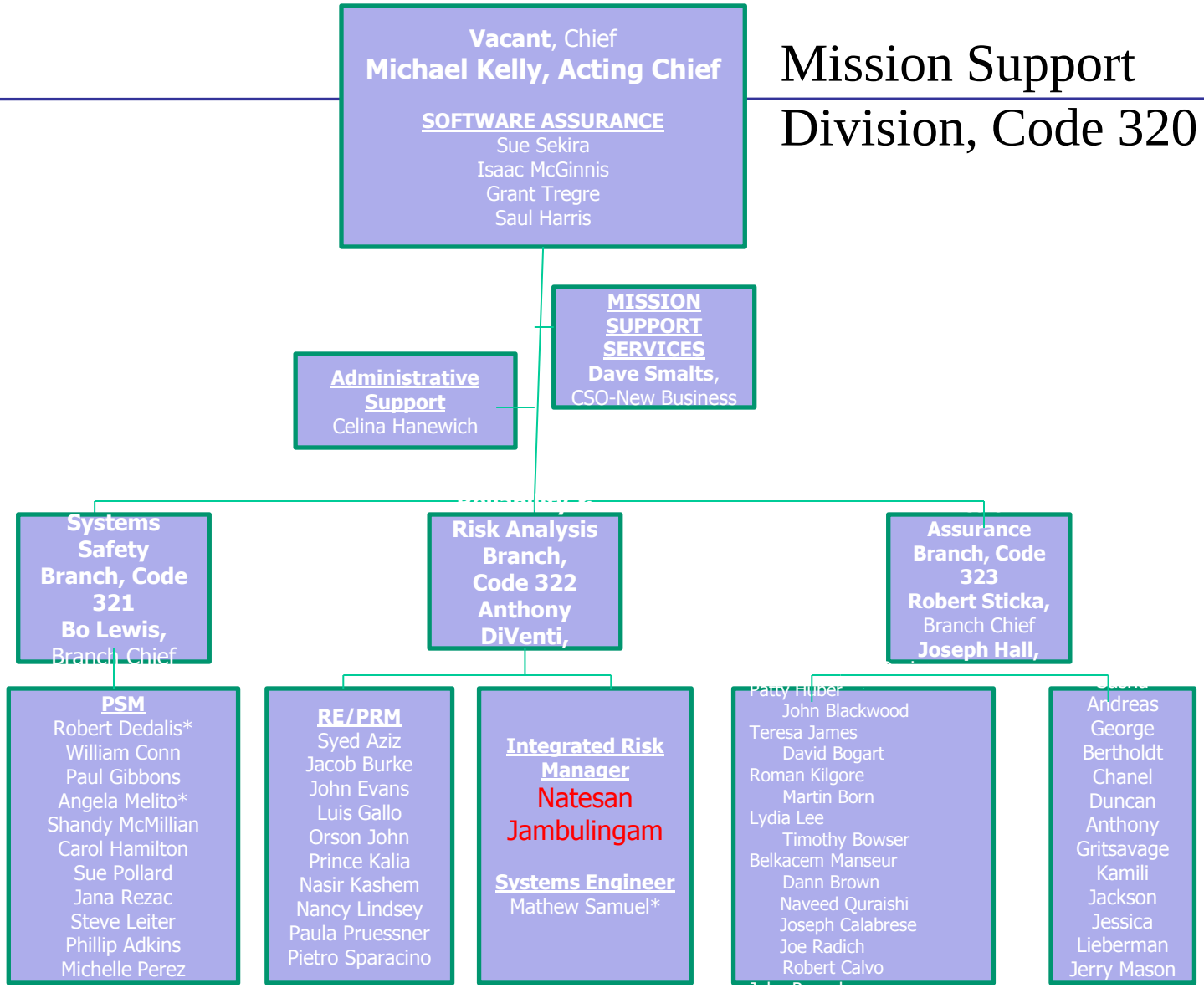
NASA Lean Six Sigma (LSS) Program

Goddard Visitor Center
March 27, 2012

Dr. Nat Jambulingam
GSFC Risk Manager & LSS Lead

Where am I at GSFC?

Mission Support Division, Code 320



Purpose

The purpose is to share the LSS activities at NASA in general and at GSFC in particular on the following:

- Why Lean Six Sigma (LSS) at GSFC?
- What is LSS?
- How we are trained in LSS?
- Who is involved in a LSS Project Event?

Why Lean Six Sigma (LSS) at GSFC?

LSS Program Intent at NASA

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
   - ✓ More effectively design *new* processes
   - ✓ Increase understanding, communication, integration, and collaboration amongst work teams

2. Develop in-house Lean Six Sigma Green Belts and Black Belts to serve as facilitators and part time leaders of process improvement team activities.

Benefiting from NASA Lean Six Sigma…

- **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."**

Lean Six Sigma Training Builds In-House Capability

NASA Change Agents

	Executive Overview	Champions Class	Green Belt	Black Belt
Who	Half day overview for NASA Leaders Training also benefits focus-area employees, contractors/suppliers, who have not attended more in-depth training	1-2 days class for NASA Leaders of improvement events provides guidance on who to send to the practitioner classes (Green/Black Belt)	One week class for NASA practitioners who carry out improvement events, and are part-time leaders/facilitators of simple events	Two week class for NASA practitioners who carry out more advanced improvement events, mentor Green Belts, and advise leadership in improvement activities
What	• Provides exposure to Lean and Six Sigma Principles • Participants will be able to recognize waste, begin to question sub-optimal processes, and initiate improvement activities • No prerequisite for this training	• Demonstrates how Lean and Six Sigma is applied to resolve improvement challenges • Participants learn what happens during an improvement event, what type of results can be expected, and how to identify event candidates • No prerequisite for this training	• Practitioners learn to apply principles/tools for application in improvement events • Practitioners learn to facilitate/lead teams through improvement event activities while under the guidance of a Black Belt • No prerequisite for this training	• Practitioners apply more advanced methods/tools/ principles to complex improvement activities • Practitioners lead teams, facilitate events, mentor Green Belts, and advise Change Agent Leaders in competency of NASA continuous improvement • Prerequisite: Green Belt Training

Summary of Certification Requirements

- **Green Belt Certification**
  - Completion of Green Belt training
  - Successful completion of Green Belt exam (80% or higher)
  - Leading / facilitating one Kaizen event
  - Provide event summary to NASA Lean Six Sigma Management Office
  - Certification issued by Center Director
- **Black Belt Certification**
  - Completion of Black Belt training
  - Successful completion of Black Belt exams (80% or higher)
  - Leading / facilitating one Kaizen event
  - Leading / facilitating two additional improvement events
  - Provide event summary to NASA Lean Six Sigma Management Office
  - Mentoring two Green Belts to certification
  - Certification issued by Center Director

NASA Lean Six Sigma Approaches

Event	Duration	Scope of Change	Team Size	Time to Implement
Kaizen	3 or 4 days	Incremental change to an existing process	Team: 5 to 10 full time members	Short term: 0 to 6 months
Product or Process Development Kaizen	3 or 4 days	Pre-Production or Design development to a process that does not exist	Team: 5 to 10 full time members	Long term: 6 to 24 months
Value Stream Mapping	3 or 4 days	ID opportunities for improvements	Team: 5 to 15 full time members	Intermediate: 6 to 12 months
Just Do It	1 to 2 days	Solution is identified - ready to implement	Team: 1 to ??	NOW
Project	1 day to 6 months	Any difficult problem	Team Work on a Part time basis - not a full-time "event"	Intermediate: 6 to 12 months

NASA Lean Six Sigma Management Offices

Lean Six Sigma Management Offices are responsible for implementing NASA LSS at centres

- MSFC/Patty Fundum; patricia.s.fundum@nasa.gov
- LaRC/Al Motley; albert.e.motley@nasa.gov
- GRC/Michael Moxley; michael.e.moxley@nasa.gov
- JSC/Laurie Peterson; laurie.j.peterson@nasa.gov
- GSFC/Natesan Jambulingam; natesan.jambulingam@nasa.gov
- JPL/Marc Montgomery; marc.h.montgomery@nasa.gov
- DFRC/Paul Condon; paul.d.condon@nasa.gov
- KSC/Rey Diaz; rey.n.diaz@nasa.gov
- Agency (Contractor)/Mark Adrian (256) 532-4676; mark.adrian@adrian-tech.com

- Experts on the NASA Lean Six Sigma tool-set
- Provides for Lean Six Sigma training
- Internal consultants for NASA Lean Six Sigma improvement events
- Coordinates site activities
- Assists with locating Lean Six Sigma Green Belts and Black Belts
- Leverages outside resources

GSFC LSS Activities (through 2011)

Training & Certifications

- One Black Belt and two Green Belts (NASA certified) at GSFC
- 17 GSFC Managers have received Executive overview training
- 19 Green Belts trained in 2011
- Numerous Industry-trained Black Belts who only lack NASA approach training

Many projects at GSFC (one example given below)

- **Lab Management Support (re: Mark Bollard)**
  - Nonconformance Reports have been written stemming from internal and external audits
  - LSS Project seeks to provide a measureable assessment of the current state and define specific areas of improvement for twenty Labs in the following areas: Personnel Certifications, ESD Compliance, Calibration Compliance, Shelf-Life Compliance, GDMS Compliance, Clutter/Cleanliness, Assigned Roles & Responsibilities, and Safety
  - An overall score for each lab is captured before and after improvements to provide a measureable delta. And results are reported monthly to GSFC Management System Council.

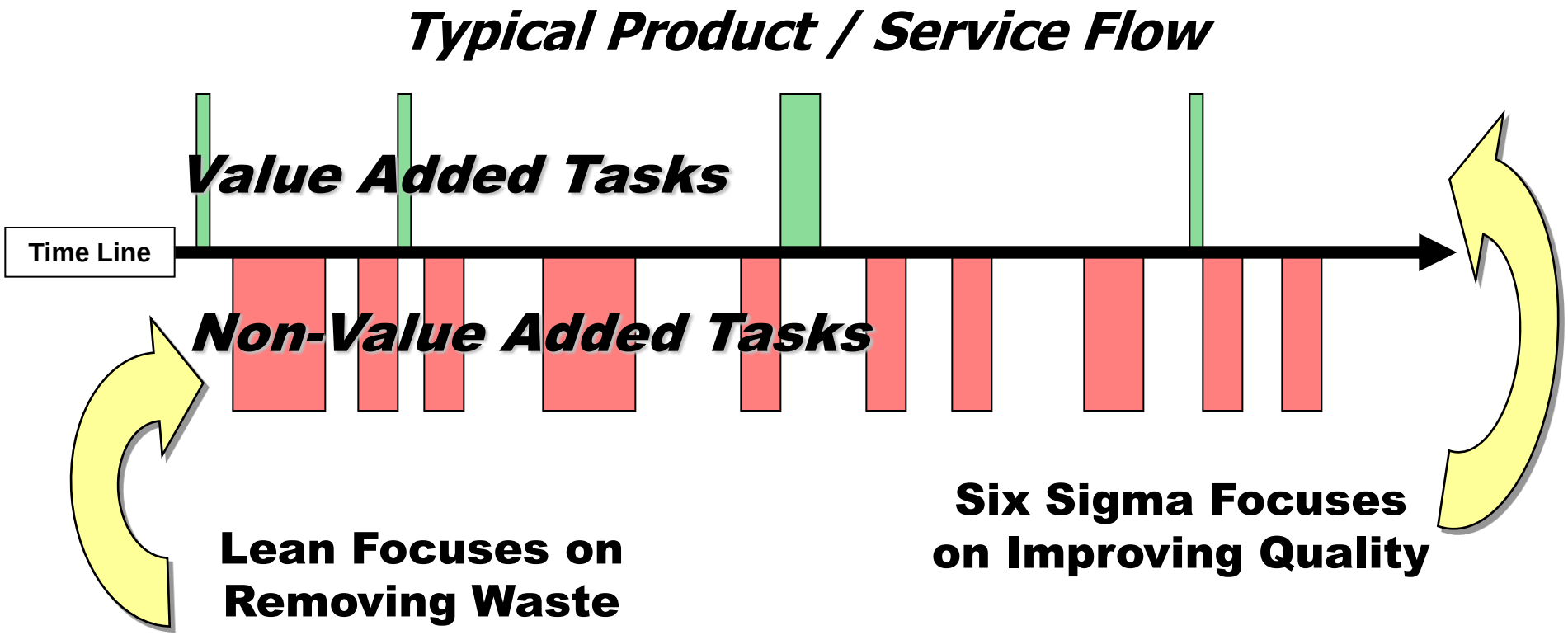
GSFC LSS Goals for 2012

1. Integrate LSS into the existing continuous Improvement (CI) process at GSFC
2. Provide LSS Training
   a) Senior Management – One day in Apr/May
   b) Greenbelt – 4 Day in May/Jun
   c) Black Belt – 2 Weeks in Aug/Sep
   d) Facilitate Green Belt/Black Belt Projects in all Directorates
   e) Help programs, projects and institution to save money and resources
   f) Help LSS participants to graduate to help themselves on the job
3. Outside Partnership with other Government agencies, corporations and universities to bring in best practices

What is Lean Six Sigma (LSS)?

What is Lean Six Sigma?

Lean (basically) is the pursuit of waste elimination while Six Sigma pursues perfection in a process



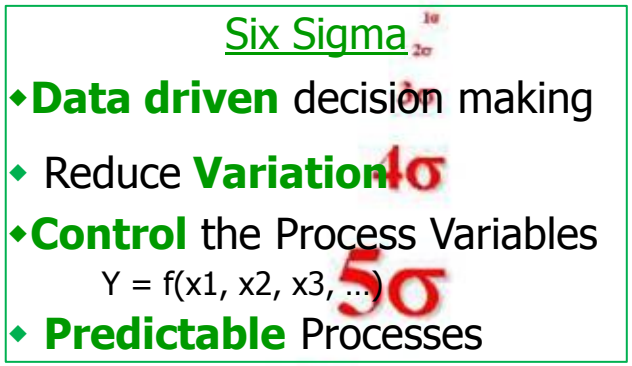
Source: Beyondlean.com

Lean Flow Goal

- **Lean Processes should Flow without interruptions**
- **Should continuously and progressively add Value in the eyes of the Customer**
  - **Starts at receipt of customer request**
  - **Ends at delivery to customer**
- **Should have the fewest number of process steps as possible, while**
  - **Meeting required production time**
  - **Minimizing non-value added activities**

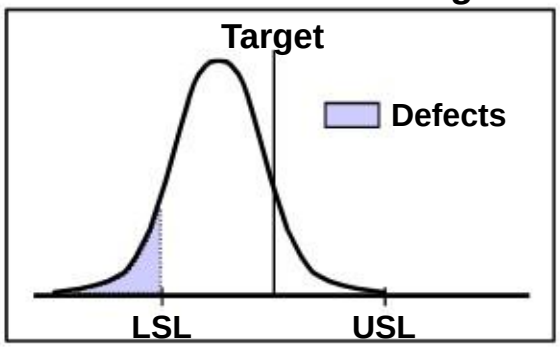
"Six Sigma" is a Methodology and Tool Set

- **We measure sigma levels to understand process performance. Higher sigma levels mean higher performance.**
- **It is a better way of approaching our entire business environment from planning through implementation. We need to routinely:**
  - **Measure our processes**
  - **Make data driven decisions**
  - **Reduce our process variation**
  - **Predict performance**
  - **Meet our customer requirements**

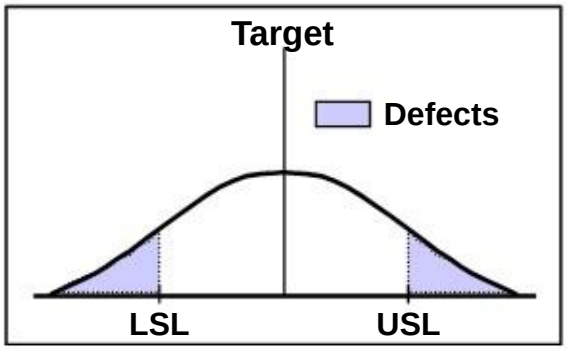


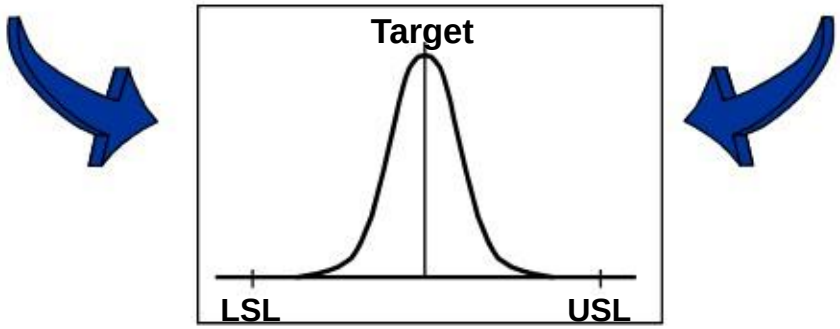
Statistical Objective of Six Sigma

Process Off Target



Excessive Variation





Reduce Spread

At 3σ a company spends >25% of revenues on internal and external repair

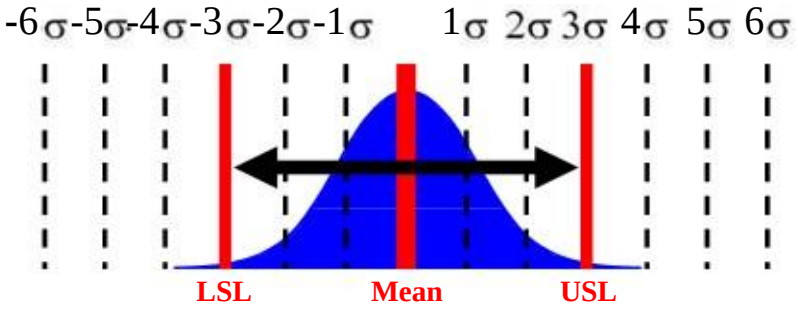
At 4σ a company spends >15% of revenues on internal and external repair

At 6σ a company spends <1% of revenues on internal and external repair

Source: *The Six Sigma Way: How GE, Motorola, and Other Top Companies are Honing Their Performance by Pande, Neuman, Cavanagh.*

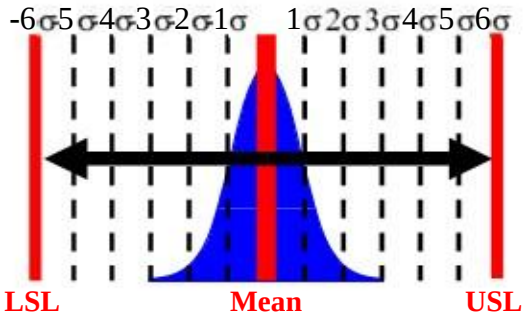
The Importance of Perfection

Process



3.8σ = 99% Good

Process



6σ = 99.99966% Good

Practical Examples

20,000 lost articles of mail per hour	⇨	7 lost articles of mail per hour
5,000 incorrect surgical operations per week	⇨	1.7 incorrect surgical operations per week
200,000 wrong drug prescriptions each year	⇨	68 wrong drug prescriptions each year
No electricity for almost 7 hours each month	⇨	1 hour without electricity every 34 yrs

Variation has a major impact on the customer's perception of quality

If we assume that many processes operate at 1σ these examples become:

636,000 lost articles of mail per hour
159,000 incorrect surgical operations per week
6.36M wrong drug prescriptions each year
No electricity for approximately 2 days per week

Using Lean Six Sigma to Achieve Perfection

OVERALL YIELD vs SIGMA
(Distribution Shifted ±1.5□)

# of Steps	±3□	4□	5□	±6□
1	93.32%	99.379%	99.9767%	99.99966%
7	61.63	95.733	99.839	99.9976
10	50.08	93.96	99.768	99.9966
20	25.08	88.29	99.536	99.9932
40	6.29	77.94	99.074	99.9864
60	1.58	68.81	98.614	99.9796
80	0.40	60.75	98.156	99.9728
100	0.10	53.64	97.70	99.966
150	---	39.38	96.61	99.949
200	---	28.77	95.45	99.932
300	---	15.43	93.26	99.898
400	---	8.28	91.11	99.864
500	---	4.44	89.02	99.830
600	---	2.38	86.97	99.796
700	---	1.28	84.97	99.762
800	---	0.69	83.02	99.729
900	---	0.37	81.11	99.695
1000	---	0.20	79.24	99.661
1200	---	0.06	75.88	99.593
3000	---	---	50.15	98.985
17000	---	---	1.91	94.384
38000	---	---	0.01	87.880
70000				78.820
150000				60.000

Source: SIX SIGMA RESEARCH INSTITUTE
Motorola University Motorola, Inc.

LSS Training at NASA/GSFC

Materials Covered

Lean Principles

NASA DMAICC Roadmap to Success

Event Roles and Approaches

Class Project (Statapult) – Baseline

Project Selection

Writing Charters

NASA Event Management

Team Dynamics

Documenting the Process

Introduction to Process Measuring

Introduction to Facilitation

Facilitator Intervention Techniques

Materials Covered – Cont.

Brainstorming

Error Proofing

Into FMEA

NASA Flow & Pull

Sustaining Improvement

Understanding Process Data

Class Project (Statapult) – Lean Improvements

Easy Analysis Tools

Introduction to SPC and Performance Measures

6S (Sort, Set-in-oredr, Shine, Standardize, Sustain, Safety)

Class Project (Statapult) – Variation Reduction (6σ)

Event Closure

How Do We Achieve Rapid Process (DMAICC) Improvement at NASA?

Focus on the Customer and the value Customers receive from NASA Products and Services

- Define Scope and Problem
- Determine Goals / Objectives
- Create Charter

- Gather As-Is Process data
- Define As-Is Process

- Identify Potential Causes
- Perform Gap Analysis from what Customer really wants

- Generate Potential Solutions
- Develop Implementation Plan

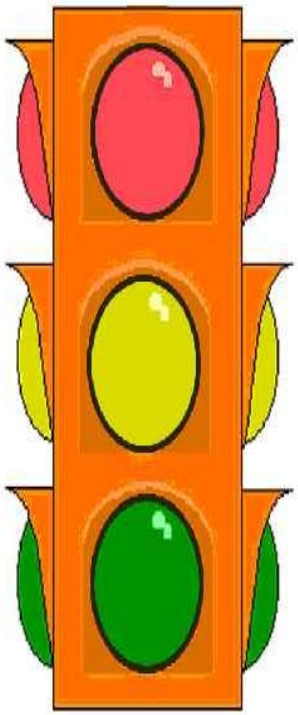
- Create and Execute Monitoring Plan
- Status Team & Sponsors

- Teams' Solutions are fully implemented
- Celebrate Success!

Class Project (Statapult) - Baseline

1. We established teams
2. Team members were teams
3. We learned the process
4. Took data to establish the baseline

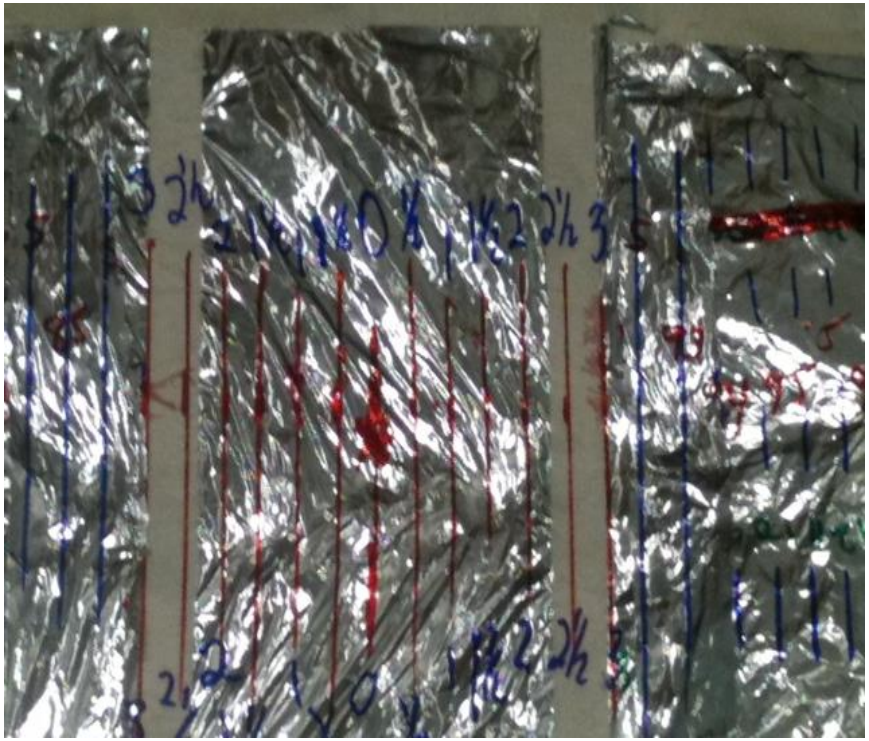
Class Project (Statapult) – Lean Improvements



1. Defined the Charter
2. Mapped the AS-IS Process
3. Visually identified each step in the process as:
   - Value-Added ( )
   - Required - Non Value Added ( )
   - Non-Value Added - Waste ( )
4. Reviewed **Waste** areas for improvement opportunities on the mapped process
   - Brainstormed
   - Cause & Effect Analysis
5. Ran Process – Took data
6. Mapped Ideal State

Class Project (Statapult) – Variation Reduction (6σ)

1. Mapped the Ideal-State
2. Brainstormed
3. PICK Chart – Big/Small Payoff, Easy/Hard to Implement
   - Possible
   - Implement
   - Challenge
   - Kill
4. Ran Process – Took Data



Who is involved?

Key Roles In LSS Events

Roles	Responsibilities
Champion	◆ Provides resources and business guidance, project selection assistance, removes roadblocks
Sponsor	◆ Project selection assistance, actively supports and encourages project teams, participates in event kick-offs and out-briefs
Team Lead	◆ Responsible for ensuring Implementation Plan happens and tracks activities for Sponsor
Team Members	◆ NTE 10 members, which include Today's Subject Matter Experts and Today's Customers
Black Belt	◆ Facilitator & Mentor of team and Green Belt candidates on LSS methodology and tool set as well as team dynamics & change management
Green Belt	Participates in Lean Six Sigma events, collects data, provides process expertise, completes improvement tasks and communicates change

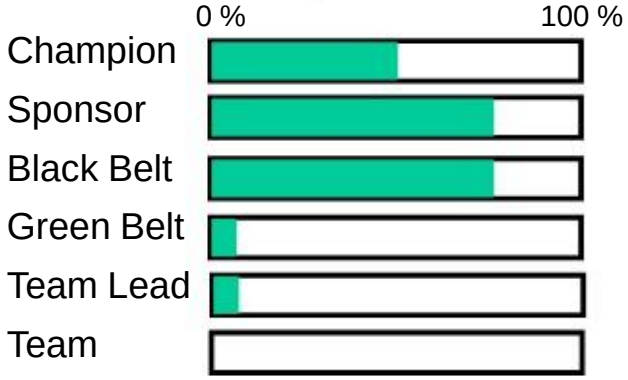
NASA's DMAICC Approach Roadmap

Define - Step 1

Activities

- Identify Opportunity
- Develop Charter
- Validate Problem Statement
- Gather Voice of the Customer
- Develop CTCs
- Perform Gemba Walk
- Validate Goal Statement
- Validate Business Case
- Validate Project Scope
- Select and Launch Team
- Develop Project Schedule
- Team Training

Who's Involved



Tools

- Value Stream Map
- Project Selection Tools
- Project Charter
- Various Financial Analysis
- Effective Meeting Skills
- Stakeholder Analysis
- Communication Plan
- SIPOC Map
- High-Level Process Map
- Project Management Tools
- VOC and Kano Analysis
- RACI and Quad Charts
- QFD

Measure - Step 2

Activities

Appropriately Map Process

Identify Key Input, Process and Output Metrics

Develop Operational Definitions

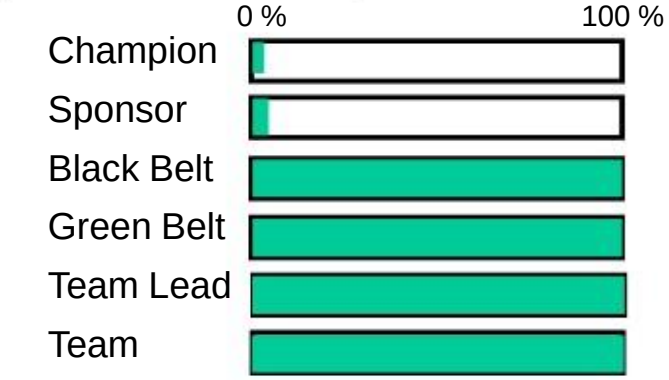
Develop Data Collection Plan

Validate Measurement System

Collect Baseline Data

Determine Process Performance/Capability

Who's Involved



Tools

Process Mapping

Process Cycle Efficiency

Operational Definitions

Data Collection Plan

Statistical Sampling

Measurement System Analysis

TPM

Generic Pull

Setup Reduction

Control Charts

Histograms

Constraint Identification

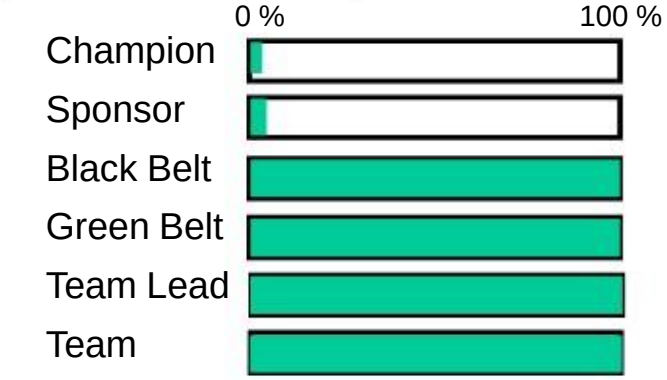
Process Capability

Analyze - Step 3

Activities

- Identify Potential Root Causes
- Reduce List of Potential Root Causes
- Confirm Root Cause to Output Relationship
- Estimate Impact of Root Causes on Key Outputs
- Prioritize Root Causes

Who's Involved



Tools

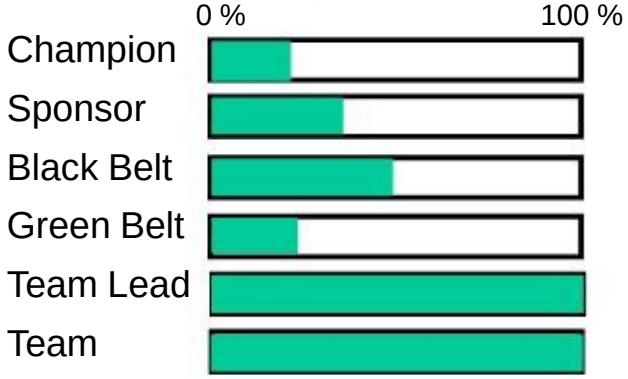
- Value Analysis
- Process Constraint ID
- Takt Time Analysis
- Cause and Effect Analysis
- FMEA
- Hypothesis Tests
- Correlation Analysis
- Simple and Multiple Regression
- ANOVA
- Sources of Variation
- Conquering Product and Process Complexity
- Queuing Theory

Improve - Step 4

Activities

- Develop Potential Solutions
- Develop Evaluation Criteria
- Select Best Solutions
- Develop 'To-Be' Process Map(s)
- Develop Pilot Plan
- Pilot Solution
- Develop Full Scale Implementation Plan

Who's Involved



Tools

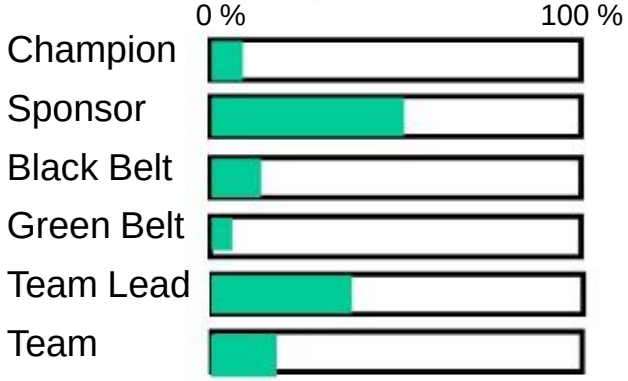
- Brainstorming
- Replenishment Pull/Kanban
- Stocking Strategy
- Process Flow Improvement
- Process Balancing
- Analytical Batch Sizing
- Total Productive Maintenance
- Design of Experiments (DOE)
- Solution Selection Matrix
- 'To-Be' Process Mapping
- ♦ Poka-Yoke

Control - Step 5

Activities

- Implement Mistake Proofing
- Develop SOP's, Training Plan and Process Controls
- ♦ Implement Solution and Ongoing Process Measurements
- Identify Project Replication Opportunities
- Transition Project to Sponsor

Who's Involved



Tools

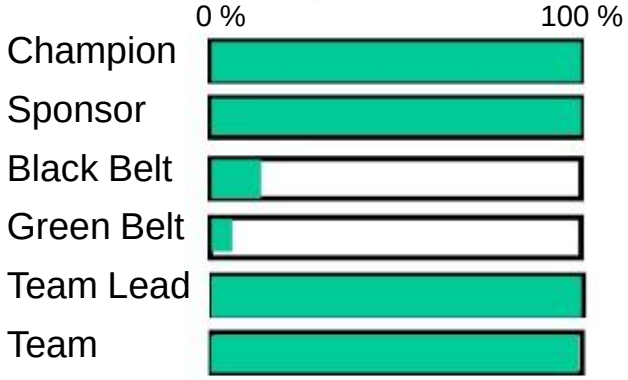
- Control Charts & SPC
- Standard Operating Procedures (SOP's)
- ♦ Training Plan
- Communication Plan
- Implementation Plan
- Process Control Plans
- Visual Process Control Tools
- Project Replication
- Follow on Projects
- Team Feedback Session

Celebrate - Step 6

Activities

- Celebrate Success
- Center Website Populated
- Lessons Learned
- Completed

Who's Involved



Tools

- Suggestion Program
- Migration of Best Practice
- Web Page
- Newsletters
- Story Boards
- Awards
- Incentives
- Giveaways

Example Charter (Page 1): Purchase Requisition Process

Issue Statement:
The current Purchase Requisition process span time is not in line with efficient and effective operations. The average PR takes xx Calendar days whereas the required metric is x business days which leads to overall customer dissatisfaction and lack of confidence in the current process.

Goal Statements: By MM/YYYY the team will improve the Purchase Requisition process to:
- Reduce the span time by xx% (in days)
- Reduce rejection rate from by x%

Project Scope Information:
- Submittal of PR in SAP (Begin) to Procurement Assignment (End)
- Commandments – Must follow Agency policies and directives
- Monuments – Must use SAP

Event Dates:

Champion:

Sponsor:

Facilitators:

Team Members:

Example Charter (Page 2): Purchase Requisition Process

Project Mission:

Examine all aspects of the current Purchase Requisition process flow (Within Kaizen Scope) and restructure it to make a more efficient and streamlined process to meet or beat the required time metrics.

Constraints:

Team members will be expected to devote 100% of their time to the project, during the event. May be required to spend some part-time effort on implementing the Team's solutions after the event.

Assumptions:

The focus of the team will be on improving the timeliness, efficiency, and quality of the existing process, not designing a new process.

Team Guidelines:

- The team will meet MM/DD/YYYY – MM/DD/YYYY from 8am to 5pm at <location>
- All decisions will be made by consensus.

Preliminary Project Plan:

Project Definition
- Analyze process data
- Secure team members
- Write Charter
- Brief Champion & Sponsor

LSS Kickoff (1st Day)

Document Reality
- Map As-Is or Current State process
- Value determinations (w/RYG)
- ID Touch time, Wait time, & Rework loops
- Determine main areas for improvements
- Perform Cause & Effect Analysis

Ideal State (2nd Day)
- Brainstorm attributes of Ideal State
- Map Ideal State
- Pick Chart what it will take to get from the Current State to the Ideal State

Future State (2nd Day)
- Map Future State using ideas from PICK
- ID improved Touch time and Wait time

Implementation of Solutions (3rd Day)
- Implementation Plan & Schedule
- OWI / MPR updates
- Action Item Closeout

Out-Brief (3rd Day)

Measure & Sustain

Examples of LSS Project Events

NASA LSS Candidates

Ctr	Date	Project Type	Title	Description	Results
MSFC	Feb-08	1 VSM	Integrated MSFC PPBE09 and WIMS	Develop structure for integrated Financial and Workforce Planning process for MSFC.	Developed a streamlined, single, flexible, process flow for Financial and Workforce planning that meets partners needs with clear lines of communication. 1,400 labor hours saved.
LaRC	Jul-09	Kaizen	Center Hiring Process	The Team will improve the current Center Hiring process; understand barriers and/or mitigate challenges associated with internal and external hiring	Developed a streamlined process that standardizes PDs, reduces process steps from 71 to 29 (60% reduction) and span time from 138 days to 77 days (45% improvement) 1,760 labor hours saved
HQ	Aug-08	1 VSM	Agency Desktop Software Delivery	Reduce software delivery time from 24 months by 25%, or 18 months	All testing has been collapsed and integrated into a single set of tests/time period prior to Agency CCB approval, minimizing rework and wait times; reduced span time from 305 work days to 187 work days (61% improvement) and approvals from 78 to 33 (58% improvement)
JPL	Feb-09	Kaizen	Evaluating Purchase Requisition to Purchase Order Process Cycle Time	Reduce the 7 day cycle time from Purchase Requisition Approval to Purchase Order Placement to 4 days, to be able to give valuable manufacturing days back to the projects.	Cycle time savings is 2.3 days average cycle time; 2.3 days = 18.4 hours x 100 purchase orders per year = 1,840 labor hours saved
JSC	Jun-09	1 VSM	Pre-Solicitation Phase of JSC's Source Selection Process	Optimize all activities required to perform the pre-solicitation phase of JSC's Source Selection Process	Reduced presolitation phase labor hours by 43% (13,334 hours to 7,536 hours)

GSFC Lean Six Sigma Activity
Example - Between several GSFC Offices

Day 1

Current State of several GSFC Offices processes will be mapped and analyzed on what each Office does to create a product or service

Day 2

An Ideal Map will be created that integrates across the Offices

Day 3

A Plan will be created on what it will take to achieve the Ideal State, and an Out-Brief will be created for the GSFC Champions & Sponsors

Typical Candidates For Improvement

Processes that have:

- High customer problems / complaints
- High-cost
- Schedule delays
- Tailored processes within orgs causing variation
- Communication and Integration issues
- High rework / mistake rates
- Employees are constantly fire-fighting
- Confusion over who does what
- Too many approvals / reviews
- Lots of "walking the paperwork through" to expedite

Excessive Processing

DOWNTIME
Excessive Processing

- Examples:
  - Unnecessary sign-offs
  - Data fields that aren't used
  - Too many iterations
  - Review cycles
  - Reformatting
  - Duplicate data entry

- Definition
  - Effort which adds no Value to a product or service
    - Work that can be combined with other processes
    - Enhancements that are transparent to the customer

AUTHORIZING SIGNATURES

Lead Test Engineer _____ **Date** _____

Test Conductor _____ **Date** _____

Mechanical Engineer _____ **Date** _____

Quality Engineer _____ **Date** _____

Safety Engineer _____ **Date** _____

Example Process Areas for GSFC LSS

- Traveler Process
- Training Process
- On-boarding Process
- Equipment sharing Process
- Reimbursable Process
- Project Baselining Process
- Returning Unused Funds Process
- Property Accounting Process interaction with facilities and logistics
- and so on…

Summary & Next Steps

Summary

- LSS program is an agency effort endorsed by HQ
- LSS is being implemented by all centers to focus on cost, quality, schedule and consistency *(Agency's ROI/Cost avoidance over the past four years is $1.3M in budgets and 670K labor hours)*
- NASA trained over 1000 executives and 1500 technical personnel in LSS
- GSFC has done many LSS type project events in an informal way by industry standard with the help of corporate Black Belt professionals and is now doing it in a formal way using NASA LSS

Next Steps

- To identify and prioritize potential projects at GSFC for process improvement through LSS process
- To get management support to form the team to work on LSS projects

Sample 3-Day Event

Event Management Agenda for Facilitators

Day 1	Facilitator #1	Facilitator #2	Facilitator #1
	Kick-Off: 8 to 9am - Team Introductions and Rules of Kaizen (use chart 2) - Charter (use charts 3 & 4) - Kick-Off is conducted by the Sponsor and/or Champion (Sponsor meets with team and explains why this event is taking place – they may refer to the Charter - notes for Sponsor is attached separately to this email) - Ground rules (use chart 5) show team this chart and create a separate sheet for this team to come up with their Ground rules for this event - Thumb Voting (use chart 6) make sure team knows consensus must be achieved on all aspects of the new process	**Current State Map: 9 to 12noon** - Explain example "Logical Process Map" (use chart 7 and 8) -- Have team hang roll of paper and add swim lanes via post-it notes (explain swim lanes represent process functional responsibilities) - Have team capture actual process steps on the wall for each swim lane (reinforce post-it notes with tape as they may fall off over night) - Have team review all process steps to assure correct step sequence - Have team link steps with arrows - Have team add touch-times and wait times to each post-it note. Have team add up times of each process step by swim lane – post times totals at the end of each lane	**ID Problems with Current process: 1 to 3pm** - Have team identify - re-work loops, - inventory, - wasted steps, - cancellations, - redundancy, and - efficiencies that can be gained by doing things concurrently - anything else? **Customer & Value Statement: 3 to 4:30pm** - Have team identify who the Customer is; the product or service being provided; and what the customer values in this process (use chart 9) NOTE: If there is time available, forge on to the brainstorming activity, first mentioned on Day 2 (see chart 10)

Team Introductions & Rules of Kaizen

1. Each Team Member explains their role in this process
2. Rules
   - Rely on the Wisdom of the Team
   - No Grandma's Hams
   - Ask Why, Why, Why, Why, Why?
   - Can't Say "Can't"
   - Use Brains, Not Money
   - Experiment
   - Make Change Happen!

Enjoy This Opportunity!!!

Example Charter (Page 1): Purchase Requisition Process

Issue Statement:
The current Purchase Requisition process span time is not in line with efficient and effective operations. The average PR takes xx Calendar days whereas the required metric is x business days which leads to overall customer dissatisfaction and lack of confidence in the current process.

Goal Statements: By MM/YYYY the team will improve the Purchase Requisition process to:
- Reduce the span time by xx% (in days)
- Reduce rejection rate from by x%

Project Scope Information:
- Submittal of PR in SAP (Begin) to Procurement Assignment (End)
- Commandments – Must follow Agency policies and directives
- Monuments – Must use SAP

Event Dates:

Champion:

Sponsor:

Facilitators:

Team Members:

Example Charter (Page 2): Purchase Requisition Process

Project Mission:

Examine all aspects of the current Purchase Requisition process flow (Within Kaizen Scope) and restructure it to make a more efficient and streamlined process to meet or beat the required time metrics.

Constraints:

Team members will be expected to devote 100% of their time to the project, during the event. May be required to spend some part-time effort on implementing the Team's solutions after the event.

Assumptions:

The focus of the team will be on improving the timeliness, efficiency, and quality of the existing process, not designing a new process.

Team Guidelines:

- The team will meet MM/DD/YYYY – MM/DD/YYYY from 8am to 5pm at <location>
- All decisions will be made by consensus.

Preliminary Project Plan:

Project Definition
- Analyze process data
- Secure team members
- Write Charter
- Brief Champion & Sponsor

LSS Kickoff (1st Day)

Document Reality
- Map As-Is or Current State process
- Value determinations (w/RYG)
- ID Touch time, Wait time, & Rework loops
- Determine main areas for improvements
- Perform Cause & Effect Analysis

Ideal State (2nd Day)
- Brainstorm attributes of Ideal State
- Map Ideal State
- Pick Chart what it will take to get from the Current State to the Ideal State

Future State (2nd Day)
- Map Future State using ideas from PICK
- ID improved Touch time and Wait time

Implementation of Solutions (3rd Day)
- Implementation Plan & Schedule
- OWI / MPR updates
- Action Item Closeout

Out-Brief (3rd Day)

Measure & Sustain

Ground Rules

- Be active, timely, and present
- Cell phones and PDA's turned off
- Everyone is responsible for our success
- One person speaks at a time
- Be respectful and supportive of all ideas
- Think process, not personality
- Vegas Rules apply

Example

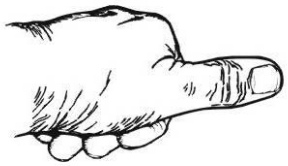
Rules For Brainstorming

- No premature decisions or evaluations
- “Wild” or “bad” ideas are welcome
- No "judgment" of ideas (positive or negative)
- Don’t sit on ideas -- express them
- Quantity over quality
- Piggyback on the ideas of others
- Everyone participants

Thumb Voting is Used to Gain Consensus

- **Thumbs Up** indicates team member agrees with specific idea and will support it through implementation when the event is over

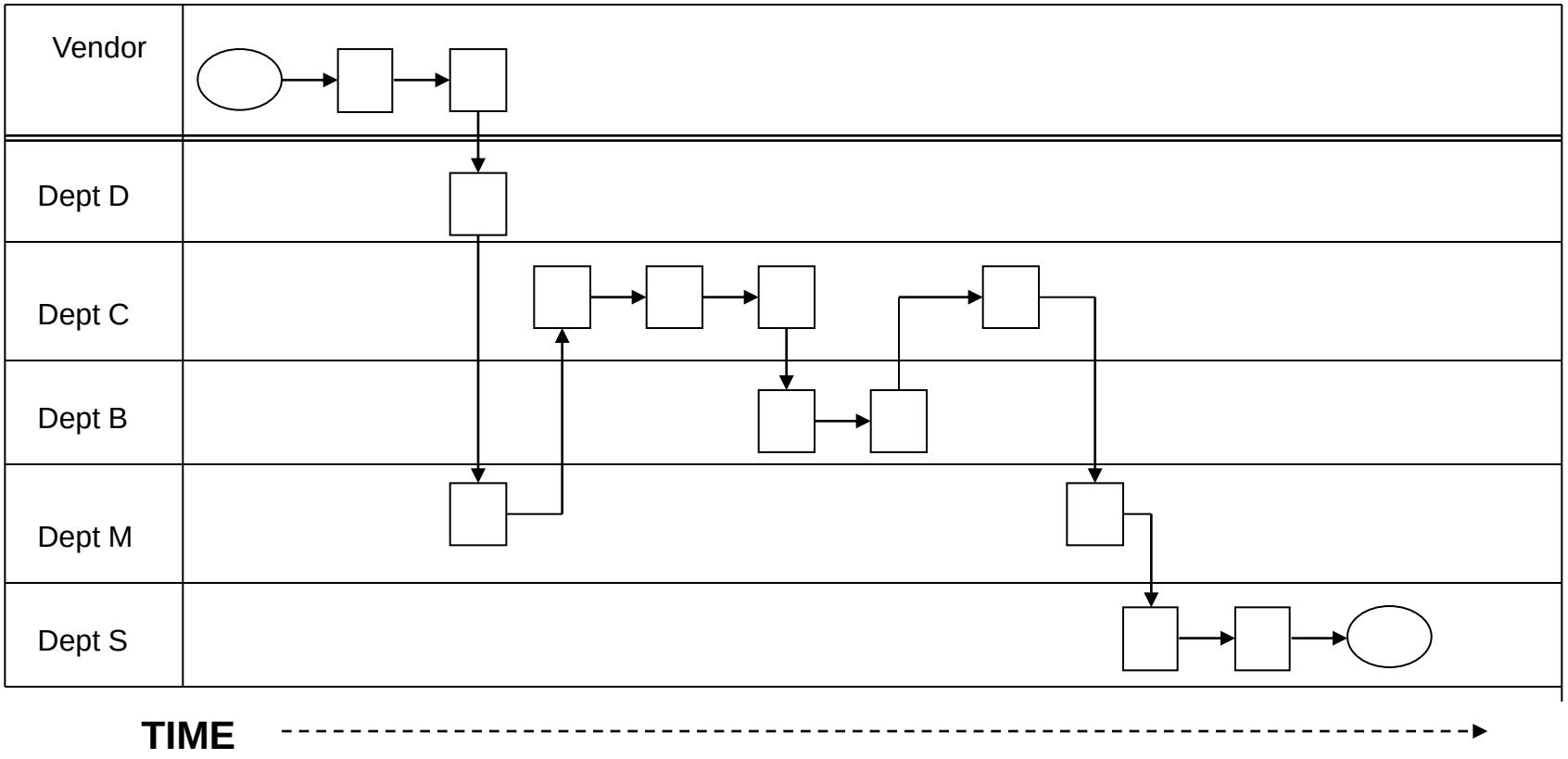
- **Sideways Thumb** indicates team member may not like the specific idea but will support it through implementation when the event is over



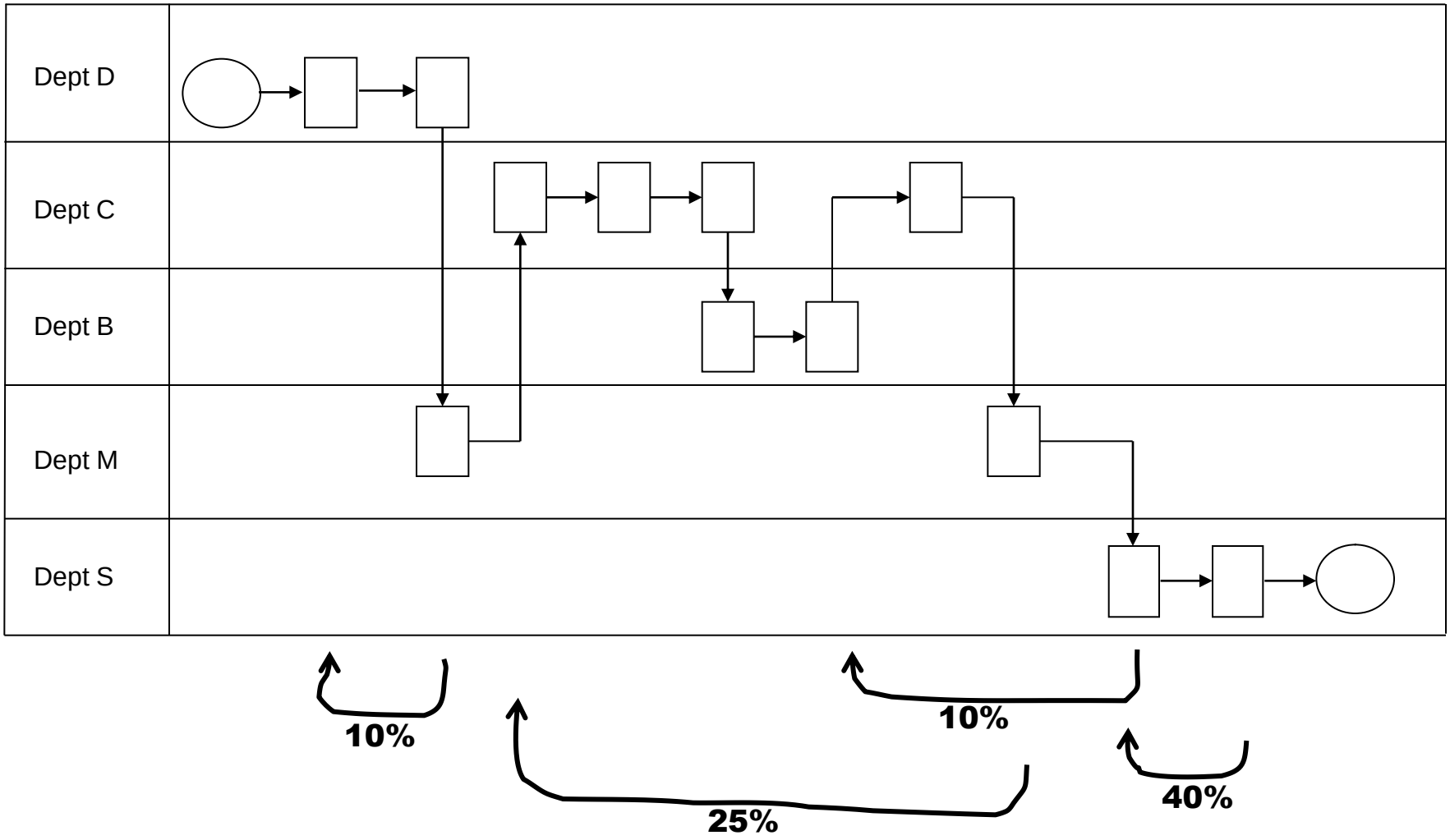
- **Thumbs Down** indicates team member does not like the specific idea and will not support it through implementation when the event is over

Functional Process Map (AS-IS or Current Reality)

- Shows not only the linear sequence of activities, but also the responsible functions for each activity



Process Rework Loops (AS-IS or Current Reality)



Current State Process Map

- A "map" which defines all actions currently required to deliver the product/service
- Visually identifies areas for improvement opportunities
- Integrate separate process flows into one combined process map

Customer, Product & Value Definitions

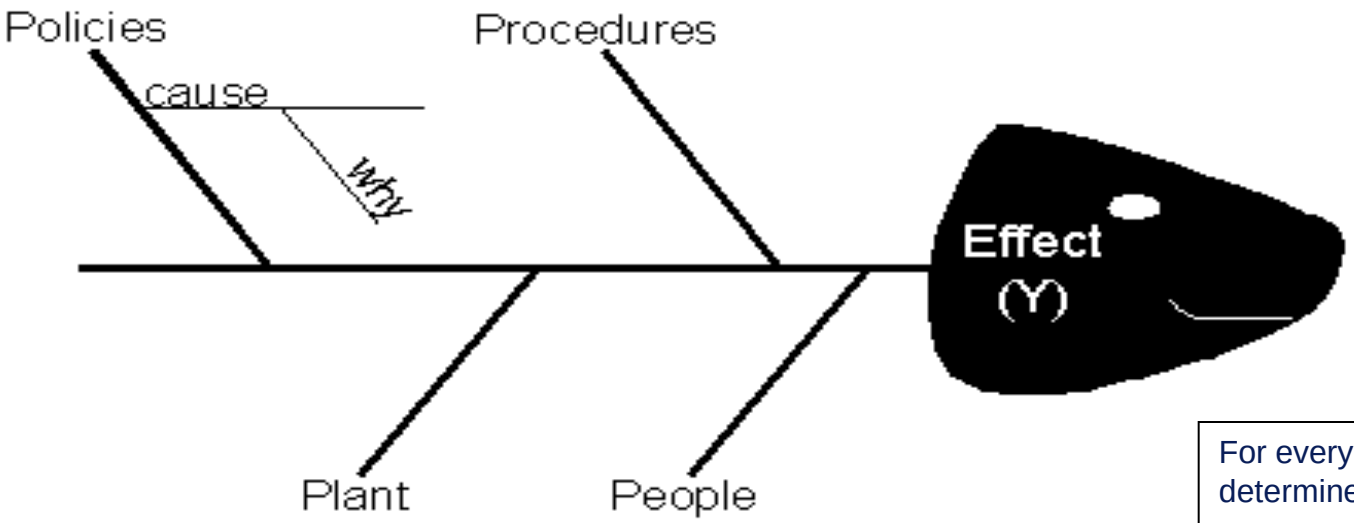
- Who is the Customer?
- What is the Product being created?
- What does the Customer value in this process?

Event Management Agenda for Facilitators

Day 2	Facilitator #2	Facilitator #1	Facilitator #2
	Brainstorming: 8 to 10:00am - Recap Current State map - Have team brainstorm ways to eliminate non-value added process steps and rework in the Current process - Review ideas for clarity and have team agree with combining duplicates, if necessary	**Cause and Effect Analysis: 10 to 12noon** - Explain Fishbone (cause & effect) analyses to determine root cause (use chart 11) - Have team split up into sub-teams (i.e. 3 people each) to create Fishbones to analyze those brainstormed items that capture what is wrong with Current process - Have team create SOV Matrices with actions for each Fishbone (use chart 12) that explain what they can do about the eliminating the problem in their new process - Have sub-teams out-brief their Fishbones/SOVs to the rest of the team	**Ideal Process Activity: 1 to 3pm** - Have team map an Ideal process (works right the first time, plenty of budget, no politics, etc.) - Have team brainstorm what it will take to get from the Current process to the Ideal Process. Have team capture their brainstormed ideas on post-its so they can be added to the PICK Chart **PICK Chart: 3 to 4:30pm** - Have team PICK chart their improvements ideas (use chart 13). Team must agree via consensus, on which quadrant each idea is to be placed

Cause & Effect Diagram (Fishbones)

- **These diagrams are used to isolate one specific defect, problem, or undesirable condition and determine the potential causes**
- **Excellent tool for determining root cause**



For every entry on the fishbone, determine if it is:

C = Controllable ⇒ requires Mistake Proofing and Standard Operating Procedures (SOPs),

N = Noise, or

X = Experimental

Major Cause Categories

Four P's for Service

- Policies
- Procedures
- People
- Plant/technology

Six M's for Manufacturing

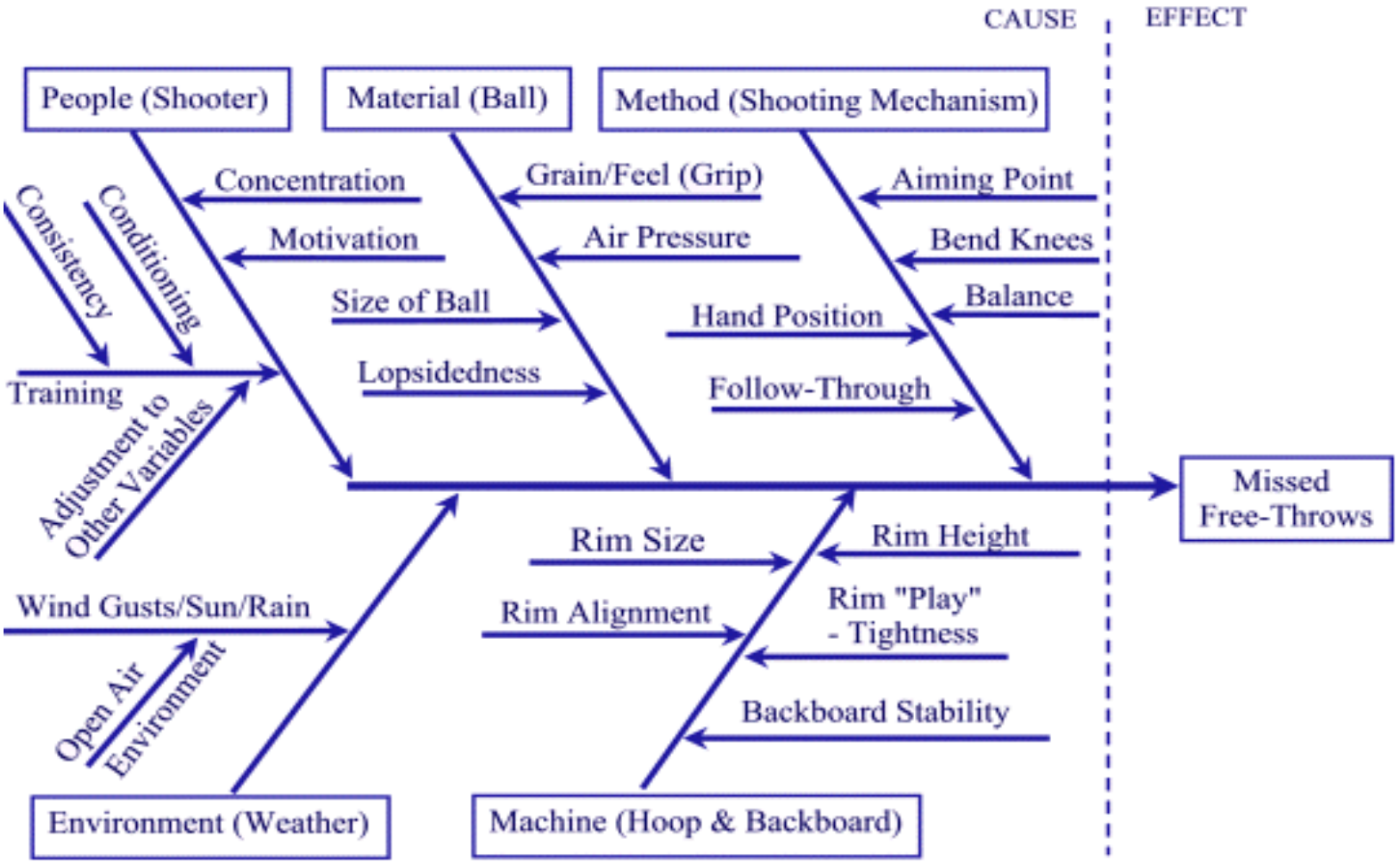
- Machinery
- Methodology
- Materials
- Measurement
- Mother Nature (environment)
- Manpower (People)

Process Steps - Consider using each major step in the process as a cause category. For example:

- Prepare Materials
- Process Materials
- Process Rejects
- Ship Product

Brainstorming Causes

- **Multifunctional team of experts brainstorm specific causes based on major categories.**
- **Attach each one to the cause arrow that leads to the centerline arrow.**



Next Steps

Once you have completed the diagram you should classify each variable as:

- **C - Controllable (Needs control mechanism, SOP)**
- **N - Noise (Can not be controlled easily)**
- **X – Experiments needed to determine effect (do not use for this exercise)**

The final Cause and Effect diagram may contain many potential factors

- **The team should prioritize which factors are the most significant causes**
- **Seek data to confirm relationships**

Note: Cause and Effect is a living document that should be saved for future reference

Ideal State

Team will develop an "Ideal State" Map where *ideal conditions* exist for this process ►

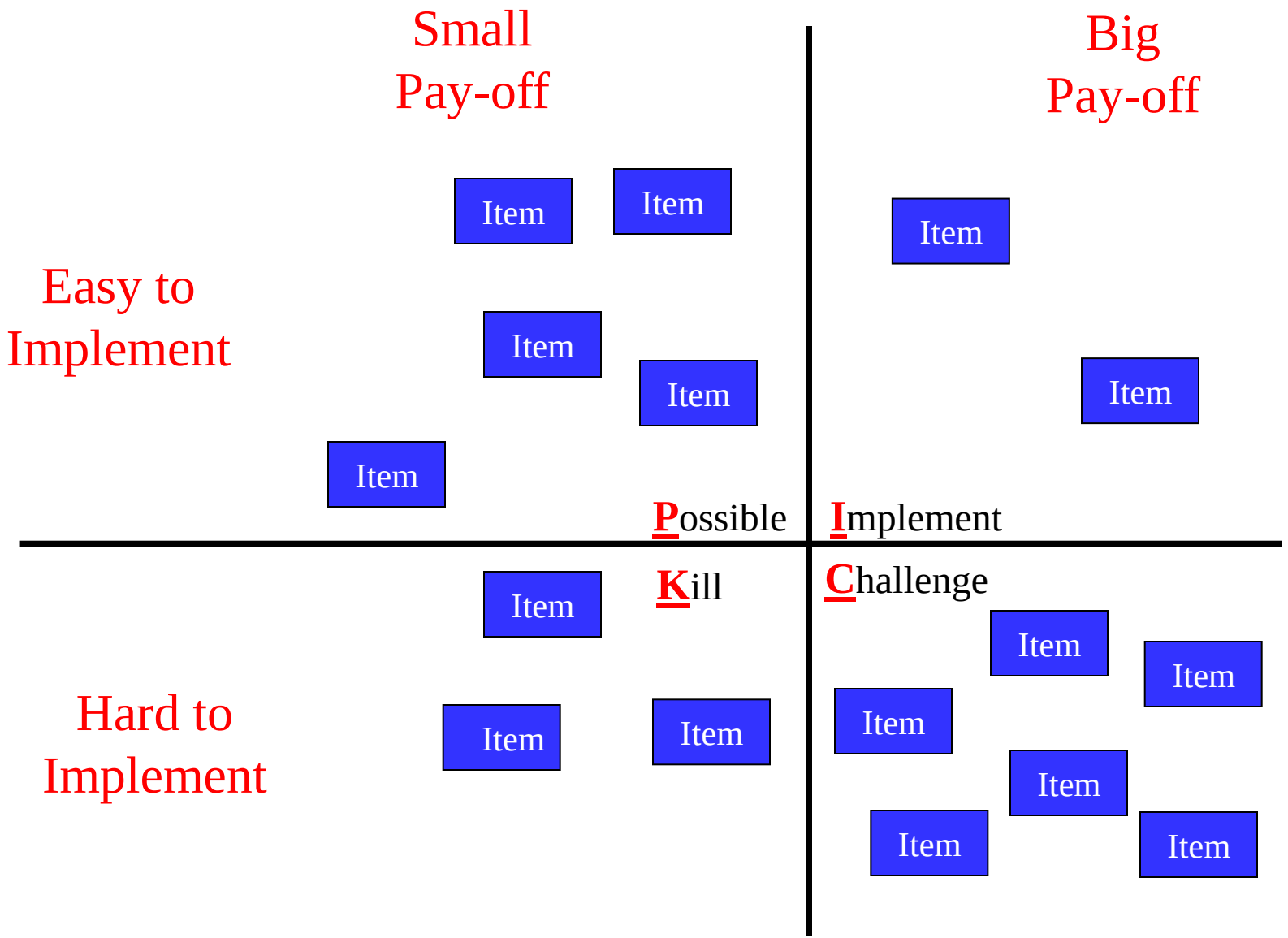
During this activity, team will capture

- **List of possible obstacles to the Ideal State**
- **list of key projects to make this happen**

- *No politics*
- *No bureaucracy*
- *Funding is not a problem*
- *Everyone shares ideas and tools*
- *The Customer defines a job well done*
- *Everyone wants to provide the Customer with the BEST product*

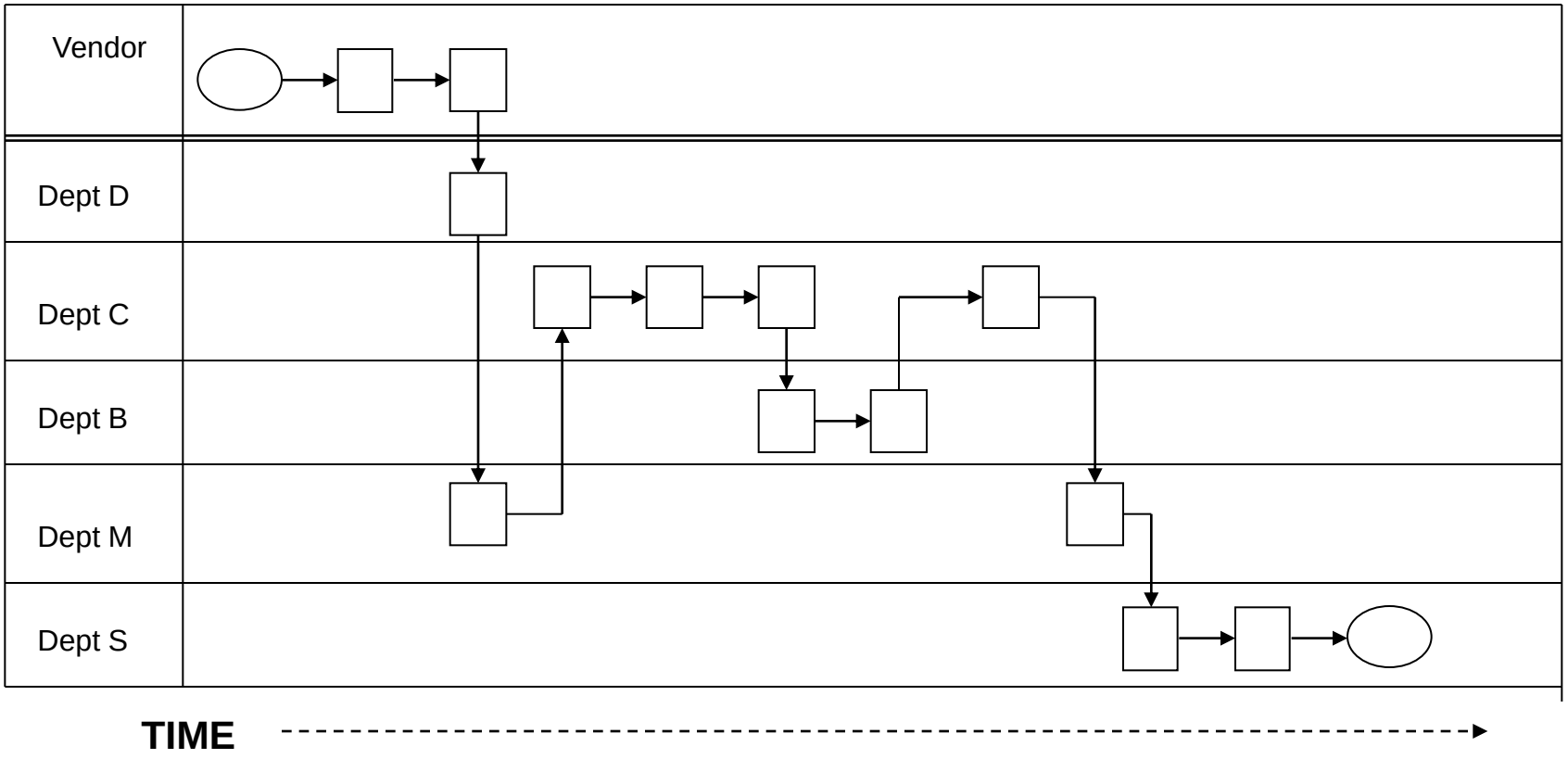
Note that IDEAL processes contain very few process steps because they are "Ideal"

PICK Chart


Small Pay-off
Big Pay-off
Easy to Implement
Hard to Implement
Item
Item
Item
Item
Item
Item
Item
Item
Item
Item
Item
Item
Item
Item
Possible
Implement
Kill
Challenge

Functional Process Map (To-Be or Future State)

- Shows not only the linear sequence of activities, but also the responsible functions for each activity



Event Management Agenda

Day 3	Facilitator	Facilitator	Facilitator
Future Process Map: 8 to 12noon - Review objectives and how team meets those in Ideal process - Have team Map new Future process on the wall with post-it notes reinforced by tape - Have team review all process steps and assure correct step sequence - Have team link steps with arrows - Have team add touch-times to post-it notes and calculate times of new process **Take Team Picture: 12noon** - Have team include team picture on Out-Brief Completion Report	**Sub-Team Work: 1 to 3:00pm** - Have a sub-team review action items and develop an Implementation plan – this may include ISO document updates (may need to split the team into sub-teams) (use chart 17) - Have a sub-team document the improvements they have made (before and after of: time, reduced process steps, reduced labor, etc.) and calculate the savings to include on Out-Brief Completion report (use chart 18) - Have a sub-team create accomplishment bullets for Out-Brief Completion Report (use Chart 18)	**Sub-Team Work: 3 to 4:00pm** - Team is briefed on sub-team activities and results, and obtains consensus to include charts in Out-Brief (tweaks are usually required) **Prep for Out-Brief: 4 to 4:30pm** - Facilitators and Team prepares for the Out-Brief - Team prepares for Champion and Sponsor Out-Brief (each team member will select an event activity to brief (show chart 19 as example agenda)

Event Management Agenda

OUT-Brief

Out-Brief is usually scheduled for an hour

- Ask the Team to keep their presentations to about 5 minutes each, so that the presentation part of the Out-Brief will only last about a half-hour

- The remaining half-hour will permit the Champions and Sponsors to ask questions to gain clarity on the new process and their role in rolling it out at the center

- Team Lead introduces team and briefly recaps the Charter (make sure the Charter is up-to-date, sometimes team members change…)

- Each team member briefs some aspect of event activity – all activities are presented at a high-level to the Sponsor – so each person speaks for only about 5 minutes

-Team Lead briefs Completion Report and asks for questions/comments from the Champions and Sponsors

- Champions & Sponsors should praise the team for their efforts!

Room Clean-up (1/2 hour):

- Facilitators have team restore room to original order

- Typically the Team Lead keeps the paper on the walls as the Team Lead is responsible for implementation of the Team's new process

Adjourn

Implementation Plan

TEAM:_____ DATE:_____

Item No.	*Problem – Issue – Opportunity*	*Action Required*	*Person(s) Responsible*	*Due Date*	*Status*

Completion Report - Event Title

date event completed

The way we used to do it...

-
-
-

The changes we made...

-
-
-

The way we do it now...

-
-
-

Picture/Graphic

Change Leader Name/Level:
Team Members:

Results

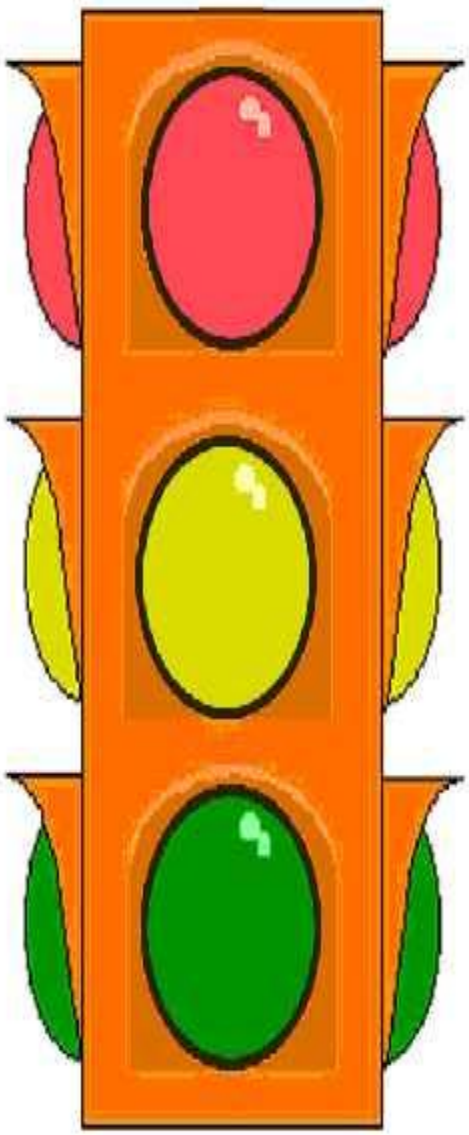
Category	***Before***	***After***	***Improvement***

Out-Brief to Champions/Sponsors:

- Integrated Current state
- Main areas for improvement
- Cause & Effect Analyses
- Ideal State
- PICK Chart
- Future State
- Implementation Plan
- Other items?
- Completion Report

Back-up

Value Added versus Non-Value Added



Non Value-added (Waste) Activities

- Activities that consume resources but create no Value in the eyes of the Customer Required (regulatory, customer mandate, legal)
- Pure Waste
- If you cant get rid of it turns yellow

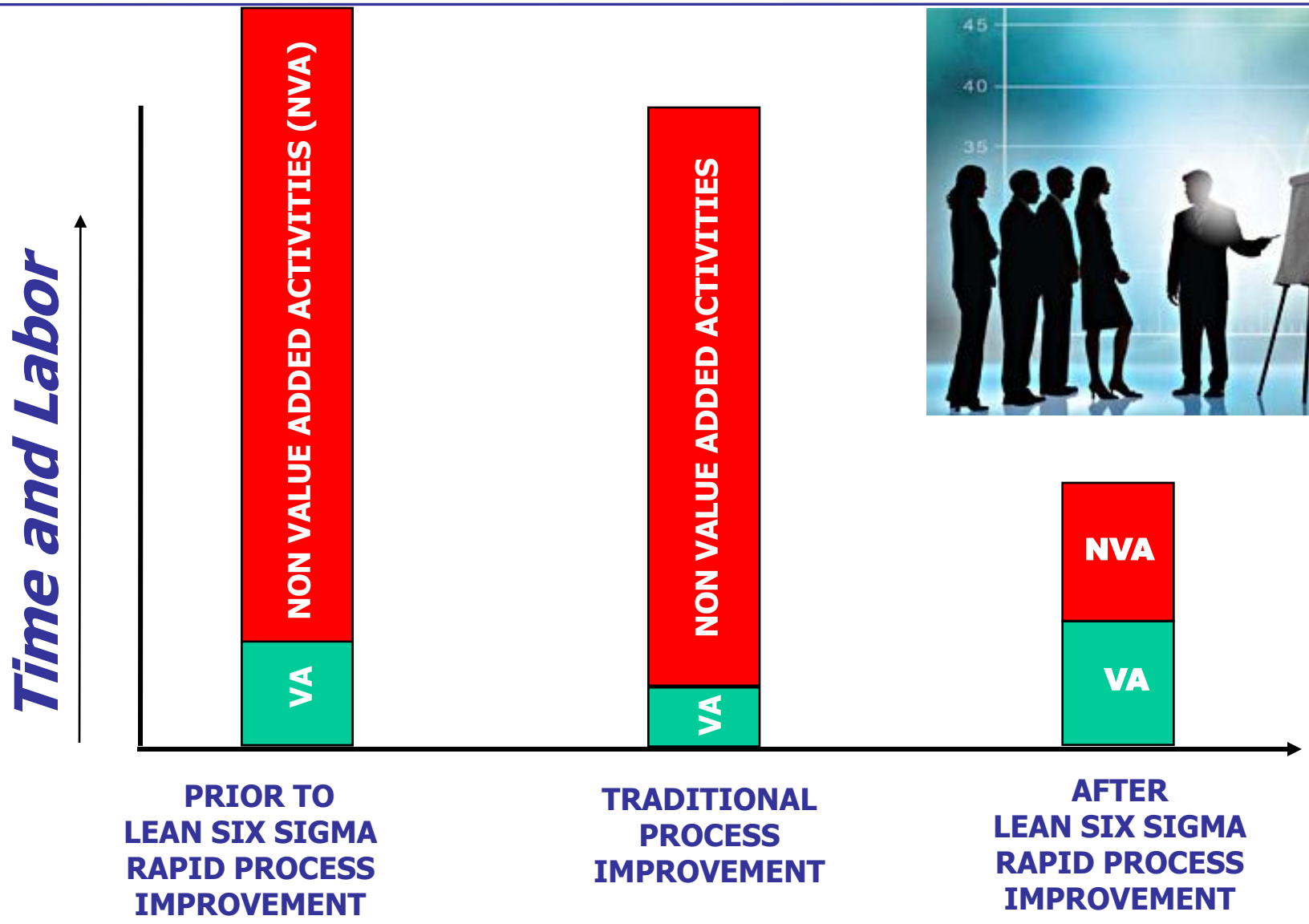
Non Value-added – Required Activities

- Activities causing no value to be created but which cannot be eliminated based on current state of technology or thinking
- Required (Required internal or external customer mandate)
- Necessary (due to non-robustness of process, currently required)

Value-added Activities

- Activities which change the form, fit or function and usability of the product/service and
- Activities which, when asked, the customer is willing to pay for and
- Activities done right the first time

NASA Reduces Non-Value Added Activities



A Focused / Prioritized Approach in Applying Lean Six Sigma

Strategic Plans…
Program Project Plans…

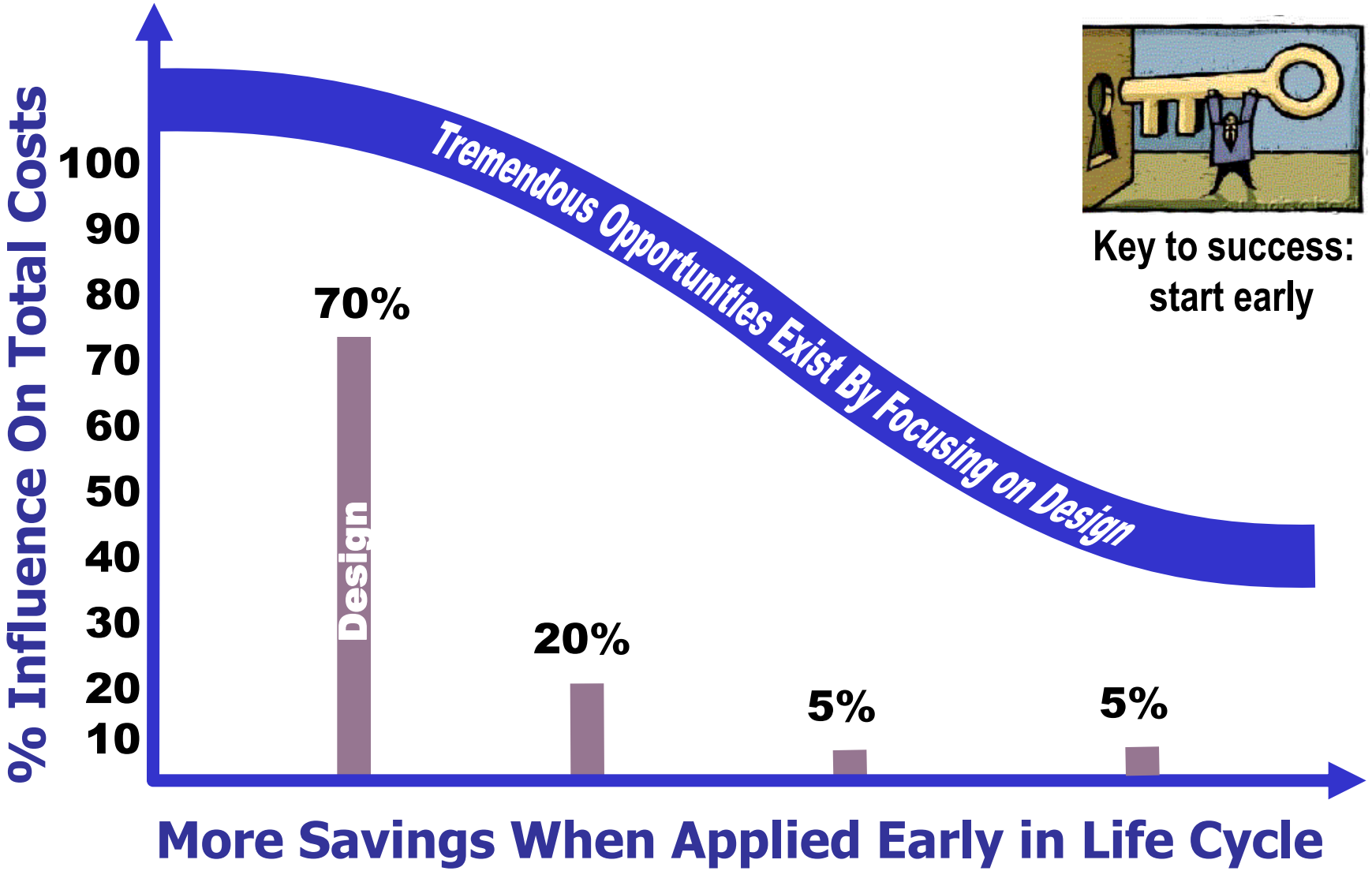
Mission changes, redirection, new enabling technologies are all reasons to …

…Focus efforts on those activities that will provide the most benefit

Hot Issues…
Low Hanging Fruit…
Benchmarking…

When Do We Start Applying Lean Six Sigma?

Key to success:
start early



Typical Kaizen Event Results - NASA

Cost Drivers	Targeted Improvement Results
Rework	30 – 80%
Span Time	30 – 80%
Labor	30 – 70%
Costs	30 – 70%
Inventory	30 – 80%
Variation	30 – 90%

You can ALWAYS reduce waste by at least 30%

How Do We Achieve Rapid Process Improvement at NASA?

By focusing on the Customer & what the Customer Values in the Products and Services they are using

- **Define Scope and Problem**
- **Determine Goals / Objectives**
- **Create Charter**

- **Gather As-Is Process data**
- **Define As-Is Process**

- **Identify Potential Causes**
- **Perform Gap Analysis from what Customer *really* wants**

- **Generate Potential Solutions**
- **Develop Implementation Plan**

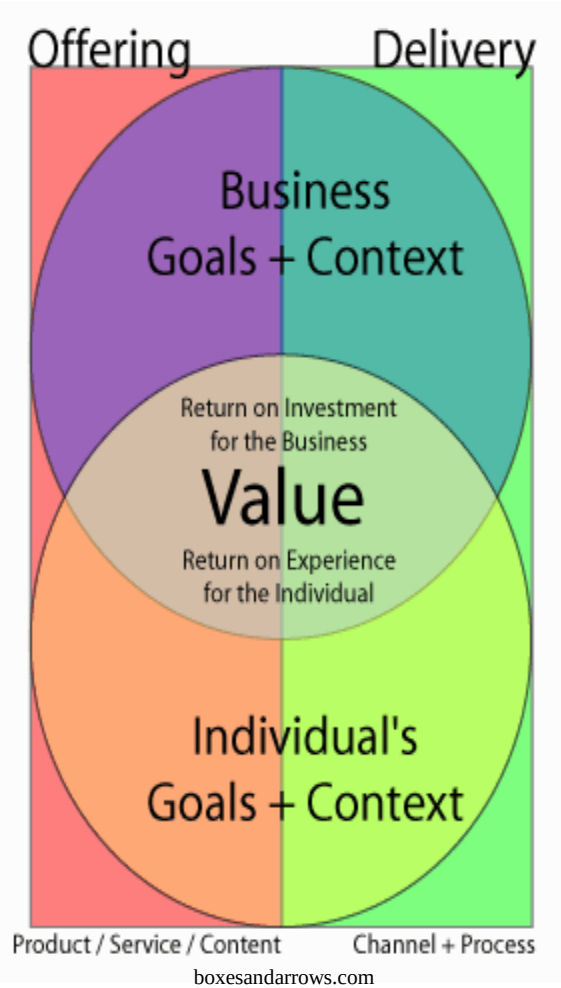
- **Create and Execute Monitoring Plan**
- **Status Team & Sponsors**

- **Teams' Solutions are fully implemented**
- **Celebrate Success**

Customer Value

Value is specified from the Customer's perspective

- Value is activity which the customer is willing to pay for
- Value is only meaningful when expressed in terms of a specific product or service which meets…
  - The customers needs
  - At a specific price
  - And at a specific time



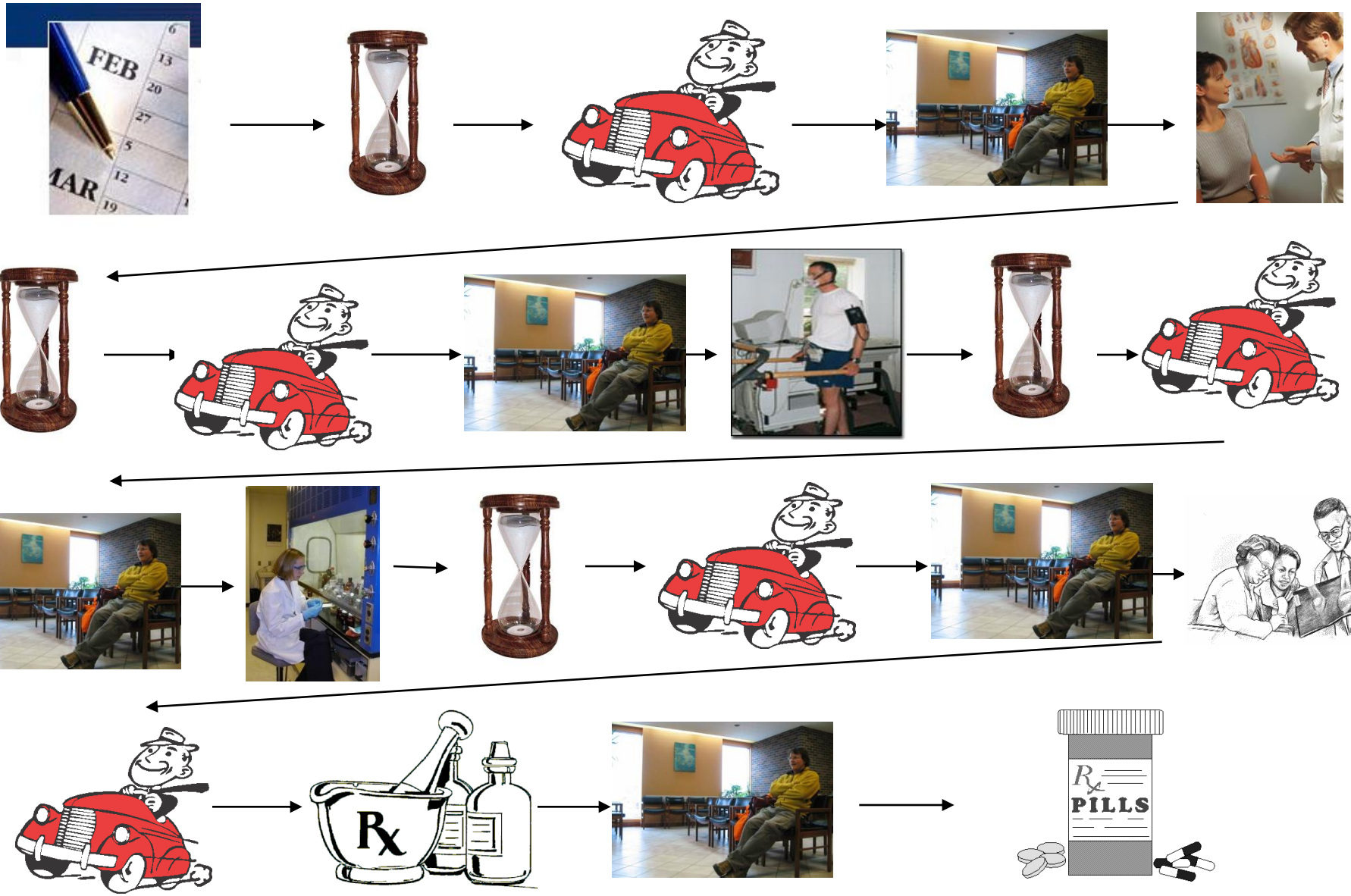
Have you asked your Customer what they Value?

Your "Value" Responsibility

- **Know your Customers**
  - **Internal (those that create the product / service)**
  - **External (End Users)**
- **Know exactly what your Customers value in your product or service**
- **Stay close enough to your Customer to know if they are satisfied or not**

- **Ensure that your Customer Satisfaction *recovery actions* are swift, effective, and lasting**

Typical Doctor Visit

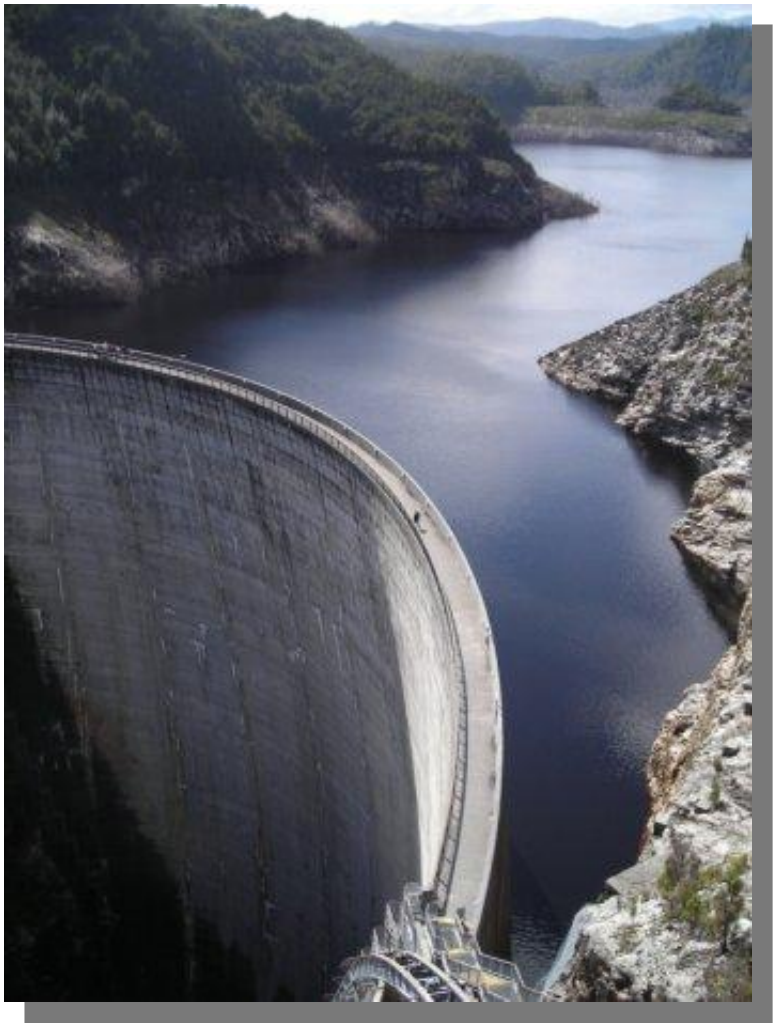


Forms of Waste = DOWNTIME

When a Value Stream stops flowing you have downtime…

- When you have **DOWNTIME** you encounter one of the 8 forms of Waste.

- **D** – **Defects**
- **O** – **Over Producing**
- **W** – **Waiting**
- **N** – **No Injuries**
- **T** – **Transportation**
- **I** – **Inventory**
- **M** – **Motion**
- **E** – **Excessive Processing**



Session Summary

- **Measuring is important to understand how well we are or are not performing**
- **Follow the five step approach to establishing good process measurements**
  - Determine what to measure
    - Always select measurements which have a purpose
  - Determine how to measure
  - Determine measurement / data source
    - Be aware of potential pitfalls in manual data collection
  - Determine data collection / sampling plan
    - Use tools such as surveys to gather data quickly
  - Determine how to maintain the measurement