area

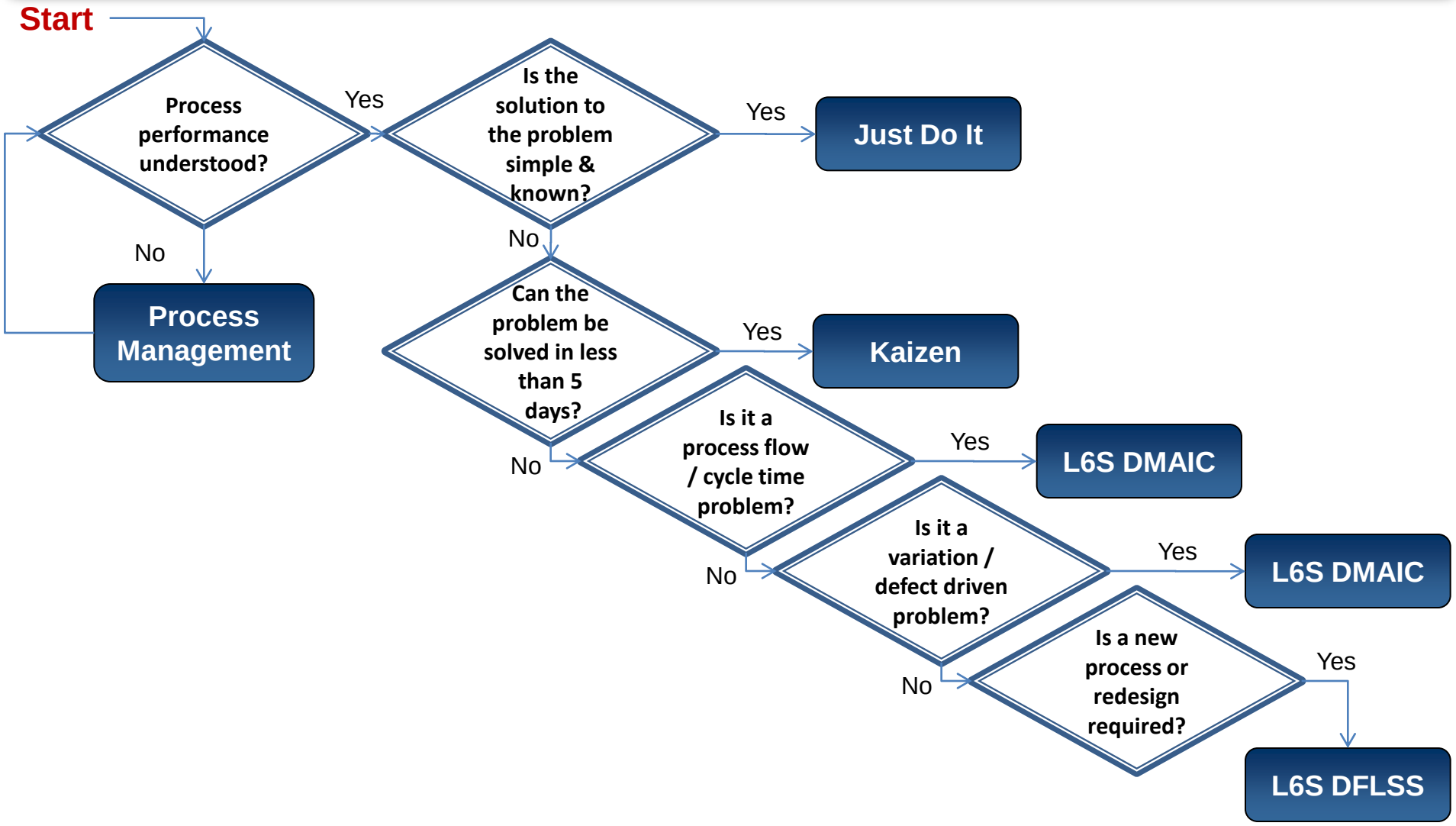
Lean Six Sigma Training

Q&A

Lean Six Sigma Training

Appendix

Selecting the Lean Six Sigma Methodology



NSSC Project Identification and Validation Process

Project Identification

1. Functional Manager (Sponsor) submits project idea to L6S Board
2. Sponsor presents project to L6S Board: problem and business case to be clearly articulated

Project Prioritization

3. Sponsor briefs the proposal to the L6S Board
   L6S Board reviews proposal and requests additional information if needed

Move to Appendix

Project Selection, Chartering & Resource Selection

4. L6S Board approves the project

5. L6S Boards assigns Lean Six Sigma Expert; Sponsor assigns team members

Project Monitoring

6. Project Sponsor and L6S Expert brief L6S Board on progress through use of Tollgate Process
7. B&A validates project ROI and briefs the SLT, L6S Board, Sponsor and L6S Expert

Lean Six Sigma Deployment Timeline

Put these as speaker notes for slide 22

Mobilize	Launch	Institutionalize
Activities		
▪ Commitment from Leadership team ▪ Business diagnostic / project identification ▪ Black Belt / Green Belt selection ▪ Training development ▪ Begin CPI Matrix Organization set-up ▪ Execute initial deployment communications plan	▪ Projects and training are active ▪ Establish Black Belt and Green Belt certification standards ▪ Build measurement dashboard, links to Voice of Customer ▪ Build project pipeline, review & reporting system ▪ Introduce general Awareness training ▪ Build multi-generational deployment plan	▪ Additional waves of Black Belt / Green Belt training ▪ Broaden reach of General Awareness training ▪ Integrate Lean Six Sigma into budgeting, reward & recognition systems
Outcomes		
▪ Projects and Black Belts / Green Belts identified ▪ Training ready to go ▪ Momentum, “buzz” is starting to build ▪ Initial CPI resources in place	▪ First projects complete, initial benefits realized ▪ All training fully developed ▪ Dashboards, project tracking in place ▪ Initial Black Belt / Green Belt network is in place ▪ Broad understanding of Lean Six Sigma across company	▪ Lean Six Sigma integrated into ongoing management systems ▪ Network of Black Belts and Green Belts in place ▪ Build Lean Six Sigma methods & tools into the way you do business

Sigma Scale

With performance at 2 Sigma:

ONLY 69.146% of products and/or services meet customer requirements with 308,538 defects per million opportunities.

Most companies processes perform at this level or below prior to improvement

With performance at 4 Sigma:

99.379% of products and/or services meet customer requirements…with 6,210 defects per million opportunities.

Realistic business performance target for transaction / service industry

With performance at 6 Sigma:

99.99966% – As close to flaw-free as a business can get, with just 3.4 defects per million opportunities.

Superior business performance target (common goal in manufacturing environments)

Why “6” Sigma?

When Processes Operate at Less then 6 Sigma:

Even if your goal is 99.0% quality… Your Results Would Be:

- **Two unsafe plane landings per day at most major airports**
- **500 incorrect surgical operations per week**
- **One hour unsafe drinking water per month**
- **16,000 pieces of mail lost every day**
- **No electricity for 7 hours per month**

Applying Lean Six Sigma

Lean Six Sigma can be applied to any process problem to achieve significant improvement results. The following are a few examples…..

Core Process Area	Application of Lean Six Sigma	Results After Applying Lean Six Sigma
Finance – Accounts Payable (Insurance Provider)	❖ Late Payments 26% of the time resulting in a loss of $1.1 MM per year. ❖ Applied Lean Six Sigma to identify root causes of payment errors.	❖ Reduced late payment errors to 5% ❖ Saved over $1 MM per year in cost avoidance dollars
HR - Staffing (Employee Benefits Provider)	❖ Applied Lean Six Sigma to identify root causes of high employee turnover and loss of high potential employees.	❖ Increased employee retention by 20% utilizing exit interview data

Applying Lean Six Sigma

Core Process Area	Application of Lean Six Sigma	Results After Applying Lean Six Sigma
Customer Call Center (Financial Service Provider)	❖ Run rate data indicated that 43% of response times were not meeting SLA resulting in low customer satisfaction and contract penalties ❖ Applied Lean Six Sigma to identify root causes of delayed response time.	❖ Improved response rate to 99% ❖ Eliminated penalty fees by $100K / year ❖ Improved Customer Satisfaction ranking
IT - QA/Testing (Software Development Company)	❖ Extended cycle time of the software bug fixing process drove increased costs of releasing a new software product. ❖ Utilized Lean Six Sigma to identify drivers of extended cycle time.	❖ Reduced average bug fixing process time from 16 to 5 business days