Lean Six Sigma –

Real Experiences from Real Practitioners

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Albuquerque, N. M.

Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy under contract DE-AC04-94AL85000.

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The opinions expressed in the presentation are solely / sorely, the presenters'.

Software Problems Have Been Eradicated (huh?)

Software defects cost the U.S. $59.6B a year[1]

38 percent of polled organizations have no SQA program[2]

Software technicians in Panama are charged with second degree murder after 27 patients received overdoses of gamma rays; 21 have died in 40 months[3]

BMW, DaimlerChrysler, Mitsubishi, and Volvo experience product malfunctions (engine stalls, gauges not illuminated, wiping intervals, wrong transmission gears) due to software[4]

In 2000, the nctimes placed the cost of one virus at $10B[5]

After more than two years of delay, the state Department of Labor's $13M million computer system to process unemployment insurance claims and checks still isn't fully off the ground[6]

[1] Informationweek, *Behind the Numbers*, March 29, 2004; pg 94
[2] CIO, *By the Numbers*, December 1, 2003, pg 28
[3] Baseline – The Project Management Center, *We Did Nothing Wrong*, March 4, 2004
[4] Informationweek, *Software Quality*, March 15, 2004; pg 56
[5] www.nctimes.com/news/050600/d.html
[6] Albuquerque Journal; *Computer A Real Labor For State*; 6/04

A Sampling of Reported Savings

Saves an average of $250K per project [1]

Ratheon Aircraft saved $.5M from one IT project alone.[2]

Textron saved $5M in six months.[2]

Allied Signal reduced costs over 5 years by $1.4B[3]

Motorola reduced manufacturing costs over 7 years by $1.4B[3]

General Electric reported a $1B savings in two years reducing defect / re-work costs by ½ .

"We are making excellent progress, $15M to date" at Mount Carmel Health

Lockheed Martin Joint Strike Fighter project – 70 – 90 percent Commonality of parts; Applicability to USAF, US Navy, US Marines, UK Navy and the Royal Navy; On schedule, under budget; 100 percent digital design process. [4]

[1]Six Sigma Academy, Scottsdale, AZ.

[2]CIO Magazine, Targeting Perfection, 12/1/2003, pg. 62

[3]Basic Statistics, Kiemele, et al; Air Academy Press; 2000, pgs. 45 & 46

[4]Quality Magazine, B. Jones; 6/03

Lean Six Sigma and CMMI®

Mentioned in at least six sessions at the 2004 SEPG Conference

CMMI[SM] Level 4 calls for the analysis of special (assignable) cause variation in process[1]

CMMI[SM] Level 5 calls for the analysis of common cause variation and to improve the process while sustaining the process with statistical predictability[1]

Northrop Grumman reports eight operating units at CMMI[SM] Level 5 using Six Sigma; corporately certifying 3000 Green Belts and 200 Black Belts

The High Maturity Workshop sponsored by the SEI in 2001 identified *many* high maturity organizations as also using six sigma.

[1] The CMMI[SM] Version 1.1; page 14

Understanding Lean Six Sigma

"***at many organizations simply means a measure of quality that strives for near perfection***"[1]

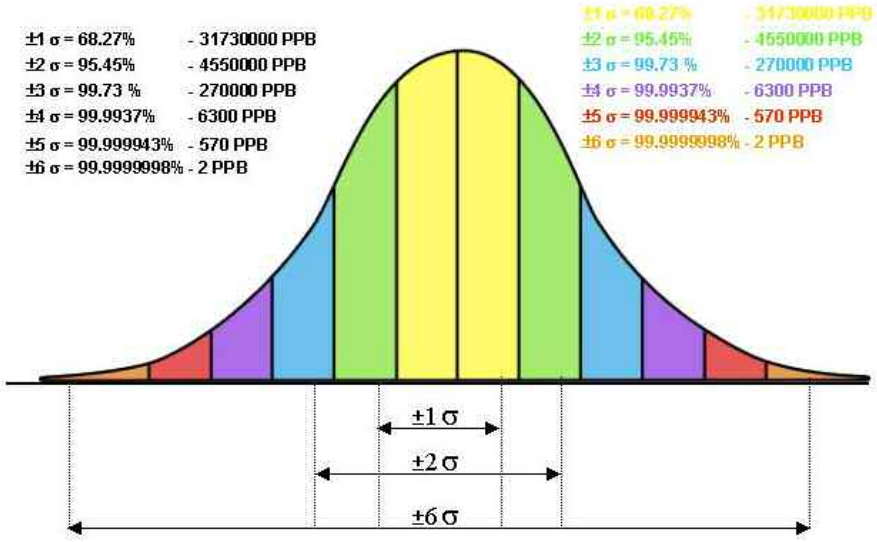
A topic mentioned on more than 3,950,000 web sites (Lean SS: 561,000) (6/05)

Not a cult group, not a slogan

Motorola's Six Sigma program was a statistical target: 3.4 defects per million opportunity (a chance for non-conformance)

Using Six Sigma as a process improvement approach – 7 ½ sites out of 10; statistical approach 2 ½ out of 10; 1 more undecided

Six Sigma for process improvement, not six sigma as a statistical target



[1] Statistical Six Sigma Definition;
http://healthcare.isixsigma.com/library/content/c010101a.asp

Industry Components of Lean Six Sigma

Typically oriented toward manufacturing floor but has also been used in business "transactional" setting

Customer – focus is on "voice of the customer"

Measurement – reduced variation – "voice of the process"

Green Belts – varying periods of training and certification activities

Black Belts – varying periods of training and certification activities, usually some mentoring; Change agents, improvement agents

Cycle time – time to complete a cycle of operation

DSS – Design for Six (or *Single*) Sigma – do we create capacity only to turn around and squander it?

Flow – product not produced until recipient requests it (less inventory, better quality if defect found in process that has inventory, less space, engages workers)

Lead time – total time to complete a set of tasks (includes delays, queues, etc.)

Lean – as much as necessary, and no more

Value Stream – a process for determining the current state and performance of a process with the intention to lean and improve process performance

Industry Uses of Six Sigma Belts

Belt Color	Coursework	Practicum	Note
Yellow	Week 1 course – pass final exam	None	Basically a green belt without practicum
Green	Week 1 course – pass final exam	Project or help with an event	"Official" belt
Brown	Weeks 2 & 3 of course – 2 more final exams	None	Basically a black belt without practicum
Black	Weeks 2 & 3 of course – 2 more final exams	Participate in 3 events; mentor 3 to Green	"Official" belt
Master Black	Weeks 4 - 7 of course	Extended experience	Availability, letters of recommendation

Note that within Lockheed Martin Corporation, the green, black, and master belts are recognized

Lean Six Sig~~ma Jarg~~on Vocab

kaikaku – (roughly) radical improvement

kaizen – kai – to take apart; zen – to make new (better)

A kaizen event includes event planning, sponsor kick-off, objectives and goals, some LSS training (can be accomplished prior to event), mapping current state, waste identification, root cause analysis, B/Sing on solutions, solution implementation, mapping the new (future) state, and ongoing reporting with the sponsor.

kanban – a indicator (card or light) that signals the movement or productions of product

muda – waste

poka-yoke – mistake proofing; preventing defects from moving forward

takt time – daily available production time / daily customer demand (quantities) or how fast you have to go?

Definitions interpreted from Lean Thinking; Womack & Jones; ISBM 0-684-81035-2

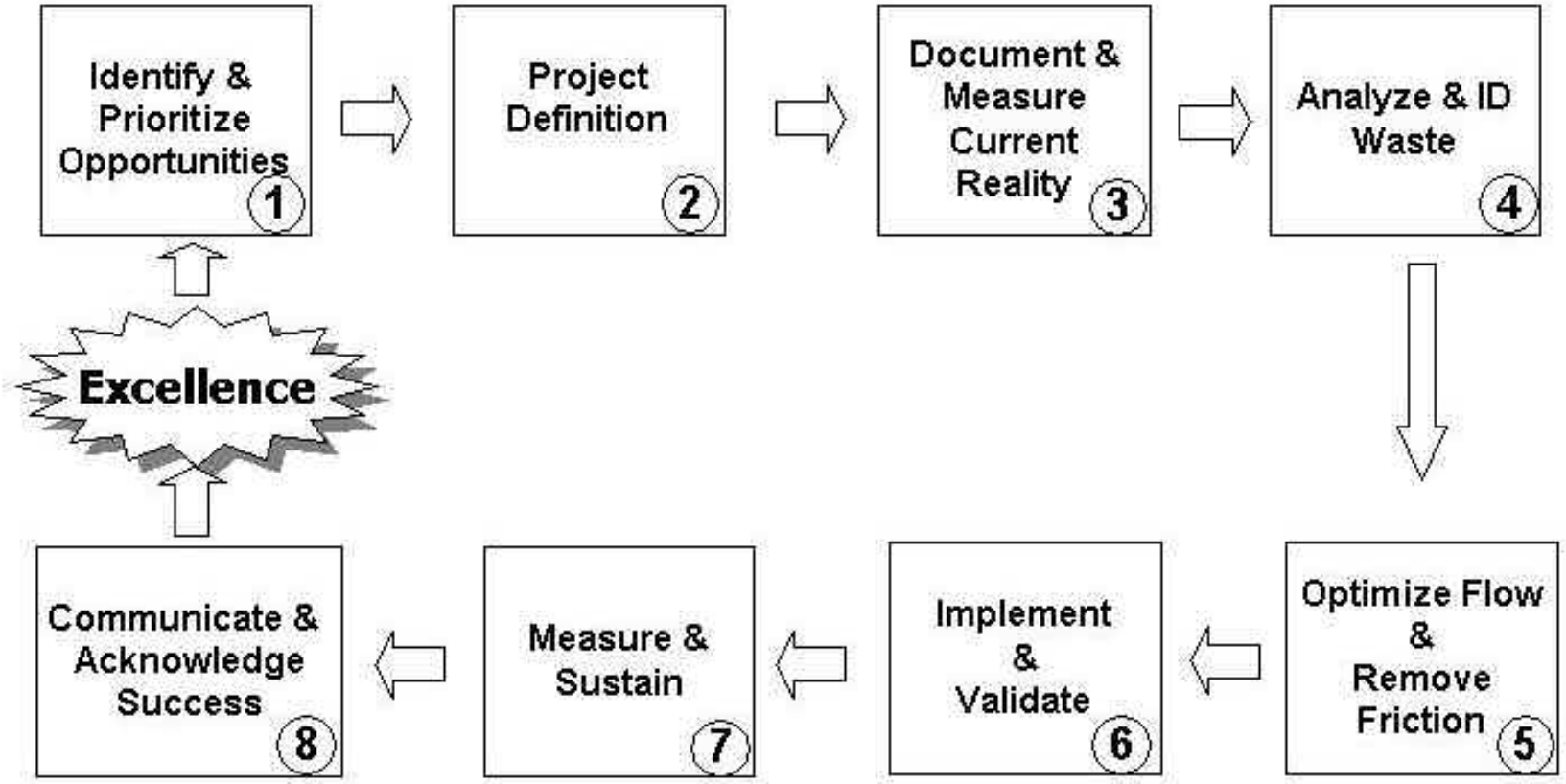
Lean Six Sigma and other Process Improvement Frameworks

DMAIC – Define, measure, analyze, improve, control (vs. delay, minimal attention, ignore, quit) ***Define*** **better include defining defects and measures across the organization.**

PDCA – Plan, do, check, act (vs. Postpone, defer, challenge, avoid)

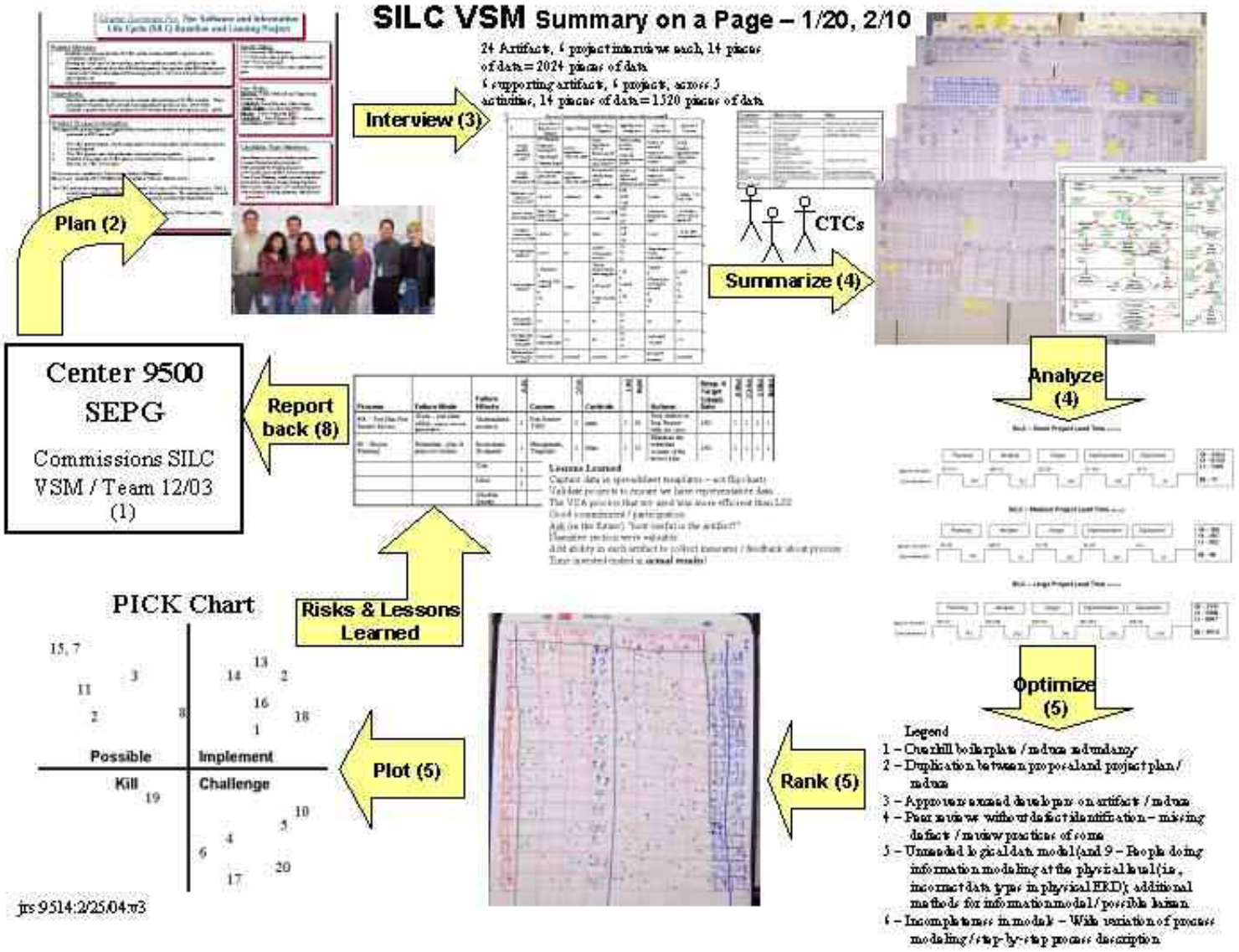
IDEAL℠ – Initiating, Diagnosing, Establishing, Acting, Learning (vs. improvise, dig-in, exclude, acquiesce, . . .)

Lockheed Martin's LSS Approach – Path to Excellence

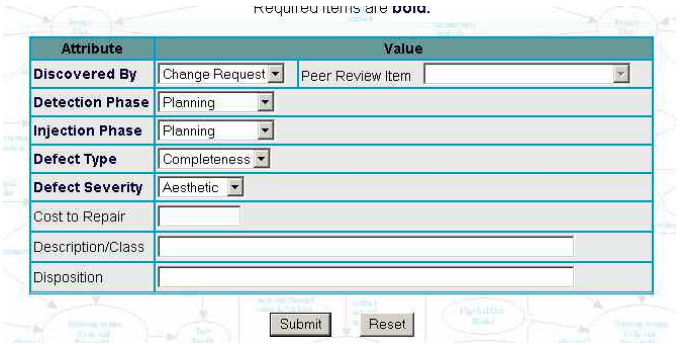


Lean Processes That Operate At Six Sigma Capability

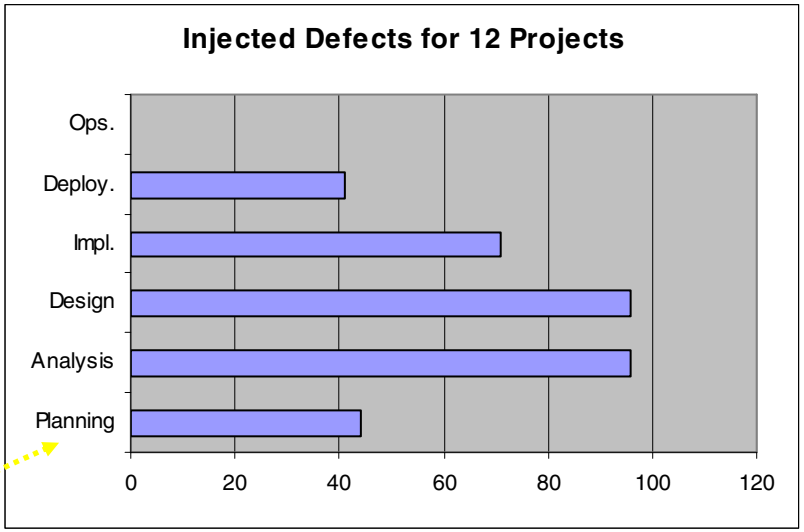
An Example of the Steps in Action



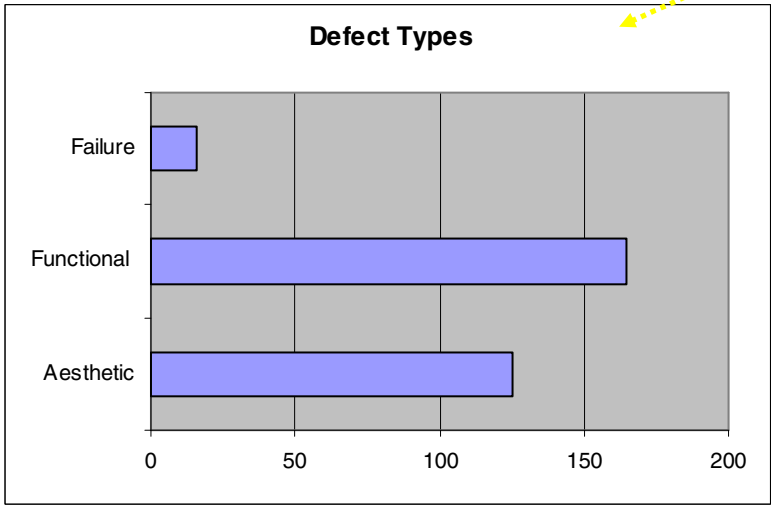
Applying DMAIC to Defect Data (cont'd)

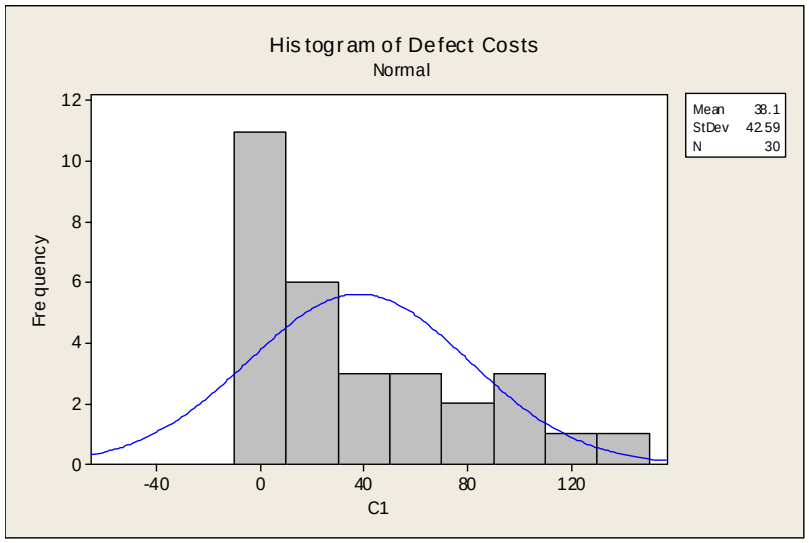


Measure

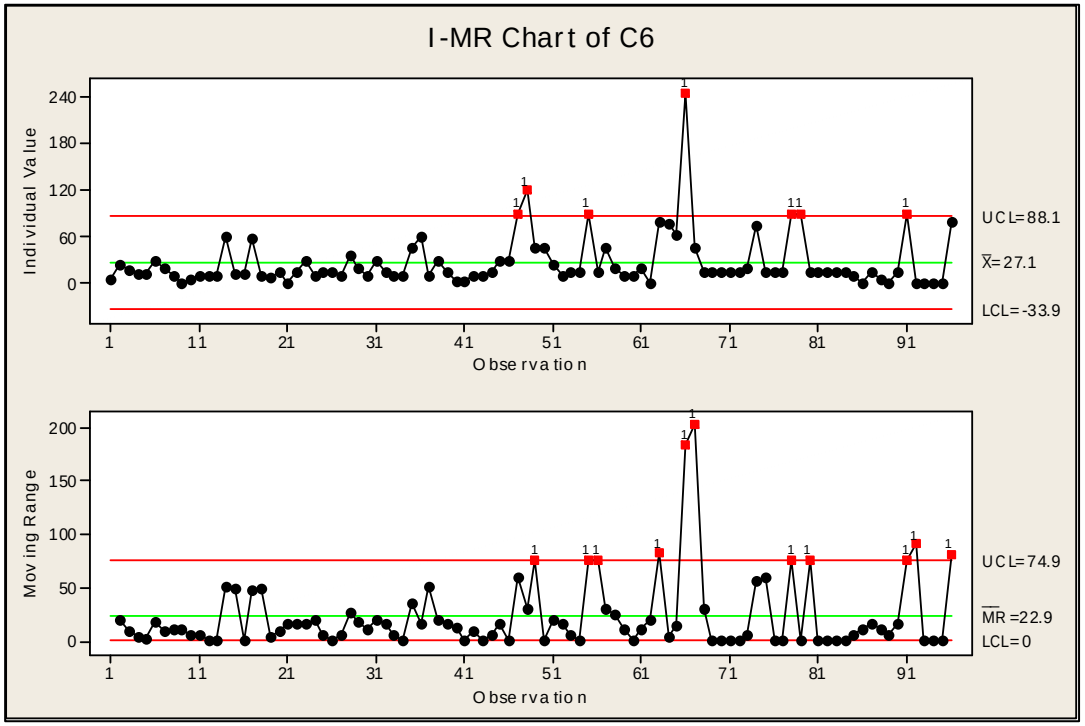


Analyze





Applying DMAIC to SQA Data



Did you know?

The SEI "requires" SPC charts at Level 4

Remember:

Special or "assignable" causes are removed at Level 4

Common causes are reduced at Level 5

Lean Six Sigma
A Practitioner's Experience

Cindy Longenbaugh

LSS Transformation

- Champion Characteristics
- Leadership Qualities
- Lessons Learned

A LSS Champion

- Must Be a ‘Passionate’ Influential Manager Believing in LSS
- Must Be Willing and Able to Standup to Criticism and Challenge
- Must Be Empathetic, yet Driven

Leadership During Change

- **Must Be Willing to Take Off the Plate, those things that aren't as important**
- **Must Plan for Extra Capacity**
- **Must Dedicate Resources Toward Continuous Improvement, Full Time**
- **Must Have Clear Metrics and Goals**
- **Must Hold Peers/Subordinates Accountable for Results**

Lessons Learned

- You Need a Burning Platform. If You Don't Have One, Create One
- Full Time Resources Dedicated Towards LSS Transformation is Critical for Near Term Success
  - Industry recommends: .5 percent of population be full time LSS Practitioners
- Inch Wide, Mile Deep Focus on Results
- Create A Support System for LSS Practitioners
  - Your LSS Practitioners are Your Future Leaders!
- Just Do It – don't over-analyze
- Never Stop Learning/Improving – There is no end.

Lean/Six Sigma Results (examples)

LSS FY04	Projected	Realized
Weapon Component Quality Tracking Project (software process)		Finished project 2 months early
Product Development Welding Cell		96% reduction in cycle time
Product Inspection Time		68% reduction in cycle time
Product Mass Property Measurement		56% reduction in cycle time

Lean/Six Sigma Results (examples)

LSS FY05	Projected	Realized
Personnel Moves	98% rework reduction	
Lab Lockout/Tagout Process		78% Page Reduction; Simpler, more visual process
Industrial Hygiene Lab 6S		Increased Bench Space by 30%; Increased Drawer Space by 50%
SNL Production Engineering Authorization Work Cell		88% Cycle Time Reduction; 60% Resource Reallocation
NWC Production Engineering Authorization Process	Reduce Cycle Time by 98%	