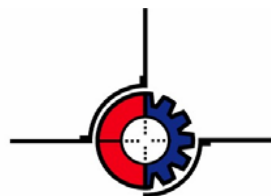




AMC



**Lean Six Sigma**  
U.S. ARMY MATERIEL COMMAND



# ARDEC's Lean Six Sigma (LSS) Program

TO

NDIA

## Armaments Technology Firepower Symposium & Exhibition

**PAUL E. CHIDO**  
Director, Quality Engineering & System Assurance,  
RDECOM-ARDEC  
Chair, AMC Quality Federation  
Certified Lean/Six Sigma Master Black Belt

12 June 2007

# ARDEC Lean/Six-Sigma Program

- LSS has Proven Fundamental to ARDEC Satisfying Army Objectives in the Acquisition and Sustainment of Armament & Munitions Systems
  - ✓ Institutionalizing a culture of “Fact & Data Based Decision Making”
  - ✓ Instilling Lean Six Sigma into Workforce Daily Activities for a Continuous Improvement “Way of Doing Business”
  - ✓ Evolving from DMAIC/DMALC to Design for Lean Six Sigma
  - ✓ Provides the tools for improving all our processes

# Why Did ARDEC Change to “LSS Way of Doing Business”?

## ➤ Original Burning Platform:

The Army could not Afford to have Ammunition with Critical Defects Escaping into the Battlefield

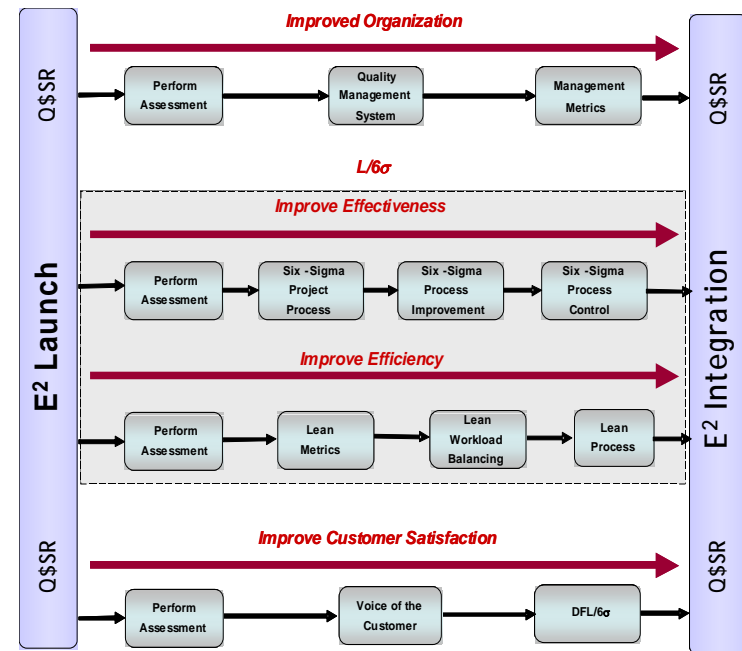
ACAT I Program Producibility Issues

## ➤ Current Burning Platform:

Continuous Process Improvements to Better Serve Warfighter Needs - Quality, Cost, Schedule & Risk (Q\$SR)

## ➤ Provide a Framework to Achieve Enterprise Excellence (QMS, L/6σ, VoC)

- ✓ A disciplined, structured approach for process and product optimization that is focused on the effectiveness and efficiency bottom line of the organization



# ARDEC ENTERPRISE EXCELLENCE

*Do Things Consistently*

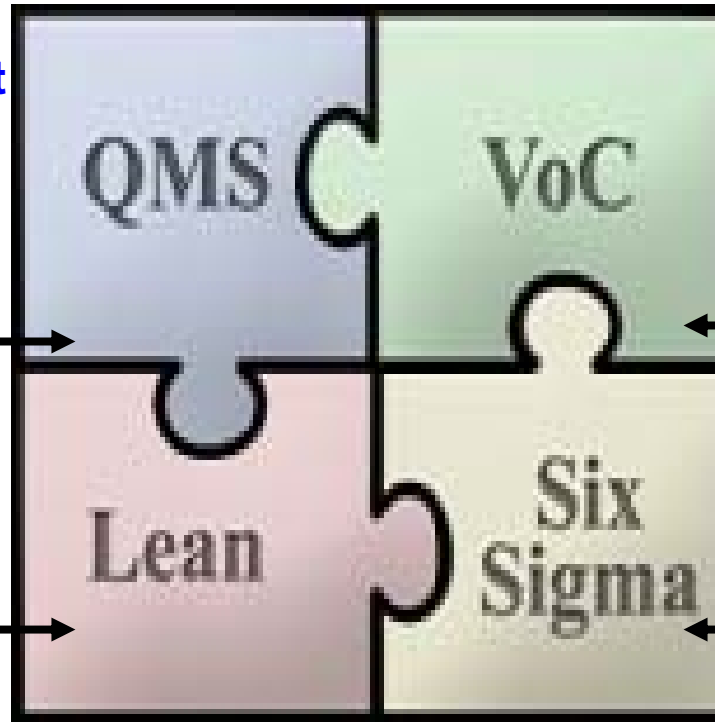
*Do the Right Thing*

Baldrige as management framework; Controlled, repeatable, tailorable processes (CMMI, ISO); Balanced Scorecard

Systems Engineering for common understanding of customer requirements

Drive efficiency - Fewer steps

Drive effectiveness



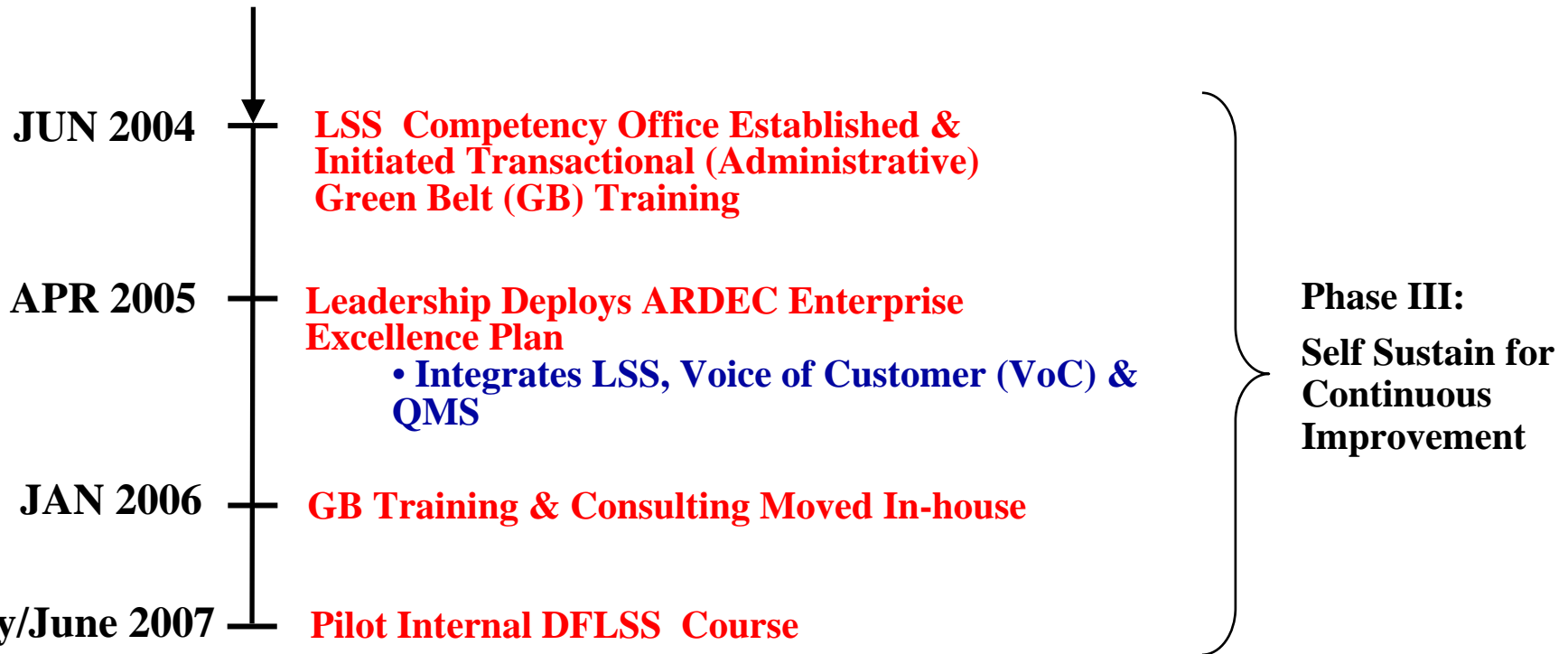
*Do Things Right*

*Integrates best practices*

# ARDEC LSS Deployment Timeline



# ARDEC LSS Deployment Timeline (Cont)



**Gold Army Performance Excellence Award Winner**  
*“[ARDEC] is one of the Army leaders in Lean Six Sigma and serves as a benchmark for other Army organizations to emulate.”*  
– Francis J. Harvey, Secretary of the Army,  
16 December 2005

# DA Business Transformation

LTG N. Ross Thompson III is the Director of the Army Acquisition Corps (AAC) and the lead office of the Assistant Secretary of the Army for Business Transformation. LTG Thompson oversees the deployment of Lean Six Sigma across the Army.

**“Together we will constantly evaluate the way we are doing business in order to streamline our business practices”**

**“Integrate and apply Lean Six Sigma (LSS) and the Balanced Scorecard approach into all of your business practices at every level”**

# Army Materiel Command (AMC)



**General Benjamin Griffin,  
Commanding General,  
U.S. Army Materiel Command**

**Lean Six Sigma Policy Signed by  
General Griffin – 22 May 2005**

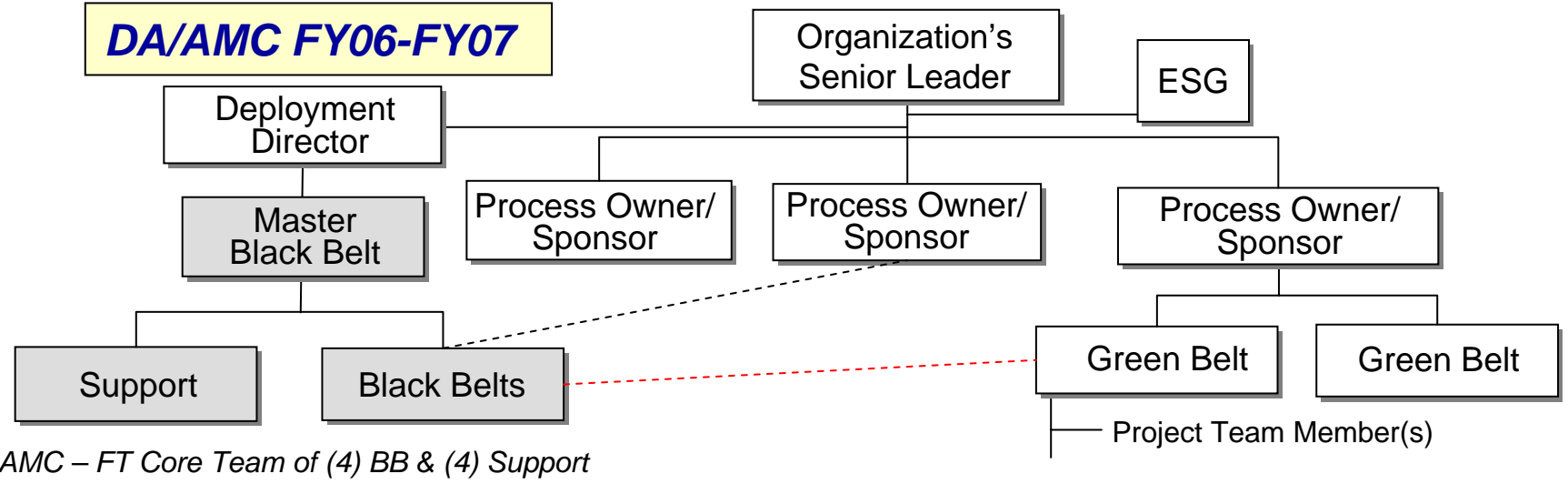
*“Need to be faster, more agile, less bureaucratic...  
better support to the Warfighter. AMC will  
continue aggressive implementation of Lean Six  
Sigma ... leaders who are willing and able to  
change the way we are doing business.”*



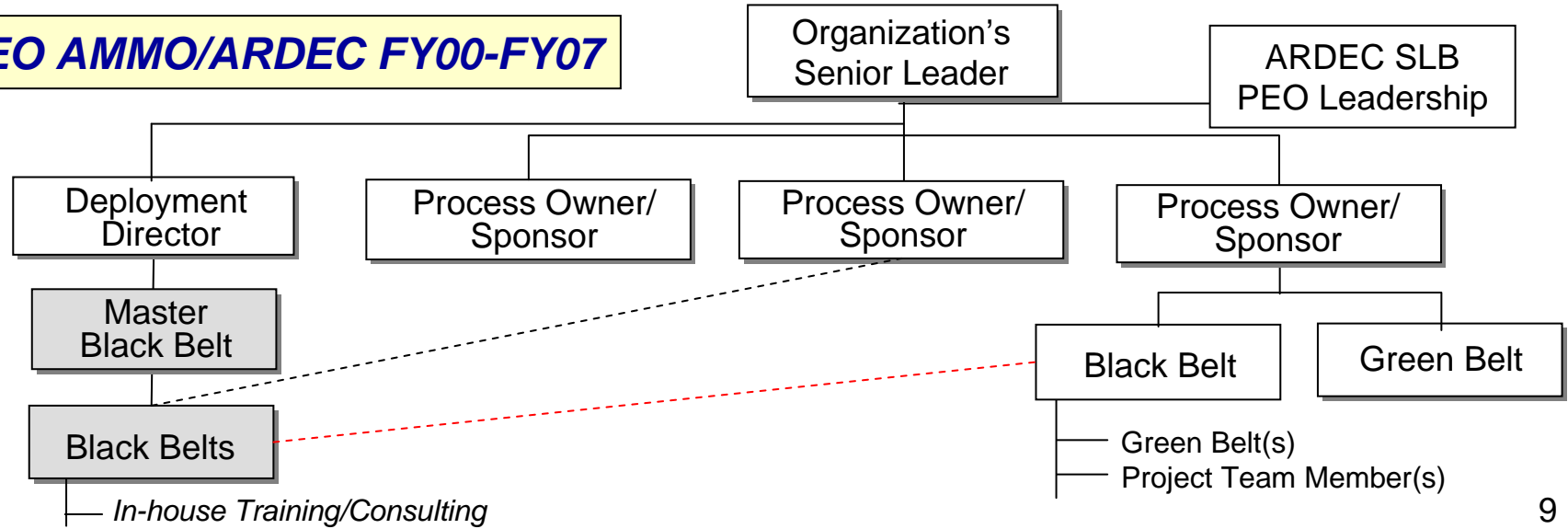
# LSS Alignment

Fulltime Position  
 Project Support  
 Mentor/Consult

## DA/AMC FY06-FY07



## PEO AMMO/ARDEC FY00-FY07



ARDEC – FT Office of (8) MBB/BB & (1) GB

# ARDEC LSS Implementing Infrastructure

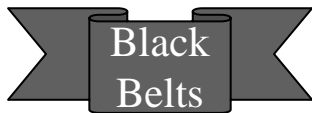


Executive Leadership

Review Board

Competency Management

Consultants



Project Leads

Integrated Teams

- Change Agents
- Vision & Resources
- Support through Words & Deeds

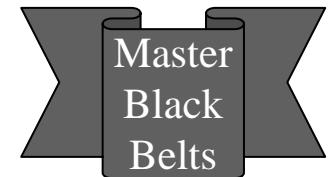
- Controls
- Relevance
- ROI

- Structure & Measurement
- Training & Mentoring
- Evolution & Innovation

- Work System-level Programs
- Assist Green Belts/Black Belts

- Satisfy Timelines
- Target Q\$SR

- Use the Tools
- Support the Customer



# Lean Six Sigma Continuous Benchmarking

**GE**

**Textron**

**The Toyota Way  
Dr. Jeffrey Iker**

**IBM**

**Naval Supply  
Systems Command**

**Caterpillar**

**The George  
Group**

**Booze Allen  
Hamilton**

**3M**

**Honeywell**

**ASQ**

**Raytheon**

**PDSS  
Ship Creveling**

**Enterprise Excellence  
VSE Corp.**

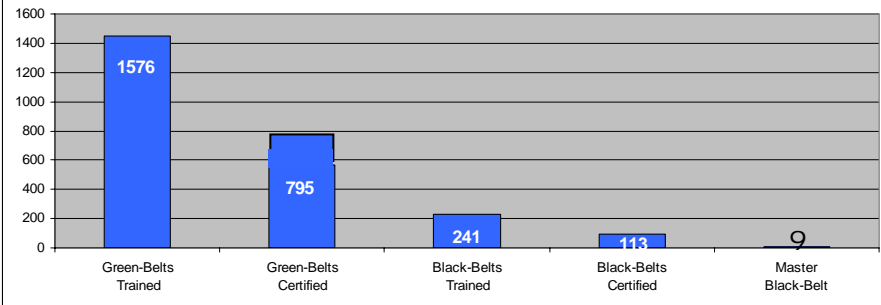
## Books

- *Achieving the Competitive Edge*, Jackson Jr., H.K., et al
- *Design for Six Sigma in Technology and Product Development*, Creveling, C.M., et al
- *Lean Six Sigma Pocket Toolbook*, George, Michael L., et al
- *Service Design for Six Sigma*, EL-Haik, Basem, et al
- *Six Sigma for Technical Processes*, Creveling, C.M., et al

**Continuously Learning from Industry Leaders**

# ARDEC LSS Metrics (1Q07)

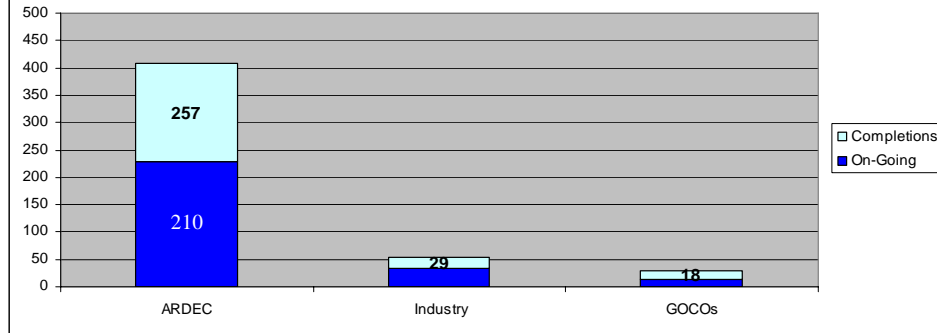
## Training & Certification



*Over 55% ARDEC Community Green Belt Trained!*

# ARDEC LSS Metrics (1Q07)

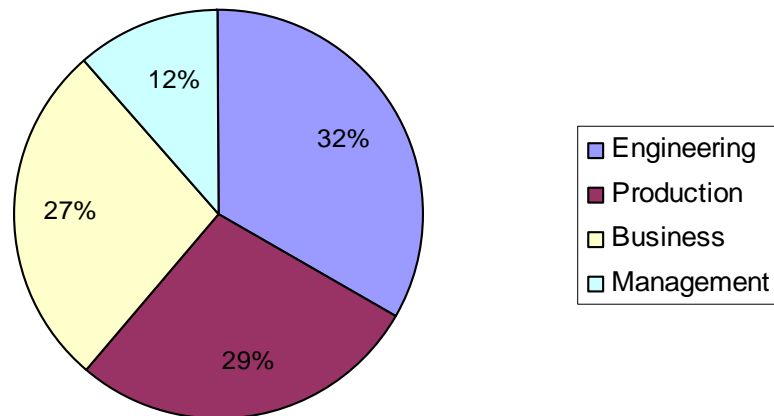
## Projects



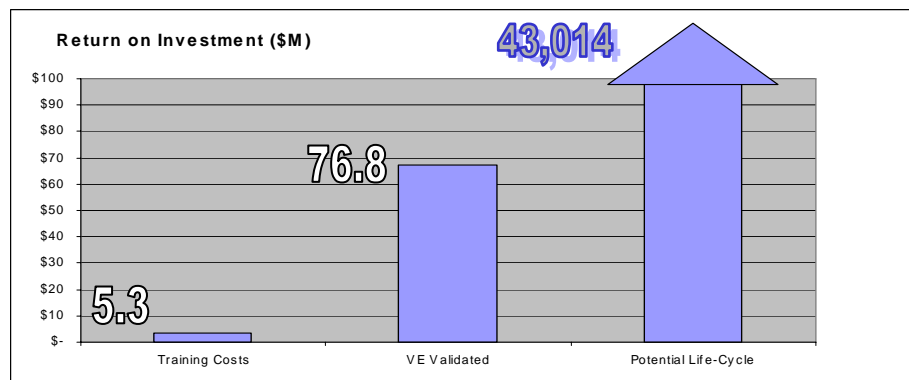
*257 Completed Projects*

# LSS Project Disciplines

## Processes Impacted by LSS Projects



# ARDEC LSS ROI



**\$43,014B Savings/Avoidance**

**15:1 VE Validated Returns**

- Value Engineering Adds Rigor
- Recognized Standard
- Independent Verification
- Hard Numbers Only

**Q\$SR Improvements:**

- ✓ Quality (92%)
- ✓ Co\$t (68%)
- ✓ Schedule (72%)
- ✓ Risk (87%)

# How We Change “Way of Doing Business”?

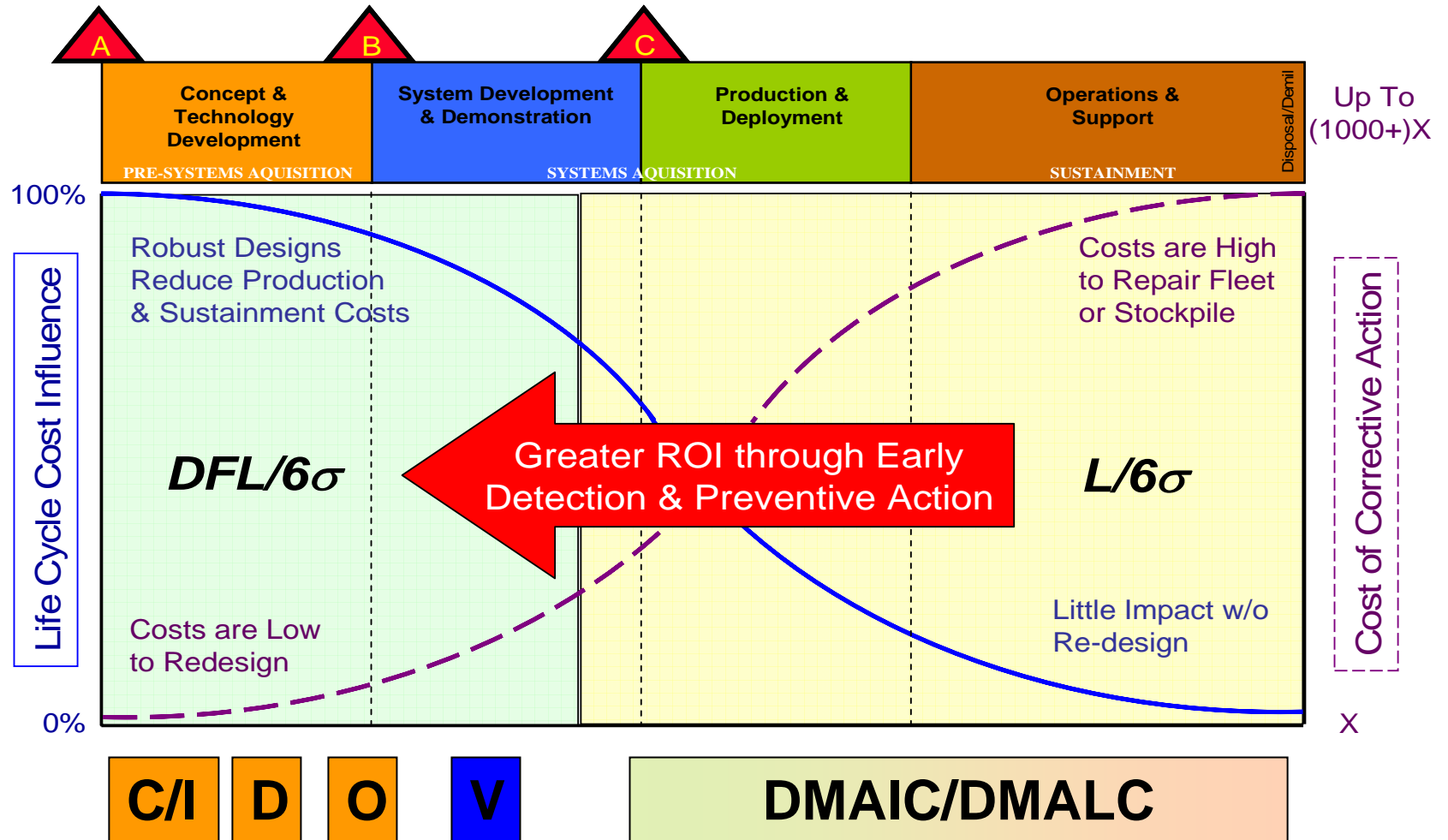
- Leadership Commitment/Involvement
  - ✓ Leadership Communication to the Workforce
  - ✓ Leadership Involvement to Prioritize Workforce Projects
  - ✓ Project Accountability through Management Chain to Align with Mission Objectives
  
- Overcoming Resistance to Change
  - ✓ Show how employee participation “makes a difference”
  - ✓ Consistent message between upper level and mid-level management
  - ✓ Convince employees not to fight change by making them part of the process, listening to their concerns and addressing issues as they arise

# *The ARDEC Journey Continues ...*

- **Design for Lean Six Sigma (DFLSS)**
  - ✓ **Innovative, Quality Products Meeting Customer Requirements**
  
- **Probabilistic Technology**
  - ✓ **Systematic Processes for Smarter Decisions in Situations of Insufficient Data**
  
- **Process Integration & Improvement**
  - ✓ **Manage and Improve Processes across Enterprise Using Enterprise Excellence (LSS, VoC and QMS)**



# DFLSS Influencing the Product Life Cycle



*“An Ounce of Prevention is Worth a Pound of Cure” – H. De Bracton*

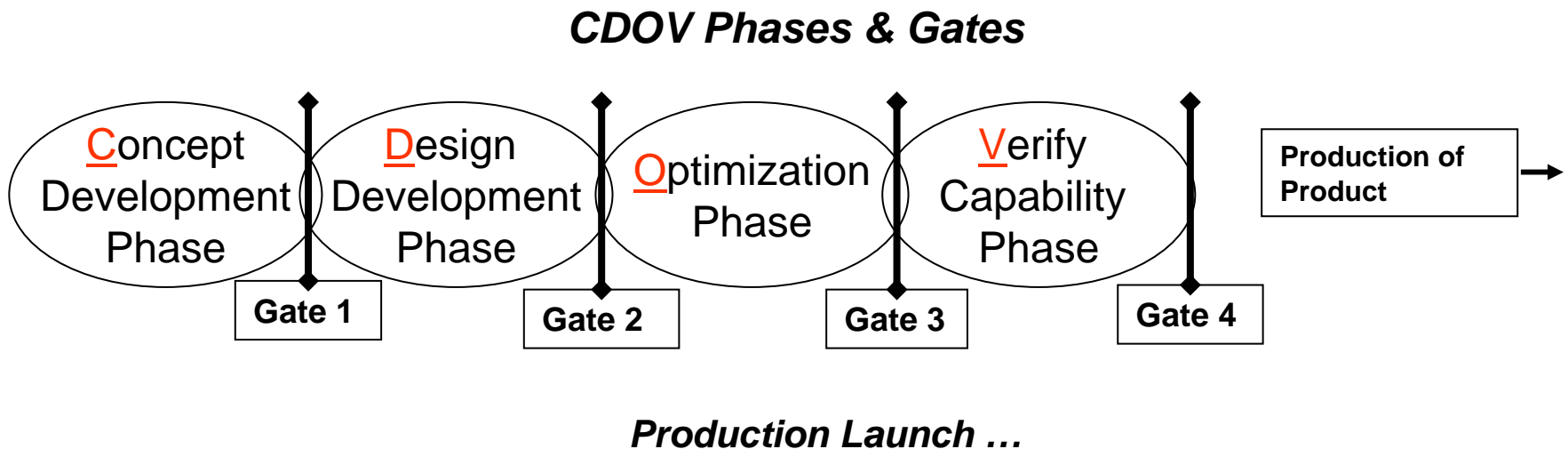
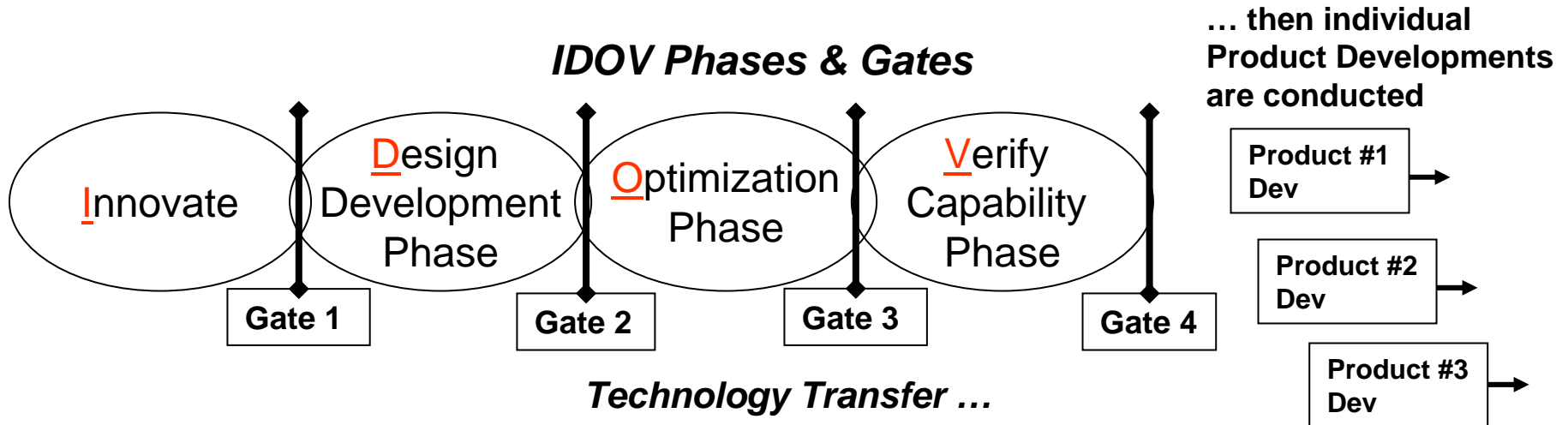
# Operational Definition of DFLSS

- Disciplined, Structured, Data-Driven Approach to Technology and Product Design, focused on Customer Requirements
- Integrate Probabilistic Technology tools when addressing uncertainties
- Focus on Critical Parameter Management (CPM)
  - ✓ Identifying Critical-to-Quality (CTQ) Requirements
  - ✓ Optimizing Robust Performance (S/N and  $\sigma$ )
  - ✓ Certifying Capability ( $C_p$  and  $C_{pk}$ )
  - ✓ Considering Manufacturing & Life Cycle Support Processes
- Integrates Three (3) Major Elements:
  1. Clear & Flexible Technology/Product Development Cycle built upon Systems Engineering Principles
  2. Portfolio of Tools & Best Practices and Defined Exit Criteria for each Phase/Gate
  3. Disciplined Project Management

**DFLSS is about preventing problems and providing breakthrough solutions to well defined requirements and not about fixing problems created in earlier phases**



# Phase – Gate Process Using DFLSS

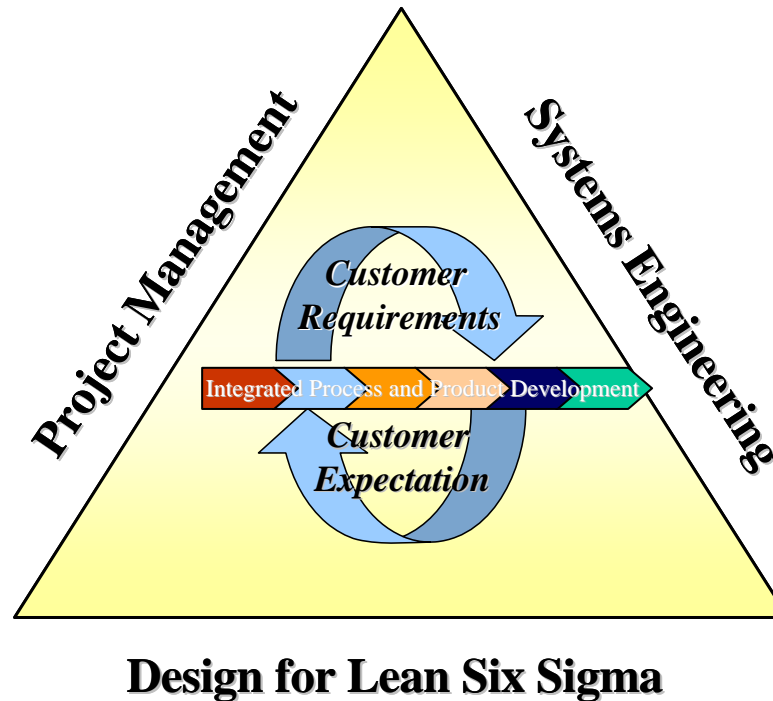


# ***Probabilistic Technology***

- **Probabilistic Technology is a Generic, Systematic, And Quantitative Approach for Making Reliable, Cost Effective Business or Technical Decisions for All Products and Services In Any Industry Or Domain**
  - ✓ **Considers and Incorporates Uncertainties in Decision Process**
  - ✓ **Minimizes Costs Associated With Change**
  - ✓ **Identifies And Eliminates Waste Effectively**
  - ✓ **Complements Existing Design For Lean Six Sigma Tools**
  - ✓ **Provides Critical Information at Early Phases of Decision Making When No Or Limited Data Is Available**
  - ✓ **Predicts Reliability, Failure Probability, and Risk at All Stages of Decision Making.**

## ***ARDEC Challenge***

- **Develop and Utilize a Disciplined ARDEC Process that Integrates Project Management, Systems Engineering and Design for Lean Six Sigma Tools as a Framework for Technology & Product Development**



## ***ARDEC LSS Take-a-Ways***

- **ARDEC Initiated LSS Over 6 Years Ago to get “Eyeballs on the Process” and to Deliver Quality Products to the Soldier in the Field**
  - ✓ **LSS Provides ARDEC a Mechanism to Solve Problems in an Effective and Efficient Manner and to Achieve Continuous Process Improvement Across the Entire Enterprise**
  - ✓ **ARDEC is Providing the Army with Meaningful Savings...Every Quality, Reliability and Process Improvement Equates to Real Dollars**
  - ✓ **ARDEC’s LSS Success has been Driven by Leadership Commitment to Cultural and Business Transformation**
  - ✓ **Workforce Applies LSS Tools for Fact Based Decision Making on a Daily Basis**
- **ARDEC’s Enterprise Excellence Journey Continues through Deployment and Integration of DFLSS, QMS, Systems Engineering and Project Management Best**

