Lean Six Sigma Training

Employee Training

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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

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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
Combining Lean and Six Sigma is Best in Class
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

![Diagram showing Step 1 to Step 4 with a bottleneck between Step 3 and Step 4.](image)

- To reduce the **cycle time** of the process

![Diagram showing inputs and outputs with cycle time calculation.](image)

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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.
“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**
- Problem 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

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Lean Six Sigma DMAIC Methodology Defined

DMAIC is a Common Lean Six Sigma Problem Solving Methodology

DEFINE
“Identify customer requirements”

ANALYZE
“Identify root cause for performance shortfalls”

IMPROVE
“Identify and implement solutions”

MEASURE
“Measure current performance”

CONTROL
“Monitor new processes or products”

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DMAIC - Define Phase Overview

- 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)**

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DMAIC - Measure Phase Overview

- 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**

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

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

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CTQ = 15 Days

Average = 22.18 Days

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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          | MAY  | JUNE |
---|--------------------|------|------|
1  | Implement Solution | 5/31 | 6/7   |
2  | Install new hardware |       |       |
3  | Install new software |      |       |
4  | Revitalize System |       |       |
5  | Train Processing Staff | 6/14 | 6/21 |
6  | Update documentation | 6/21 | 6/28 |
7  | Develop Training Plan |       |       |
8  | Train Staff |       |       |
9  | Test |       |       |

**Best Practices**
- Ideas from Other Projects
- Performance Targets
- Benchmark Ideas
- "Discoveries" During Analysis
- Brainstorming
- Root Causes

**Generate Solution Ideas**

**RELASED - Printed documents may be obsolete; validate prior to use.**
**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

**Chicago Loan Processing Cycle Time**

<table>
<thead>
<tr>
<th>Time</th>
<th>Processing</th>
<th>Administration</th>
<th>Adjusters</th>
<th>Payables</th>
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<tbody>
<tr>
<td>1</td>
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<tr>
<td>15</td>
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</tbody>
</table>

**Chicago Package Accuracy – Error Type**

- Final Package Accuracy Sigma = 3.5
- LP Reviewing Time Sigma = 3.1

**Chicago LP Reviewing Time**
Organizations Deploying Lean Six Sigma (a sample)

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

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### Functional Areas Deploying Lean Six Sigma (a sample)

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

_Lean Six Sigma Applies to All Areas of the Business_

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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

Mobilize = Complete
Launch = In Progress
Institutionalize

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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

- 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.
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

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

NSSC Reversals Process Kaizen - Summary

<table>
<thead>
<tr>
<th>Current</th>
<th>Future</th>
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<tbody>
<tr>
<td>1- Steps</td>
<td>12</td>
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<tr>
<td>Cycle Time</td>
<td>1263</td>
</tr>
<tr>
<td>Touch Time</td>
<td>123</td>
</tr>
<tr>
<td>FPY</td>
<td>84%</td>
</tr>
<tr>
<td>2- Steps</td>
<td>14</td>
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<tr>
<td>Cycle Time</td>
<td>2383</td>
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<tr>
<td>Touch Time</td>
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<td>FPY</td>
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<tr>
<td>3- Steps</td>
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<tr>
<td>Cycle Time</td>
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<tr>
<td>Touch Time</td>
<td>166</td>
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<tr>
<td>FPY</td>
<td>93%</td>
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<tr>
<td>4- Steps</td>
<td>28</td>
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<tr>
<td>Cycle Time</td>
<td>239</td>
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<tr>
<td>Touch Time</td>
<td>92</td>
</tr>
<tr>
<td>FPY</td>
<td>86%</td>
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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 (PEP)

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**

<table>
<thead>
<tr>
<th>Center</th>
<th>Certifications as of 6/15/10</th>
<th># of L6S Events as of 6/15/10</th>
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<tbody>
<tr>
<td></td>
<td>Green Belt</td>
<td>Black Belt</td>
</tr>
<tr>
<td>NASA HQ</td>
<td>19</td>
<td>4</td>
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<tr>
<td>ARC</td>
<td>1</td>
<td>0</td>
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<td>GRC</td>
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</tr>
<tr>
<td>SSC</td>
<td>0</td>
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</tr>
</tbody>
</table>

**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](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

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Selecting the Lean Six Sigma Methodology

Start

1.Process performance understood?
   - Yes
   - No

   - Process Management

2. Is the solution to the problem simple & known?
   - Yes
   - No

   - Just Do It

3. Can the problem be solved in less than 5 days?
   - Yes
   - No

   - Kaizen

4. Is it a process flow / cycle time problem?
   - Yes
   - No

   - L6S DMAIC

5. Is it a variation / defect driven problem?
   - Yes
   - No

   - L6S DFLSS

6. Is a new process or redesign required?
   - Yes
   - No

   - L6S DMAIC
NSSC Project Identification and Validation Process

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

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

4. L6S Board approves the project
5. L6S Boards assigns Lean Six Sigma Expert; Sponsor assigns team members

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

Mobilize
- 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

Launch
- 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

Institutionalize
- Additional waves of Black Belt / Green Belt training
- Broaden reach of General Awareness training
- Integrate Lean Six Sigma into budgeting, reward & recognition systems

Activities

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

Measurable Improvements In Quality & Cost

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**With performance at 2 Sigma:**

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

**With performance at 4 Sigma:**

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

**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.
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:

- **Finance – Accounts Payable (Insurance Provider)**
  - Reduced late payment errors to 5%
  - Saved over $1 MM per year in cost avoidance dollars
  - 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

- **HR - Staffing (Employee Benefits Provider)**
  - Increased employee retention by 20% utilizing exit interview data
  - Applied Lean Six Sigma to identify root causes of high employee turnover and loss of high potential employees

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### Applying Lean Six Sigma

**Core Process Area**

**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.

**Results After Applying Lean Six Sigma**

- Improved response rate to 99%.
- Eliminated penalty fees by $100K/year.
- Improved Customer Satisfaction ranking.

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**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.